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A P P E N D I X

to

P U B L I C H E A R I N G

before

ASSEMBLY COUNTY GOVERNMENT AND REGIONAL AUTHORITIES COMMITTEE

ASSEMBLY BILL NO. 4105

(Requires the Department of Environmental Protection to conduct a study of the cumulative impact of resource recovery facilities on the environment, and also appropriates $75,000 to the Department of Environmental Protection to conduct the study)

May 23, 1989
Palmyra Borough Hall
Palmyra, New Jersey

A P P E N D I X V O L U M E II

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New Jersey State Library

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PRESENTING

Biocomp, Inc.

RESOURCE RECOVERY SYSTEMS

A pollution-free resource recovery facility
that will solve your solid waste problems.



27 McDERMOTT PLACE, BERGENFIELD, NEW JERSEY 07621. 201/385-8371

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Introduction

WE CAN SOLVE YOUR SOLID WASTE PROBLEM

Today, nearly every city, county, village and town in the United States are faced with major decisions on where and how to dispose of their solid waste. These decisions, more critical than in the past because of a lack of reasonably inexpensive, reliable, and environmentally safe disposal alternatives, are compounded by waste disposal quantities having more than doubled in the last 30 years.

If your community is searching for answers to a solid waste disposal problem, this proposal will be of considerable interest to you. In it we present a disposal alternative which is:

Simple and reliable

Odor and vector free

Not energy intensive

Environmentally safe

Inexpensive compared to other disposal methods;

and also,

Recovers 75% of the input waste stream

Can be located near areas where solid waste is generated --

reducing hauling costs

Can dispose of municipal sewage sludge. (optional)

THE BIOCOMP SYSTEM

Presenting the **BIOCOMP** solid waste processing system, a disposal method which receives incoming waste directly from collection vehicles, shreds it to a predetermined particle size and biologically degrades it under aerobic conditions to a stable, odor and pathogen free, highly marketable fertilizer product called **FERTILSOIL.**

With this system, there is minimal separation of waste prior to processing. All domestic waste materials, including metals, rubber, plastics and glass, can be accepted These material are fully converted to the **FERTILSOIL** product, assuring 75% recovery of the incoming waste.

The **BIOCOMP** system, a highly desirable alternative to landfilling or incineration, has had a successful track record since 1955. It is currently gaining widespread recognition.

Three contributing factors for growing popularity of the process are:

1. The dramatic increase of landfill costs because of environmental regulations, equipment prices and hauling costs.
2. The failure of other methods of resource recovery owing to lack of market, too complicated a system, or other problems.
3. The rapid rise in fertilizer costs and need for organic materials.

BIOCOMP can process (450 to 2,000) tons per day of municipal solid waste, and can be scaled up to accommodate any volume of waste material. The **BIOCOMP** system can dispose of waste at a lower cost than a landfill or an incinerator in almost every case. A basic process, it does not suffer from the major process problems associated with some of the more complex resource recovery schemes. The end product is extremely valuable in light of rising costs of commercial fertilizer products. The micronutrients it normally contains have to be added at great expense to commercial fertilizers. Our plant is enclosed so there are no environmental problems associated with **BIOCOMP.** It is a technically safe method for solid waste disposal.

LOOK AT YOUR ALTERNATIVES

Available alternative systems include landfills or shredfills and incinerators, with or without recovery of heat, steam, fuel, aluminum, glass or iron. A careful look at the record of these alternatives reveals that major problems exist with each. For example:

Odor and victor problems

Leachate contamination of groundwater resources

Sky-rocketing costs

Limited availability of land

No recovery of resources

Problems with after use of site

Fire hazard and resultant air pollution

Dust and noise problems.

Shredfills:

Most of the same problems as landfills, plus:

More energy intensive

Higher capital costs

Incinerators:

Air pollution problems: dioxin emissions and toxic ash residue (since 1968, 200 of the existing 250 municipal incinerators were closed for non-compliance with air pollution standards)

Escalating costs

No resource recovery

Energy, Metal and Glass Recovery Systems:

Unreliable, complex technologies

Limited market

Unproven economics

Air pollution problems (steam heat recovery)

The **BIOCOMP** system exhibits none of these serious problems. Its many benefits can turn your solid waste into a valuable resource.

OUR PROPOSAL

To demonstrate that **BIOCOMP** is the solution to your municipality's solid waste problems, we would like to construct a "prototype" plant capable of processing 300 Or more tons per day of your waste. All we require from you is:

1. A site: cleared, filled to local flood criteria, and provided with access for collection vehicles;
2. A guaranteed minimum daily tonnage of waste;
3. A dumping fee per ton of waste.

If desired, we can finance and operate the entire facility. Other options include sharing of the capital costs or financing the operation through debt, equity or a combination of instruments. The tipping fee depends on the method of financing and the quantity of waste provided, land and construction costs.

THE BIOCOMP PROCESS: HISTORY, ECONOMIC AND ENVIRONMENTAL CONSIDERATIONS

The **BIOCOMP** process was pioneered over 25 years ago and perfected through the course of processing hundreds of thousands of tons of municipal solid waste into a useful soil end product. Today, the method is accepted and proven:

Two plants, each processing over 350 tons of solid waste per day have been operational;

The process had been approved by the Pennsylvania Department of Environmental Resources and the U. S. Environmental Protection Agency.

The end product, **FERTILSOIL,** has been sold on a large scale for use on pastureland, on all kinds of fruit trees and vegetables, and on golf courses.

The **FERTILSOIL** product has been approved by the U.S.D.A.

The **BIOCOMP** process solves a worldwide problem with minimum source separation (costly and inefficient) and without incineration or landfill (environmental pollution). It produces an end product required worldwide and, most importantly, in most cases can process the waste at lower cost than landfilling, incineration or other resource recovery methods.

With proven operational plants in both McKeesport, Pennsylvania and Jamaica, including many European operations and approval from the Pennsylvania Department of Environmental Resources, (one of the toughest regulatory bodies of its kind in the nation), the **BIOCOMP** process is the most reliable and effective way to dispose of your community's waste.

In 1983, **BIOCOMP, INC.** was founded as a subsidiary of TECHSCIENCE INDUSTRIES, INC., a Delaware Corporation to represent the **BIOCOMP** process. The company employed top level consultants to thoroughly investigate all aspects of the **BIOCOMP** system and is now prepared to construct and operate large scale plants (approximately 450 to 2,000 TPD) in municipalities where sufficient waste quantities can be guaranteed.

ECONOMIC CONSIDERATIONS: Cost Comparisons With Other Disposal Methods

Disposal Costs

The lower cost of waste disposal via **BIOCOMP** has recently generated

favorable interest. In 1955 when **BIOCOMP** was first utilized, unit disposal costs were high, relative to average landfill or incinerator costs. At that time, land was available and inexpensive, and pollution control was not a major consideration. The costs for all three disposal methods increased gradually until around 1972, when rising equipment costs, fuel costs, land scarcity, and pollution control regulations caused municipal landfilling prices to skyrocket.

Today, solid waste disposal by **BIOCOMP** processing is cheaper, in most cases, than landfilling or incineration. Our pollution-free process is not affected by pollution control regulations. Capital and operational costs have remained relatively low because of the simplicity of the process. As is evident in Figure A, the **BIOCOMP** system has come into its own economically.

Hauling Costs

Unlike a landfill or an incinerator, the **BIOCOMP** plant can be located in any industrially zoned area. Since it is smoke, odor and vector free, it does not have to be located away from populated residential areas. This can substantially reduce hauling costs -- the single greatest cost element of any solid waste collection/disposal program.

Fertilsoil Marketing

FERTILSOIL is a readily saleable product which is in active demand for farm crops, golf course upkeep, orchards, greenhouse operation, home gardening, and tree and plant nurseries. With a limited amount of advertising and publicity, the entire daily product of existing plants can be sold. Current high prices and projected increases in the cost of commercially produced fertilizers secure continued success for the **FERTILSOIL** product.

Fertilizer prices range from $200 per ton and are expected to rise as function of oil increases. Figure B shows a history of fertilizer prices since 1975. Prices, at their highest in 1975 because of a shortage of materials, decreased through the latter part of 1977 as supplies become available. Since 1977, prices have steadily increased expecting to become more pronounced as oil gets increasingly expensive.

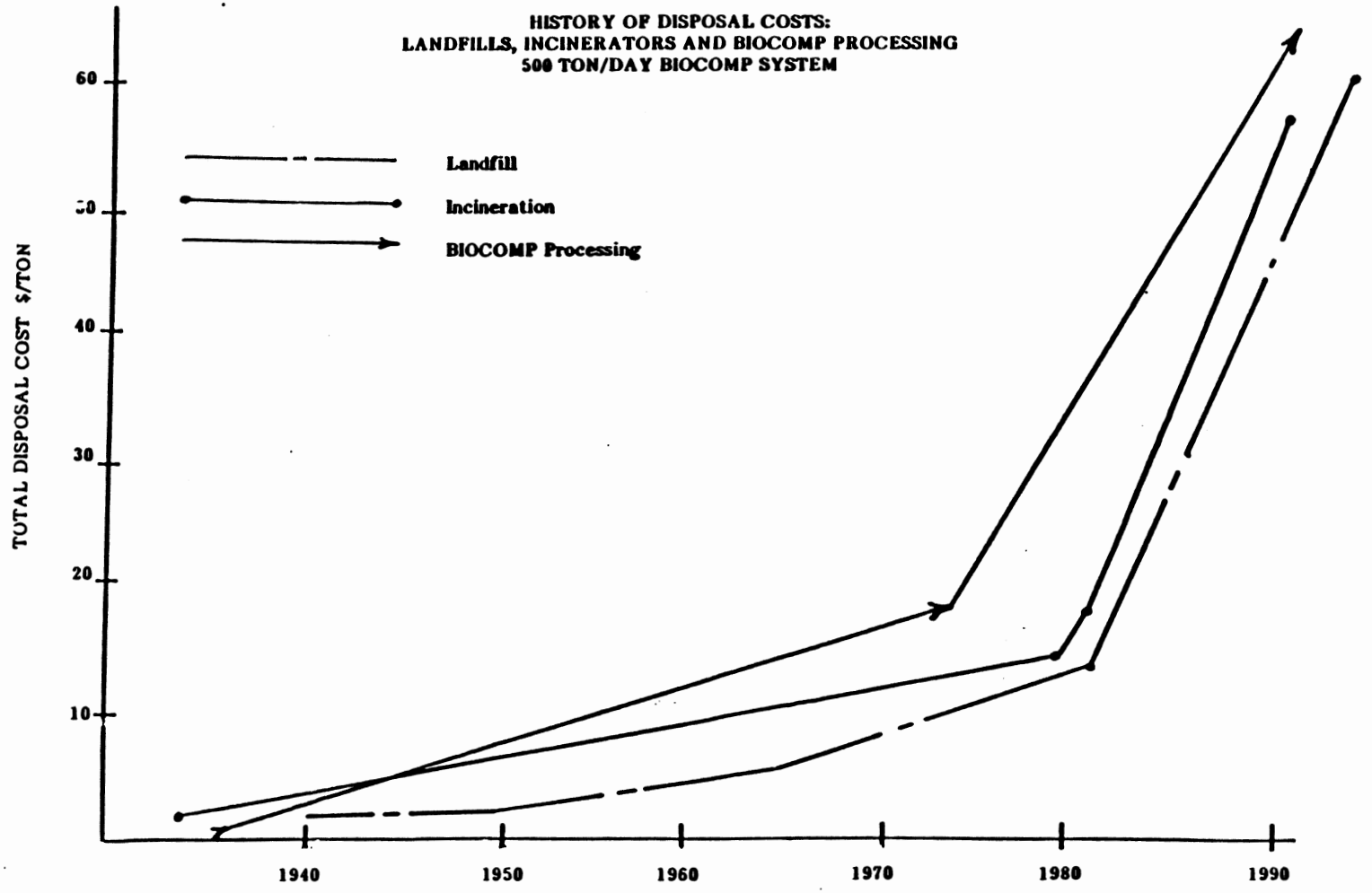

HISTORY OF DISPOSAL COSTS:
LANDFILLS, INCINERATORS AND BIOCOMP PROCESSING
500 TON/DAY BIOCOMP SYSTEM
TOTAL DISPOSAL COST $/TON
60
50
40
30
20
10
Landfill
Incineration
BIOCOMP Processing
1940
1950
1960
1970
1980
1990

Figure A

THE PRODUCT FERTILSOIL

The **BIOCOMP** process produces a dry, fine-particle compost material which the company calls **FERTILSOIL.** Its origin -- municipal waste (garbage, paper, metal, glass, plastic, leather rubber, tree and lawn clippings, etc.) — provides a consistently wide range of elements. The material has been tested by independent agricultural laboratories and has been found to contain a variety of nutrients and trace elements commonly found in fertilizers and fertilizer products. This range of elements is predictably consistent and is approximately as follows, based on the averaging of various laboratory analyses (testing methods and laboratory efficiency will produce varying individual readings).

FERTILSOIL
Typical Analysis

Total Nitrogen		4.8%
Nitrate Nitrogen	0.2%	
Ammoniacal Nitrogen	0.3%	
Water Soluble Organic Nitrogen	1.5%	
Water Insoluble Nitrogen	2.8%	
Phosphate (P205)		2.0%
Potash (K20)		2.0%
Chloride (Cl), Maximum		1.0%
Iron (Fe)		5.2%
Aluminum (Al)		1.4%
Manganese (Mn)		0.5%
Magnesium (Mg)		0.4%
Boron (b)		Trace
Copper (Cu)		0.3%
Zinc (Zn)		1.3%
Molybdenum (Mo)		Trace
Calcium (Ca)		3.2%

Important considerations beyond chemical percentages are the physical prop-properties.

Texture

The product is free-flowing, even after long storage, it does not "cake". This is partially the result of about 8% each of silica and mineral elements and nonbiodegradable materials that are received in the municipal waste. The product can be applied with a conventional spreader.

Ph

The product can be controlled within a range of 5.5 to approximately 8.4. Unless otherewise requested, the delivered value will be 6.7 to 6.9. The advantages for various soils and crops are obvious.

Color

The dark color of the product is advantageous. It has been found to raise soil temperatures at least 2% to 3% at night, increasing bacterial activity, stimulating growth, and retarding frost damage. This phenomenon occurs as the warmer air rises from the darker soil.

Moisture Content

The product has a slow absorptive rate for moisture, but once "wet", has a higher retentive capacity than average soil.

Elemental Release

The combination of materials — organic and inorganic — involved in the accelerated decomposition of the waste-conversion system provides the end product with readily soluble salts and slow release continuity.

There are precise criteria established by the various states for defining a fertilizer.. **FERTILSOIL** may or may not meet the generally accepted definition of "fertilizer" for every state. **FERTILSOIL** will be marketed as a fertilizer or a soil condiitioner, depending on state laws. The following definitions may help clarify this distinction:

Fertilizer - any organic or inorganic material of natural or synthetic origin that is added to a soil to supply elements essential to plant growth.

Soil Conditioner - any material added to a soil for the purpose of improving its physical condition.

The distinction between a "fertilizer" and a "soil conditioner," if finely drawn, is generally related to the content of three macronutrients: nitrogen (N), phosphorus (P), and potassium (K). Fertilizers and fertilizer-related products contain varying but significant amounts of these three elements as the following table shows:

	N-P-K Ratio	Sale Unit (lbs.)	Retail Price Per Ton	Estimated Wholesale Price Per Ton*
Rite Green Lawn Builder	16-4-8	44	$346	$208
Rite Green Lawn Fertilizer (50% organic)	6-6-6	44	$224	$134
Rite Green Citrus Special	4-6-8	44	$212	$127
Rite Green Lawn Fertilizer	8-8-8	44	$221	$132
Rite Green Lawn Fertilizer (100% organic)	6-6-6	44	$221	$132
Rite Green Lawn Fertilizer	10-10-10	44	$269	$161
Milorganite	6-2-0	44	$190	$108
Florida Brand Organic Topsoil	N/A	40	$118	$ 71
Greenleaf Organic Peat Humus	N/A	40	$ 84	$ 51
USS Plant Fertilizer	10-10-10	50	$319	$191
USS Lawn Treet (50% organic)	6-6-6	50	$239	$143
Hector Green (50% organic)	6-6-6	35	$399	$239
F.F.F. Turf Grass with Iron	16-4-8	35	$570	$342
F.F.F. (100% organic)	6-6-6	50	$319	$191
F.F.F. (50% organic)	6-6-6	50	$279	$167
Fertilsoil	4.8-2-2			$ 50

*Estimated at 60% of retail price; normal industry mark-ups range from 67% to 100%.

As can be noted from the above table, **FERTILSOIL** is lower in macronutrient content than other fertilizer products. **FERTILSOIL** is, however, rich in magnesium, zinc, sulfur, manganese, molybdenum, and boron, which are referred to as "trace" elements. Soil is commonly deficient in one or more of these essential trace elements, which are often present only in minute quantities. It is the presence of these trace elements in significant quantities which will make **FERTILSOIL** a highly marketable product. These trace elements will catalyze the macronutrient (N-P-K) content.

Product Users and Market Acceptance

An earlier market study prepared for **BIOCOMP** quantified the demand for the product by potential users for the State of Florida. That study and a subsequent update in 1978 calculated the annual market potential for Florida at 146,985,230 tons. The table below shows total calculated demand segmented by potential users.

Comparative studies will be made available for all regions of the United States subject to evaluation and contract potential.

FERTILSOIL
YEARLY MARKET POTENTIAL
STATE OF FLORIDA

Agricultural	Market Potential (Tons)	
Nurseries	746,600	
Top Dressing for Lawns	928,570	
Fertilizer		
Vegetable Crops	446,250	
Citrus	1,230,300	
Fruits and Nuts	1,300,390	
Commercial Woodlands	64,800,000	
Sod Production	185,120	
Cattle Feed	23,394,000	
Total Agricultural		93,031,230
Nonagricultural		
Land Reclamation	44,200,000	
Road Building	9,754,000	
Total Nonagricultural		53,954,000
Total		146,985,230

Source: Market Analysis, National Feasibility Corporation

Biocomp's initial marketing effort will be directed primarily toward the following agricultural users for a **BIOCOMP** facility.

Nurseries	746,600
Top Dressing for Lawns	928,570
Fertilizer	
Vegetable Crops	446,250
Citrus	1,230,300
Fruits	1,300,000
Total Tons	4,837,230

Even using this conservative market potential, **BIOCOMP** forecasted production of 168,300 tons of **FERTILSOIL** per annum by a **BIOCOMP** facility in the greater Boca Raton region (see projection as attached) will only represent a 3.5 share of the tabulation noted above.

This substance constitutes at least 50% of the fertilizer product. Blending and mixing operations in most states represent the best potential source for large purchases of **FERTILSOIL** for several reasons:

A. Demand for organic fractions in commercial fertilizer mixes by blenders is more than adequate to account for a 1200 ton per day **BIOCOMP** plants annual production.

B. Commercial blenders in most states are currently paying $70 to $90 per ton, plus freight, for processed sludge -- the only source for bulk organics.

C. Blenders have the financial resources to commit to preproduction purchase agreements. They also have the storage capacities to accept regular deliveries throughout the production year.

As part of its overall marketing plan, **BIOCOMP** also intends to take the following steps, concurrent with the sales effort to the blenders:

A. Obtain applicable state registration for direct consumer sales. **BIOCOMP** anticipates positive approval based on the analysis report of the National Bureau of Standards which determined the product to be nonhazardous by current EPA regulations.

B. Reserve a portion of the first plant's production for retail development. **BIOCOMP** will initially limit the market area for **FERTILSOIL** to insure a stable and continuous supply to retailers and to concentrate limited marketing resources.

C. Offer **FERTILSOIL** in two bag sizes: 5 to 10 lb. and 40-50 lb. sizes. These two basic sizes will provide for most of the specified applications at the consumer level.

D. Segment the market to maximize price levels within the broader fertilizer market. To this extent, **FERTILSOIL** could be identified as "organic", "independently tested", "registered", and a "compost". Composts generally have a favorable market image of being rich in natural nutrients.

Following this identified market strategy, **FERTILSOIL** willl be an established market product within two years.

Product Pricing

A comparison of selected fertilizers and fertilizer-related products (see page shows that both the wholesale and retail prices received for products are directly related to a number of factors. For fertilizers, the most important factor is the N-P-K ratio or macronutrient content of the fertilizer. As the nitrogen (N) content of the chemical fertilizer drops from 16% to 6%, the wholesale price decreases from a high of $342 per ton to $108 per ton. Similarly, products with lower or no stated N-P-K ratio bring lower wholesale prices ranging from an estimated $51 to $71 per ton.

Of the market surveyed, **FERTILSOIL** is most similar to Milorganite, which has a wholesale price of $108 per ton. Milorganite is dried activated sludge from local municipalities in Wisconsin.

In fact, the "Milorganite" experience provides a close parallel to expectations from **FERTILSOIL.** Although Milorganite has an N-P-K ratio of 6-2-0, its market strength comes from having a wealth of trace elements.

Milorganite has been produced and sold nationally for over 50 years. Recent increases in the costs of all fertilizer products have allowed the producers of Milorganite to significantly increase their own price. Since 1976, the per ton price (f.o.b. the plant) has increased from $57 per ton to $108 per ton. Producers are anticipating a similar price increase over the next four to five years.

The Company does not expect to achieve immediate market prices for **FERTILSOIL** in the $108 range since it is not an established product. Past sales from the Jamaica plant, however, indicate that such prices will eventually be attainable once the product is market "tested" and "accepted". As early as 1973, the Jamaican operation was paid $50 per ton (f.o.b. the plant) for 20 tons shipped to Disney World in Florida.

Based on prices of comparable products, past sales of an analogous product and potential purchasers who have indicated they would buy the product in the $55 per ton range, it is anticipated that initial individual sales could begin at wholesale prices ranging from $50 to $60 per ton.

Also shown in Figure B are historical and projected prices for **FERTILSOIL.** **FERTILSOIL** has sold for $35 to $90 per ton, with modest increases projected. It contains many micronutrients which must be added to commercial fertilizers at substantial expense. The value these elements offer plant growth is only now being recognized. Such recognition will further increase the worth of **FERTILSOIL** as will the increased cost of adding micronutrients to other fertilizers.

A separate publication has been prepared which further discusses market applications of **FERTILSOIL.** We believe it to be the fertilizer product of the future since it solves two worldwide problems at one time.

Environmental Considerations

Besides being less expensive, the **BIOCOMP** process creates none of the environmental problems characteristic of other disposal methods. Our pollution-free system actually converts a potential hazard into an environmentally beneficial product. Resource recovery is 75% with **all** elements returned to the earth as a nutrient-rich fertilizer.

Even with strict regulatory measures to safeguard the environment, the dangers involved with landfills and incinerators are by no means eliminated. Major adverse impacts are still possible. They may not become evident until its too late to do anything about them.

Figure C shows how the environmental effects of landfilling and incineration compare with those of the **BIOCOMP** process. No adverse impacts can be expected from the **BIOCOMP** plant, while landfills and incinerators, even when constructed in compliance with current regulations, can cause serious environmental damage. Some of the problems include:

Surface Water Quality

Landfills:

Runoff and leachates carrying oxygen demanding substances, nutrients, and toxic chemicals from the waste can contaminate essential surface water resources. Proven technology for eliminating this problem is not available.

Incinerators:

Particles from stack emissions settle into surface waters. They contribute to the "acid rainfall" problem.

COMPARATIVE COST ANALYSIS: COMMERCIAL FERTILIZER VS. FERTILSOIL

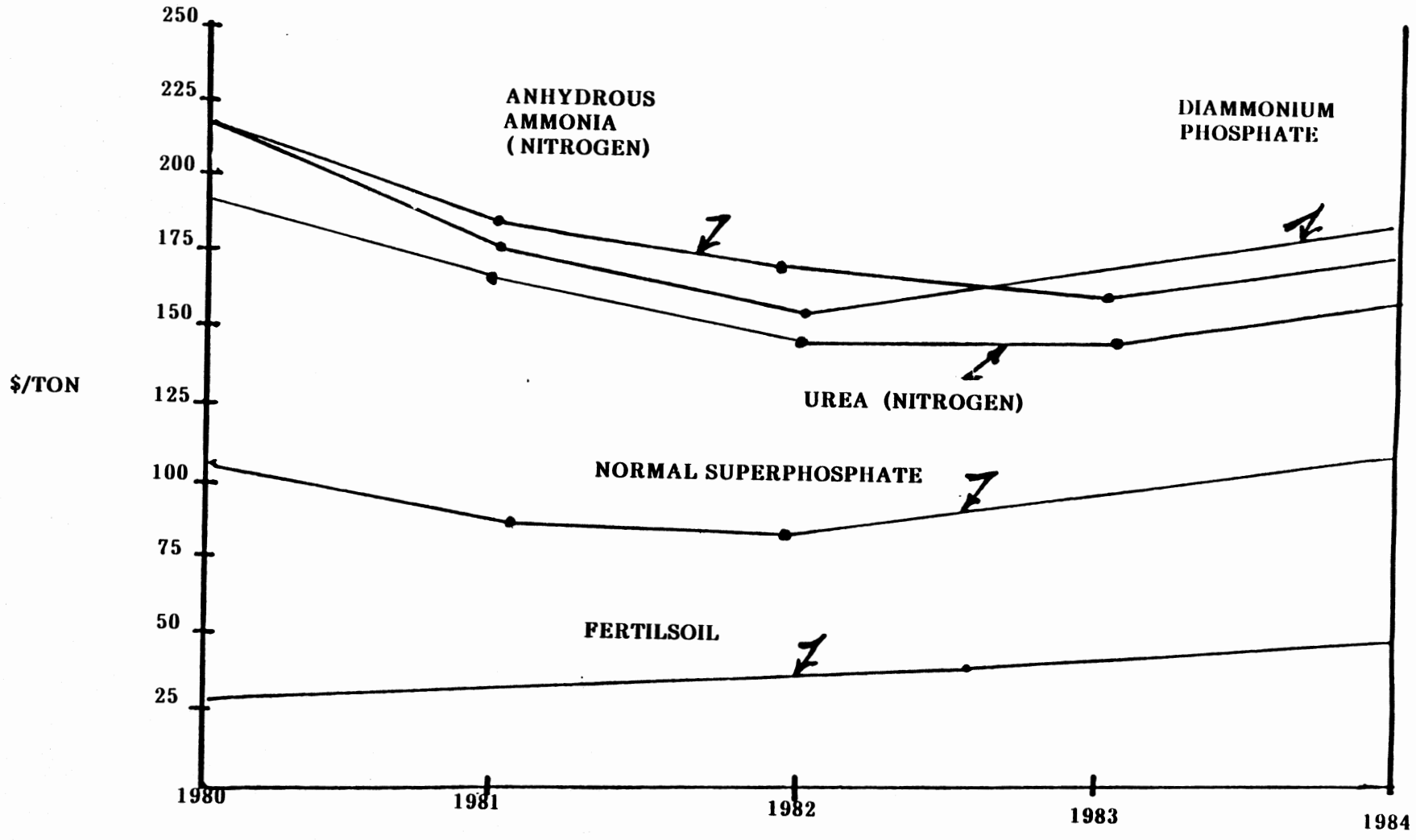


Figure B

BIOCOMP System

A fully enclosed process allows no runoff to come into contact with the waste. There are no leachate or atmospheric emissions to threaten water quality. No liquid wastes are generated since all water is consumed in the biodegradation process. The only wastewater is from employee facilities.

Groundwater Quality

Landfills:

Pollutant laden leachates generated by water percolating can seriously damage our groundwaters (our major source of drinking water). Problems may not become evident for many years because of slow groundwater movement and long term production of leachates. Landfill liners may be effective on the short term, but long term reliability is not known.

BIOCOMP System

There is no production of leachate from the **BIOCOMP** plant. The process is fully enclosed, therefore groundwater sources are protected.

Landfills:

Air quality is impacted by smoke from frequent spontaneous fires, characteristic of all landfills.

Incinerators:

Despite technology to control particulate emissions to meet air quality standards, maintenance problems with control equipment have resulted in major particulate emissions episodes. Also, while most air quality standards are based on particulate content, there are other substances that have been identified as present in the gases, some of which may have as yet unknown effects on human life. Since 1968, two hundred of the existing 250 municipal incinerators in the United States were closed because of air pollution problems. Air quality standards could not be met — even with the state-of-the-art control equipment.

BIOCOMP System

There are no odors. Raw waste is completely processed within two (2) minutes of delivery at the **BIOCOMP** plant. There are no emissions of smoke particulates.

Disease Vectors and Public Health

Landfills:

Landfills provide food and harborage (shelter and breeding) for common disease vectors such as rats, other rodents, flies and birds. In addition, surface impoundments on a landfill site, such as borrow pits or detention basins, can often breed

mosquitoes, with attendant disease problems.

Incinerators:

Because the waste material is burned almost immediately upon receipt, there are few vector problems with incinerator facilities.

BIOCOMP System

The **BIOCOMP** plant immediately shreds waste, placing it in windrow piles where it is frequently turned and re-piled. Thus, it is not a desirable habitat for disease vectors. Also, temperatures in the piles reach 170 degrees F, further reducing their desirability as a vector habitat. The plant is fully enclosed so that birds are not a problem.

Aesthetics (Appearance, Noise, Odor, Dust and Litter)

Landfills:

By their nature, landfills are aesthetically undesirable, have severe odor problems, are noisy and dusty because of equipment operations, and are plagued by blowing litter.

Incinerators:

Most municipal incinerators are massive, unattractive structures with huge smokey and sooty stacks. In some cases, the stack gases are foul smelling and problems with blowing litter are frequent.

BIOCOMP System

The **BIOCOMP** plant is attractive and has a low, clean profile. A pleasingly landscaped site, the entire facility is a desirable addition to any area. Because the waste is shredded and the biodegradation process is aerobic, there are no odor problems. There are no dust problems, and blowing litter will be kept to a minimum by fencing and careful placement of landscape features.

Future Site Use

Landfills:

When a landfill is completed, generally after the 20-year period, something must be done with the site. Problems with differential settling of the waste and gas generation restrict the possible uses. A new site, probably further from the major solid waste generation areas, has to be found. Thus, landfilling is only temporary solution to solid waste disposal.

BIOCOMP System

Once a **BIOCOMP** plant is constructed, it can remain at that site. No further site use considerations are needed. Best of all, the **BIOCOMP System** is a **permanent solution** to waste disposal problems.

Environmental Considerations in Your Area

The above comparisons will apply for the vast majority of landfill or incinerator installations. Each locality has unique environmental characteristics which may further compound the problems associated with those facilities. A site specific assessment can be performed by **BIOCOMP** consultants, to determine the environmental impact of your current disposal method, or other methods you may be considering, compared to the impact of the **BIOCOMP** plant.

ENVIRONMENTAL IMPACT

BIOCOMP PROCESSING VS. LANDFILLING OR INCINERATION

	LANDFILL	INCINERATOR	BIOCOMP SYSTEM
SURFACE WATER QUALITY	Serious adverse impact	Minor adverse impact	No impact
GROUNDWATER QUALITY	Major adverse impact	No impact	No impact
AIR QUALITY	Minor adverse impact	Major adverse impact	No impact
DISEASE VECTORS AND PUBLIC HEALTH	Major adverse impact	Minor adverse impact	Beneficial impact
AESTHETICS (Appearance, Noise Odor, Litter)	Major adverse impact	Serious adverse impact	Beneficial impact
FUTURE SITE USE	Major adverse impact	No impact	Beneficial impact

Figure C

425K

PROPOSED BIOCOMP FACILITY

PLANT OPERATIONS

The **BIOCOMP** plant is a simple operation involving four basic steps: (1) raw waste handling with minimal separation, (2) grinding, (3) decomposition in windrow piles and (4) **FERTILSOIL** product handling. A schematic of the **BIOCOMP** plant is illustrated in Figure D and is described below:

RAW WASTE HANDLING

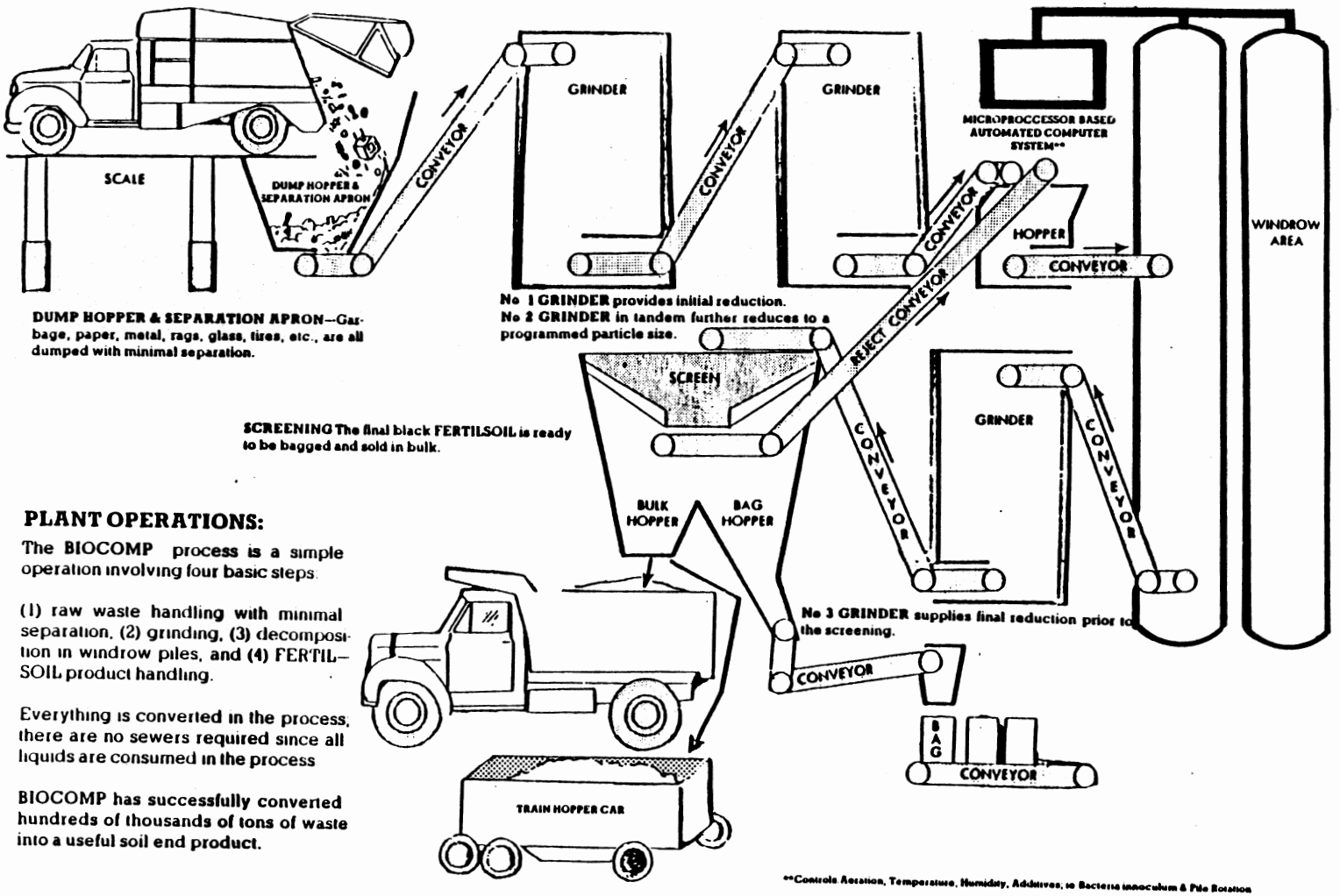
Collection vehicles entering the **BIOCOMP** plant site are weighed on standard weighing equipment. Their net weight of solid waste is determined and recorded. The trucks then proceed to the receiving area where they dump waste under the direction of the receiving supervisor. A specially designed dumping apron provides for separation of certain non-combustibles. Front end loaders then move the remaining waste into a dumping pit eliminating further handling of the waste by using an oscillating stainless steel plate conveyer. The material is moved onto rubber belt conveyers which carry it to the grinding area.

The receiving area and pit are maintained clean at all times, and problems with blowing litter are eliminated. All waste is processed immediately upon receipt so that odor problems do not develop.

GRINDING OPERATIONS

The incoming material from the pit area is fed by conveyer onto a two-stage grinder system consisting of two hammermills in series. The first one reduces the material to a coarse size, the second further reduces it to a size which best promotes biologic degradation. The grinder technology utilized in the **BIOCOMP** process has been developed through years of "hands on" practical experience. The grinders have been specifically modified from the standard factory-made product to provide trouble-free, low maintenance operation. Sophisticated grinder technology is one of the major strong points in the **BIOCOMP** process.

SCHEMATIC OF BIOCOMP FACILITY



DUMP HOPPER & SEPARATION APRON—Garbage, paper, metal, rags, glass, tires, etc., are all dumped with minimal separation.

No 1 GRINDER provides initial reduction.
No 2 GRINDER in tandem further reduces to a programmed particle size.

SCREENING The final black **FERTILSOIL** is ready to be bagged and sold in bulk.

No 3 GRINDER supplies final reduction prior to the screening.

****Controls Aeration, Temperature, Humidity, Additives, ie Bacteria innoculum & Pile Rotation**

PLANT OPERATIONS:

The BIOCOMP process is a simple operation involving four basic steps.

(1) raw waste handling with minimal separation, (2) grinding, (3) decomposition in windrow piles, and (4) FERTIL–SOIL product handling.

Everything is converted in the process, there are no sewers required since all liquids are consumed in the process

BIOCOMP has successfully converted hundreds of thousands of tons of waste into a useful soil end product.

Figure D

WASTE DECOMPOSITION

Ground waste is inoculated with a formula that expedites the breakdown of all elements in the waste. In order to diffuse inoculant through the waste, water is added as a diffusion agent. The inoculant is contained in a special tank of water that is under constant agitation. This produces a constant flow and a consistent mixture.

The shredded, inoculated waste is then conveyed to the composting area. Here it is windrowed. Biological activity, accelerated by the inoculant, breaks down the waste.

The bacterial action is aerobic (oxygen present) which prevents the formation of odor-causing gases. Aerobic decomposition generates great quantities of heat, thus temperatures in the piles reach highs of approximately 170 degrees F, hot enough to destroy most pathogenic bacteria. The active bacteria in the pile are not only capable of degrading organic material, but also metals, plastic, and other constituents resulting in a high trace-element content in the **FERTILSOIL** product.

Each of the piles are numbered. Readings of temperatures and moisture content are taken at six hour intervals. They are plotted on graphs to monitor the activity taking place in the pile through its various phases. Temperatures usually increase rapidly to approximately 170 degrees F, then slowly recede to the ambient or outside temperature. This cycle usually takes about three days. The pile is then "turned", repiled using special equipment, and moisture is added as needed. "Turning" promotes aeration which reactivates the bacterial decomposition cycle.

After about four turning cycles, a period of fourteen to sixteen days, the material reaches a black humus-like state and is fully stabilized. It still contains all of the basic elements that were present in the bulk waste.

FERTILSOIL PRODUCT HANDLING

The fully decomposed stabilized waste is now transferred by conveyor to a third grinder or hammermill. Here it is reground to eliminate coarse material. The reground product is screened to insure full elimination of all coarse particles, and finally fed into bulk storage or bagging equipment for later marketing.

The screening process efficiently handles about 85 percent of the reground waste. The 15 percent reject material not passing through the screen is conveyed to the rear of the original process line, where it is added to the incoming mass of freshly ground waste. In this manner, it is recycled back into the composting area for a second time, after which it is totally processed. One hundred percent of all incoming material is converted to **FERTILSOIL.**

PROCESS REQUIREMENTS

The entire processing requirements are electricity and water. Since no other fuel is needed, no burning or fumes result. Except for personnel facilities, no sewers for drainage are required. All liquids from the incoming waste are recycled into the windrow piles and consumed in the composting process.

Because 75 percent of the waste is utilized, there is no need for a sanitary landfill adjacent to the site. There are, however, some materials which cannot be processed in the **BIOCOMP** plant, and therefore require separate processing and disposal. These include pathogenic and toxic waste, and hospital waste, materials which generally require special care no matter what waste disposal method is used. Hospitals normally process their own waste by incineration or dispose of it at sites designed for that purpose. Similarly, generators of toxic or chemical waste are required to dispose of these wastes in special hazardous or toxic waste disposal facilities. As with other solid waste programs, **BIOCOMP** will not take large items such as automobiles.

WASTEWATER SLUDGE OPTION

Disposal of sludge from sewage treatment operations is rapidly becoming one of the most costly aspects of wastewater treatment. A number of alternative sludge disposal methods have been investigated, including landfilling, incineration, landspreading and notably, composting. Sludge from secondary or tertiary treatment, can be added to the **BIOCOMP** process at a point just following the second stage grinding. In fact, the addition of sludge is of substantial benefit to the **FERTILSOIL** product. Ideally, the **BIOCOMP** plant should be located adjacent to the sewage treatment plant so that sludge from the plant can be easily transported to the facility.

Besides sewage sludge, other problem waste can be handled easily and economically by the **BIOCOMP** process. With a slight modification, the **BIOCOMP** process can handle the special problems of waste from food processing plants or agricultural discards such as tomato culls, cattle manure, etc. It is actually possible to consolidate all waste disposal operations for an area into a single site.

EMERGENCY PROCEDURES

The **BIOCOMP** plant, designed with a sufficient backup, can function at full capacity with a major piece of equipemnt out of operation. In plants where large quantities of waste are processed and continuous operation is critical, emergency electric power is provided by standby diesel units.

BUILDING AND FOUNDATION

Figure E shows plan and profile views of a 200 tons per day **BIOCOMP** plant. The building basically consists of three areas. These are: receiving, grinding and screening, and the windrow pile area. The receiving area includes the dumping pit, the oscillating stainless steel plate conveyer and the rubber belt conveyer. This area encompasses approximately 10,000 square feet and has sufficient space for five collection vehicles to dump waste at any given time.

The grinding and screening area, approximately 8,000 square feet, contains the two-stage grinders for incoming waste, the final grinder and screening equipment, and the bagging and bulk handling equipment. This portion of the building has an eave height of approximately 30 feet, with a roof made of translucent panels for adequate daytime light.

The windrow pile area encompasses approximately 43,000 square feet, providing storage for twenty days accumulation of waste in various stages of composting. This area of the building has eave heights of fifteen to twenty feet and is designed to accommodate the equipment that transports the material and "turns" the windrow piles. The walls in this area are concrete. Their height of eight feet minimizes damage caused by the waste handling equipment.

A standard prefabricated warehouse, the facility has the appearance of a typical commercial/industrial installation. Concrete foundations and floors allow for highway-

TYPICAL PLAN FOR A 200 TON PER DAY FACILITY

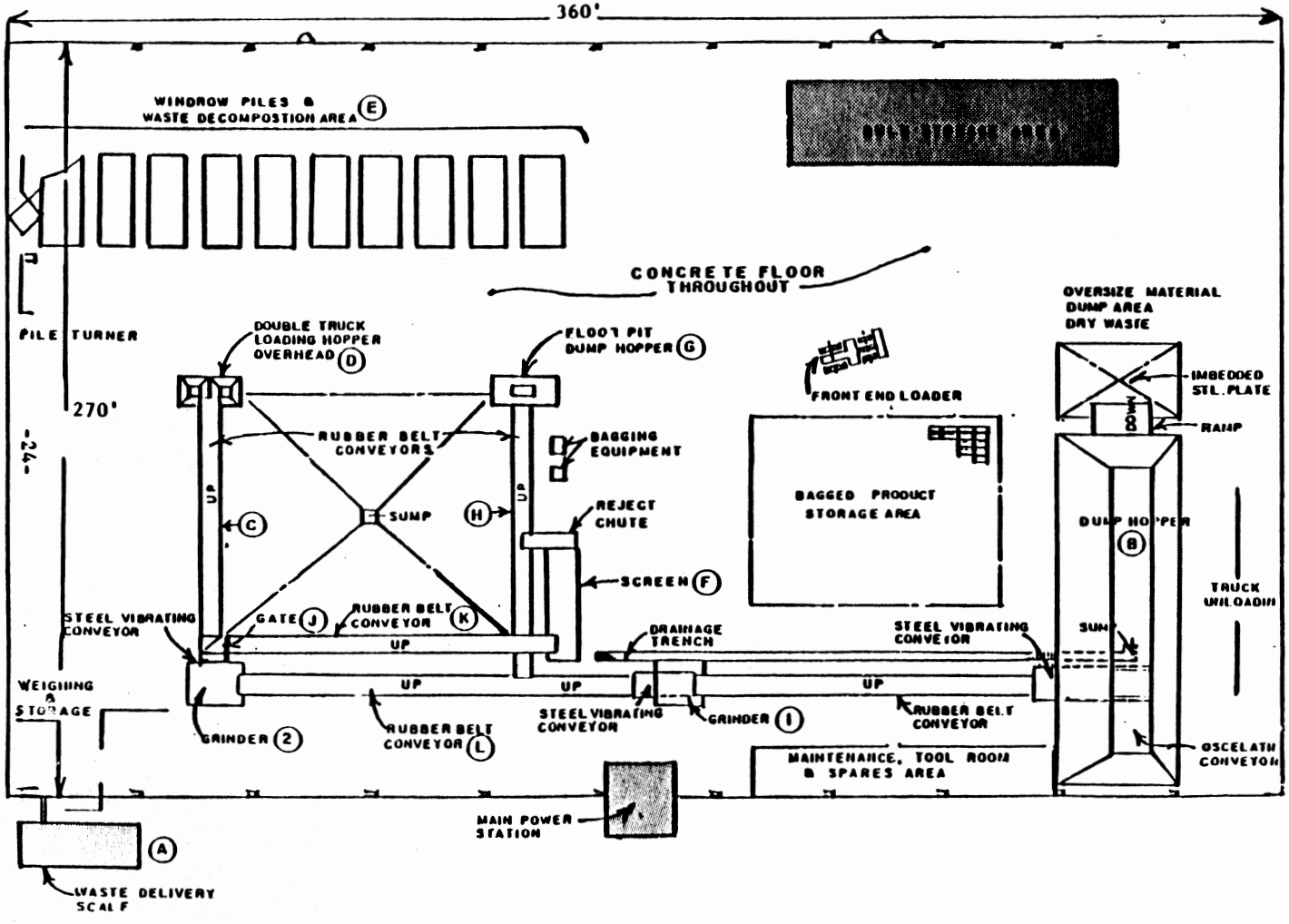


Figure E

PROFILE VIEW FOR A 200 TON PER DAY FACILITY

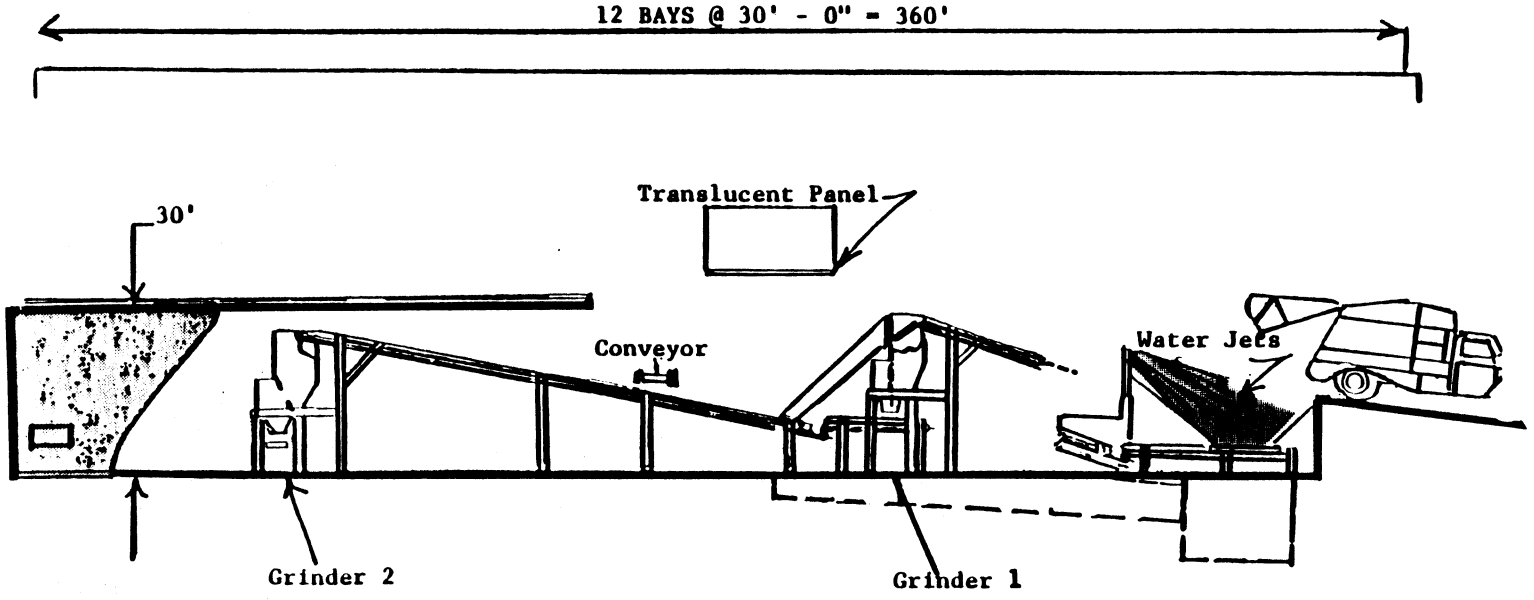


Figure E (Profile view)

type loading, permit heavy equipment to move freely throughout the building, and provide a surface which is resistant to damage. Most important, the concrete floors assure consistency in the end product and prevent leaching of any contaminated liquid into the soil.

The interior of the building is maintained in a clean, sanitary condition. All areas of the building are odor free because the waste is shredded immediately and the time between dumping and placement in the windrow piles is relatively short.

SITE REQUIREMENTS AND FEATURES

The **BIOCOMP** large scale plant requires a site that is approximately thirty acres, relatively level and filled to local flood criteria. It should be located as near as possible to the centers of solid waste generation. **BIOCOMP** consultants can assist your community in determining the best site location based on minimum hauling costs. The site can be in any industrially zoned area and does not necessarily have to be located away from residential areas. Typically, it should be near a major highway with adequate provisions for ingress and egress of heavy vehicles.

The site would be beautifully landscaped, including a testing and garden area where the **BIOCOMP** product will be demonstrated on various crops, flowers, etc. The entire area would be fenced in, preventing unauthorized entrance or litter from blowing away. Adequate parking for plant employees and visitors will be provided, as will sufficient space for moving about the refuse collection vehicles, and the vehicles transporting **FERTILSOIL.**

INTERFACE WITH LOCAL SOLID WASTE MANAGEMENT PLAN

Many states now require local solid waste management plans for selected cities and counties. These plans are mandated by federal legislation, such as the Resource Conservation and Recovery Act of 1976 (RCRA), the Safe Drinking Water Act, and the Water Pollution Control Act amendments of 1977.

BIOCOMP staff members and consultants are well qualified in the development of municipal solid waste programs and can assist at all levels from designing or updating individual collection routes to site selection for the **BIOCOMP** plant.

> **NOTE:** In a firm proposal to a specific community, this section would discuss the local solid waste management plan, updated as necessary to include the **BIOCOMP** plant. Where no plan exists, this section can be used as input around which the community can develop a solid waste plan.

ECONOMICS AND FINANCING

CAPITAL INVESTMENT

Site specific factors and the current rate of inflation make it difficult to develop capital cost figures which will remain accurate for any reasonable period. However, for the present purposes, we can estimate that capital costs, including building, equipment, utilities and architect/engineer fees, but not including the cost of the site and fill to meet local flood criteria (furnished by municipality) will be approximately $40,000 per ton/day of capacity.

This investment is considerably lower than that of a landfill, incinerator, or any resource recovery plant meeting current pollution control requirements. Currently, costs for energy and resource recovery facilities range from $70,000 to $150,000 per ton/day capacity or a maximum of $300 million to dispose of 2,000 tons per day. Much of the investment for landfills is for pollution control features such as liners, underdrains, leachate treatment systems and runoff control systems, none of which is required for the **BIOCOMP** plant. Availability and costs of land are also major factors.

OPERATION AND MAINTENANCE

The cost of operating and maintaining the **BIOCOMP** plant, including labor, materials, water and power is approximately $50 per ton for a 1,000 ton per day plant.

TIPPING FEE

In order to make an economic comparison between our process and other disposal methods, the tipping fee is used as a common denominator. It represents a community's unit cost of disposal via **BIOCOMP** and can be directly compared with unit costs of other methods. The fee will vary with construction costs and the method of financing, but will be within the range of $45.00 to $60.00 per ton. Compare this with your current method of disposal or other proposed methods meeting all environmental requirements.

ALTERNATIVE FINANCING ARRANGEMENTS

There are four basic methods by which the **BIOCOMP** plant can be financed. These are summarized as follows:

Standard Financing

The standard method of financing a **BIOCOMP** plant involves full ownership by **BIOCOMP.** Our company will furnish all necessary capital, labor, materials and supplies to construct and operate the plant. The municipality must furnish the site, filled to local flood criteria, guarantee a minimum quantity of solid waste, and pay a tipping fee for all waste processed at the plant.

Industrial Revenue Bonds

The **BIOCOMP** plant can also be financed through industrial revenue bonds. By this method, a bond company will sell bonds based on the merit of the process. **BIOCOMP** is obligated to repay the accrued debt, and will operate the plant. The municipality lends its name to the bond sale, but has no financial obligation.

Municipal Bonds

A Third financing alternative involves purchase of the facility by the municipality through issuance of general obligation bonds, revenue bonds, or special assessment bonds. The tipping fee would be adjusted for bond repayment by whatever means deemed best by the municipality. **BIOCOMP** would operate the plant through a management contract or lease with the municipality.

Other Methods of Financing

The **BIOCOMP** plant can also be financed using combinations of, or variations on the above alternatives. The specific financing arrangements desired by your community can be negotiated.

CONSTRUCTION CONTRACT AND SCHEDULE

Our firm proposal to your community will include a construction contract, the nature of which will depend upon the financial arrangements desired by the community. The contract will be designed to insure that a good relationship is maintained between the parties of the agreement, **BIOCOMP** and your community.

MANAGEMENT CONTRACT

Under all financial arrangements, **BIOCOMP** will operate and maintain the **BIOCOMP** plant. When owenrship is vested with the community, our final proposal to your community will include a Management Contract in this section to outline the terms of plant operation.

GUARANTEE

BIOCOMP will provide contracting communities with performance guarantees regarding the reliability of the conversion process, disposability of end product, and conformance with local, state and federal pollution control regulations.

436X

TESTIMONTIALS AND ENDORSEMENTS

ON COMPOSTING

"This method of Solid Waste Disposal, with an end product of fertilizer, is the one recommended by our commission as offering the best solution to solid waste disposal as a result of our three-year study."

Environmental Commission
Glassboro, New Jersey

"I was quite favorably impressed with your composting process, especially the simplicity with which the system operated. The lack of odor at the plant and the quality of the finished product are to be commended."

J. Carroll Duggan
Environmental Scientist
Tennessee Valley Authority
Chattanooga, Tennessee 37401

"Based on experience in solid waste disposal systems such as incineration, landfills, the more recently promoted anaerobic fermentation or methane generation, and ocean dumping, the aerobic or composting system under consideration, is decidedly more efficient, more economic and has less environmental impact. The product from aerobic digestion is useful and profitable and installation and operating costs are favorable compared to other disposal systems. Incineration and landfill systems have self-limiting operational lives, materially contributing to their costs.

"About the product: The composted product is an excellent soild conditioner with high humus content and usually high moisture retention qualities. It is rich in the many micronutrients necessary or essential for plant growth and health."

J. F. T. Berliner, Ph.D
Chemical and Engineering Consultant
Registered Professional Engineer
2501 N. Sheffield Street
Chicago, Illinois 60614

"Nigeria with a population of over 80 million people has one of the worst problems about efficient handling of city gargage.

'In an effort to supply technical and budgetary information, we approached the United States Embassy in Lagos, Nigeria.

"The name of your company was readily given to us as a leader in this field."

J. A. Makanjuola
Managing Director
Josbaf Trading Company, Ltd.
Lagos, Nigeria

"I wish to confirm my full support for the installation in this country of a BIOCOMP plant principally to help improve sanitation in our country and also to provide the needed ingredient for our main policy of 'Operation Feed Yourself. ' "

Lt. Col. A. H. Selormey
(Commissioner for Health)
Republic of Ghana

"Our review of your waste handling process indicates that the FERTILSOIL should not pose a hazard to our livestock population. Accordingly, you are authorized to import the product without Agricultural restriction."

Donald Miller
Acting Director
Programs Development and Application
United States Department of Agriculture
Hyattsville, Maryland 20782

"We are extremely interested in the process and the product produced. From our experimental use of this material, we find that we can take completely worn out land or almost pure sand and bring it back to a state of productivity."

G. A. Furgason
General Manager and Vice President
Morris Cattle Company
Ocala, Florida

"Ever since the inception of your company, we have been using your fertilizer on our golf course and I would like it to go on record that it is an excellent product, and in fact this is one of the reasons why our golf course always looks green and beautiful."

J. Ziadie
Chairman of Greens Committee
The Caymanas Golf and Country Club, Ltd.
Spanish Town, Jamaica, W.I.

"There are more plant nutrients thrown out in our wastes than are contained in all the commercial fertilizer used by our farmers today."

Hon. Russell E. Train
Administrator, U. S. Environmental Protection Agency
Prepared for delivery at the International Waste Equipment and Technology Exposition
Chicago, Illinois June 2, 1976

"FERTILSOIL for some reason stimulates root growth of bedding plants almost beyond belief. In fact, to the point that by using it, root binding in small containers could be a problem. This action in the ground in larger plants would be most advantageous in my opinion."

M. B. O'Bryant
Tahitian Plan-O-Rama
Princeton, Florida 33030

"During the past two years, we have used several tons of your product, **FERTILSOIL**, on our groves. The results have been very satisfactory and we anticipate the use of some 20 to 30 tons during 1975 of this same product."

Irving L. Jones, Jr.
President
All Organics, Inc.

"Observations of nursery beds also suggest that very shallow furrows filled with **FERTILSOIL** is a very favourable medium for rapid germination of tomato, cabbage, and pepper. The advantages of using **FERTILSOIL** have proven so encouraging to date, that the range of crop investigations involving this product have been increased to include field scale trails of Schillion, Tomato, Cabbage, Sweet Potato, and Corn."

Horace W. Payne
Agronomist
Regional Field Experimental Programs
Faculty of Agriculture
Mona, Jamaica

439X

AVAILABLE EXPERIENCE IN COMPOSTING PLANTS

IN BOTH U.S.A. AND FOREIGN COUNTRIES

DEFINITION OF BIOCOMP'S TECHNIQUE OF COMPOSTING

Composting, a process in which micro-organisms break down organic material to a stable humus-like material, is distinguished from digestion or fermentation in that the decomposting material is primarily discrete solids with open pore spaces, rather than solids in a liquid or semi-liquid environment. Composting processes vary from anaerobic to aerobic and from mesophilic to thermophilic decomposition. **BIOCOMP, INC.** uses thermophilic composting in an aerobic environment. This process provides the fastest, most complete decomposition of the oxidizable or putrescible matter.

Compost cannot be considered a fertilizer, but rather a soil conditioner with high organic content, water-holding capacity, and improved nutrient-holding capacity. **BIOCOMP's** compost can be made into a fertilizer by the addition of certain additives and other enriching materials.

Our composting technique will permit the recycling of municipal waste materials back to the soil without environmentally damaging pollution of water or land resources. It is an excellent soli conditioner for the growth of plants, shrubs and other park scenery.

The BIOCOMP Process

The **BIOCOMP** process was developed in the early '50's. In 1955, the first **BIOCOMP** technology solid waste conversion plant was constructed in McKeesport, Pa. This plant ran at a rate of 150 tons-per-day until 1959.

Improved upon, then moved to Jamaica in 1962, it operated there at 350 tons-per-day for several years. The plant now runs periodically as a demonstration plant to show the feasibility of the process.

European Experience

Solid waste management in Europe has long been lauded as a model of efficiency and appropriateness. The argument or explanation has been that, in densely populated Europe, one simply must be correct about solid waste management, and the Germans, Swiss, Dutch and other Europeans are correct. 440X

Two examples used to substantiate the success of composting are: (1) Nine composting plants have begun operation in Germany since World War II, (2) the success of composting manufacture and sale by VAM or Waste Transportation Corp., Amsterdam and Wijster, Holland. VAM makes 160,000 of the 200,000 tons of municipal compost each year. Some eight cities and towns, including the capital of Den Haag (1 million inhabitants), deliver all their municipal waste to the organization.

Composting is more applicable to a city's domestic refuse than to commercial or industrial refuse. It is not generally appropriate to debris from construction and demolition. Thus, most European composting plants accept only domestic refuse and have alternate or supplementary facilities for handling noncompostable parts of commercial and industrial refuse. Even with domestic refuse, a considerable percentage (15 to 30% by weight) is not compostable and must be removed before the compost can be sold or used.

SURVEY OF EUROPEAN COMPOSTING PLANTS

GERMANY

Blaubeuren: Population Served, 20,000; Type of Plant, Windrowing of Shredded Refuse — Blaubeuren is a small community in the Alb Mountains of Germany. A large cement plant in the city uses the calcareous rock of the surrounding area as raw material for cement manufacture. Dr. E. Spohn, mill manager and part owner, has long believed in returning the ore-stripped land to agricultural productivity and has advocated and demonstrated the value of compost.

Blaubeuren does not produce enough compost to reclaim the land at the rate it is being consumed. Composting is rather expensive for such a small community, and no tangible, direct measure of the value of land reclamation is yet available. Not only is Dr. Spohn personally knowledgeable in composting technology, but he has equipped his cement manufacturing operation with a research laboratory and an experimental farm for the study of compost utilization.

The Blaubeuren plant is small and unpretentious. Incoming raw domestic refuse is run through a Dorr-Oliver rasper. Burnable uncompostable refuse is disposed of in a simple incinerator. The raw rasped refuse is piled into windrows, cured with

one or two turnings in 3 to 6 months, then used in the land reclamation research. Sewage sludge is sometimes trucked in and added to the ground refuse before it is put into windrows.

St. Georgen: Population Served, 14,000; Type of Plant, Windrowing of Ground Refuse -- St. Georgen is a small spa, or resort town, in the Black Forest, southwest of Stuttgart. The city's small compost plant takes the community's domestic and commercial waste, (thee is no industry other than tourist) plus sewage sludge, and converts it into compost. The refuse is handpicked for salvageable items, iron is removed by a magnetic separator, and the refuse is ground with a Buhler hammermill.

Noncompostable material (most commercial refuse) is burned in a 1.5 metric-ton-per-hour (1.65 short-ton-per-hour) incinerator. The ash is returned to the freshly ground refuse along with sewage sludge; and is arranged in windrows (about 10 ft. wide and 4 ft. high) then cured for 3 to 6 months.

About 1,400 cubic meters (1,800 cubic yards) of finished compost are produced yearly, and sold to home gardeners, truck crop farmers, and forestry nurseries. The net cost to the city though not reported, would appear to be high because of the small volume of waste handled plus the investments in both incinerator and composting equipment. The plant is neat and well run.

Stuttgart: Population Served: 75,000; Type of Plant: Windrowing of Ground Refuse -- The Stuttgart composting operation is similar in concept to those of Duisberg and Deidelberg.

This is the only German plant that was not conceived to take sewage sludge. The incoming refuse is conveyed from the storage bunker over a picking belt. When salvage prices are favorable, glass, cardboard, clean paper, or rags can be picked off. At present, only iron is removed with an overband electromagnet. The refuse goes to a Dorr-Oliver rasper and is abraded. It is then transported by truck some 50 to 100 years to the windrow area, where composting occurs. The material is t ned twice within about 3 months.

Citizens of Stuttgart may come to the plant and take, at no charge, small amounts of the compost for their homes and gardens. Most of the material, however, is sold to neighboring grape farmers.

At Stuttgart, composting is considered both a public service for homeowners and a demonstration of principles of conservation. The city government recognizes that composting costs more than alternative waste disposal methods but that it is an appropriate community expenditure, the same as supporting city parks or museums.

SWITZERLAND

Buchs: Population Served, 40,000; Type of Plant, Windrowing Ground Refuse — The Buch compost and waste-burning plant in Switzerland serves some 40,000 people in 16 communities in two countries (Switzerland and Lichtenstein). Located in the town of Buchs, population 5,000 the plant receives domestic refuse from the various communities. The composted product is marketed primarily to grape growers in the area.

Incoming refuse is first ground with a Buhler coarse hammermill. Iron is then removed with a magnetic pulley, and the refuse falls into a second hammermill for fine grinding. The refuse is then seived. (Scalpings are buried in an industrial waste landfill site.)

HOLLAND

Arnhem: Population Served, 134,000; Type of Plant, Windrowing of Ground Refuse — Composting is successful in Holland because the end product is utilized. Incoming domestic and compostable commercial and industrial wastes are run over a magnet for iron removal, shredded in a Dorr-Oliver rasping machine, then placed in concentric windrows by a pivoting belt conveyer. The unshredded material from the rasp, plus burnable, bulky objects and noncompostable industrial waste, is burned in an on-site incinerator (an operation similar to that of Schweinfurt).

Not all the freshly placed refuse is allowed to cure at the compost plant. At intervals, freshly ground refuse is bought by specialty farmers in the area and used in hotbeds. Like horse manure of old, this freshly ground refuse undergoes biological stabilization, producing heat and keeping the plant bed warm.

The refuse that is not sold is immediately piled into windrows about 4 or 5 feet high. After an initial heating, the windrow is turned, piled higher into a windrow 12 to 15 feet high, and curing is continued. The compost is then sold by the VAM organization.

U. S. EXPERIENCE

Norman, Oklahoma: The first plant using the Naturizer process was built a number of years ago by the Naturizer Company of Norman, Oklahoma. This plant and the later one in San Fernando, California, were taken over subsequently by SACS, Inc. (Salvage and Conversion Systems), which entered into a marketing agreement with Westinghouse Electric Corporation.

In 1965, these companies, together with Allstate Insurance Company, formed a new company, International Disposal Corporation, which incorporated the assets of SACS. The plant treated the 35 tons-per-day of mixed refuse from the city of Norman.

San Fernando, California: The San Fernando compost plant, built by Lockheed Aircraft Corporation and operated by General Conversions System Corp., was taken over by SACS, Inc., and finally by International Disposal Corporation, Shawnee, Oklahoma. The plant had a capacity of 70 tons-per-day of refuse but operated at only about 40 tons-per-day.

The California plant provided an afterburner on top of the composting unit to insure that no odors were to be discharged.

Compost was sold in bags and in bulk, as was its unique by-product, Sta-Soil. A water suspension of compost, chemical fertilizer, grass seed and shrub seed, Sta-Soil helped provide a blanket against soil erosion and allowed grass and shrubs to quickly take root.

Wilmington, Ohio: The 20 ton-per-day refuse composting plant at Wilmington was built by Good Riddance, Inc. A minimum of sorting is provided and two hammermill grinders are used in series. The ground refuse is composted in windrows, where it is turned weekly by means of a front-end loader.

Johnson City Project: In March, 1963, the Division of Agricultural Development, TVA, initiated a project called, "The Use of Municipal and Industrial Organic Waste in the Production of Soil Amendments and Fertilizers." The compost plant was to investigate the process as a method for disposing of wastes while reclaiming waste for the benefit of the land.

In August, 1964, the USPHS and the TVA agreed upon a joint research and demonstration project for composting solid wastes and sewage sludge. The Division of Health and Safety, (now the Office of Health and Environmental Science) collaborated in the detailed planning for the project. Under the agreement, TVA would have financed and constructed the composting plant. When the Solid Waste Disposal Act was passed in October, 1965, the Bureau directed that the proposed plant be financed from funds available under the terms of the Act to the Department of Health, Education and Welfare. Johnson City had been selected as the site for the composting project.

Residential wastes of 31,000 persons and 40% by weight of the commercial wastes are collected weekly in Johnson City by the Sanitation Department. Sixty percent of the homeowners, however, burn some wastes in their backyards. Others employ private collectors to provide supplemental service once a week. Street sweeping and brush are collected by the Street Department and deposited in the city's landfill.

Industries in Johnson City generate about 130 tons of solid wastes weekly. The majority of these are hauled to disposal sites by employees. The Sanitation Department collects from seven industries totalling about 9 tons-per-week.

Wastes collected by the Sanitation Department are delivered to a transfer station. Here they are transferred to a compaction trailer for hauling to the compost plant or the landfill. One load per day of commercial material, an average of 10 tons, is routinely hauled to the landfill.

Hospital wastes and some yarn wastes from an industrial establishment also do not reach the composting plant. When the compaction trailers are out of service for any reason, the residential collection trucks deliver their refuse to the composting plant. From January, 1968, through June, 1969, the compost plant received an average of 33.8 tons-of-refuse-per-day for 5-days-per-week. Added to the daily tonage sent to the landfill, this equals about 2.8 lbs per-capita-per-day on a 5-day week basis and 2 lbs. per-capita on the 7-day week basis.

Refuse is delivered to the plant, 5.4 miles distance from a central transfer station in Johnson City. The refuse is weighed, dumped into a hopper in the

receiving building or onto the paved apron and later moved into the hopper by a front-end loader. Items such as mattresses, bed springs, bicycle frames, wire and plastic bags which might block or entangle the equipment are removed. A 6 ft. wide plate conveyer forms the bottom of the hopper. Advancing at a rate of 2 to 10 ft. per minute, it carries the refuse under a vertical leveling gate and drops it onto an elevating belt which carries it into the processing building. The receiving building is roofed and enclosed on three sides. The belt conveyer is covered between the receiving and the processing building. It houses all of the refuse processing operations, the sludge thickener, and the refuse-sludge mixer. The elevating belt conveyer from the receiving building becomes horizontal after it enters the upper level of the processing building. It carries the refuse past a picking station at a rate of 60 ft. minute.

Two or more pickers manually remove bulky paper, rags, glass, plastics, metals and other noncompostable material. The belt then passes around a magnetic pulley where cans and other ferrous metal objects are separated from the refuse.

Some plants may employ a primary grinding operation prior to magnetic separation to reduce the amount of compostable material that might be trapped by the ferrous materials and removed with them. The rejected material, including that removed at the receiving building, is weighed and hauled to the city landfill. About 27% of the incoming material was rejected during the period of this report because no salvaging was practiced.

After removal of noncompostables, the refuse proceeds to either a hammermill or a rasping machine for comminution. These are placed to allow alternate use for efficiency and cost comparisons. The hammermill, a swing hammer type, has 44 chisel point hammers, each weighing 21 lbs. The mill is driven at 1,150 rpm by a 250 horsepower electric motor and has a rated capacity of 12 ton/hr. The rasping machine is similar to that developed by the Dutch NV Vyuilafvoer Maatschappij (VAM). It is made up of a covered cylindrical housing 18 ft. in diameter and 8 ft. 6 in. high.

Revolving arms attached to a vertical shaft scrape the refuse against projecting pins in the floor and on the wall of the housing, forcing it through a perforated floor.

Refuse as received has an average moisture content of 39%. When using the rasper, water is added in the receiving hopper to presoften cardboard. Water is also added in the rasper. When the hammermill is used, water is added after grinding, but before the refuse-sludge mixer. The ground refuse or refuse-sludge mixture is adjusted to a specific wet weight. Raw or partially digested sludge containing 3 to 5% dry solids is pumped to the composting plant from the nearby sewage treatment plant. When using sludge from the same population generating the refuse, the water content is greater than the needed 50 to 60% moisture content. Thus, sludge dewatering must be provided. For sanitary reasons, it is impractical to add sludge to the refuse at any point where the workmen come into contact with the refuse.

Sludge is thickened in a Permutit Dual Cell Gravity (DCG) Solids Concentrator which uses a revolving filter of fine mesh nylon cloth. As a plug of sludge revolves inside the filter, it becomes dewatered, rolls up and is discharged. Special coagulants (polyelectrolytes) are used to condition sludge for filtering. The filtrate is returned with other liquid wastes to the sewage treatment plant where it is treated with incoming sewage. The tickened sludge is discharged to a conveyer belt which in turn discharges it to the mixer.

Refuse and thickened sludge are mixed in a horizontal cylindrical mixing drum. Internal vanes then carry the mixture to the discharge end. From the mixer, the material is carried to the ground refuse-sludge storage bin, loaded into dump trucks and transported to the windrow area.

The ground refuse-sludge mixture is composted in one of the 34 windrows located on a graded, stabilized area. They are hay-stack shaped to help shed rain, contain the heat of decomposition and for easy aerating. As the plant operates 5 days a week and one windrow is laid down each working day, each windrow can remain on the field for up to 45 days. Active composting time in the field is 35 to 44 days.

While the material is composting, it is mechanically turned 8 or more times. The patented machine straddles a windrow, turning it as it proceeds from one end to the other. Turning aerates and supplies oxygen for proper aerobic decomposition. To maintain the desirable 50 to 60% moisture content, water can be added as needed before turning.

After the material has composted in the open field for up to 7 weeks, it is turned, taken from the field and deposited in the curing and drying shed. A drying period follows. The compost is screened and reground as required using a vibrating screen and a hammermill. It is either stored in the unground and unscreened state or in the finished condition in stockpiles.

Summary

These operating experiences in the U.S.A. and Europe prove the acceptance of the **BIOCOMP** process using windrows as the final step in production of soil conditioners. Although the largest plant built to date is 350 ton-per-day, a 2,000 tons-per-day plant is entirely feasible and practical. The willingness of Techscience Industries to finance and build the plant is a positive demonstration of our absolute belief in the viability of our Composting Plant.

Potential Problems Due to Scale-Up of the 450 Tons-Per-Day

An analysis of the **BIOCOMP** process reveals the following potential problems and solutions.

Waste Handing

Receiving

We estimate that 50 trucks of refuse are required for a 500 tons-per-day plant on a 12-hour basis. Schedule management and sufficient receiving space are required to mitigate against long-wait time or backups of schedules.

Solution: Adequate unloading areas, delivery schedule management and system redundancy, to assure continued operation in spite of a partial system failure.

Bulky Objects

Bulky objects cannot enter the composting system. They must be removed for other disposal.

Solution: Experience at other Resource Recovery operations points to a need for "pickers" to remove material such as bed springs, appliances, gas cans, large containers and other large items not readily accepted by the system.

Glass, Cans and Plastic Materials

Other Resource Recovery Plants have encountered operational problems due to pluggage of the system by rags, panty hose and large pieces of plastic.

Solution: Our design and operational procedure removes the vast majority of these materials before they enter the grinding process. These principals involve density separation, ballistic separation, magnets and similar devices for removal prior to entering the grinder. In addition, the redundancy characteristics of the system provide for continued operation while one of the other units is cleared or repaired.

All refuse is processed on the same day upon receipt, eliminating odor problems.

Grinding and Processing

Scale-up problems could include plugging by foreign materials and excessive maintenance on the Grinders.

Solution: Experience with Grinders has resulted in an improved life for the grinding operations. A plant maintenance schedule every seven days will mitigate against system failures. The redundancy built into the system allows it to continue operating while the other system is unplugged.

Biological Decomposition

No scale-up problems are anticipated. The process will be maintained under thermophilic and aerobic conditions by the controlled turning of the windrows and the addition of air.

Product Handling

No scale-up problems are anticipated. The end-product will be delivered for use as a cover material. At a later date, the composted soil conditioner will be upgraded to a fertilizer and sold through various distribution outlets.

FAILURE OF U.S. PLANTS

General

A careful review of the unsuccessful U. S. plants reveals three main problems:

1) Under capitalization and inexperience in compost operations; 2) failure to prevent odor and rodent problems due to anaerobic operations and 3) economics, there was no market for the end product when compared against fertilizer manufactured from Natural Gas.

Summary

Many operations fail to assign proper marketing and distribution for the product. Historically, when the compost could not be sold, operating plants produced stockpiles of compost for which there were few or no takers — often even on a give-away basis. Because this possibility had not been considered, the stockpiles grew in size, often remaining after the plant was closed.

Through active promotional campaigns, municipalities were led to believe that they could profit from operating composting plants. Eager to make money while solving their solid waste problems, communities entered into agreements for the construction and operation of composting plants. When actual operations proved that composting was more expensive than other solid waste disposal methods, cities became disenchanted and turned to other techniques.

Solution: The economics have changed drastically due to the quantum increase in natural gas prices. Also successful plants **all** have a ready outlet for the sale of their end product. Our marketing strategy includes pre-selling to a ready outlet.

THE BIOCOMP, INC. PROCESS - ENVIRONMENTAL CONSIDERATIONS

The **BIOCOMP** process has the following characteristics for various environmental considerations:

Surface Water Quality

A fully enclosed process allows no runoff to come into contact with the waste. No leachate or atmospheric emissions can threaten water quality. Liquid wastes are not generated, since all water is consumed in the bio-degradation process. The only wastewater is from employee facilities.

Groundwater Quality

A fully enclosed **BIOCOMP** plant protects groundwater resources.

Air Quality

There are no odors or emissions of smoke particulates. Raw waste is completely processed within a short time of delivery to the **BIOCOMP** plant.

Disease Vectors and Public Health

Waste is shredded, placed in windrow piles and is frequently turned and re-piled making the plant an undesirable habitat for disease vectors. The high temperatures inside the piles further reduce their desirability as a vector habitat. The plant is enclosed so that birds are not a problem.

Aesthetics

The **BIOCOMP** plant is attractive, clean and is located on a site that is pleasingly landscaped. The facility is a desirable addition to any area. Because our biodegradation process is aerobic, there are no odor problems. Blowing litter will be kept to a minimum through fencing and careful placement of landscape features. There are no dust problems.

Future Site Use

Once a **BIOCOMP** plant is constructed, it can remain at that site. No further site-use considerations are needed. The **BIOCOMP** system is a **permanent solution** to waste disposal problems.

PATHOGENS

General

Studies indicate that aerobic, thermophilic (45 to 70 C) composting is able to produce end products that have few, if any, pathogens. In a windrow composting operation, using raw sewage and ground hardwood bark, viable cultures of Escherichia coli, Candida albicans and Salmonella heidleberg were added to the raw sewage in an effort to determine pathogen survival rates. After 36 hours of composting at temperatures above 60 C, there was no evidence of survival for these human pathogens. Identical results were obtained when

Salmonella newport, Ascaris lumbriocoides, Candida albicans and poliovirus type 1 were added to raw sewage under similar conditions. Additional controlled studies have shown that a wide variety of pathogenic micro-organisms that may be harmful to man are destroyed during the composting process.

Destruction of Pathogens

In addition to the effect of metobolic heat generated during the composting process, pathogens are also killed during composting by antibiosis, (the destriction of pathogens through antagonistic cell wall lysis) or by bactericidal substances produced by certain bacteria and fungi. Salmonella typhimurium, S. cairo, S. typhi and S. paratyphis B were killed at a sustained temperature of 50 C as long as the pathogens were in contact with the composting material. When protected by encapsulation in gelatin, they were not destroyed at that temperature.

Properly controlled composting conditions have a direct effect on the activity of micro-organisms and it is this activity that generates sufficient heat, antibiotics and enzymes to destroy pathogens. It is important in this type of process to insure that proper composting conditions are maintained.

Micro-organisms, because of their metabolic processes, are controlled to a large extent not only by the moisture content but also by a balanced carbon/nitrogen ratio in the compost. Carbon/nitrogen ratios of from 20:1 to 30:1 are desirable because the micro-organisms use these elements in those proportions to meet their metabolic requirements. A higher ratio tends to inhibit the composting process because nitrogen becomes a limiting factor, conversely a lower ratio results in a loss of nitrogen by ammonia formation.

The most desirable moisture levels for composting range from 40 to 70 percent. When the moisture content of the compost is less than 40 percent, the metabolic activity of the micro-organisms is substantially reduced and when the moisture content is greater than 70 percent, the compost tends to become anaerobic.

MAINTAINABILITY OF BIOCOMP

General

Economic, engineering and environmental factors play major

roles in the success of composting plants.

A small composting operation, processing 45-50 tons-per-day, in Altoona, Pennsylvania has been operating quite successfully since 1951 and has been selling all of its production to fertilizer manufacturers, mushroom growers and horticulturists.

Composting has also been successful in Europe and the Middle East. These countries have a genuine need for the finished product in agriculture, thereby satisfying the economic factor. Also, agriculture has taken up their total production, thus bypassing any merchandising problems.

In the United States, although a tremendous quantity of solid waste is generated daily, we also have highly developed fertilizer manufacturing. This has made it difficult to sell compost which inturn has been the major economic stumbling block. Even if there had been a satisfactory demand for the finished product, operations in this country have not been successful for two major reasons: 1) Improper engineering and 2) environmental pollution. Many of the plants were previously designed without a basic knowledge of all the mechanical and operational parameters that were required. As a result, there have been design failures when the units were placed on stream. Additionally, because of insufficient aeration, a number of the plants created noxious odors which resulted in their closing. A properly designed composting plant, such as **BIOCOMP's** , contains the exhaust gases and neutralizes them prior to discharge into the atmosphere.

Economics

Perhaps the greatest factor which has interfered with the development of composting on a nationwide scale has been the economics. Until the present time, the use of compost has been quite limited in the United States. The consensus of agronomic opinion was that the addition of fertilizers to the soil supplied all the nutrients that were required by the growing plant.

In recent years, it has been demonstrated quite conclusively, that the loss of organic matter in the soil has led to a number of secondary conditions which have had a serious impact on the agricultural productivity of the farmer. As a result, there is a trend to use compost, when available, as a soil amendment. Secondly, in strip mining operations, it has been

determined that in order to obtain proper plant regrowth on the filled areas, sufficient organic matter has to be present to allow for the propagation of the plants. It is here that large quantities of compost will be consumed as soon as sufficient supplies are generated. With the rising costs of fertilizers and the need to reduce operational costs, the agricultural industry is now searching for alternative sources of nutrients to reduce fertilizer requirements and reduce the costs. Compost ideally fills this need.

At the International Conference on Bioresource Development held at the University of Houston, it was determined that approximately 50% of agricultural residues had to be added back to the soil in order to maintain the necessary soil energy. Stanford and Worne demonstrated that the addition of municipal solid waste or compost to the soil would act as a fertilizer. With the aid of nitrogen fixing bacteria, it would fix sizable amounts of atmospheric nitrogen. The results of this very successful combined study done under an EPA grant are to be published in the near future.

Advantages

In a properly operated composting process, pathogen removal is quite complete. To accomplish this, the heat of the pile must be raised to 60-70 C and sufficient air supplied to maintain a positive aerobic balance. Experimental work with compost indicates that its presence in soil helps to increase soil particle aggregation, soil structure, aeration, tilth and workability. The soils action exchange capacity is markedly increased, which results in longer term retention of applied inorganic fertilizers and improved economics. Compost increases the buffering capacity of the soil and enhances the chelation of metals. Its humic acid fractions affect a biological stimulation of growth by serving as a substrate for microorganisms, as well as a direct plant growth stimulation by providing a slow release of auxins, amino acids and organic phosphates. It promotes the conversion of several mineral elements into forms available to plants. In the presence of compost, phosphate increases and nutrient leaching losses are reduced. Also, the humic acids in compost are effective in converting iron and phosphorus from the roots to the stalks and leaves in plants. In the absence of the compost humic acids, iron tends to form insoluble precipitates with phosphorus, rendering it unavailable.

When compost was used as a soil additive in field experiments, larger yields of potatoes and soybeans resulted. Similar results have been obtained when compost was added to fertilizer and used as a side dress for tomatoes. At a rate of 15 pounds-per-acre, a 16.7% yield increase was achieved. As a seed drill application, the results were increased seedlings, young plant growth of tomatoes, as well as higher yields of large and marketable fruits, compared to growth and yield of untreated plants.

MECHANICAL BIOCONVERSION

A FUTURE IMPROVEMENT POTENTIAL

BIOCOMP is considering a mechanical process for compost production for future use. A short discussion of the principles follows:

General

The process of bioconversion of the mechanically treated waste involves special inoculum thermobac which contains a selected balance of oxicative micro-organisms. The inoculum, mixed with the pre-ground waste at a rate of 45 grams-per-ton must be previously diluted into a specified quantity of ground waste and added to the ground refuse. In order to get proper dispersion, an applicator at a pre-selected rate is used. In practice, a 50-ton digester requires 45 x 50 plus 2,250 g. of micro-organisms diluted with 500 kg. of ground waste. In this way, the required selected micro-organisms are introduced into the digester.

MICRO-ORGANISM REACTION

A. Protease - Amylase - Lipase - Pectinase

Micro-organisms secreting the above enzyme systems are the first to enter the bioconversion. They attack the starches, fats, proteins and pectins, degrading them to simple sugars, soluble proteins and in the process, they initiate the primary temperature raise.

B. Thermotolerant Micro-organisms

These micro-organisms secrete broad spectrum enzymes which further degrade the remaining starches, fats and proteins and initiate the biodegradation of cellulose and lignins. During this period, their metobolic activity causes a further increase in temperature.

C. Thermophilic Micro-organisms

This group raises the temperature of the mass and by secreting cellulase and ligninase enzymes, further degrade fermentable sustances such as cellulose, lignin, etc., to lower molecular weight compounds.

D. Funci (monocellular)

Fungi, such as the Aspergillus, Actinomycetes and Penicillium

secrete antibiotics which eliminate other competitive fungi and bacteria from the microecology.

CONDITIONS FOR OPTIMUM BIOCONVERSION

The environmental condtions necessary to optimal bioconversions are the following:

A. Waste Composition - Only metropolitan and urban trash and garbage are acceptable. Industrial waste, unless of selected types, is excluded from the process of bioconversion.

B. Size of Waste - Waste size must be uniform and ground to pass through a one-inch sieve. This allows for programmed bio-oxidation.

C. Moisture Content - After grinding,the organic content of the waste should be at least 50%. The quantity of the selected micro-organisms in this process does not change in connection with the quantity of ground waste, since it has been computed on a 50% minimum organic content. If the organic content of the waste is greater than 50%, the compost's quality improves.

D. C/N Ratio - Substances having a high C/N ratio, such as straw, paper, sawdust, etc., are difficult to decompose because they do not supply the micro-organisms with a sufficient quantity of nitrogen for assimilation and transformation. In this case, the C/N ratio of solid waste can be improved by the addition of sewage or inexpensive nitrogen sources to accelerate the process of bioconversion. The optimal C/N ratio is estimated to be between 10 and 15.

E. pH - Excessive acidity of the ground waste inhibits the development of the micro-organisms and reduces the velocity of the process of bioconversion. To prevent this, the material must be suitably buffered with powdered limestone or suitable substitutes. The pH range, which permits optimal bioconversion, is pH 6.0-7.0.

F. Oxygen - During the process of bioconversion, air must be supplied regularly and constantly, according to the oxygen demand.

THE PROCESS

In the first compartment, the micro-organisms secrete protease, amylase, pectinase and lipase enzymes which saccharifies the starcy materials and solubilizes the proteins,

pectins, pectins and fats. The temperature rises from ambient to 30 C.

In the second compartment, the saccharificaiton of the starches diminishes and the thermotolerant micro-organisms secrete additional quantities of proteolytic and lipolytic enzymes which decompose the remaining proteins and fats. The termperature rises up to 40 C.

In the third compartment, the temperature rises to approximately 50 C and the thermophilic micro-organisms further attack the cellulose and lignin.

In the fourth and fifth compartments, as the bioconversion progresses, the temperature goes up to 70-80 C. It begins to decrease in the sixth compartment because the substrate is consumed and the process of bioconversion is about to end.

All of the bases produced are collected and passed through a properly designed exhaust system to wash the effluent gases prior to discharge into the atmosphere. At each compartment, special thermo-couples permit the control of temperature and process velocity.

The biotherm digester performs the following operations:

1. It provides the controlled environmental conditions necessary for the development of the micro-organisms.

2. It permits the elimination of the pathogenic bacteria and insects.

3. It permits a rapid and controlled rise in temperature coupled with a compensatory oxygen supply.

4. It requires a limited space in comparison with its conversion capability.

5. It permits the entire process of bioconversion to develop in a confined area.

Once out of the digester, the material is essentially composted. The compost undergoes a ballistic separation which segregates inert materials such as stone fragments, glass fragments, non-ferrous metals, etc. so that although its weight diminishes, its organic content increases. The ballistic separator can also be situated after the rotating drum drier.

COMPOST REFINEMENT

A low moisture content, (45-50%) allows the compost to be preserved in heaps outdoors or indoors. Outdoor arrangements for rain water drainage, however, are necessary. The

temperature inside the compost heaps can rise due to the final bio-oxidation of residual cellulose and lignin. This reaction terminates without producing objectionable odors.

After a period of time, a 5-10 inch thick whitish layer of fungi Penicillium, albidum and various Aspergillus will form. Their presence contribute to soil fertilization and help prevent moisture evaporation and water infiltration.

In large capacity plants the compost can be dried mechanically to an approximately 25-30% moisture level, then enriched with chemical nutrients. This step is optional.

A. Drying - To dry the compost, a fuel oil or natural gas combustion chamber must be installed. The hot gases derived from the combustion, suitably mixed with cold air, are then conveyed to the rotating drum drier. Hot gas and compost enter the drier in the same direction. A blower mounted at the outlet opening of the drier produces a hot draft, which together with the mechanical motion of the machinery shifts the drying compost. Once dried, the product is conveyed to storage, then to the bagging machine or to the enrichment section. Fuel can be saved in large capacity plants by utilizing the hot gases derived frm the incineration of the rejects.

An average analysis of the dry basis compost obtained from Cherry Hill, New Jersey, municipal solid waste shows:

Total Organic Substances	**46.50%**
Active Organic Substance	**32.08%**
Humic Acids	**5.50%**
Nitrogen	**1.84%**
Phosphorous as P_2O_5	**0.88%**
Calcium as Oxide	**8.25%**
Magnesium as Oxide	**1.10%**
Potassium as Oxide	**0.47%**
Total Carbon	**27.80%**
Active Carbon	**18.16%**
Carbonates	**12.30%**

The high percentage of organics present in the compost, underlines its ability to supply the quantity of humus which is indispensable to the life of the bacterial flora present in the soil.

B. Enrichment - The dry compost can be enriched with chemical fertilizers in pre-established quantities and types. The combination is then weighed, collected in a holding container conveyed to a mixer, and conveyed to the bagging machine. The quantities and types of additives and dry compost can be varied in accordance with the requirements of the local market.

FUTURE POTENTIAL FOR

REFUSE/SLUDGE CODISPOSAL

GENERAL

Considerable discussion within the solid waste management profession deals with "codisposal". With tongue-in-cheek, Eldredge and Gordon stated that, "Proposals for codisposal systems range in technological complexity most of the way from simple incinerators to solar-powered, forcefield chambers to propel sludge through a black hole into the Fourth Dimension. But codisposal can be as simple and direct as burying sludge and refuse together in a sanitary landfill."

Eldredge and Gordon point out that one of the most attractive versions of codisposal is the joint composting of refuse and sewage sludge. There are considerable benefits in composting refuse/sludge mixtures. "The attention of sludge is considered a plus -- adding organic materials and nitrogen which is otherwise sorely needed. Adding compost to soil, improves tilth, soil workability, increases biological activity and improves the soil's ability to retain moisture and nutrients. With proper application, cured compost can be used in erosion control, strip mine reclamation, citrus cultivation and, when adequately cleaned, animal feed."

Recognizing the energy involved in using composting as a waste treatment process, many local governments have active or planned programs. Ongoing projects are in Los Angeles County, California; Bangor, Maine; Camden, New Jersey; Durham, New Hampshire; Nassau County, New York; and Houston, Texas. The following are studying or have joint refuse/sludge composting projects planned: New York City, Philadelphia, Boston, Washington, DC., Chicago, San Francisco Bay Area, Winsor, Ontario; Merrimac, New Hampshire; Stratford, Connecticut and Yarmouth, Maine.

The surge of interest in refuse/sludge composting these past five years has been spectacular. During a workshop on Health and Legal Implications of Sewage Sludge Composting, Harvard University Science Center, Steven Marcus said, "Composting has reached an advanced stage. It is now widely recognized that the process works and that the product is accepted." Apparently, the Environmental Protection Agency (EPA) agrees. EPA might allow construction grant funds to be used for most refuse/sludge codisposal facilities. The basis for the grants is to

encourage innovative and alternative technology for multiple-purpose use — integration of solid waste management and sewage sludge disposal.

Technology

In an article reviewing sludge composting practices, Snell comments that composting for treatment of sludge is not new. While United States experience with composting in general cannot match the long record of Europe and elsewhere abroad, previous U. S. efforts proved to be technical successes.

Most of the interest in sludge composting stems from work conducted by the United States Department of Agriculture, Agricultural Research Center demonstration project at Beltsville, Maryland. The Beltsville system uses wood chips as a bulking agent to enable required aeration. Wood chips are screened from the product compost and reused. In the Durham, New Hampshire sludge composting facility, 40 to 50 percent of the wood chips are retrieved. Hence, the bulking agent is a key ingredient for success. The Camden, New Jersey sludge composting facility also employs wood chips as the bulking agent. This facility handles 5 percent solid sludge at a rate of 150 gallons-per-minute.

Recognizing that wood chips may be an expensive way to maintain aerobic conditions, Snell states, "Often great savings in money and land may be obtained by using amendments rather than bulking agents such as wood chips, which must be removed and recycled. Some amendments may be added in amounts as low as 5% with good results.

"Special attention should be given to free or almost free organic wastes, including some or all available presalvaged, preshredded refuse. It is conceivable that inexpensive gravity dewatering to 8% to 10% solid sludge will yield a mixture suitable for composting when mixed with all the refuse from the sludge-generating population."

An alternate amendment, the Lobo System, has been used to compost septage at South Tacoma and Bremerton, and is under construction at Lewis County and Kent, all in the State of Washington. The Lebo technique uses a patented preaeration process prior to spraying septage on piles of sawdust, wood shavings, or other dry organic material. A one-to-two-inch application is covered with additional sawdust and the mixture is piled to minimize heat loss. Natural draft aeration, because of the bulky nature of the mixture, eliminates

the need for turning or forced aeration.

Work in Canada is directed toward expanding knowledge of optimal parameters for sludge composting. While the Canadian efforts are theoretically oriented, Swedish research and development has a more practical direction. The Swedes constructed a test plant to process 8,500 metric-tons-per-year of mixed shredded refuse combined with 4,000 cubic meters of sludge per year. Their intent is to provide economical and effective treatment to both solid wastes and sewage sludge for small communities having populations in the 10,000 range. Early results have been promising.

Summary

1. The usefulness of refuse/sludge codisposal is widely recongized.
2. The technology of sludge composting, particularly as represented by the Beltsville System, is well demonstrated at several locations throughout the country.
3. Amendments other than the wood chip bulking agents in the Beltsville System could provide a more economical pathway for refuse/sludge composting.
4. Swedish experiments have shown that mixed refuse is a suitable amendment to sludge composting.

BENEFITS OF CODISPOSING VIA THE BIOCOMP PROCESS

A combination of the **BIOCOMP** product, shredded feed and sewage sludge should provide an excellent compost product.

Advantages

The solid waste management and water quality at Dade County's Black Point location strongly suggests synergistic use of shredded municipal refuse and sewage sludge. Adjustments in shredding procedures at the Dade landfill shredder or at the proposed hammermills can help to optimize compatibility of the refuse as a sludge amendment:

particle size is expected to be important in producing the desired compost.

Solid waste normally has a water content of about 15 to 20 percent less than is required for composting aerobically. The moisture content of sludge can raise a codisposal mixture's moisture content to the 40 to 50 percent range -- the most desirable for composting to take place. Moreover, raw sludge can be used as the additive, saving the costs of digestion and drying.

BIOCOMP shredded material need not be recovered as wood chips must be. Hence, the process has greater simplicity and is more economical.

Any leachate resulting from the refuse/sludge composting mixture can be collected and routed back to a secondary treatment plant. This is envisioned to be the only output of the composting plant which needs treatment prior to discharge into the environment.

The principle problem involved with composting of sewage sludge is the possibility of heavy metal accumulation in crops grown by the compost. Heavy metals found in sewage sludge usually are the results of industrial activity. It is possible that low heavy metal concentrations may be expected in the sludge, depending on the industrial contribution.

Summary

The **BIOCOMP** process for handling municipal refuse has a potential big bonus benefit. It may be compatible with modificaitons of a plant with refuse-sludge codisposal. Based upon the extensive favorable experience with sludge composting to date, this should be considered when evaluating a proposal for future investigations of codisposal.

BIOGRAPHICAL DATA

OFFICERS AND DIRECTORS

MANAGEMENT

BIOCOMP, INC.

JOSEPH W. HAFESH - Chief Executive Officer, Treasurer, Chairman, Board of Directors

Education

Bachelor of Science Degree Mechanical Engineering	Tri-State University Angola, Indiana 1961-1965
Graduate Studies Towards A Masters Management Science	Stevens Institute of Technology 1966-1968
Post Graduate Studies Advanced Mathematics	Seton Hall University Fairleigh Dickinson University

Experience

An Environment/Systems Specialist for over 17 years, Joseph W. Hafesh, **Chief Executive Officer of Techscience Industries, Inc.,** has been a technical, marketing and financial consultant for several corporations. His consulting activities in the solid waste area include: developing specifications for equipment, marketing analysis of composting procedures and process engineering involving unseparated waste and decomposition through bacteria inoculant chemical engineering.

As Chief Executive Office for Pulsotronics, Inc., Mr. Hafesh designed and developed communications, monitoring and diagnostic systems and equipment for the life science and bio-medical fields. He was responsible for overall operational practices of the Corporation; its fiscal expenditures policy, maintaining budgetary control and establishing internal policy, while providing technical and management leadership to a group of designers, engineers and technicians.

While serving the **Bendix Corporation** as a **Project Engineer,** Mr. Hafesh supervised functions in the design, development, assembly and testing on numerous projects including the Lunar Excursion Module Decent Engine used for the first manned lunar landing.

Corporate Affiliations

Bendix Corporation
Computer Applications, Inc.
Curtis Wright Corporation
Fairchild Camera Space and Defense Systems
Pulsotrnics, Inc.

Summary

Mr. Hafesh provides **BIOCOMP, INC.** with a strong executive background with corporate development expertise in research, engineering, planning, finance (public and private), law (contractual negotiations) and with marketing functions directly and indirectly related to the proposed business of the company.

Related Experience

The major projects and other assignments in which Mr. Hafesh has been involved, include the following:

1. Technical Marketing and analysis of Foregin and Domestic Composting System and Process.

2. Review and evaluation of a proposed composting conversion plant feasibility report for Bumper Hall, Kingston, Jamaica.

3. Preparation of proposals, i.e., Meadowlands Commission, Camden and Ocean Counties in New Jersey.

4. Research and development of a sewage treatment plant for commercial and military applciations.

5. Environmental studies and design of innovative oil containment and separation systems.

6. Market and distribution analysis of fertilizers and soil enrichers for agricultural and livestock usages.

7. Technical design of computer controls and automated electromechanical handling systems.

Patents/Patent Applications

1. Pulsometer/heart monitor system

2. Automated Electromechanical Handling System

3. Remote Physiological Monitoring Communications system

Publications

1. IEEE, "Methods of Thermal Control for Orbiting Space Vehicles."

2. Numerous research and development, engineering, marketing, mathematical analysis', product and system design, finance, solid waste management and corporate development reports.

Mr. Hafesh is an Officer and Director of Techscience Industries, Inc., a public corporation.

FRANCIS A. GOVAN

Education

Masters Degree in Business Administration	University of New Haven, 1979
Bachelor of Science Degree - Engineering	U. S. Merchant Marine Academy, 1948
Additional Graduate Work Environmental Engineering	University of Florida, 1963-1964

Professional Qualifications

Registered Professional Engineers - M5900 - District of Columbia

Marine Engineers License (1948)

Instructor in environmental Engineering - Nuclear Defense

Qualified Submarine Officer (USNR - Retired a Commander) 1970

Memberships

Building Thermal Envelope Systems/Advisory Committee -- Department of Energy, Oak Ridge National Laboratories

Past Member - Board of Directors - Connecticut Business and Industry Association

Member - National Society of Professional Engineers

Member - Connecticut Society of Professional Engineers

Past Chairman - ASTM Commitee C-16 on Thermal Insulation and Cryogenic Materials

Past Member and Staff Manager - National Academy of Sciences - National Research Council-Solid Waste Management Committee

Chairman - U. S. Delegation to ISO Commitee 163

Member - American Society of Heating, Refrigeration and Air Conditioning Engineers

Past Chairman of ASHRAE Technical Committee 2.4 on Thermal Insulation and Vapor Burners

Member - EPA Advisory Panel on NO_x Reduction for Combustion Processes

Experience

February, 1981 - Partner, NMD & Assoc. P.C. consulting engineers. Undertake engineering/ Environmental/economic studies in the areas of power Plant, Resource Recovery Facilities and Process Industries. Perform trouble-shooting work primarily in the area of coal and solid waste combustion, HVAC and sewage treatment plants.

April, 1980 to February, 1981 - Corporate Vice President, Energy Products and Services Division; Combustion Equipment Associates, Inc.

March, 1976 to April, 1980 - Corporate Vice President, Energy Products and Services Division; Combustion Equipment Associates, Inc.

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December, 1968 to March, 1976 - President, York Research Corporation, Stamford, Ct.

March, 1957 to December, 1968 - Associate Director - Technical Operations, BRAB, National Academy of Sciences, Washington, D.C.

July, 1948 to March, 1957 - Industrial Fuels Application Engineer, Washington Gas Light Company, Washington, D.C.

(Part Time 1952-55) - C. Warren Bogan and Associates, Inc., Consulting Engineers.

Awards

1950 - Serval Award for Outstanding Engineering Design - Commercial Air Conditioning System

1958 - U. S. Air Force - Directorate of Civil Engineering Award - Air Force Facilities Evaluation Group

1968 - ASHRAE Award of Meritorious Service - Chairman Technical Committee 2.4 Thermal and Vapor Burner Systems

1976 - ASTM Award of Merit - Chairman Technical Committee C-16 - Insulation and Cryogenic Systems

1978 - Election to "Who's Who in The East" - Business and Industry

Publications

Over 24 technical papers publications and articles on subjects including thermal energy distribution systems, combustion processes, environmental control, economic analysis of energy systems, and solid waste management and disposal systems.

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DR. EVERETT H. KILLAM, Ph.D - Vice President of Engineering

Education

Ph.D, Civil Engineering, University of Wyoming 1973
MS, Civil Engineering, University of Wyoming 1965
BS, Civil Engineering, University of New Hampshire 1961

REGISTERED PROFESSIONAL ENGINEER: Indiana, Wyoming

University Experience

Rose-Hulman Institute of Technology 1974-1977
Terre Haute, In.

University of Wyoming 1969-1972
Laramie, Wy

Career Summary

Over twenty-five years of professional experience in engineering management of large structure and process facility construction. As Manager of Engineering for the past ten years, responsibilities included design and construction engineering of lump sum turn key construction projects and development of new process technologies. Responsible for selection and supervision of vendors/subcontractors. Accountable for equipment and material selection and procurement. Experience also includes consulting and six years of teaching civil engineering undergraduate and graduate courses.

Career Experience 1983-1988

Manager, Engineering

Reported to president. Directed a staff of 35 professionals, including structural, mechanical and electrical engineers, responsible for lump sum, large scale ($20-100 million) new technology projects, including:

Municipal solid waste incineration and power generation plant.
Development and construction supervision of a non-incineration technology to process municipal solid waste resulting in the construction of a $22 million facility, currently undergoing start-up.

Additional Accomplishments

Evaluated emerging technologies for introdution into company product lines.
Resolved field construction problems with owners and/or vendors.
Managed redesign of product line, reducing cost by more than 12%.
Supported sales efforts for waste treatment projects.
Participated in evaluation and negotiation of warranty claims.
Selected and monitored vendors and subcontractors.
Initiated budgets and monitored project execution.

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Consulting Achievements

Managed fast turn around $150,000 modification to sludge composting plant, including material procurement and construction supervision of 20 people.

Conducted investigation of corrosion-resistant titanium in ducts of electric generating plants.

Affected economical solution to start-up problems in cogeneration project.

Custodis Construction Co., a Research-Cottrell Co., Chicago, Il. 1977-1982

Manager, Engineering

Managed professional group which developed special purpose construction equipment to facilitate construction resulting in lower cost and safer equipment. Also, prepared proposals for development projects, including construction procedures. Projects included:

Analysis of construction loads and design procedures to determine allowable loads on uncured concrete.

Development of analysis and testing methods and design calculations for structural loads on elevators used in construction, resulting in safer procedures for lifting.

Experimental program to determine physical properties for composite materials in large-diameter cyclinder.

Development of design procedures for fiber reinforced plastic chimney liners.

Supervision of lab and field structural testing.

Earl & Wright 1973-1974
San Francisco, Ca.

Structural Engineer - Analyzed response of deep water offshore production platform to wind, wave and earthquake forces.

Boeing 1966-1968
Seattle, Wa.

Stress Engineer

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HERMAN W. STEINBERG, Counsellor at Law - Board of Director

Mr. Steinberg is an attorney and has been engaged in the individual practice of law in Paterson, New Jersey for thirty years. He is house counsel for Quality Data Processing, Inc. and several constructiion firms. He is a member of the Passaic County Bar Assocation, New Jersey Bar Association and American Bar Association. He is also a Director of Techscience Industries, Inc.

JAMES W. DEER, ATTORNEY - Secretary and Director of BIOCOMP, INC.

James W. Deer, Esq. has been a partner of the law firm of Holtzmann, Wise and Shepard, New York, New York for over 25 years. He is a director of the following public companies: Applied DNA Systems, Inc., Allegheny & Western Energy Corporation, Ampower Instrument Company, Inc., Art's -Way Manufacturing Company, Enertech Corporation, Multi Tech Corporation, T-Bar Incorporated, Techscience Industries, Inc. and Weigh-Tronix, Inc.

DR. WILLIAM V. BESHLIAN

Education

Bachelor of Arts Degree	Columbia University, New York City 1940-1943
Medical Doctor Degree	New York Medical College, New York City 1943-1946

Experience

Dr. Beshlian is a physician and has been engaged in the private practice of medicine in Paterson, New Jersey for thirty years.

Memberships

Member of Passaic County Medical Society

Member of New Jersey Medical Society

Attending staff at St. Joseph's Hospital and Medical Center, Paterson, New Jersey
1950 to present

Corporate Affiliations

Board of Directors - Electro-Neucleonics, Fairfield, New Jersey

Board of Directors - Techscience Industries, Inc., Bergenfield, New Jersey

Board of Directors - Biocomp, Inc., Bergenfield, New Jersey

New Jersey State Library

Catrel USA
A RESOURCE RECOVERY CORPORATION

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AN INTRODUCTION TO

CATREL USA

March 23, 1989

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Catrel USA
A RESOURCE RECOVERY CORPORATION

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Appendix A Summary of Argonne National Laboratory Test Results

Appendix B Summary of Rochester Gas and Electric Test Results

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I EXECUTIVE SUMMARY

The Catrel process, licensed from Catrel SA, a Swiss corporation, converts household refuse into an embrittled solid pelletized product. The product can be cleanly burned in admixture with coal in existing pulverized coal utility boilers, circulating fluid bed boilers, or chain grate stoker boilers. It can also be burned in admixture with residual oil in oil fired utility boilers. The crushed embrittled product is a synthetic low sulphur fuel having properties similar to low grade coals. Beyond combustion, the Catrel product can also find uses as a soil amendment and as light and heavy aggregate for use in construction and in the manufacture of cinder and cement block.

By far the largest market potential for Catrel end product is as a synthetic fuel to partially replace coal and oil in electricity and steam generation. Combustion studies and commercial applications by Rochester Gas and Electric, United Illuminating, Argonne Laboratory, Baltimore Gas and Electric, and others have demonstrated that properly prepared refuse and embrittled refuse derived fuel is a very suitable partial substitute for coal and oil in utility and industrial boilers. Co-firing Fueltrel™ with coal in utility boilers in the Central Atlantic Region alone represents the potential consumption of 157,000 tons per day of municipal solid waste.

The Catrel process offers municipalities a lower cost, more environmentally sound disposal alternative to mass burn incineration. Use of the Catrel process over mass burn incineration will benefit the citizens of a municipality by reducing tipping fees and reducing the cost of generated electricity. It also maximizes recycling of reusable materials and eliminates hazardous emissions through efficient co-combustion of a high quality fuel product in utility scale units operated by experienced personnel.

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II CORPORATE BACKGROUND

Overview

Catrel USA is a resource recovery company, incorporated in California in August, 1987. Catrel USA's corporate charter is to develop, build, own and operate Catrel plants that process municipal solid waste (refuse) using the proprietary and patent pending Catrel technology. Catrel USA has the exclusive rights to the Catrel refuse conversion technology within the United States and its territories, excluding the State of Florida.

The Catrel technology, developed in 1984 by a French chemist, Georges Biez, is licensed by Catrel SA, a company based in Geneva, Switzerland. Catrel International, London, England, is responsible for the worldwide exploitation of the Catrel technology. The Catrel process converts common household refuse into stable, friable, high quality end products that have economic value with a vast, seemingly endless, market demand. Primary U.S. Catrel end product applications are Fueltrel™, a coal or residual oil substitute, and Soiltrel™, a soil amendment. A secondary application is an aggregate, Aggretrel™, for use in construction and in the manufacture of cinder and concrete block. Moreover, when market demand for recyclable material exists, i.e., paper, cardboard, plastics, aluminum, and iron, the Catrel process maximizes resource recovery through both manual and mechanical separation. Catrel USA has its corporate headquarters in San Diego, California, and two East Coast offices, one in Pennsylvania and one in New Jersey. Catrel Pennsylvania, a Pennsylvania corporation subsidiary wholly owned by Catrel USA, located in Edwardsville, has received a $70,000 matching fund grant from the State of Pennsylvania which is intended to accelerate and assist the siting of the first Catrel plant within that state. Authorities representing the Pennsylvania Department of Environmental Resources have examined the Catrel process at work in Europe and permit preparation is currently in progress. A $25,000 matching fund grant from the State of Pennsylvania has been offered to assist Catrel Pennsylvania with additional research for other end product uses.

Catrel New Jersey, a New Jersey corporation subsidiary wholly owned by Catrel USA, has offices in Edison, New Jersey. Catrel New Jersey is housed within and draws upon the resources of the Hanlin Group, Inc., a corporate shareholder in Catrel USA.

Catrel USA employs the services of B&R Engineering, Canada, as its technical consultant and has selected Black & Veatch as its engineering contractor.

Catrel SA

Catrel SA, incorporated in October, 1984, is the licensor of the proprietary Catrel refuse conversion technology. As a licensee, Catrel USA depends on Catrel SA for the technical and marketing support that will be required to establish and successfully demonstrate the Catrel technology in the United States. Catrel SA is controlled by SOCOFI, a Swiss financial company. SOCOFI is part of an ownership entity encompassing five banks; two of them are the Petra International Bank in Washington, DC, and the Mebco Bank in Geneva, Switzerland. The bank entity ownership focuses on international banking with an additional view to manufacturing, retailing, trading and venture capital.

During the first three years of its existence, Catrel SA's team of engineers and scientists significantly improved the process technology through modification of the pilot facility and by conducting numerous tests and production runs which were witnessed by internationally recognized Swiss laboratories (EMPA, ACCEPSA, EPFL, etc.). This important work produced four patent applications which have been filed in 54 countries (Table 1). Catrel's base patent for "transforming organic and inorganic waste into materials that are solid, inert and water insoluble" was approved on December 28, 1987, for Switzerland and eight other European countries. The U.S. patent application was filed by Catrel SA on June 19, 1985, and is currently pending.

Catrel SA has invested approximately $6 million over the past four years in research and development at its one ton per hour industrial pilot facility in Viry, France, 15 miles from Geneva, Switzerland. In addition, over $9.5 million has been invested in a full-scale industrial plant in Moudon, Switzerland. This plant is currently in commercial operation, processing ten tons per hour of municipal solid waste. Catrel SA has invested over $20 million to date on technology development and demonstration.

The Hanlin Group, Inc.

The Hanlin Group was founded in 1971 through a leveraged acquisition of a chlor/alkali plant in Linden, New Jersey, from GAF Corporation. Today the Hanlin Group is one of the top ranked USA producers of chlorine, caustic soda, potassium based chemicals, muriatic acid, sodium hypochlorite chloromethane and polyvinyl chloride products. The Hanlin Group's growth has increased at the rate of approximately twenty percent (20%) annually over the past ten (10) years. The Hanlin Group has an annual sales volume of $230 million, operates 10 chemical and plastic plants, has 1,400 tank cars and 6 barges, 32 terminals and warehouses, and employs 940 people.

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TABLE 1

Catrel SA Patents

Catrel SA has filed four patents in 54 countries covering five continents. All four patents are intended to protect Catrel's technology as well as the process of manufacture of end products resulting from the treatment and recycling of municipal solid waste (MSW). The following is a list of those patents:

1. Patent described as "Process for transforming organic and inorganic and municipal solid waste into inert and water insoluble solid materials."
   International deposit in Berne (Switzerland), June 19, 1985, No. 02-601/85-0.
   Serial No.: 07/030847
   Filing Date: 02/19/87
   U.S. Ref. No.: B5332 US
   Filing Company: Loma Finance Inc.
   The patent was issued in several European countries, including Switzerland as of December 28, 1987.

2. Patent described as "Process for the manufacture of cement."
   International deposit in Berne (54 countries), March 12, 1987, No. 0933/877-6.
   Serial No.: 07/038160
   Filing Date: 12/28/87
   U.S. Ref. No.: B5674 US
   Filing Company: Trivino-Vasquez

3. Patent described as "Process to transform municipal solid waste into a material pellet form."
   International deposit in Berne (54 countries), March 19, 1987, No. 1046/87-6.
   Serial No.: 07/264765
   Filing Date: 10/31/88
   U.S. Ref. No.: B5895 US
   Filing Company: Catrel SA

4. Patent described as "Process to manufacture from municipal solid waste, granules that can be used to make construction materials.
   International deposit in Berne (54 countries), November 2, 1987, No. 4282/87-0.
   Serial No.: 07/139308
   Filing Date: 12/29/87
   U.S. Ref. No.: 62181/B5685 US
   Filing Company: Catrel SA

NOTE: Trademark CATREL is registered in the 54 countries corresponding to patents' deposits.

Hanlin is providing the following services to Catrel USA in exchange for a partnership position in Catrel USA:

- Office space, secretarial and other support services (i.e., telephone, telefax, printing, office supplies, etc.).
- Assistance in site permitting, project development and planning for Linden and future Catrel plant sites.
- Business development support including development of contracts for refuse supply and end product consumption.
- Land and building at Hanlin's Linden, New Jersey, site.
- A firm fuel consumption contract at Hanlin's Moundsville, West Virginia plant for the first Catrel plant output.

B&R Engineering

B&R Engineering has been serving as a technical advisor and consultant to Catrel USA since the inception of the company. After a comprehensive review and study of the Catrel technology at work in Europe, B&R Engineering completed preliminary engineering and cost estimates for two different capacity (17.5 TPH and 50 TPH Catrel plants, designed for Fueltrel™ and Soiltrel™ production, and geared to specifically handle USA refuse. B&R Engineering has had extensive experience with various phases of the engineering, procurement, and construction, involving over $200 million of refuse conversion facilities, totalling nearly 6,000 tons per day (TPD) of total capacity. B&R Engineering projects include the following at an estimated cost of $35 million:

1200 TPD	Incineration Project; Akron, OH
2200 TPD	Waste to Energy Facility; Niagara Falls, NY
25 TPD	Rotary Kiln Incineration Project; Ontario, Canada
110 TPD	Waste to Energy Facility; General Motors, Oshawa, Ontario
2000 TPD	Waste to Energy Facility; Compton, CA
70 TPD	Waste to Energy Facility; 3M Corporation, London, Ontario
1000 TPD	Resource Recovery Facility; Genstar Conservation Systems, Vancouver, British Columbia, Canada

* TPH = Tons Per Hour

Black & Veatch

Catrel USA has selected Black & Veatch as their engineering contractor. Black & Veatch is one of the premiere engineering contractors in the municipal solid waste processing and energy generation areas. They have had extensive experience with various phases of the engineering, procurement, and construction of refuse plants with nearly 12,000 TPD capacity as well as conducted preliminary engineering and feasibility studies for more than 50 municipalities and clients.

Black & Veatch projects include the following:

560 TPD	RDF Fired Power Generation Plant Conversion; Environmental Protection Resources, Lubbock, TX
2500 TPD	RDF Fired Resource Recovery Facility; Connecticut Resource Recovery Authority, Hartford, CT
200 TPD	Mass Burn Incineration; Southern Michigan State Prison, Jackson, MI
3300 TPD	RDF Fired Resource Recovery Facility; City of Detroit, MI
3000 TPD	RDF Preparation Plant; Honolulu, HI
1500 TPD	RDF Fired Power Generation Plant Conversion; Elk River, MN
800 TPD	Solid Waste Incineration Facility; City of Houston, TX

III CATREL PROCESS DESCRIPTION

The Catrel process converts municipal solid waste into an embrittled, pelletized, solid product. The European Catrel plant design has been adapted for the more varied heterogenous characteristics of U.S. refuse. This results in a more hands on approach to initial processing of the refuse. The size reduction, chemical and thermal process steps are virtually identical.

In the U.S., the Catrel process can be described as follows: refuse collection vehicles are weighed on a truck scale located on the access road to the building. Weighed vehicles back into the building and dump the refuse onto a large, flat receiving floor. A front end loader (tractor) is used for preliminary sorting of the incoming refuse as well as for loading waste onto the processing line(s). The waste flow through the plant undergoes initial processing which involves conveying, rotary screening, hand picking, and coarse size reduction. Two streams result from this initial processing: (1) waste material which is ready for further processing; and (2) rejected material for landfilling or recycling if economically feasible. Material to be landfilled is compacted with other rejects, pre-selected on the receiving floor.

Some of the valuable materials recovered on the incoming line, as well as materials pre-selected on the receiving floor, are baled. For example, if economics favor recycling, rich corrugated waste is stored in a specific area of the receiving floor along with clean corrugated paper recovered from the processing line. When enough corrugated material has been recovered, it is loaded onto a separate conveyor feed to a baler. Aluminum, glass, and plastic may be selectively removed in areas where curbside recycling is not being applied. Hand picking also allows for removal of undesirable materials such as fuel canisters, batteries or any other undesirable items prior to mechanical processing. The waste material which is now ready for further processing undergoes primary magnetic separation for ferrous metal recovery. From here the waste goes through a coarse size reduction step via a low speed, high torque shredder. The shredded waste then goes through secondary magnetic separation by action of a polishing magnet prior to high speed size reduction. Following these size reduction and recovery steps, the refuse is then conveyed to a mixer for inclusion of additives. The additives are fed onto the incoming refuse stream and automatically mixed. The mixed material is temporarily stored in two metering bins which feed the extruding machines that densify and pelletize the refuse into a cylindrical shape granulate. The granulate becomes a final product after being dried and embrittled in a rotary drier equipped with a natural gas or fuel oil burner.

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Embrittlement results from the fusion of plastics, the carbonation of the additive via reaction with flue gas and from the cooking of proteins in the pellets. The hot embrittled end product is subsequently cooled on a vibrating screen. Dust created during this operation is removed through the use of a dust collector. After being thermally processed and cooled, the final product is conveyed by bucket elevator into storage vessels. Figure 1 presents a flow diagram which outlines the process in more detail.

Mechanically, the Catrel process is superior to conventional RDF processes. Through the unique combination of manual separation and simple, reliable mechanical and chemical processing steps, Catrel has been able to completely eliminate air classification, disc screening and the accompanying high volume gas cleanup. Further, Catrel's system minimizes maintenance and improves reliability through the use of rotary screening, and manual and magnetic separation prior to size reduction of the refuse.

The environmental aspects of the Catrel process are superior to conventional waste processing methods in all respects. The calcination step in the process is done in a rotating kiln where oil or gas burners supply the heat to drive off the moisture and sterilize the material without incinerating the waste. By limiting the pellet temperature in the kiln to 212 degrees fahrenheit, emissions from refuse constituents such as polyurethane and plastics are avoided. No deleterious, carcinogenic products of refuse combustion such as PCB, dioxins, furans, or chlorides are released to the atmosphere. Dust from the separation and sorting steps is removed by a baghouse from air streams exiting the facility. The collected dust products are recycled to the process stream.

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FIGURE 1

Catrel Process Flow Diagram

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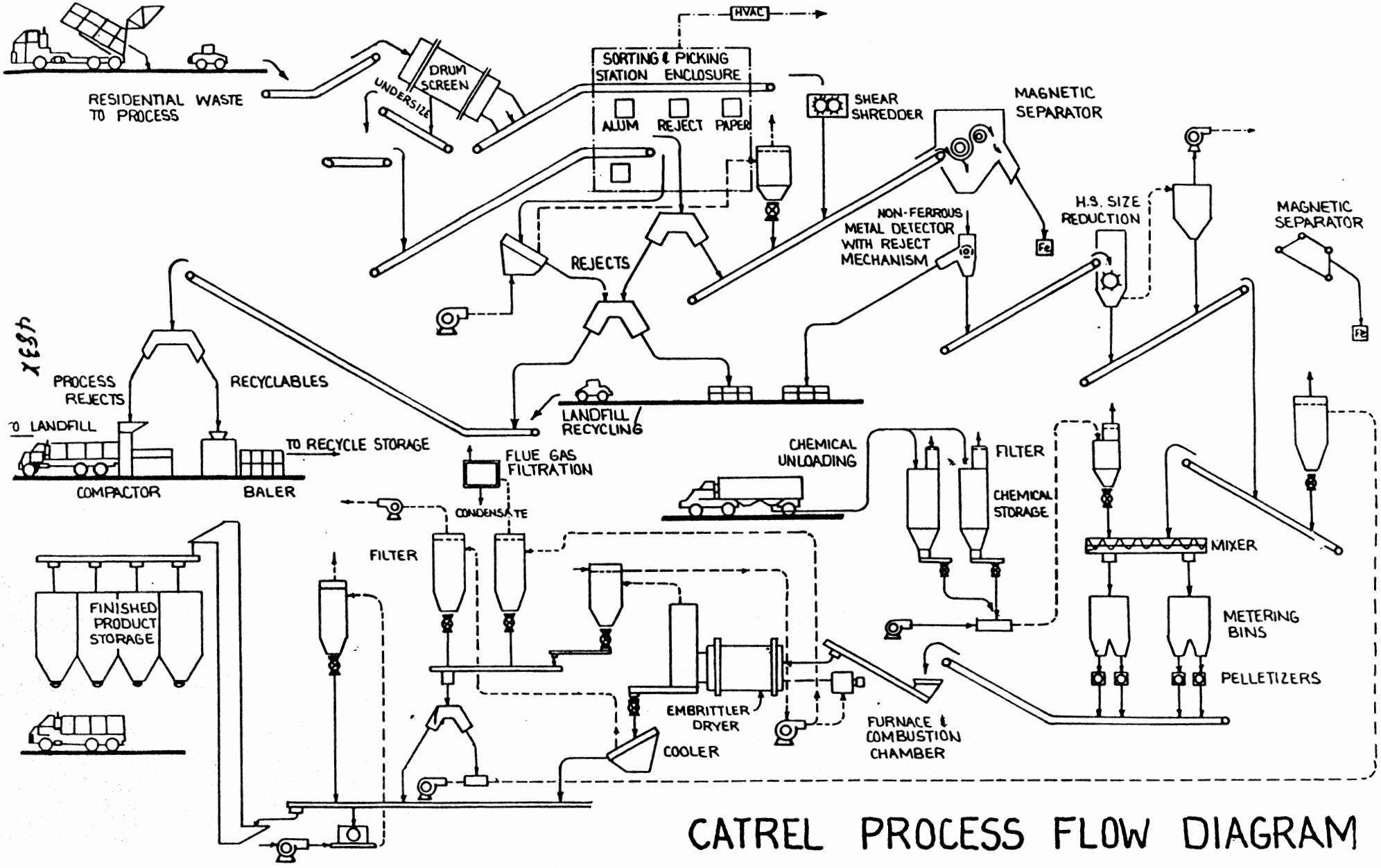

CATREL PROCESS FLOW DIAGRAM

IV CATREL END PRODUCTS AND APPLICATIONS

Overview

The basic end product that results from the Catrel process is a stable, embrittled solid that can be used for a number of different applications. The physical and chemical characteristics of the Catrel end product can be refined by varying the amount of chemical additives used and the level of densification applied prior to the thermal conversion step. Catrel's high quality Fueltrel™ end product differs from other refuse derived fuel (RDF) products in that it is a dry, dense, embrittled, biologically stable solid that is easily and economically transported and stored. The low moisture content and superior heating value make Fueltrel™ attractive to fossil fuel energy users for co-firing applications. The Fueltrel™ product has the largest market potential in the U.S. as a coal or residual oil substitute in utility and industrial boilers and kilns.

Use of Catrel's end product, Soiltrel™, is also a good application on a regional basis. Beyond these primary applications, Catrel end products can also be employed as a light and heavy aggregate, Aggretrel™, for use in construction and in the manufacture of cinder and concrete block.

Fueltrel™

Fueltrel™ is an exceptionally good synthetic coal product. Fueltrel™ has about 65% of the BTU value of most eastern coals and is attractive by comparison due to its low cost, low sulphur content, and its inherent emissions capture capability. Fueltrel™ has a heating value of approximately 7500 BTU per pound, an ash content of approximately fifteen percent (15%) and a moisture content of between 2 and 4 percent. When combusted, the free calcium oxide contained in Fueltrel™ combines with SO2, thereby helping to control pollution.

Fueltrel™ can be co-fired as a pellet in chain grate stokers or circulating fluidized bed boilers. It can also be pulverized and fired in pulverized coal fired or residual oil fired boilers. Co-firing ratios of ten percent (10%) to fifty percent (50%) and higher have been successfully demonstrated using embrittled and unembrittled refuse derived products. Co-firing in cement kilns also represents another excellent application for Fueltrel™. Both the free calcium oxide and the ash contained in the end product become part of the cement clinker and ultimately are incorporated into the cement end product.

Refuse derived fuel products similar in properties to Fueltrel™ have been successfully burned by United Illuminating and by Argonne Laboratories. Fluff RDF products of a lower quality than Fueltrel™ have been successfully burned by Rochester Gas and Electric and are currently being burned by Baltimore Gas and Electric.

United Illuminating has very successfully co-fired an embrittled RDF product similar in characteristics to Fueltrel™ in combination with residual oil in their Bridgeport, Connecticut, generating unit. This embrittled RDF product was manufactured in the mid to late 1970s by a company called Combustion Equipment Associates (CEA). CEA's process was entirely different from the Catrel process in that they employed a sulphuric acid embrittlement step, followed by a combined drying and pulverization step in a hot ball mill. The CEA process was ultimately found to be infeasible. However, prior to the discontinuation of plant operation, CEA manufactured a significant amount of embrittled RDF product which was well received by utilities such as United Illuminating, Public Service Electric and Gas, and Atlantic Electric.

The CEA's RDF equivalent of 16,000 barrels of oil was fired in United Illuminating's 80 MWe Bridgeport Unit No. 1. RDF co-firing ratios of up to 50% by heat input were demonstrated without any adverse environmental or operational impacts. United Illuminating's technical people have stated that they could have gone successfully to even higher co-firing ratios. This generating unit is a wet bottom B&W Cyclone Furnace in which a pulverized embrittled RDF was injected through the ash recycle ports. United Illuminating officials have stated that they were ready to commence long term use of this fuel and were very disappointed to see the project terminate.

Argonne Laboratory (U.S. Department of Energy) has manufactured an unembrittled RDF pellet and successfully co-fired it in combination with high sulphur coal in their 80,000 pound per hour (pph) chair grate stoker boiler. After evaluation and testing over 100 different materials, Argonne Laboratory selected a binding agent very similar to the one used in the manufacture of Fueltrel™. Argonne Laboratory manufactured and successfully burned 700 tons of pellets in their boiler at co-firing ratios of between ten percent (10%) and fifty percent (50%). The Argonne tests demonstrated that at these co-firing levels, all ash samples passed EP toxicity tests, including the leaching tests for lead and cadmium. Sulphur dioxide (SO_X) emissions were reduced between 10% and 28%, and nitrous oxide (NO_X) emissions were reduced between 20% and 30%. No detectible concentrations of bromines, fluorides, chlorinated dioxins, or furans were found in flue gas and fly ash samples. A summary of Argonne's testing is presented in Appendix A.

Rochester Gas and Electric conducted a 2.5 year program at their Russell Station and successfully co-fired RDF fluff in a 65 MWe pulverized coal fired boiler. Results of the Rochester test indicate that co-firing RDF fluff in ratios up to twelve percent (12%) by heat input can be maintained successfully in a dry bottom pulverized coal fired unit. At ratios equal to or less than 12%, no unacceptable environmental, mechanical, or metallurgical impacts were observed. A summary of Rochester's test results are presented in Appendix B. When considering these results, one must realize that the physical and chemical characteristics of Fueltrel™ are superior to any RDF fluff, making it more viable for co-firing in this type of application.

Baltimore Gas and Electric has been successfully co-firing RDF in combination with bituminous coal in a 200 MWe B&W wet bottom cyclone furnace at their Crane Station since 1984. The plant co-fires up to twenty percent (20%) RDF on a heat input basis. Co-firing has required more frequent sootblowing of the superheater section of the unit. It has been over 2.5 years since this unit has had an unscheduled outage due to RDF co-firing.

Fueltrel™ offers significant economic benefit over either coal or residual oil. At a delivered cost of $15/ton, on an equivalent heating value basis, Fueltrel™ costs approximately sixty percent (60%) the cost of coal at $40/ton and forty percent (40%) of the cost of residual oil at $14/barrel. This means that an energy user who consumes the Fueltrel™ output from a 1,000 TPD plant would realize an annual cost savings of between $1.5 and $2 million.

There is an enormous potential in the United States for Fueltrel™. Table 2 presents a summary of the coal fired electric utility generating capacity in the United States. At a ten percent (10%) Fueltrel™ blending ratio (heat input basis), this total power plant capacity has the potential of consuming the output from processing 1.5 million tons per day of municipal solid waste. This is nearly three times the waste generated daily in the United States. In addition, coal fired utility stations are accustomed to long-term coal contracts which is consistent with requirements for Catrel plant project financing. Just within the six state Central Atlantic Region, 157,000 TPD, or the output from 157 Catrel plants with a capacity of 1,000 TPD could be consumed.

In addition to co-firing with coal, firing Fueltrel™ with residual oil also offers a very significant opportunity. In the Northeastern United States, over one million barrels of residual oil are consumed in utility boilers. At a ten percent (10%) blending ratio, these plants could potentially consume 4.1 million tons per year of Fueltrel™. This would represent Fueltrel™ production from 25 one thousand ton per day Catrel plants.

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TABLE 2

U.S. Coal Fired Electric Utility Generating Capacity

Geographic Area	Number of Generating Units	Average Operating Capability (MWe)	Fueltrel™ Co-Firing Potential 10% Blending Ratio (TPD of MSW)
Delaware	5	923	4,864
Maryland	13	3,857	20,326
Massachusetts	9	1,753	9,238
New Jersey	9	1,672	8,811
New York	32	3,829	20,179
Pennsylvania	65	17,731	93,442
Total 6 State Region	133	29,765	156,860
TOTAL United States	1,271	293,685	1,547,720

487K

A significant market for Fueltrel™ also lies with solid fuel fired cogenerators and independent power producers. These plants are having to become more competitive and many are based on fluidized bed technology which appears to be ideally suited for Fueltrel™. Table 3 presents a few solid cogeneration developers who are potential Fueltrel™ users. These off balance sheet financed cogeneration plants operators usually enter into long-term fuel contracts and are very motivated to reduce their fuel costs since they represent the largest component of total operating expense.

In addition to the significant Fueltrel™ markets outlined above, it should also be noted that the Hanlin Group, one of the important shareholders in Catrel USA, owns and operates a chemical plant in Moundsville, WV, which burns coal to produce process steam. This facility operates four spreader stoker boilers with a total steaming capacity of 360,000 pounds per hour that could consume all of the Fueltrel™ produced by the first one or two Catrel plants.

Soiltrel™

Soiltrel™ is a Catrel end product that has a rough texture and is more porous than Fueltrel™. Tests conducted in both Clarkson Laboratory and Maxwell Laboratory support the use of Soiltrel™ as a soil amendment. Inexpensive chemicals, such as ammonium sulphate, can be added to Soiltrel™ in order to enhance its suitability for agricultural uses.

The traditional soil amendment material is woodchips. Woodchips act as an aeration agent and when blended with minerals and nutrients enhance plant growth. Woodchips decompose in approximately six months. Like woodchips, Soiltrel™ also consists of fibrous material. However, it is projected that Soiltrel™ will not decompose as quickly as woodchips, thereby enhancing its value as a soil amendment.

In the United States, it is estimated that 30 million cubic yards of soil amendment is used annually for commercial and retail applications. The bulk density of Soiltrel™ typically runs around 2.6 cubic yards per ton. To use an unrealistic example, if one were to assume that all the projected 28 plant production was Soiltrel™, then the Soiltrel™ consumption rate would be 4.4 million tons per year, or a 38% market share. In certain areas, use of Soiltrel™ represents a viable market for absorbing a portion of the end product output from Catrel refuse conversion plants.

Aggretrel™

Aggretrel™ is a synthetic aggregate pellet that the Catrel process makes in numerous sizes and shapes. One common size is

TABLE 3

Cogeneration Plant Developers Who Could Burn Fueltrel™

Ultrapower	CFBC & SS
Energy Factors	CFBC
Air Products & Chemicals	CFBC
Gilberton Coal Company	CFBC
Reading Coal Company	CFBC
Applied Energy Services	CFBC
Cogentrix	SS
GWF	BB
Pyropower	CFBC
CRS Service	CFBC

NOTES:
CFBC: Circulating Fluidized Bed Boilers
BB: Bubbling Fluidized Bed Boilers
SS: Spreader Stokers

approximately 1/2" long x 1/4" diameter, and cylindrical in shape. Aggretrel™ has an approximate 20% variance in length. Aggretrel™ can be produced in a hard form quality, achieved by the degree of pressure in the pelletizer in connection with certain Catrel additives.

Considerable product development has been done by Catrel SA on using Aggretrel™ as aggregate in road sub base and in various cement/sand mixes to produce concrete blocks. Quality products can be made but formulations must be adjusted to account for the differences between Aggretrel™ pellets and natural aggregate.

The Swiss Federal Laboratory for Materials Testing and Research conducted extensive tests on concrete blocks containing Aggretrel™. The laboratory, after running standard strength tests, freeze/thaw cycles, and repeated immersion in water, concluded that "Catrel granulates have proven to be durable." In addition, "Their use in the manufacture of building blocks and other cement-combined items seems to be possible without difficulty."

The concrete products and materials used to build Catrel SA's industrial plant in Moudon, Switzerland, employed the Aggretrel™ product manufactured from their pilot plant in Viry, France. The Moudon plant is Catrel's flagship facility that demonstrates the Catrel process to the world, including the actual use of the Aggretrel™ product.

Aggretrel™ is an outstanding product for use in Switzerland and those parts of Europe where natural aggregate is scarce and high in cost. Catrel USA recognizes the future potential for this product in the U.S. However, because of the more favorable economics in the production of Fueltrel™ and Soiltrel™, with a higher price value for Fueltrel™ and Soiltrel™ compared with Aggretrel™, Catrel USA will not initially manufacture the Aggretrel™ product. End product production will be determined by market conditions on a regional basis.

The following is for general illustration purposes only:

Information regarding aggregates in the United States is contained in the Mineral Yearbook, in which data is supplied by the Bureau of Mines and other organizations related to the mineral industry, of which aggregates (sand and gravel) are a part. The estimated volume use of aggregate in the United States is 775 million tons per year.

The West produces approximately 277 million tons of aggregate annually (36%), the North Central U.S. 208 million tons (27%), the South 199 million tons (26%), and the Northeast 89 million

tons (11%). The most productive states are California, Texas, Michigan, Ohio, Arkansas, Arizona, Colorado, Illinois, New York, and Washington. Approximately 25% is used in concrete highway construction, 14% for road base, 9% for asphalt concrete aggregate, 7% commercial fill, and 1% for concrete products, such as bricks and blocks. Among the uses listed for the 44% remaining material is railroad ballast and track bedding, roofing materials, snow and ice control, and other generalized applications.

The commercial value of aggregate is fairly uniform in all areas of the country and costs approximately $3.25 to $4.00 per ton, with a retail value from $7.50 to $12.00 per ton.

Potentially, Catrel USA can produce 4.4 million tons of Aggretrel™ by 1999, utilizing 28 plants, representing approximately 0.006% of the total aggregate market. Based on this data, the total potential wholesale value of Aggretrel™ would be $14.3 million to $17.6 million between now and the turn of the century.

V CATREL PROCESS ADVANTAGES AND DIFFERENTIATION

Overview

The two key areas of differentiation and advantage that the Catrel process have are (1) it produces a high quality product that will be embraced by fossil fuel users as a legitimate, economical, easy to use substitute for coal and oil, and (2) the process uses existing rather than new energy generation infrastructure which ultimately eliminates refuse, thereby conserving capital and reducing pollution.

Comparison to Mass Burn Incineration

The capital cost required to construct a 1000 TPD mass burn plant is more than four times higher than the capital cost for a comparable Catrel facility (see Table 4). The gross disparity in capital cost is due to the expensive combustion and power generation equipment required to mass burn raw unprocessed refuse. This capital cost differential is further amplified by the significant difference in construction duration and carrying costs. The diseconomy of mass burn incineration becomes even greater at capacities below 1000 TPD due to capital equipment scale down effects, making it economically impractical to decentralize mass burn plant sites. Even with sale of electricity at avoided cost levels, tip fees for mass burn units are in excess of $50/ton, excluding the cost of ash disposal. These tip fees continue to rise due to recent increases in interest rates, revisions in tax legislation which has historically favored capital intensive mass burn projects, and increasingly stringent air pollution control equipment requirements (i.e., scrubbers, thermal DeNO$_x$ systems). Further, since the flyash from mass burn units is often hazardous due to lead and cadmium levels, this can result in mass burn ash disposal costs in excess of $200/ton. In comparison, a privately operated Catrel plant with an extremely attractive return on investment is able to sell Fueltrel™ at 50% to 65% of coal market pricing (delivered price; equivalent heat input basis) and comfortably offer tip fees 15% to 20% lower than mass burn units.

Operating and maintenance costs associated with the Catrel process are also lower than mass burn incineration due to the far less complicated process design. Further, Fueltrel™, which is a highly refined material compared to raw municipal solid waste, will be co-fired in conventional fossil fuel-fired boilers by experienced and qualified power plant operations people.

Aside from the obvious economic advantages, the Catrel process is more environmentally sound than mass burn incineration. The Catrel process allows for the recycling and reuse of metals

Catrel USA
A RESOURCE RECOVERY CORPORATION

TABLE 4

Capital Cost Comparison for Competing Refuse Disposal Systems

System	Capital Cost ($/TPD of MSW)
Mass Burn Incineration	$100,000
RDF Fluff	$ 44,000
Composting	$ 63,000
Catrel	**$ 22,000**

including removal of troublesome nickel-cadmium batteries. It also allows for the removal and recycling of glass, aluminum and plastic from the refuse prior to fuel production and combustion. In a mass burn incinerator, these materials are combusted, often times resulting in a toxic, heavy metal ladened incinerator flyash which must be disposed of as a hazardous waste. A typical example of this disposal problem can be found in Warren County, New Jersey, where the flyash is failing to meet Environmental Protection toxicity limits for lead and cadmium set by the Federal Environmental Protection Agency. By contrast, the relatively clean ash produced by the combustion of Fueltrel™ is diluted into a larger volume of ash produced by the co-fired fossil fuel prior to the ultimate disposal of the combined ash. The binder used in the Catrel process also helps to reduce the leachable characteristics of heavy metals such as lead. Overall, when co-firing RDF with coal, the EPA limits on leachability for lead, cadmium, and other heavy metals are not exceeded, as borne out by both the Argonne Laboratory test data (see Appendix A) and by analysis conducted at Baltimore Gas & Electric's Crane Station.

Comparison to Other RDF Processes and Products

The Catrel USA process is mechanically simpler than conventional RDF processes. Unlike other RDF processes, Catrel USA does not use air classification, disc screens, and high volume dust collectors. This mechanical simplicity, combined with refuse processing prior to size reduction, makes Catrel's process more reliable and less expensive to maintain than conventional RDF processes.

The combination of hand sorting, chemical and thermal processing makes the Catrel process unique when compared to any other conventional RDF process. As a result, Fueltrel™ has superior physical, chemical and biological qualities compared to any other RDF product. The chemical additives binder used in the Catrel process increase the bulk density and mechanical strength of the end product, making it easy to transport by rail or truck as well as to store and use. This convenience is contrasted against RDF fluffs which have to be transported by garbage truck, will biodegrade and smell when stored for any extended period, and are problematic to transport and feed into boilers because of their very low bulk density. RDF fluffs are not compatible with existing coal and oil boiler fuel storage and transport systems. Fueltrel™, however, can be co-fired in coal boilers, either as a pellet or after pulverization, using existing fuel storage and feed equipment. Further, Fueltrel™ is biologically stable and can be stored for extended periods of time just like coal, without any odors.

Fueltrel™'s low moisture content makes it more efficient to burn than conventional RDF fluffs. Further, co-firing Fueltrel™ will reduce baseline NO_x and SO_x levels as demonstrated in the Argonne Laboratory tests.

Comparison to Composting

Soiltrel™ production does not require a large area or extended residence times like typical composted refuse since it does not have to be aerobically biodegraded. The land requirements for a Catrel plant is less than half the area required for composting refuse. For example, in San Diego County, two composting system suppliers submitted proposals for 150,000 tons per year (410 tons per day) composting plants that would require thirteen (13) acres of land. A comparable capacity Catrel plant would require less than six (6) acres of land. This factor can be significant in densely populated areas where land availability is limited. In addition, the volume of rejected materials from competing composting systems is 50% greater than a Catrel plant's volume. As illustrated in Table 3, the capital costs for competing composting plants are three (3) times that of a Catrel plant, primarily due to increased complexity and material inventorying requirements.

rj/corpback

Appendix A

Summary of Argonne National Laboratory Test Results

ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE, ARGONNE, ILLINOIS 60439
TELEPHONE 312/972-5593

March 8, 1989

Mr. James Sahagian
Catrel USA
Raritan Plaza II
CN3106
Edison, NJ 08818

Dear Jim:

As a follow-up to our recent telephone conversation, I have assembled some preliminary findings we have reached regarding our dRDF/coal combustion tests we conducted at Argonne National Laboratory during June-July 1987. I would like to share with you some of the more important ones:

- All bottom ash and fly ash samples from all test runs passed the EP Toxicity tests. A total of 103 fly ash samples and 131 bottom ash samples were analyzed. Most importantly, lead and cadmium, which are found to fail the EP tests in many cases involving the mass burning of MSW were not found to exceed the limits of 5 and 1 mg/l, respectively, in the leaching solution.

- The EP leaching procedure tests indicated that increasing the binder content decreased the amount of lead leached from the bottom ash. However, no clear trend was observed as to a similar reduction in the fly ash samples, although all fly ash samples were below the detection level for lead.

- Uncontrolled (prior to pollution control devices) sulfur dioxide (SO_2) flue gas emissions decreased from the coal baseline of 1400 ppm as blend ratios of dRDF/coal increased, and as the binder percentage was increased. The dRDF pellet without binder was noted to result in a 5% reduction, whereas 4 and 8% binder resulted in 10 and 15% reductions in SO_2 at the 10% dRDF/coal blend firing rate, a 15% reduction was noted for the dRDF pellet without binder, whereas 4 and 8% binder, resulted in 22 and 28% reductions in SO_2 for a 20% dRDF/coal blend firing rate. At the 30% dRDF/coal blend firing rate, a 21% reduction was noted for the dRDF pellet without binder, whereas 4 and 8% binder resulted in reductions of SO_2 of 24 and 27%, respectively.

- Uncontrolled hydrogen chloride (HCl) flue gas emissions increased above the coal baseline of 11.39 ppm when dRDF/coal blend firing rates were increased.

- Uncontrolled hydrogen chloride flue gas emissions were reduced as the amount of lime binder was increased from zero to 8%. At a 30% dRDF/coal blend and 8% binder, the HCl emissions were 27.45 ppm, somewhat below the 30 ppm limit applied in some localities.

- Uncontrolled nitrogen oxide (NO_x) flue gas emissions decreased from the coal baseline of 127 ppm as blend ratios of dRDF/coal increased and as binder percentages increased. The fluctuations in the data were too wide to determine with assurance as to the exact percentage reductions, however approximate reductions for a 20% dRDF/coal firing blend with a 4% binder is 20%, while an approximate reduction of 33% is observed for a 30% dRDF/coal firing blend with a 4% binder.

- No detectable concentrations of bromides or fluorides were found in the flue gas emissions at sampling locations 9 (prior to spray dry scrubber and baghouse) and 10 (at the stack). Detection levels were 0.04 ppm for fluorides and 0.1 ppm for bromides.

- All fly ash samples tested were below the detection levels for tetra through octa chlorinated dioxins and furans. Detection levels were .99 ng/g to 2.5 ng/g for dioxins and .99 ng/g to 4.98 ng/g for furans.

- All tetra through octa chlorinated dioxins and furans are below the detection levels for all flue gas samples tested at sampling location #10 (at the stack). Detection levels were .07 ng/m^3 to 5.16 ng/m^3.

The major preliminary conclusions which can be drawn from these findings are:

- The test results show that dRDF pellets can be fed along with coal to an existing stoker-fired boiler at rates up to 30% dRDF (by heat input) without upsetting combustion stability or the ability of the boiler to maintain load demand. The limitation of 30% dRDF (by heat input, which is equivalent to 42 to 50 percent by volume) is the approximate feeding capacity of the spreader; which could, if modified permit firing at dRDF rates in excess of 50%. Based on our studies, firing rates in excess of 50% should present no boiler operational problems if relatively minor modifications are made to the boiler (e.g. feed and ash handling system capability increased). Fuel handling, slagging and clinkering problems were not noticeably worse than when firing with coal.

- To the eye, carry-over of particulate from the furnace into the convection bank of the boiler did not appear to be significantly greater than when firing coal alone. "Sparklers" were rarely evident. When dRDF fuel was bunkered with coal, the refuse material could be handled without incurring housekeeping problems in the boiler plant. Some minor odors were reported by the operating personnel.

- Uncontrolled HCl emissions when co-firing dRDF/coal increased when firing rates were increased. However, at 30% firing rate with an 8% binder were 27.5 ppm, somewhat below the 30 ppm limit applied in same localities.

- Uncontrolled HCl emissions were reduced as the amount of binder was increased.

- Uncontrolled NO_x and SO_2 flue gas emissions decreased as blend ratios of dRDF/coal were increased and as binder percentages increased.

- The ash residues from co-firing, while containing more heavy metals, such as lead and cadmium than coal, do not exceed the allowable levels for these metals as determined by the EP Toxicity tests.

- Densified RDF pellets containing a calcium hydroxide binding agent additive have demonstrated several very important advantages over conventional dRDF pellets fabricated without a binder additive. Several of the more significant are:

  1. Bulk density is a good indicator of the mechanical strength and durability of dRDF pellets. Pellets fabricated with a calcium hydroxide binding agent have consistently demonstrated, both in the laboratory and when fabricated commercially in large quantities (i.e. hundreds of tons per day), bulk densities 80% greater than pellets without a binder. This increase in bulk density allows the pellets to be more easily transported, and minimizes handling and conveying problems when firing the pellets.

  2. The use of calcium hydroxide as a binding agent allows the pellets to be stored outside for a period of six (6) months without biological and chemical degradation. Conventional dRDF pellets without a binder cannot tolerate outside storage periods of longer than four to five days without suffering substantial chemical and biological degradation.

  3. Pellets containing a calcium hydroxide binding agent can be stored inside for indefinite periods of time without biological and chemical degradation. Such pellets have been stored at ANL for over three years. Pellets without a binder agent show visual biological degradation within two to three weeks.

  4. dRDF pellets containing a calcium hydroxide binding agent contain two (2) percent less -3/8 fines than conventional dRDF pellets without a binding agent. This reduction means less bridging and jamming in feed hoppers and conveying systems.

Less fines also means fewer agglomeration problems when stored in feed hoppers and fewer "dusting" problems when pellets are being transported or conveyed.

5. The optimum moisture content when pellets are fabricated without a binding agent varies between approximately 15 and 20%. For moisture contents greater than 20% it is not possible to produce even a marginal-quality pellet. With a calcium hydroxide binding agent, quality pellets can be produced with moisture contents up to and including 36%. Since considerable drying of the RDF substrate is necessary to reduce the moisture content to a maximum of 20% for conventional dRDF pellets, a substantial energy savings is realized by producing pellets containing calcium hydroxide.

6. Our combustion tests have indicated that flue gas and ash residue emissions are reduced when pellets containing calcium hydroxide additives are fired. Acid gas emissions such as SO_2, NO_x, HF, and HBr are reduced up to 20% over that realized by conventional dRDF pellets. Organic flue gas emissions such as dioxins, furans, PAH's and PCB's have also been shown to be reduced. EPA leaching procedure tests have indicated that dRDF pellets with calcium hydroxide binders show a reduction in the levels of toxic heavy metals such as lead, cadmium and mercury in the fly ash and bottom ash residue compared with dRDF pellets without a binder.

If I can be of any further assistance to you in the future, please don't hesitate to contact me.

Sincerely,

Ole

Ole Ohlsson
Energy from Municipal Waste Program
Energy and Environmental Systems Division

OO:mjs

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Appendix B

Summary of Rochester Gas & Electric Test Results

SUMMARY OF RESULTS OF RDF TEST PROGRAM AT ROCHESTER GAS & ELECTRIC'S RUSSELL STATION

Objectives of Test Programs

Examine impacts of co-firing RDF and coal on:

- Boiler efficiency
- Combustion characteristics and stability
- Boiler operations and maintenance
- Corrosion of boiler and precipitator
- Environmental impacts
- Compliance with regulatory statutes
- Costs, including O&M and disposal

Facility and Program Description

- 65 MWe Pulverized coal fired boiler with dump grate bottom and an electrostatic precipitator
- 2.5 Year testing period
- Pneumatic injection of RDF
- Coal - approx. 12,500 BTU/LB
  4% to 8% moisture
  10% to 14% ash
- RDF - 4000 to 6000 BTU/LB; average 5000 BTU/LB
  Ash content - average 15%; range 10% to 20%
  Moisture content - average 30%; range 20% to 38%

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Results and Conclusions

- Boiler efficiency reduction ranged from 0.29% to 0.52% due to increase in fuel moisture and hydrogen. It averaged 0.37%

- 9% Ratio of RDF to coal by heat input was found to be optional; at this ratio, there was very little adverse effect on normal operation except at low loads, below 55% of MCR

- Above a 12% ratio of RDF to coal, heavy particulate carryover, slagging, clinkering and pluggage occurred. This required more maintenance and additional personnel.

- RDF firing at 11% of heat imput at MCR required the boiler to be derated by approximately 12% due to increased flue gas volume and ID fan limitations

- Particulate emission increased by 20% when co-firing at MCR, although still within the existing regulatory limits

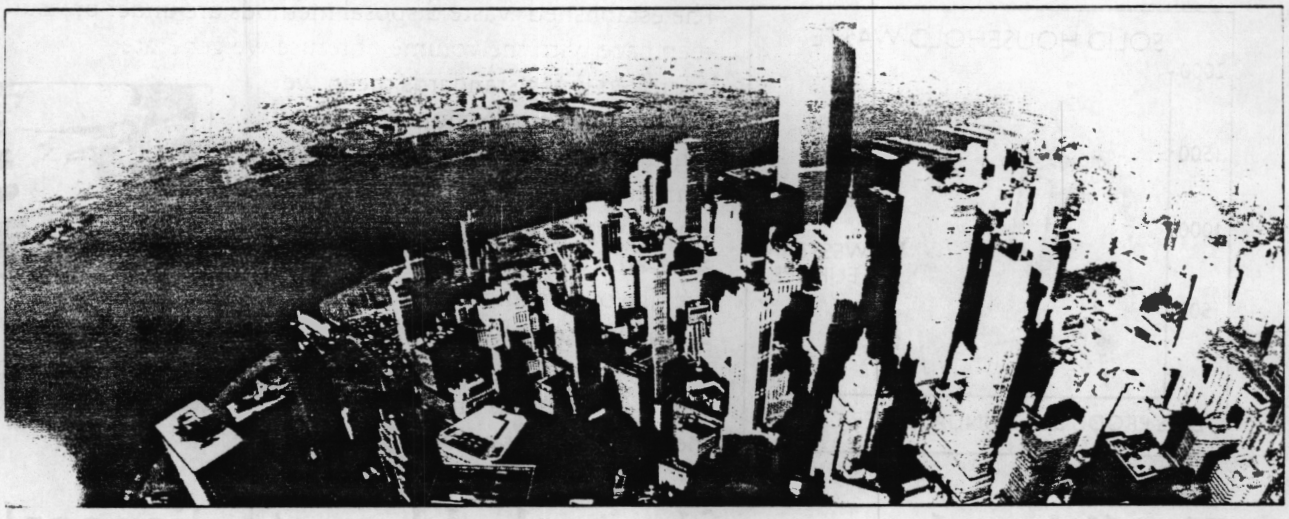
- Ash composition during co-firing met all the environmental regulations for disposal

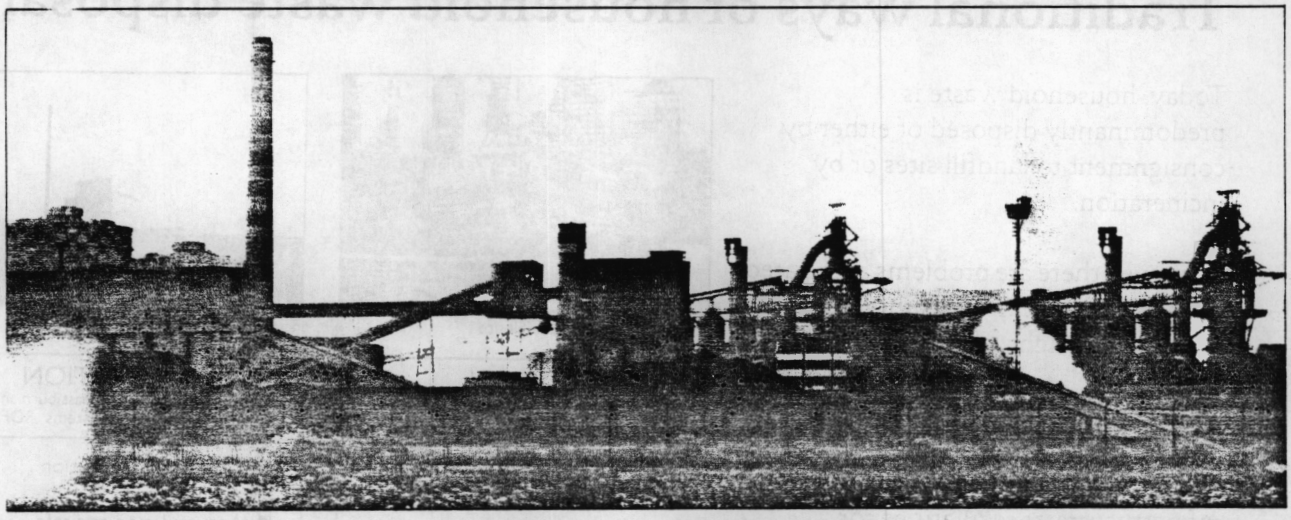
- Corrosion rates of carbon steel and low alloys in the furnace zone were reduced when co-firing

- Low alloy steels and stainless steel in the superheater section increased slightly due to sulfidation attack. No evidence of chlorine attack was observed

- Overall long term corrosion effects are projected to be small

The Catrel way for waste disposal







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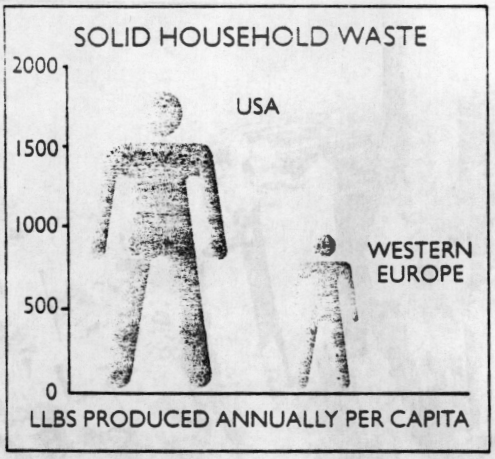
The problems of waste disposal



The established waste disposal methods are under pressure to keep pace with the volume of refuse we generate.

Improved living standards mean we discard more of the shortlife consumables. which become our long term disposal problem.

Up to five pounds of refuse per person is generated daily in America, with an average of two and a half pounds per person in parts of Western Europe.



Rising populations and increasing affluence will only accelerate the growth of refuse occurring worldwide.

Traditional ways of household waste disposal

Today. household waste is predominantly disposed of either by consignment to landfill sites or by incineration.

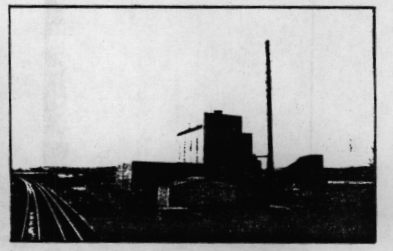
However, there are problems associated with these alternatives as shown by the tables to the right.

As yet there is no international approach to the waste management problem. Each country has set up its own infrastructure of regulations for controlling how waste is handled. by whom and by what methods of disposal.

However. increased public awareness of environmental issues has put pressure on the responsible organisations to dispose of refuse in a safe. clean. and cost effective manner.



Barge en route to a landfill site



Incineration plant

LANDFILL SITES
■ Existing sites are filling fast and new sites are increasingly scarce
■ High transportation costs to the landfill sites
■ Potential health risks through underground water contamination
■ Accumulation and disposal of landfill leachate
■ Landfill gas emission
■ Increasing costs for the enforcement of more stringent landfill control regulations
■ Containment costs associated with the problems of the older closed sites

INCINERATION (including open and mass burn and (Refuse-To-Energy systems (RDF))
■ Potential air pollution
■ Accumulation and safe disposal of possibly hazardous incinerator ash; up to 25% can remain as residual ash
■ Very high capital costs

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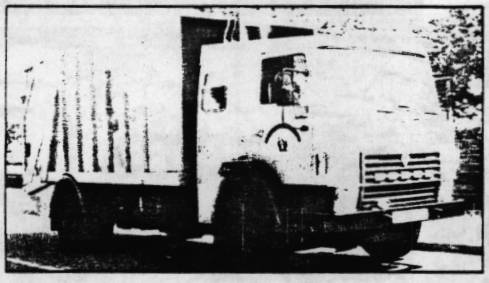
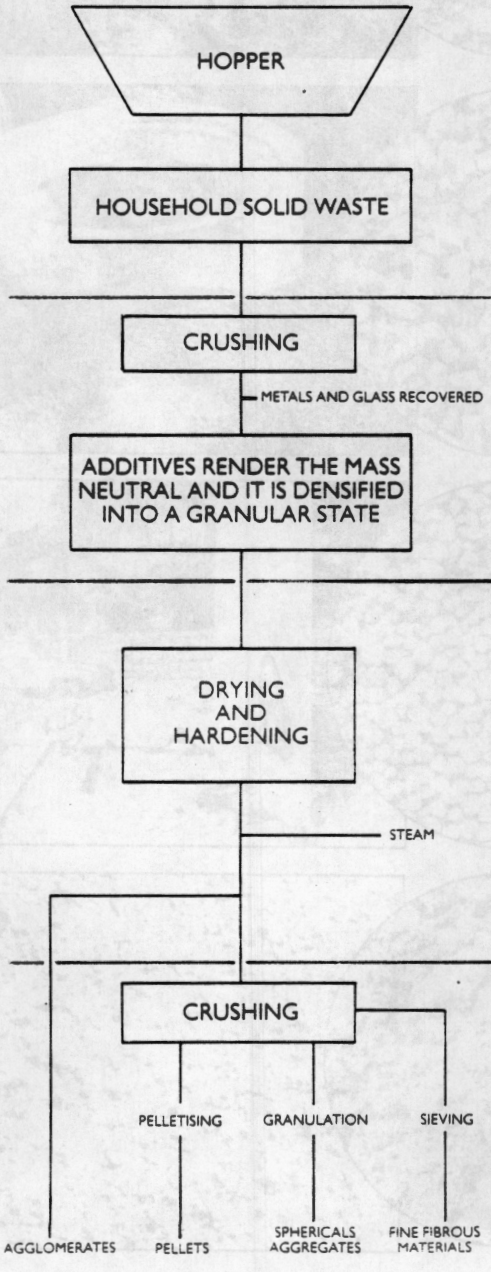
The Catrel technology



The Catrel method is a closed system that does not **burn** or **pollute**.

It moves solid household waste through a number of processes:



The household waste enters the plant and is conveyed to the first stage of handling where all outsized materials are removed for separate disposal.
These rejects represent only a very small percentage of the total waste stream.

The remaining waste moves on for primary crushing, and is conveyed through a screening process where all metal and glass are recovered. The ground refuse is chemically neutralised and fed into extruders that compacts the mixture into a granular form.

These waste granules are dried and hardened in a rotary kiln at controlled temperatures that do not exceed the pyrolsis of typical primary constituents in the waste mass.
The product which emerges, combustible agglomerates: is stable. biologically inert and odourless.
These agglomerates can either be further processed or sold as a refuse-derived fuel.

The agglomerates are processed further by incorporating additional fillers and additives and the resultant blend is moulded into pellets and sphericals ready for use.
Dust produced during the process is removed by cyclones. and recycled back into the waste stream.

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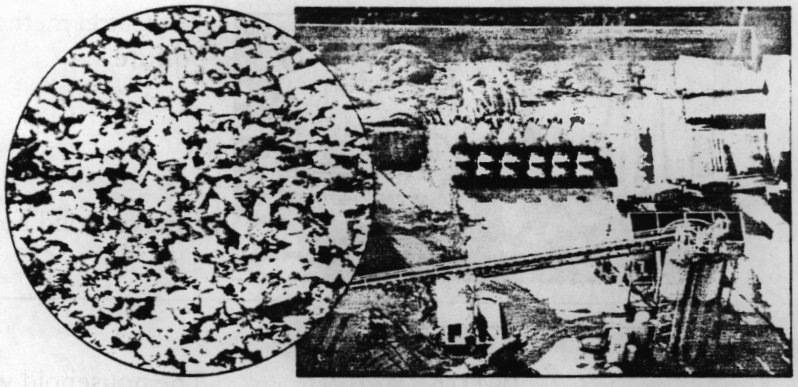
The Catrel products and their applications

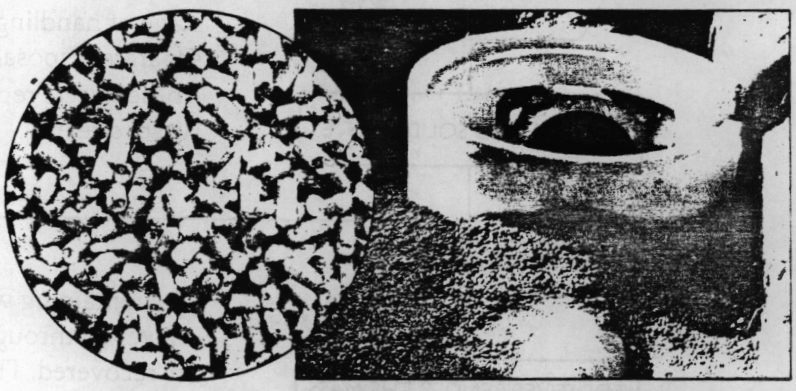
Agglomerates

- A secondary energy form.
- Burns with coal to fire cement kilns.



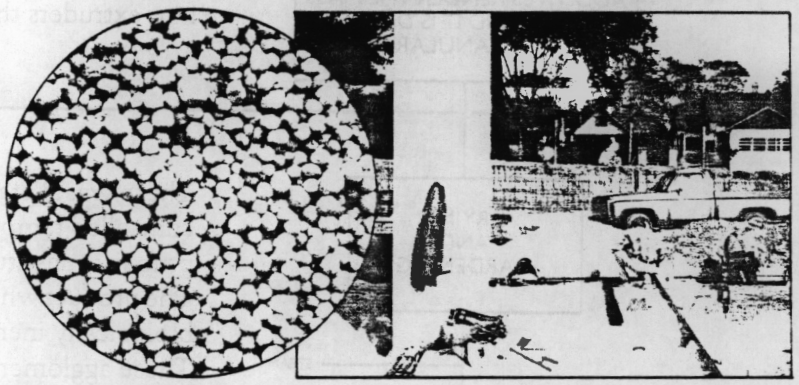
Pellets 'PELECO'

- A construction material.
- A component element for concrete, blocks, slabs and bricks.
- A base material in road and canal construction.



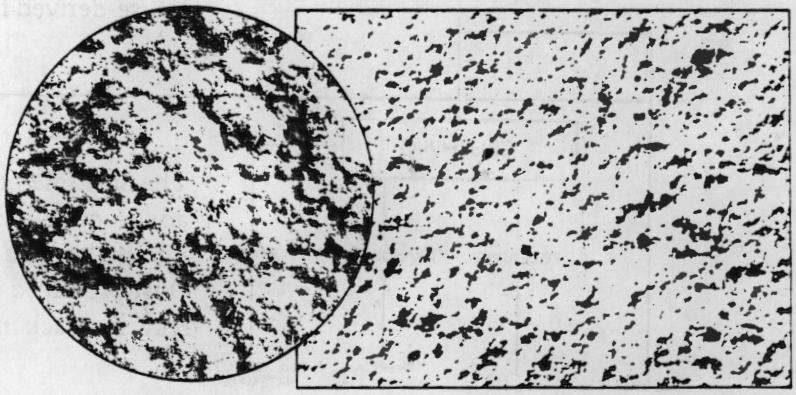
Spherical Aggregates 'AGRECO'

- A construction material.
- Lightweight concrete bricks and blocks.
- Excellent insulating properties.
- A finer finished product.



Fine Fibrous Materials 'FIBRECO'

- A building material.
- Fine quality plasters and mortars.
- Strong insulating and adhesive properties.

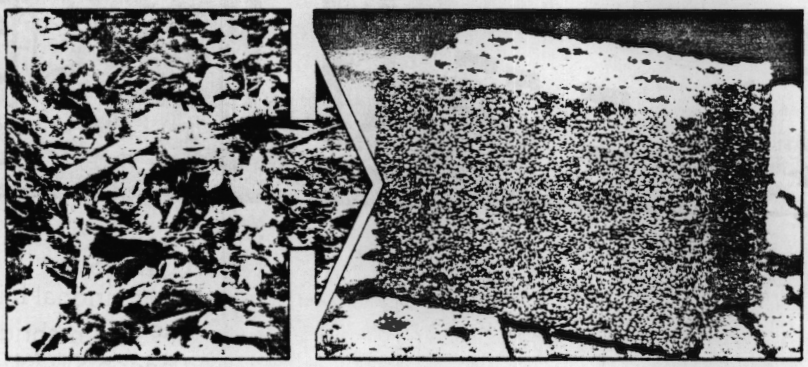


The Catrel solution

Catrel S.A. (incorporated in Switzerland) specialises in industrial research and product development. Our new waste processing plant in Switzerland, with a capacity of 200 tonnes of refuse per day – 10 tonnes per hour – is the result of many years of research in the field of modern waste disposal technology

The Catrel process is unique. It transforms household waste within a non-polluting, non-burning system into a range of products that are solid, biologically inert, odourless, and water insoluble.

Household refuse is crushed, removing all the metals and glass for recycling. The ground waste is thermo-chemically neutralised: compacted into granules and embrittled by drying. Further processing takes place to produce more refined end- products.



These products have a wide range of applications in the construction industry and as a refuse-derived fuel.

One of the key advantages of the Catrel process is its ability to handle and transform a very wide composition of refuse without residual waste.

The mechanics of the process are relatively simple which means a lower capital outlay and reduced maintainence costs.

Process designs allows significant flexibility within the product lines.

The Catrel technology provides an efficient, clean and cost effective solution to the problems of waste management.

Investing in the Catrel process is a commitment to better waste management technology.

We can define the advantages of the Catrel process as follows:

TECHNICAL

- Not labour intensive
- Computerised quality control
- The process uses non-toxic, readily available raw materials
- Plant size and technology mean it can be located near cities reducing transportation costs

ENVIRONMENTAL

- None of the waste is burnt
- No hazardous by-products
- Almost all the waste is treated and transformed into usable products
- Very low levels of reject waste to be disposed of
- No visual pollution usually associated with landfill sites and incineration plants

ECONOMICAL

Efficient plant design and cost efficiencies mean lower costs for:

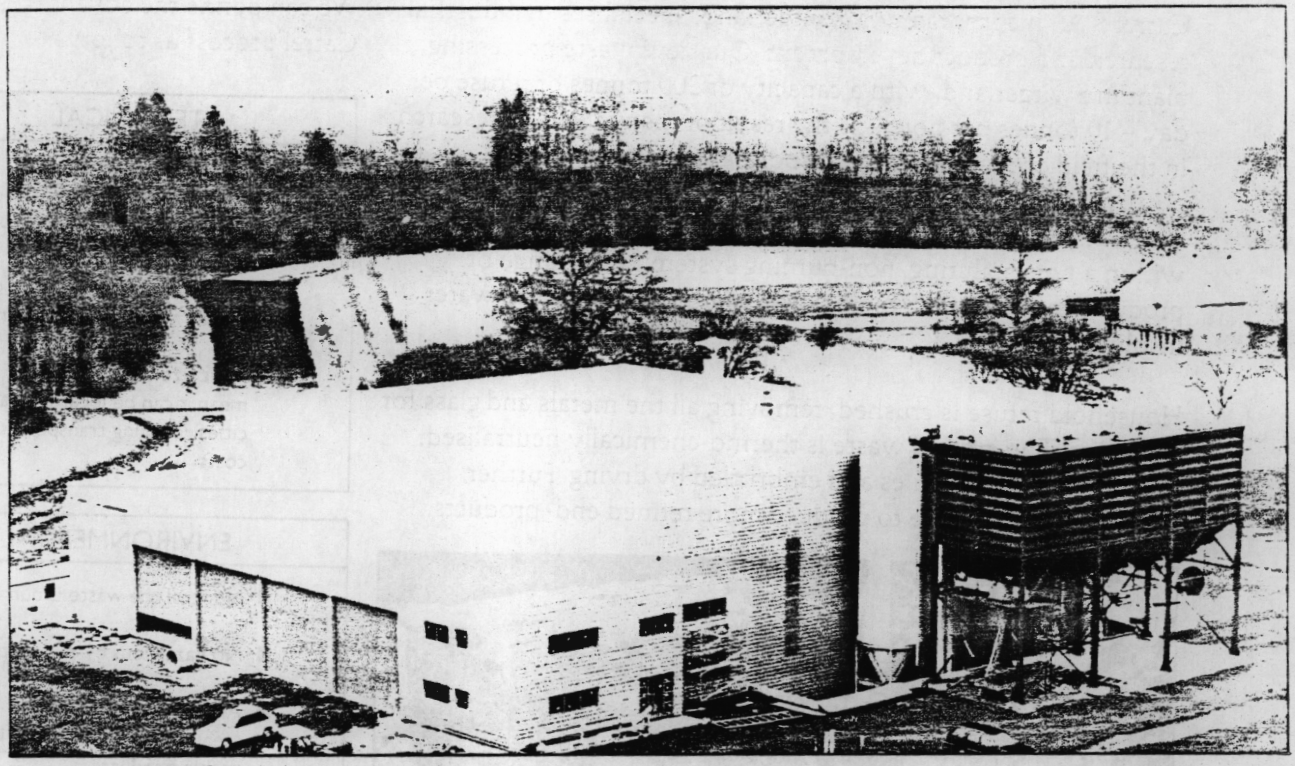
- Installation
- Operation
- Overheads

Optimum land utilisation

ADAPTIVENESS

The process can be adapted to any:

- Climate
- Culture
- Environment



The Catrel plant, Moudon, Switzerland.

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Telex: 94017813 CATR G

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REMARKS OF

ASSISTANT MINORITY LEADER

THOMAS P. FOY

ON

LEGISLATION IMPOSING A MORATORIUM

ON THE CONSTRUCTION OF INCINERATORS

PALMYRA, NEW JERSEY

MAY 23, 1989

CHAIRMAN, MEMBERS OF THE COMMITTEE, THANK YOU FOR PROVIDING THIS OPPORTUNITY FOR THE CITIZENS IN AND AROUND MY LEGISLATIVE DISTRICT IN BURLINGTON COUNTY TO EXPRESS THEIR THOUGHTS REGARDING THE STATE'S RELIANCE ON INCINERATION FOR SOLID WASTE DISPOSAL.

AS YOU KNOW, GROWING CONCERN ABOUT THE ENVIRONMENTAL AND ECONOMIC IMPACT OF INCINERATION AS THE STATE'S FAVORED MODE OF SOLID WASTE DISPOSAL HAS PROMPTED OUR COLLEAGUES, ASSEMBLYMEN BILL PASCRELL AND JOHN ROCCO TO INTRODUCE LEGISLATION IMPOSING A 12 MONTH MORATORIUM ON THE CONSTRUCTION OF INCINERATORS. ALTHOUGH I AM TROUBLED BY THE UNINTENDED, BUT POTENTIALLY ADVERSE IMPACTS OF AN ABSOLUTE, 12 MONTH MORATORIUM, I AM CONVINCED THAT THE SPONSORS' CONCERN IS WELL PLACED AND THIS BILL WARRANTS THE LEGISLATURE'S THOUGHTFUL CONSIDERATION.

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THIS LEGISLATION RAISES SEVERAL IMPORTANT QUESTIONS ABOUT NEW JERSEY'S SOLID WASTE MANAGEMENT POLICY THAT MUST BE ADDRESSED BEFORE WE RUSH AHEAD TO CONSTRUCT NO LESS THAN 17 INCINERATORS.

WHAT EFFECT WILL 17 OR MORE INCINERATORS HAVE UPON THE STATE'S AMBIENT AIR QUALITY, REGIONAL LAND USE PATTERNS, INCLUDING TRANSPORTATION AND RESIDENTIAL DEVELOPMENT AND WATER SUPPLY? MOST IMPORTANT, HOW MANY INCINERATORS DOES NEW JERSEY REALLY NEED TO HANDLE ALL OF ITS GARBAGE?

BY FAR THE MOST PURSUASIVE ARGUEMENT FOR A MORATORIUM IS THE RECOGNITION THAT NEW JERSEY SIMPLY DOES NOT NEED 17 OR MORE INCINERATORS TO HANDLE THE STATE'S GARBAGE. WHETHER, IN LIGHT OF A 25% RECYCLING GOAL AND ALL OTHER RELEVANT FACTORS, NEW JERSEY WILL REQUIRE 6 OR 8 OR 10 INCINERATORS IS THE MOST PERTINENT QUESTION. DEP OFFICIALS, HOWEVER, HAVE BEEN EITHER UNWILLING OR UNABLE TO PROVIDE AN ANSWER.

THE CONSEQUENCES OF BUILDING TOO-MANY INCINERATORS HAVE BEEN LARGELY UNADDRESSED IN THIS DISCOURSE. HOWEVER, I SUBMIT TO YOU THAT THE CONSEQUENCE COULD BE DEVASTATING TO NEW JERSEY AND CANNOT BE OVER-EMPHASIZED. IN ORDER TO OPERATE ECONOMICALLY, INCINERATORS MUST BURN THE AMOUNT OF WASTE FOR WHICH THEY ARE DESIGNED.

WHEN WASTEFLOW IS OVER-ESTIMATED, TWO SERIOUS PROBLEMS RESULT: (1) COUNTIES MUST LOOK BEYOND THEIR BORDERS FOR GARBAGE, AND (2) RATEPAYERS ARE REQUIRED TO PAY ARTIFICIALLY INFLATED RATES.

FOR EXAMPLE, WARREN COUNTY'S INCINERATOR IS THE SMALLEST OF THOSE PRESENTLY UNDER CONSTRUCTION OR IN THE PLANNING OR DESIGN PHASE. YET, IT HAS ALREADY EXPERIENCED A SHORTFALL OF GARBAGE AND IS NOW BEGGING OTHER COUNTIES FOR THEIR GARBAGE.

THIS SITUATION SHOULD SEND A CLEAR SIGNAL THAT IF WE PERMIT THE CONSTRUCTION OF MORE INCINERATORS THAN WE ACTUALLY NEED, WE RISK BECOMING A MAGNATE FOR OUT-OF-STATE-WASTE. THE OPERATORS OF THESE FACILITIES WILL BE FORCED TO SEEK GARBAGE FROM BEYOND OUR BORDERS TO REMAIN ECONOMICALLY VIABLE. SINCE, UNDER CURRENT LAW, THE BOARD OF PUBLIC UTILITES IS NOT REQUIRED TO REGULATE THESE MATTERS, INCINERATOR OPERATORS ARE FREE TO SOLICIT WASTE FROM PENNSYLVANIA AND NEW YORK OR ANY OTHER STATE.

FURTHERMORE, MOST CONTRACTS BETWEEN COUNTIES AND INCINERATOR OPERATORS REQUIRE THE RATEPAYERS TO PAY FOR THE DISPOSAL OF A STIPULATED AMOUNT OF GARBAGE WHETHER OR NOT THE GARBAGE IS ACTUALLY COLLECTED AND BURNED. THUS, IF THE COUNTY OVER-ESTIMATES IT WASTEFLOW, IT MAY BE CHARGED RATES HIGHER THAN THE TRUE COST OF DISPOSAL.

BASED UPON THESE OBSERVATIONS AND CONCERNS, I AGREE WITH THE SPONSORS OF THIS LEGISLATION THAT THE STATE HAS NOT ADAQUATELY ASSESSED THE AMOUNT OF GARBAGE REQUIRING DISPOSAL, INCLUDING FUTURE WASTEFLOW PROJECTIONS. AS A RESULT, THE STATE CANNOT ACCURATELY DETERMINE THE NUMBER AND SIZE OF INCINERATORS NEEDED STATEWIDE AT THIS TIME.

I BELIEVE DEP SHOULD IMMEDIATELY CONDUCT A THOROUGH ASSESSMENT OF STATEWIDE SOLID WASTE DISPOSAL REQUIREMENTS. BASED UPON THIS ASSESSMENT, DEP SHOULD DETERMINE THE NUMBER AND SIZE OF INCINERATORS NEW JERSEY ACTUALLY NEEDS.

I HAVE NO DOUBT THAT ONCE DEP DETERMINES THE NUMBER OF INCINERATORS NEEDED BASED UPON THIS ASSESSMENT, THE NUMBER WILL BE NOWHERE NEAR THE 17 TO 22 WE ARE PRESENTLY TALKING ABOUT.

DEP SHOULD TAKE SEVERAL STEPS TO ENSURE AN ACCURATE ASSESSMENT. SOLID WASTE IN MANY COUNTIES IS BEING ILLEGALLY TRANSPORTED TO OUT-OF-STATE LANDFILLS IN DIRECT AND BLATANT CONTRAVENTION OF DEP WASTEFLOW ORDERS. FOR EXAMPLE, IT IS ESTIMATED THAT AS MUCH AS 60% OF THE WASTEFOW IS BEING ILLEGALLY DIVERTED IN BERGEN COUNTY. ONE CONSEQUENCE OF THIS PRACTICE IS THAT IT IS DIFFICULT TO ACCURATELY ESTIMATE THE TOTAL AMOUNT OF WASTE REQUIRING DISPOSAL. DEP SHOULD ENFORCE THE ROUTINELY VIOLATED WASTE FLOW ORDERS.

IN ADDITION, THE LEGISLATURE SHOULD ENACT ASSEMBLYMAN SHINN'S LEGISLATION, REQUIRING THAT SOLID WASTE BE MEASURED BY WEIGHT INSTEAD OF BY VOLUME AS IS THE CURRENT PRACTICE. THIS MEASURE WOULD ENHANCE THE STATE'S ABILITY TO ACCURATELY MEASURE THE STATEWIDE WASTEFLOW.

MOREOVER, THE LEGISLATURE AND THE ADMINISTRATION MUST MAKE A MORE SUBSTANTIAL COMMITMENT TO RECYCLING IF WE ARE GOING TO REACH THE 25% GOAL ESTABLISHED IN THE MANDATORY STATEWIDE RECYCLING LAW. PRESENTLY, WE ARE SPENDING COMPARATIVELY INSIGNIFICIANT AMOUNTS IN STATE FUNDS ON RECYCLING EFFORTS. A GREATER STATE ROLE WILL NOT ONLY ENHANCE A WORTHY POLICY, BUT WILL ALSO HELP MAKE ATTAINMENT OF RECYCLING GOALS MORE PREDICTABLE.

FINALLY, I BELIEVE THE LEGISLATURE SHOULD PROMPTLY ENACT A-4476, SPONSORED BY OUR COLLEAGUE BYRON BAER, WHICH WOULD REQUIRE THE UNIFORM ECONOMIC REGULATION OF INCINERATORS BY THE BOARD OF PUBLIC UTILITIES. THIS WOULD ENSURE THAT, AMONG OTHER THINGS, WHERE BARGAINING POWER DISPROPORTIONATELY FAVORS THE OPERATOR, CONTRACTUAL ARRANGEMENTS ARE FAIR AND REASONABLE.

ONCE THE NUMBER OF FACILITIES NEEDED IS DETERMINED, DEP SHOULD ENCOURAGE A REGIONALIZED APPRAOCH TO SOLID WASTE MANAGEMENT. FOR EXAMPLE, TO ENSURE THAT COUNTIES COOPERATE WITH EACH OTHER, DEP COULD REFUSE TO ISSUE A PERMIT FOR MORE THAN ONE FACILITY IN EACH COUNTY. (I.E. LANDFILL, INCINERATOR).

UNTIL THIS ASSESSMENT IS COMPLETED, NEW JERSEY SHOULD NOT ISSUE PERMITS FOR NEW FACILITIES AND WE SHOULD PROHIBIT THOSE COUNTIES IN THE PLANNING STAGE FROM SEEKING FINANCING OR ENGAGING IN LONG TERM OBLIGATIONS.

HOWEVER, I AM CONCERNED ABOUT THE FINANCIAL IMPACT A MORATORIUM WOULD HAVE UPON THOSE ENTITIES THAT HAVE ENTERED INTO FINANCING AGREEMENTS FOR THE CONSTRUCTION OF A FACILITY. I UNDERSTAND THAT RATEPAYERS IN THESE COUNTIES COULD BE SOCKED WITH MILLIONS OF DOLLARS IN ADDED COSTS IF A MORATORIUM WERE IMPOSED UPON THEM. I WOULD THEREFORE, RESPECTFULLY SUGGEST IT MAY BE MORE RESPONSIBLE TO LIMIT THE APPLICATION OF THIS MORATORIUM BE LIMITED TO THOSE COUNTIES THAT HAVE NOT, AS OF THIS DATE, ENTERED INTO FINANCIAL COMMITMENTS.

IT WOULD BE PATENTLY UNFAIR TO THE RATEPAYERS IN THOSE JURISDICTIONS TO IMPOSE THE SEVERE FINANCIAL COSTS THAT WOULD RESULT FROM A MORATORIUM. ON THE OTHER HAND, BY PERMITTING THESE FACILITIES TO GO FORWARD, WE WOULD NOT BE CONTRAVENING THE INTENT OF THIS BILL - TO LIMIT THE NUMBER OF FACILITIES TO THOSE ACTUALLY NEEDED.

IMPLICIT IN THIS IS MY BELIEF THAT INCINERATION MUST BE A PART OF NEW JERSEY'S SOLID WASTE MANAGEMENT STRATEGY. IT IS NOT PHYSICALLY POSSIBLE TO RECYCLE 80% OF THE WASTE WE GENERATE AS A SOCIETY AS SOME HAVE SUGGESTED.

I AM COGNIZANT, HOWEVER, OF THE ENVIRONMENTAL CONCERNS ASSOCIATED WITH INCINERATION. THAT IS WHY I HAVE CO-SPONSORED AND ACTIVELY CAMPAIGNED FOR THE TOUGHER ENVIRONMENTAL SAFEGUARDS CONTAINED IN ASSEMBLYMAN SPADORO'S LEGISLATION.

OUR COLLEAGUE, GEORGE SPADORO HAS PROPOSED LEGISLATION TO IMPOSE THE MOST STRINGENT, STATE OF THE ART AIR EMISSION CONTROLS UPON ALL INCINERATORS. A SECOND BILL WOULD REQUIRE THAT ALL INCINERATOR OPERATORS BE CERTIFIED BY DEP AND THAT A CERTIFIED OPERATOR BE PRESENT AT ALL TIMES DURING THE OPERATION OF THE FACILITY. A THIRD MEASURE WOULD REQUIRE THE ENVIRONMENTALLY SOUND DISPOSAL OF ASH.

I RESPECTFULLY SUBMIT THAT THESE MEASURES ARE NECESSARY BOTH TO ENSURE THE HIGHEST DEGREE OF PUBLIC CONFIDENCE IN OUR SOLID WASTE DISPOSAL STRATEGY AND TO PROTECT THE PUBLIC HEALTH.

UNFORTUNATELY, CURRENT LAW IN NEW JERSEY DOES NOT GUARENTEE THESE SUBSTANTIAL SAFEGUARDS. FOR EXAMPLE, NEW JERSEY DOES NOT HAVE A STATEWIDE ASH DISPOSAL PLAN. WE DON'T EVEN HAVE LAWS REQUIRING THAT ASH BE TESTED FOR TOXICITY AND DISPOSED OF AS A HAZARDOUS WASTE IF IT IS DETERMINED TO BE TOXIC. I FIRMLY BELIEVE THAT WE SHOULD NOT PERMIT THE CONSTRUCTION OR OPERATION OF INCINERATORS UNLESS THESE SAFEGUARDS ARE IMPOSED.

THANK YOU, AGAIN FOR THIS OPPORTUNITY TO ADDRESS THE COMMITTEE.

Let's protect our earth

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION

DONALD A. DEIESO, Ph.D.

Assistant Commissioner
for Environmental Management and Control
CN 402
Trenton, NJ 08625-0402
(609) 292-8058
Fax # (609) 633-1166

May 19, 1989

Honorable John E. Rooney
Assemblyman, 39th District
70 Kinderkamack Road
Emerson, New Jersey 07630

Dear Assemblyman Rooney:

The attached information is in response to the questions posed at the March 2, 1989 public hearing on Assembly Bill 4105 regarding water usage and the level of air impacts by resource recovery facilities.

Both statewide and facility by facility impacts are depicted by the attached charts. To illustrate the water consumption effects that the resource recovery facilities have relative to all permitted uses, I refer specfically to Figures 10-12. As you can see, as a percentage of the overall county water usage, the water to be consumed by the listed resource recovery facilities is insignificant (0.237%).

Likewise, the impacts to air quality of these resource recovery facilities will not be significant relative to county-wide and state-wide permitted emissions. State-of-the Art, Best Available Control Technology (BACT) controls ensure this to be the case. These controls are backed by round-the-clock monitoring and stringent enforcement. Details of air impacts are contained in the final section of this package.

Additional information in response to questions submitted after the March meeting will be forthcoming.

Feel free to contact me or my staff should you have additional questions.

Sincerely,

Donald A. Deieso

Donald A. Deieso, Ph.D.
Assistant Commissioner

Enclosure

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c.: Cindy Lombardi, Committee Aide
Glen Bebe, Majority Staff
Jacob Genovay, Minority Staff
Commissioner Daggett
Director Czapor
Director Devaney
Manager Binder

RESOURCE RECOVERY FACILITIES

IN NEW JERSEY

ESTIMATED WATER USAGE

AND

AIR IMPACTS

PREPARED BY:

N.J. DEPARTMENT OF
ENVIRONMENTAL PROTECTION

CHRISTOPHER J. DAGGETT
COMMISSIONER

519X

RESOURCE RECOVERY FACILITY

List of Tables & Figures

TABLE 1 Warren County RRF

a. Water supply to the facility

b. Average unit consumptive water uses for the facility with total facility water usage (average daily usage calculated under maximum continuous rating (MCR) with the turbine fully operational)

c. Facility cooling system

d. Permitting wastewater discharge to the sewerage system and the receiving POTW

e. Equivalent population serviced by the facility (calculated at 7.5 lbs per person per day generation at 0.65 processible solid waste)

f. Per person facility water usage (calculated by dividing e. equivalent population serviced into b. total water usage)

g. County water usage (obtained from the Division of Water Resources' 1987 Water Usage Reports and Public Community Water Supplies)

h. Percentage of county usage (calculated by dividing b. total facility water usage by g. county water usage and multiplying by 100)

i. Water purveyors water usage (obtained from the Division of Water Resources' 1987 Water Usage Reports and Public Community Water Supplies)

j. Percentage of water purveyors usage (calculated by dividing b. total facility water usage by i. water purveyors water usage and multiplying by 100)

Figure 1 Pie chart of Warren County RRF's water usage as a percentage of the total county water usage (obtained from items b. g. and h. of Table I)

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TABLE 2 Essex County RRF

Items the same as described in Table 1 above

Figure 2 Pie chart of Essex County RRF water usage as a percentage of the total county water usage

TABLE 3 Gloucester County RRF

Items the same as described in Table 1 above

Figure 3 Pie chart of Gloucester County RRf water usage as a percentage of the total county water usage

Range of county industrial users

TABLE 4 Bergen County RRF

Items the same as described in Table 1 above

Figure 4 Pie chart of Bergen County RRF water usage as a percentage of the total county water usage

TABLE 5 Camden County RRF

Items the same as described in Table 1 above

Figure 5 Pie chart of Camden County RRF water usage as a percentage of the total county water usage

TABLE 6 Pennsauken RRF

Items the same as described in Table 1 above

Figure 6 Pie chart of Pennsauken RRF water usage as a percentage of the total county water usage

TABLE 7 Hudson County RRF

Items the same as described in Table 1 above

Figure 7 Pie chart of Hudson County RRF water usage as a percentage of the total county water usage

TABLE 8 Passaic County RRF

Items the same as described in Table 1 above

Figure 8 Pie chart of Passaic County RRF water usage as a percentage of the total county water usage

TABLE 9	Union County RRF
	Items the same as described in Table 1 above
Figure 9	Pie chart of Union County RRF water usage as a percentage of the total county water usage
TABLE 10	Atlantic County RRF
	Preliminary EHIS review - items the same as described in Table 1 above
TABLE 11	Cape May County RRF
	Preliminary EHIS review - items the same as described in Table 1 above
TABLE 12	Mercer County RRF
	Preliminary EHIS review - items the same as described in Table 1 above
TABLE 13	Middlesex County RRF
	Preliminary EHIS review - items the same as described in Table 1 above
TABLE 14	Ocean County RRF
	Preliminary EHIS review - items the same as described in Table 1 above
TABLE 15	Somerset County RRF
	Preliminary EHIS review - items the same as described in Table 1 above
Figure 10	Water used in mgd by the permitted RRF's as compared to total county water usage - county water usage from item g. of Tables 1-9, total facility water usage from item b. of Tables 1-9 (figures for total facility water usage denoted on an expanded scale because of the large range between county and facility usage)
Figure 11	Water used by the permitted RRF's in gallons per person per day as compared to design average daily per person water consumption - facility per person water usage from item f. of Table 1-9 (figures for RRF's per person per day usage denoted on an expanded scale because of the large range between design average daily per person water use and the facility per person water use)

Figure 12 Total water used in mgd by the permitted RRF's as compared to the total permitted RRF's county water usage - county water usage from totals of items g. of Tables 1-9, total facility water usage from totals of item b. of Tables 1-9

Figure 13 Warren County Resource Recovery Facility - Nitrogen Oxide Concentrations (Predicted impact against standard)

Table 16 New Jersey Resource Recovery Facilities - Projected Significant Impact Areas

RESOURCE RECOVERY FACILITIES

WATER USAGE

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TABLE 1

WARREN COUNTY RRF, OXFORD TOWNSHIP 400TPD
WARREN ENERGY RESOURCE CO., INC. (LP)
WARREN COUNTY POLLUTION CONTROL AUTHORITY BLOUNT CO., INC.

STATUS: OPERATING

a. Water Supply - 2 wells located along the Pequest River

b. Water Consumption
   i. potable/sanitary - 2,000 gpd
   ii. scrubber evaporation - 10,436 gpd
   iii. ash quench evaporation/disposal - 4,882 gpd
   iv. cooling system evaporation - 270,166 gpd
   v. waste water treatment - 86,343 gpd
   Total - 374,411

c. Cooling System - Wet cooling tower

d. Wastewater Discharge - 87,843 gpd to the Pequest River Municipal Utilities Authority

e. Equivalent Population Serviced - 164,103

f. Water Usage Per Person - 2,282 gal/cap/day

g. County Water Usage - 120.478 mgd

h. Percentage of County Usage - 0.311%

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WATER USED BY THE WARREN CO. RRF COMPARED TO COUNTY USAGE

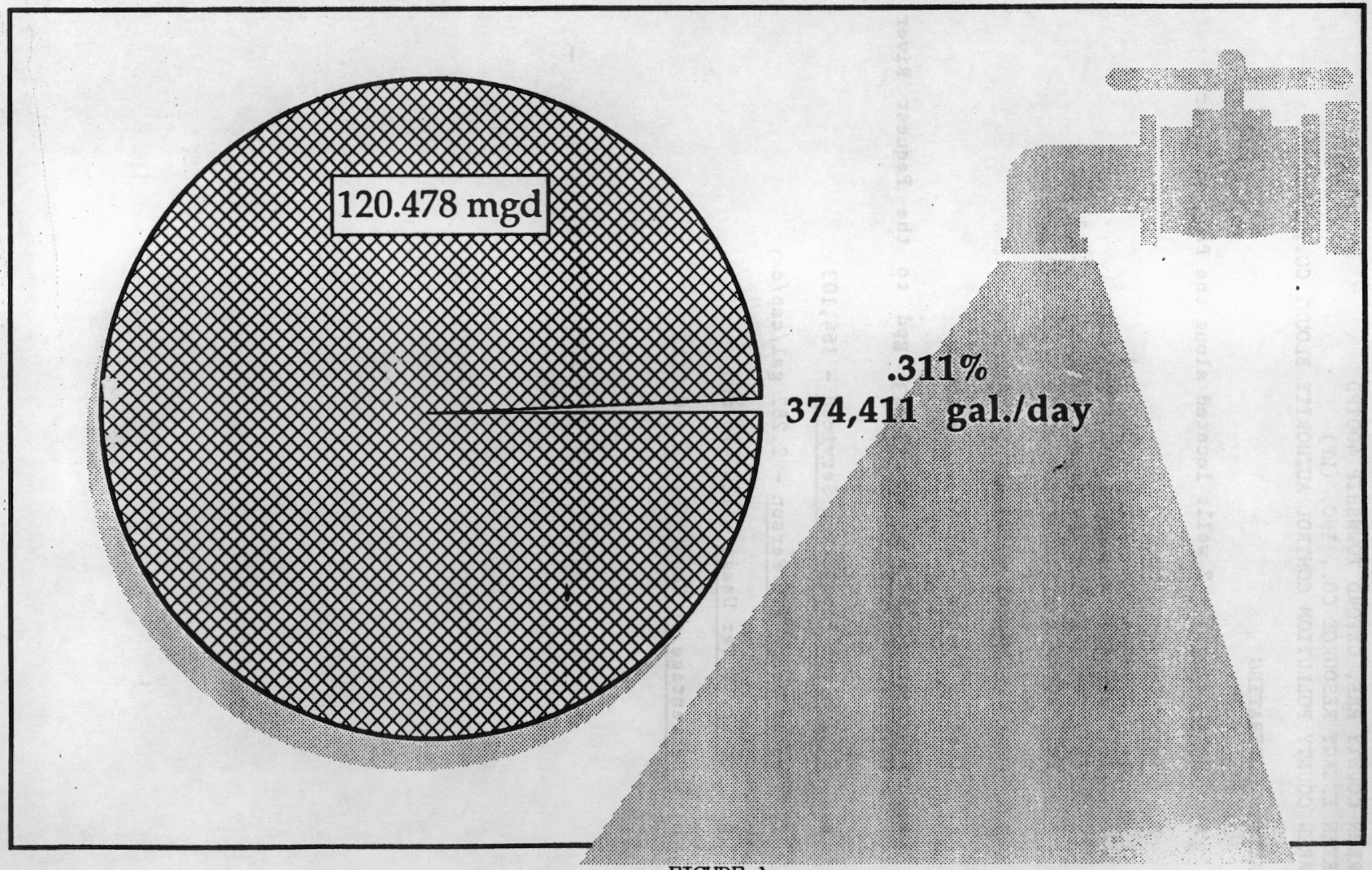

FIGURE 1

TABLE 2

ESSEX COUNTY RRF, CITY OF NEWARK 2,250 TPD
AMERICAN REF-FUEL OF ESSEX COUNTY

STATUS: UNDER CONSTRUCTION

a. Water Supply - City of Newark supply

b. Water Consumption
   i. potable/sanitary - 5,760 gpd
   ii. scrubber evaporation - 194,400 gpd
   iii. ash quench evaporation disposal - 46,080 gpd
   iv. cooling system - 0
   Total - 246,240 gpd

c. Cooling System - Air cooled condenser

d. Wastewater Discharge - 4,320 gpd to the Passaic Valley Sewerage Commission Treatment Plant

e. Equivalent Population Serviced - 923,077

f. Water Usage Per Person - 0.267 gal/cap/day

g. County Water Usage - 150.457 mgd

h. Percentage of County Usage - 0.164%

i. City of Newark Usage - 68.661 mgd

j. Percentage of City of Newark Usage - 0.359%

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WATER USED BY THE ESSEX CO. RRF COMPARED TO COUNTY USAGE

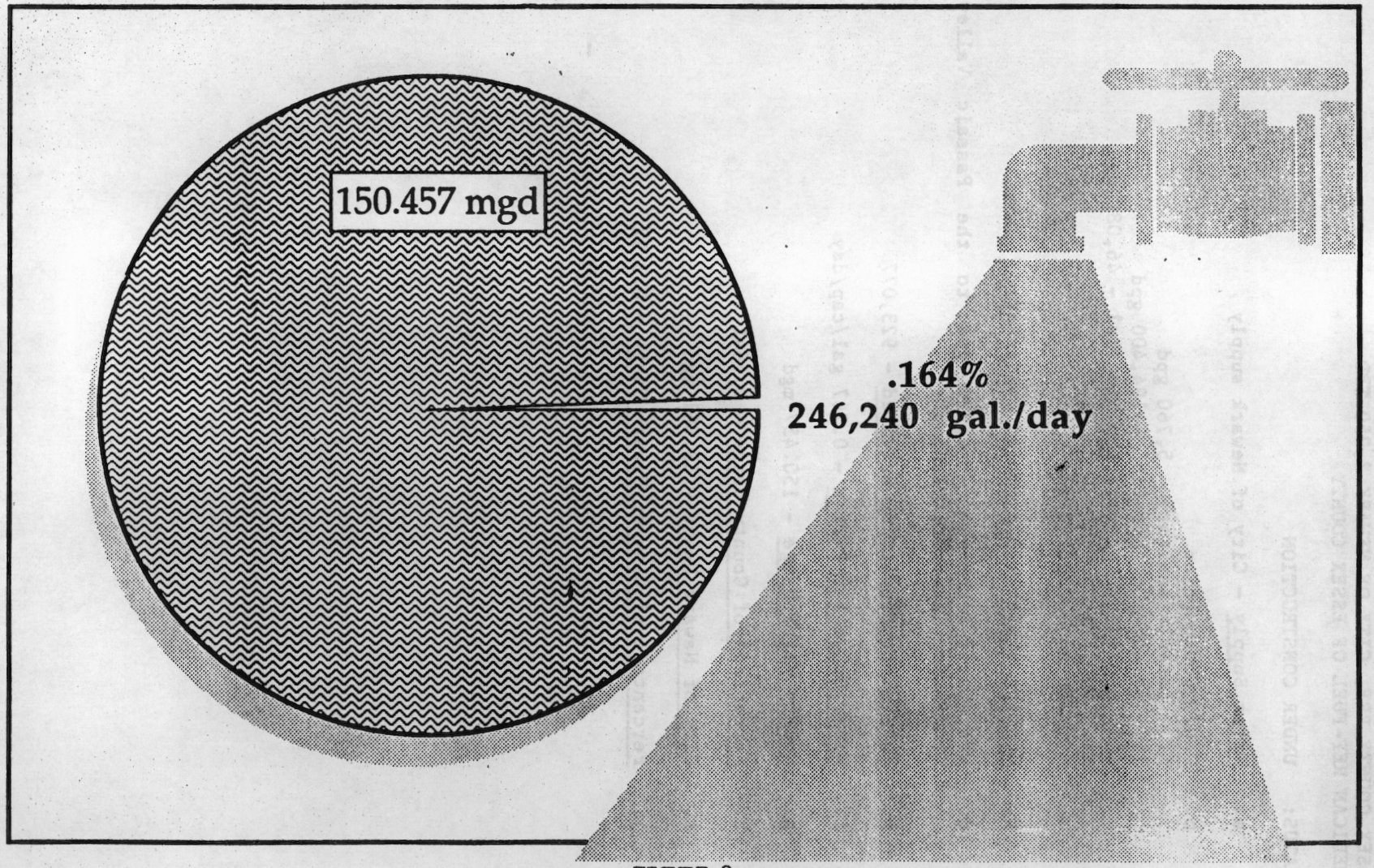

FIGURE 2

TABLE 3

GLOUCESTER COUNTY, WEST DEPTFORD TOWNSHIP 575 TPD

STATUS: UNDER CONSTRUCTION

a. Water Supply - Delaware River water for cooling and process, on-site well, potable

b. Water Consumption
   i. potable/sanitary - 1,440 gpd
   ii. scrubber evaporation - 36,778 gpd
   iii. ash quench evaporation/disposal - 12,700 gpd
   iv. cooling system - 65 - 650 gpd
   v. process water treatment - 2,880 gpd
   Total - 54,448 gpd

c. Cooling System - once-through cooling using Delware River water 17.28 mgd under maximum use 17,279 mgd returned to the Delware River

d. Wastewater Discharge - 4,320 gpd to the Gloucester County Utilities Authority

e. Equivalent Population Serviced - 235,847

f. Water Usage Per Person - 0.231 gal/cap/day

g. County Water Usage - 85.078 mgd

h. Percentage of County Usage - 0.064%*

* Facility uses Delaware River water for cooling and processing water - 1,440 gpd for potable/sanitary from on-site well, therefore, actual percentage is lower (0.0017%)

WATER USED BY THE GLOUCESTER CO. RRF COMPARED TO COUNTY USAGE

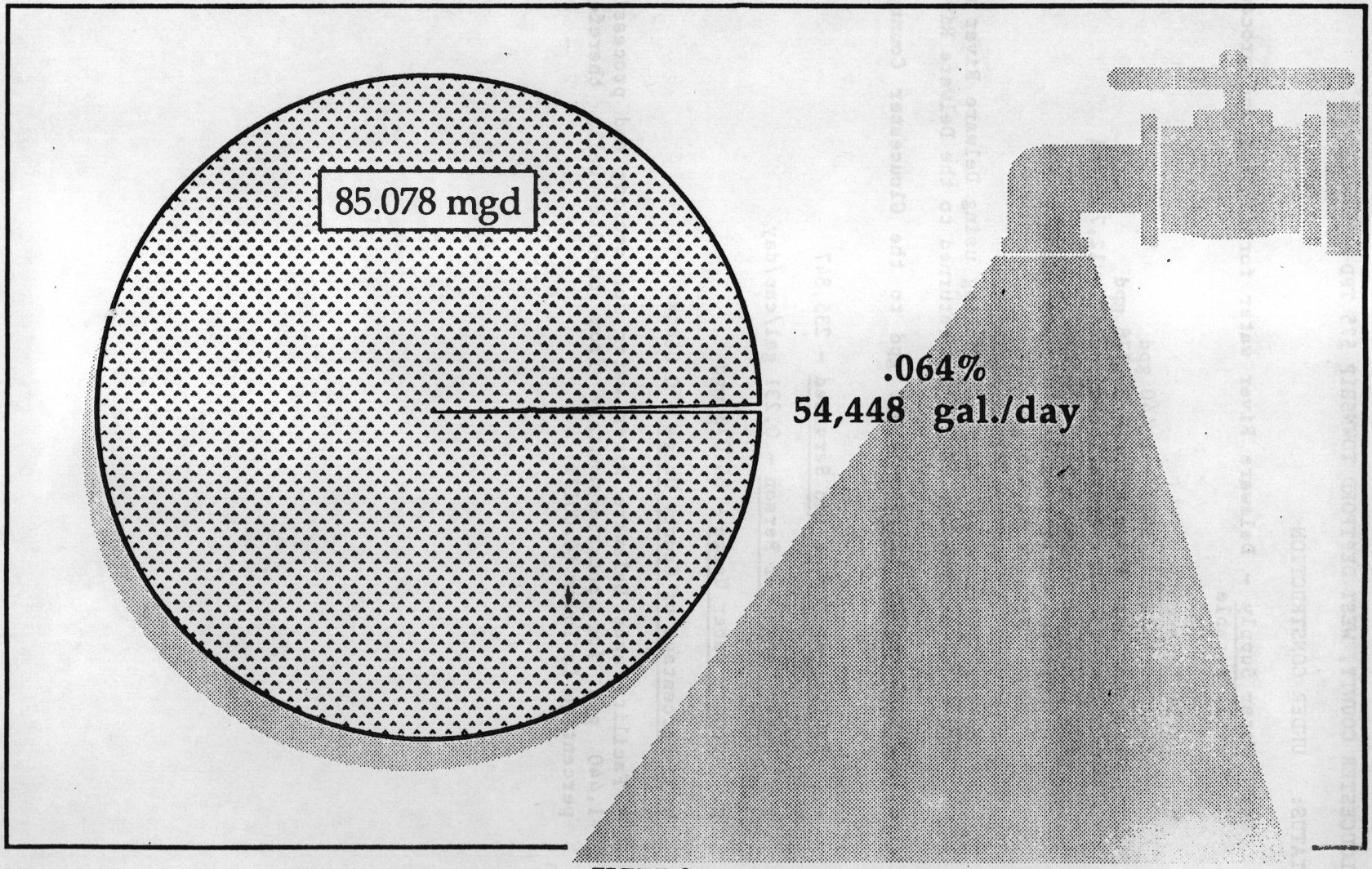

FIGURE 3

TABLE 4

BERGEN COUNTY RRF, BORO OF RIDGEFIELD 3,000 TPD
AMERICAN REF-FUEL OF BERGEN COUNTY

STATUS: FINAL PERMIT ISSUED

a. Water Supply - Hackensack Water Company, City of Ridgefield Supply

b. Water Consumption
   i. potable/sanitary - 5,760 gpd
   ii. scrubber evaporation - 259,200 gpd
   iii. ash quench evaporation/disposal - 53,424 gpd
   iv. cooling system - 0
   Total - 318,384 gpd

c. Cooling System - Air-cooled condenser

d. Wastewater Discharge - 4,320 gpd to the Bergen County Utilities Authority Treatment Plant

e. Equivalent Population Serviced - 1,230,769

f. Water Usage Per Cap - 0.258 gal/cap/day

g. County Water Usage - 86.361 mgd

h. Percentage of County Usage - 0.369%

i. Hackensack Water Co. Usage* - 81.300 mgd

j. Percentage of HW Co. Usage - 0.392%

* Hackensack Water Co. supplies water to municipalities in both Bergen and Hudson Counties

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WATER USED BY THE BERGEN CO. RRF COMPARED TO COUNTY USAGE

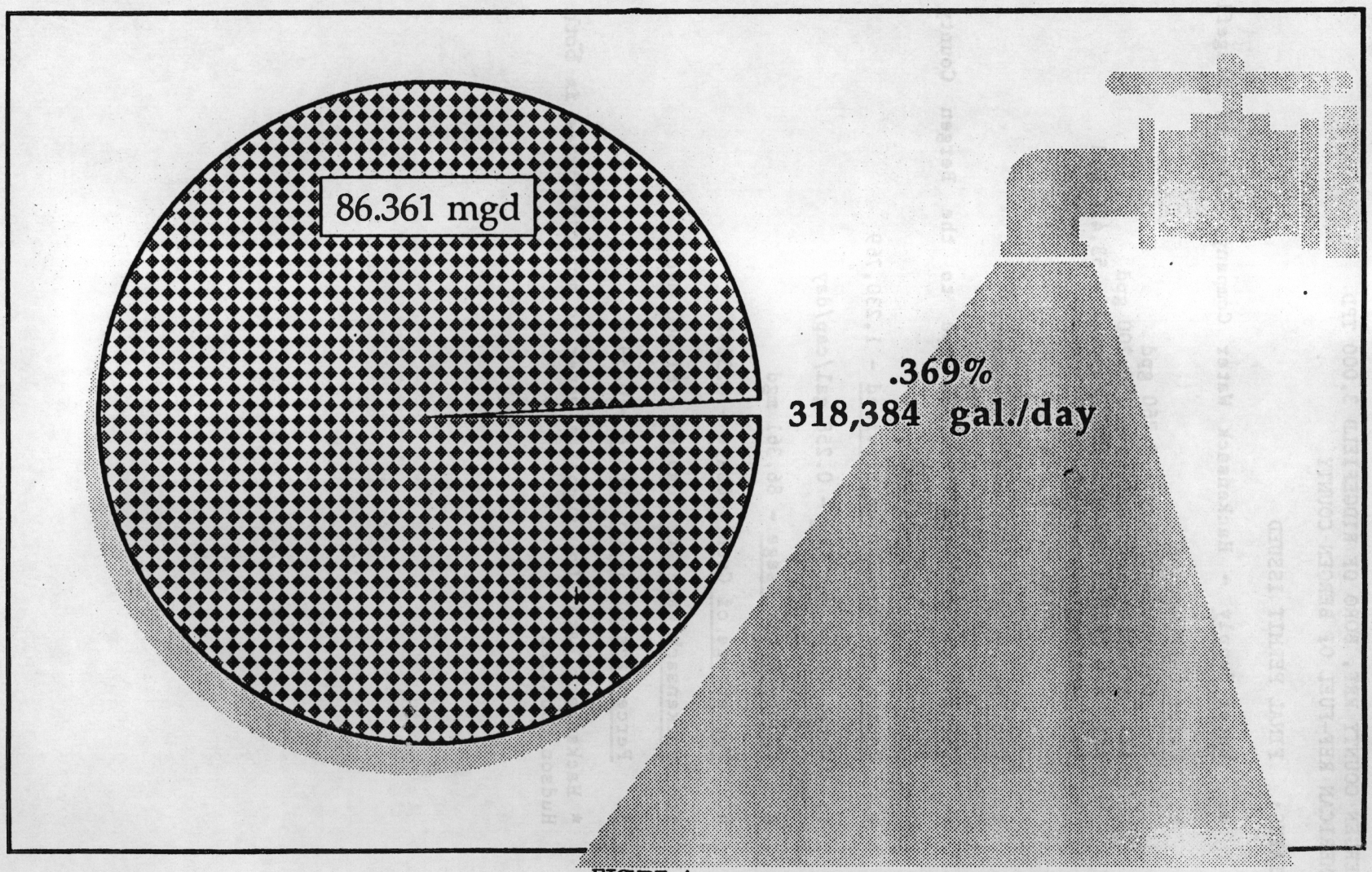

FIGURE 4

CAMDEN COUNTY RRF, CITY OF CAMDEN 1050 TPD*
FOSTER WHEELER INC., CAMDEN COUNTY

STATUS: FINAL PERMIT ISSUED

a. Water Supply - City of Camden water system, dedicated City of Camden well

b. Water Consumption
   i. potable/sanitary - 2,000 gpd
   ii. scrubber evaporation - 74,090 gpd
   iii. ash quench evaporation/disposal - 34,730 gpd
   iv. cooling system - 810,720 gpd
   v. process wastewater - 93,690 gpd
   Total - 1,014,780 gpd

c. Cooling System - Wet cooling tower

d. Wastewater Discharge - 95,190 gpd to the Camden County Municipal Authority includes 93,690 gpd from process wastewater and 1,500 gpd sanitary

e. Equivalent Population Serviced - 574,359

f. Water Usage Per Person - 1.767 gal/cap/day

g. County Water Usage - 76.984 mgd

h. Percentage of County Usage - 1.318%

i. City of Camden Usage - 17.830 mgd

j. Percentage of City Camden Usage - 5.691%

* Utility impacts based on a 1400 TPD facility.

** 99.09% of water supply is from a City of Camden dedicated well - not presently in use.

WATER USED BY THE SOUTH CAMDEN RRF COMPARED TO COUNTY USAGE

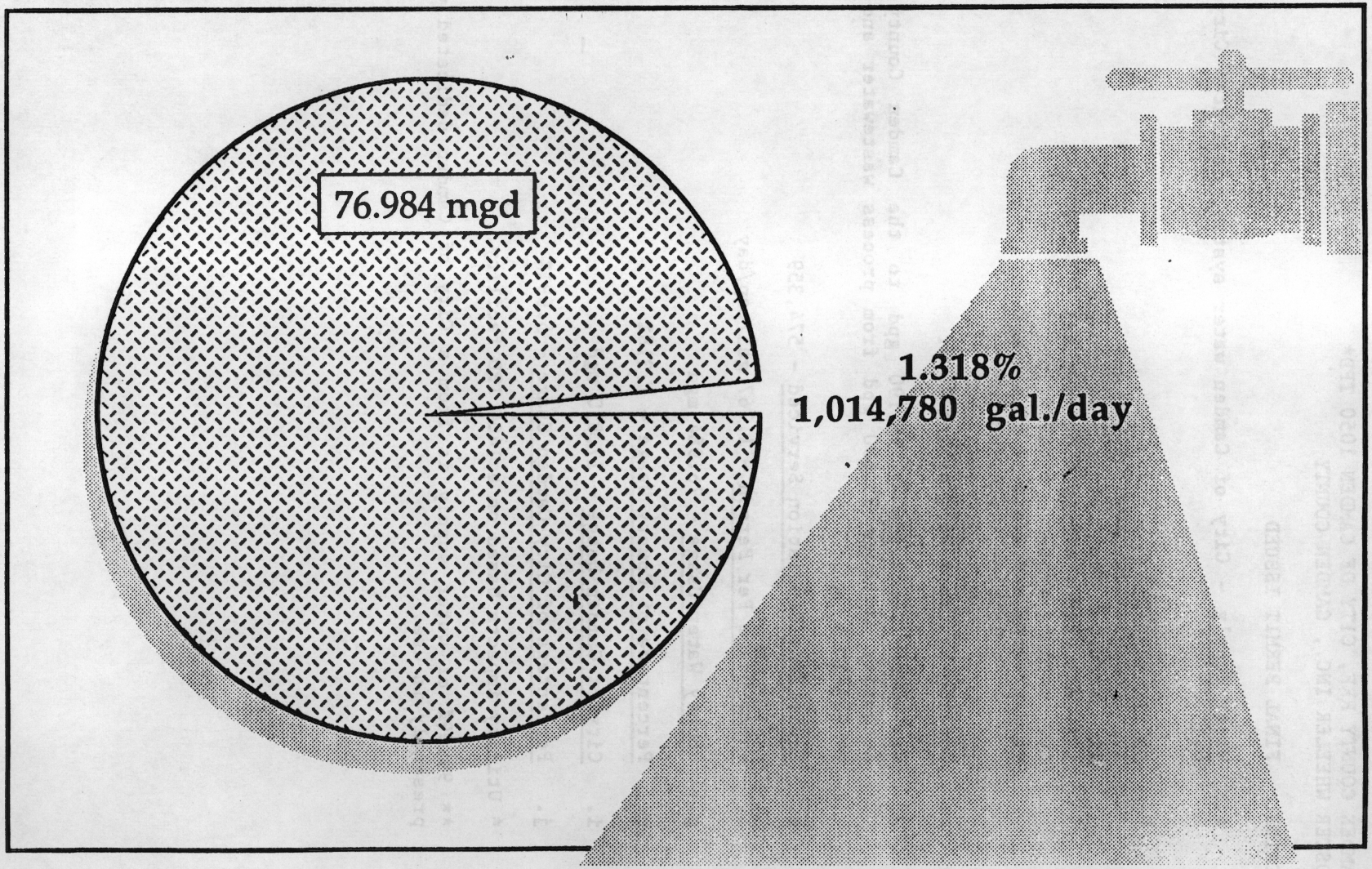

FIGURE 5

PENNSAUKEN, CITY OF PENNSAUKEN 600 TPD
OGDEN MARTIN SYSTEMS INC. OF PENNSAUKEN
PENNSAUKEN SOLID WASTE MANAGEMENT AUTHORITY

STATUS: FINAL PERMIT ISSUED

a. Supply Water - Merchantville - Pennsauken Water Co.

b. Water Consumption
   i. potable/sanitary - 1,555 gpd
   ii. scrubber evaporation - 18,500 gpd
   iii. ash quench evaporation/disposal - 6,500 gpd
   iv. cooling system - 0
   Total - 26,555

c. Cooling System - Air-cooled condenser

d. Wastewater Discharge - 1,500 gpd

e. Population Serviced - 246,154

f. Water Usage Per Person - 0.107 gal/cap/day

g. County Water Usage - 76.984 mgd

h. Percentage of County Usage - 0.0345%

i. Merchantville-Pennsauken Water Usage - 5.889 mgd

j. Percentage of MP Usage - 0.451%

WATER USED BY THE PENNSAUKEN RRF COMPARED TO COUNTY USAGE

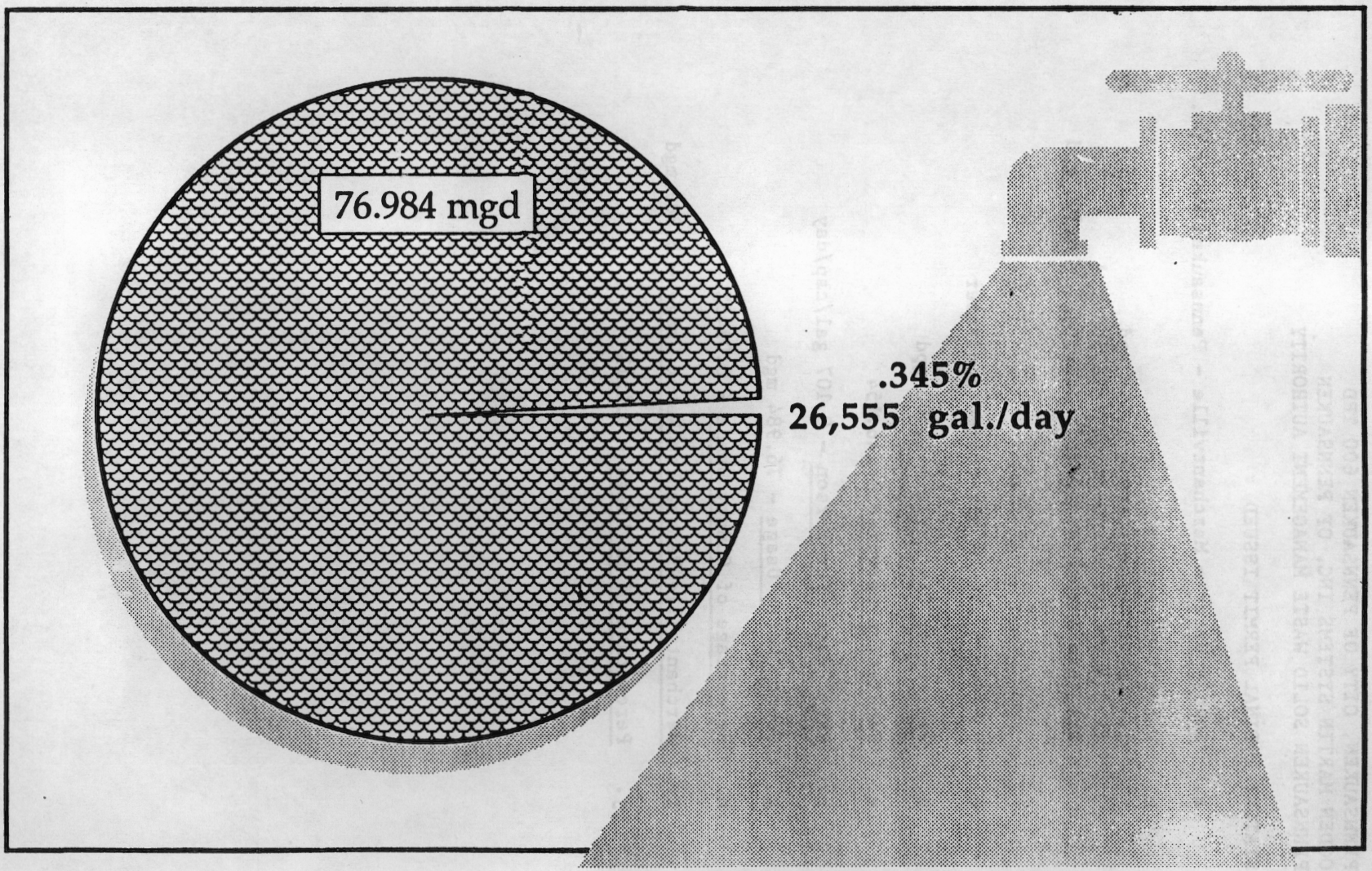

FIGURE 6

TABLE 7

HUDSON COUNTY, CITY OF KEARNY 1500 TPD
OGDEN MARTIN SYSTEMS, INC. OF HUDSON

STATUS: PERMIT UNDER REVIEW

a. Watter Supply - Hackensack Water Co.
City of Kearny supply

b. Water Consumption
i. potable/sanitary - 7,200 gpd
ii. scrubber evaporation - 163,300 gpd
iii. ash quench evaporation/disposal - 32,000 gpd
iv. cooling system - 0
v. boiler feed water vent - 4,900 gpd
Total - 214,400 gpd

c. Cooling System - Air-cooled condenser

d. Wastewater Discharge - 6,700 gpd Passaic Valley Sewerage Commission Treatment Plant

e. Equivalent Population Serviced - 615,384

f. Water Usage Per Cap - 0.384 gal/cap/day

g. County Water Usage - 150.457 mgd

h. Percentage of County Usage - 0.142%

i. Hackensack Water Co. Usage* - 81.300 mgd

j. Percentage of HWC Usage - 0.264%

* Hackensack Water Co. supplies water in both Bergen and Hudson Counties.

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WATER USED BY THE HUDSON CO. RRF COMPARED TO COUNTY USAGE

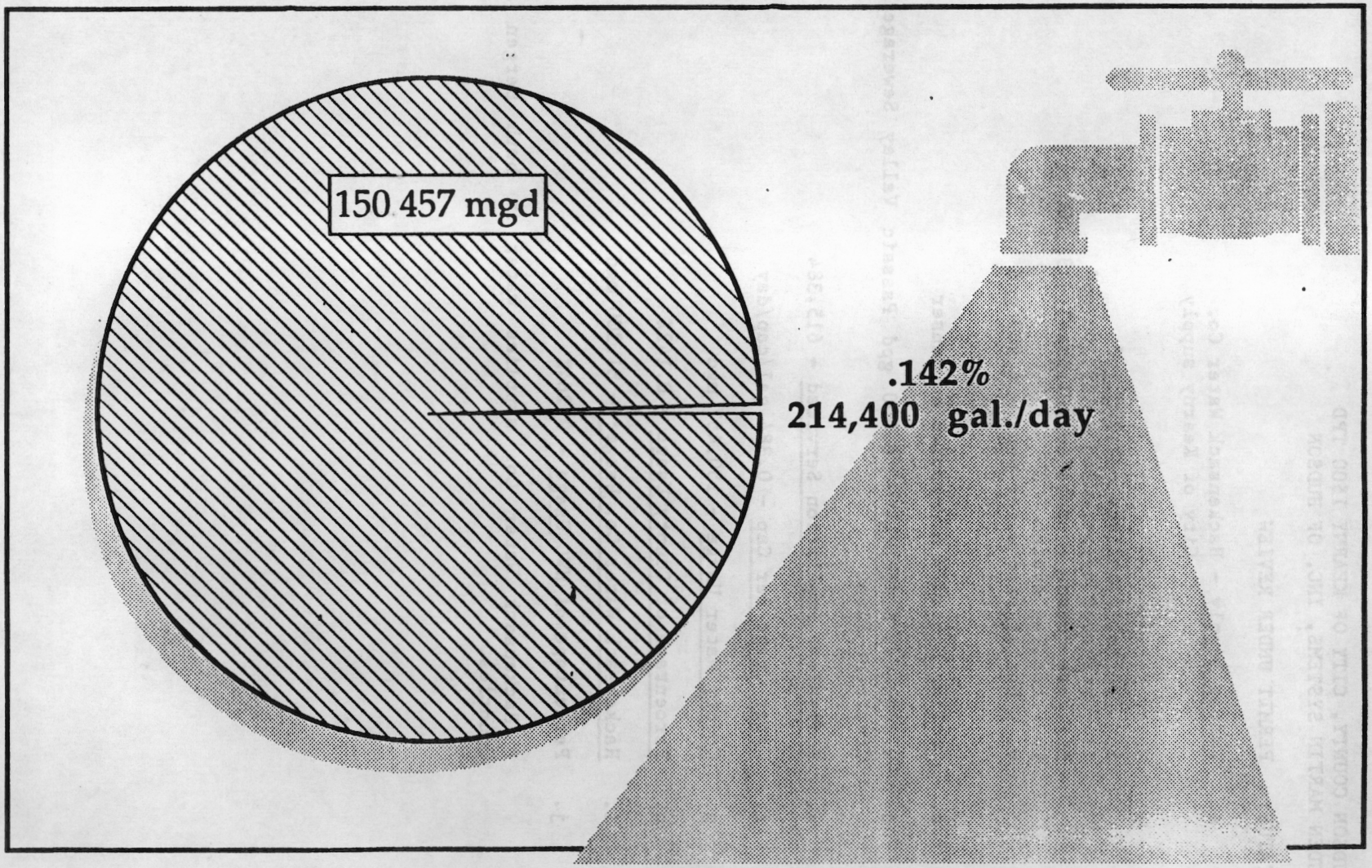

FIGURE 7

TABLE 8

PASSAIC COUNTY, CITY OF PASSAIC 1500 TPD
FOSTER WHEELER INC. OF PASSAIC COUNTY
PASSAIC COUNTY UTILITIES AUTHORITY

STATUS: PERMIT UNDER REVIEW

a. Water Supply - Passaic Valley Water Commission 191,750 gpd
City of Passaic supply

b. Water Consumption
i. potable/sanitary - 2,000 gpd
ii. scrubber evaporation - 82,960 gpd
iii. ash quench evaporation/disposal - 51,110 gpd
iv. cooling system -
v. auxiliary cooling system - 44,600 gpd
Total - 180,660 gpd

c. Cooling System - Air cooled condenser for process steam and auxiliary wet cooling system for other processes (air conditioning)

d. Wastewater Discharge - 1,600 gpd Passaic Valley Sewerage Commission Treatment Plant

e. Equivalent Population Serviced - 615,385

f. Water Usage Per Cap - 0.294 gal/cap/day

g. County Water Usage - 181.093 mgd

h. Percentage of County Usage - 0.100%

i. Passaic Valley Water Commission Usage - 46.875 mgd

j. Percentage of PVWC Usage - 0.385%

WATER USED BY THE PASSAIC CO. RRF COMPARED TO COUNTY USAGE

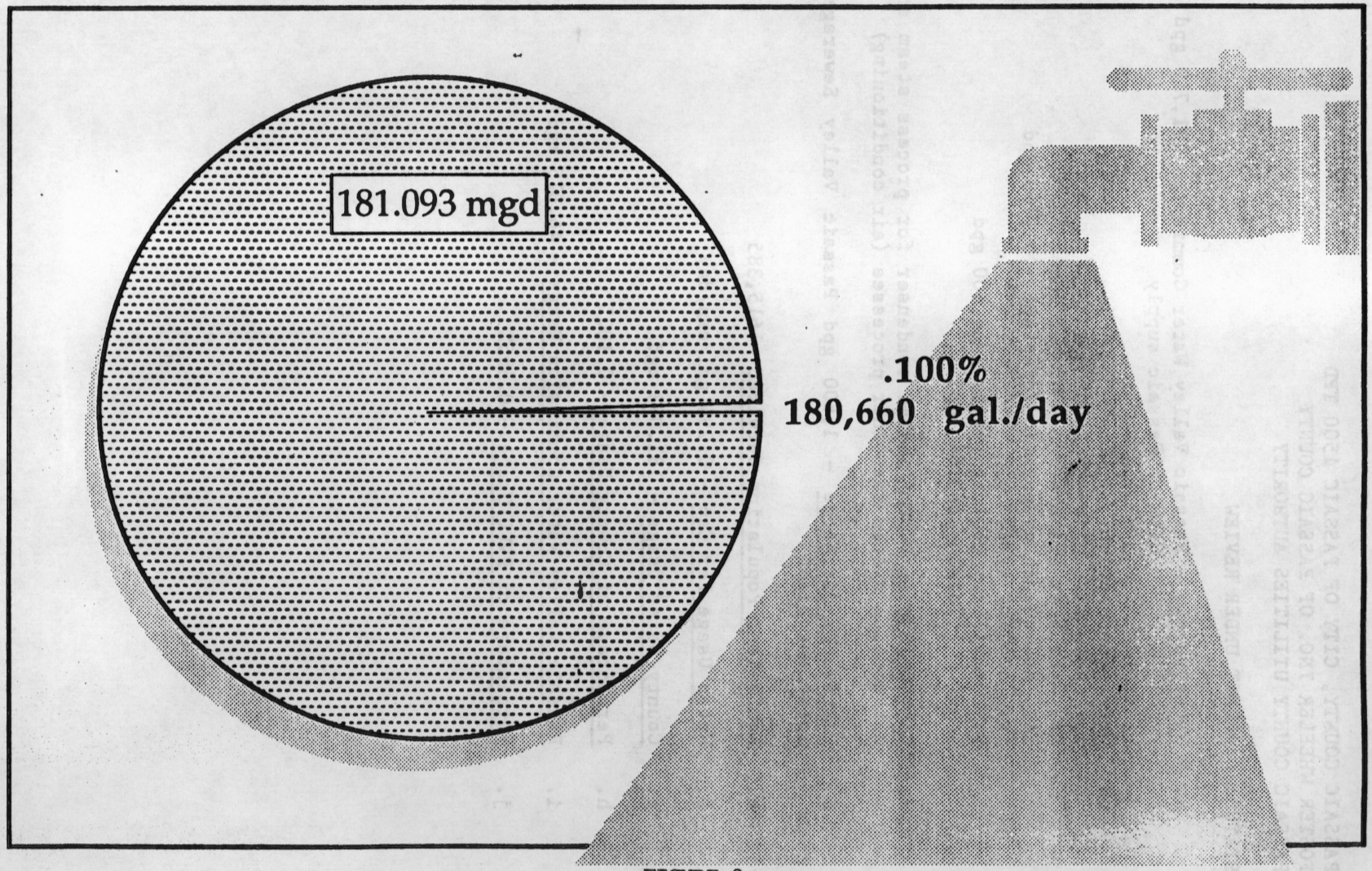

FIGURE 8

UNION COUNTY, CITY OF RAHWAY 1440 TPD
OGDEN MARTIN SYSTEMS INC. OF UNION
UNION COUNTY UTILITIES AUTHORITY

STATUS: PERMIT UNDER REVIEW

a. Water Supply - City of Rahway supply

b. Water Consumption
   i. potable/sanitary - 5,000 gpd
   ii. scrubber evaporation - 123,000 gpd
   iii. ash quench evaporation/disposal - 27,000 gpd
   iv. cooling system - 0
   v. water treatment discharge - 11,500 gpd
   total - 166,500 gpd

c. Cooling System - Air cooled condenser

d. Wastewater Discharge - 16,200 gpd, Rahway Valley Sewerage

e. Equivalent Population Serviced - 590,769

f. Water Usage Per Cap - 0.282 gal/cap/day

g. County Water Usage - 244.355 mgd

h. Percentage of County Usage - 0.491%

i. City of Rahway Usage - 4.756 mgd

j. Percentage of City of Rahway Usage - 3.501%

WATER USED BY THE UNION CO. RRF COMPARED TO COUNTY USAGE

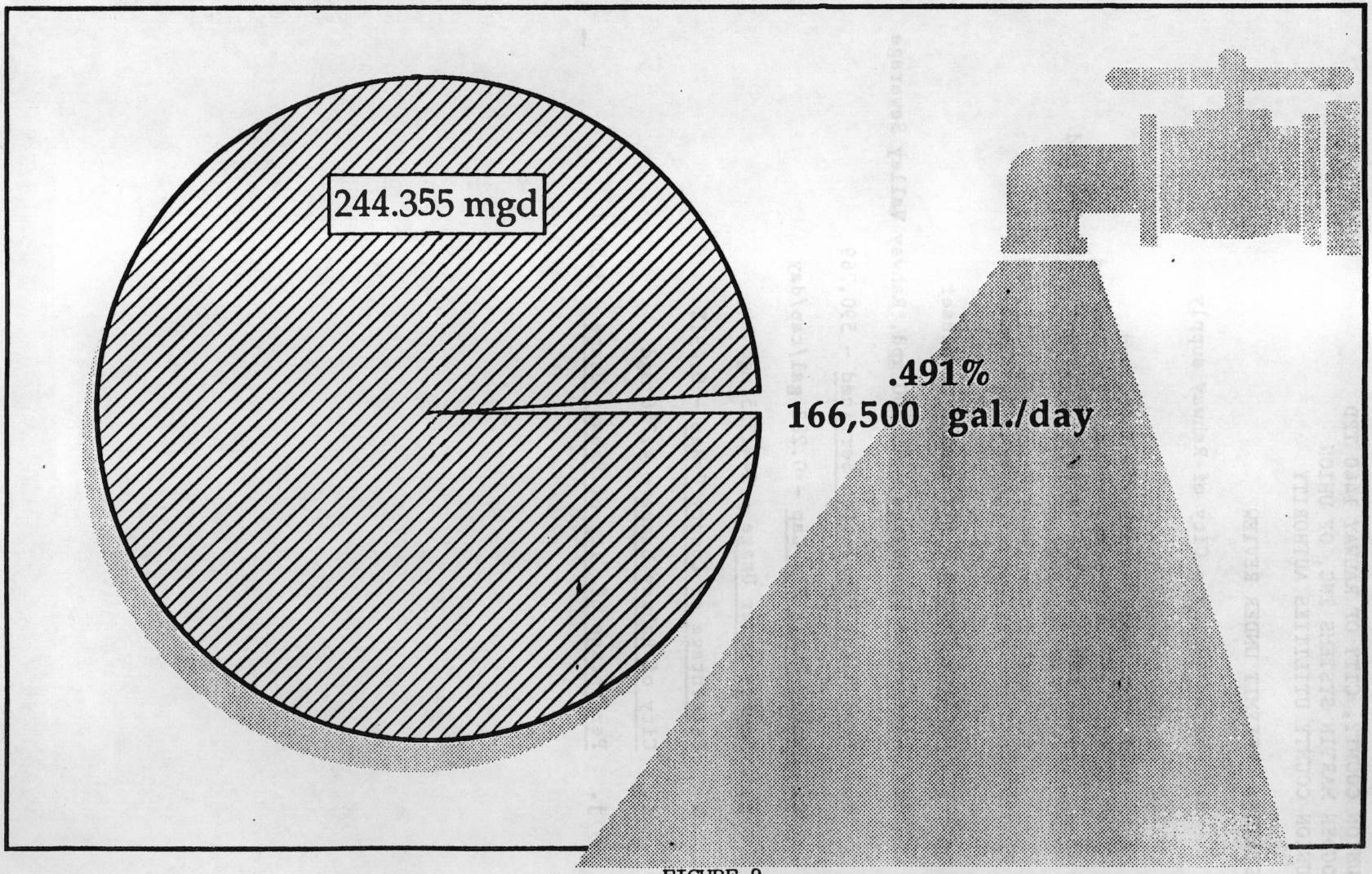

FIGURE 9

TABLE 10

ATLANTIC COUNTY 850 TPD

STATUS: PRELIMINARY ENVIRONMENTAL AND HEALTH IMPACT STATEMENT*

a. Water Usage - 93,300 gpd N.J. American Water Company

b. Wastewater Discharge - 15,000 gpd, Atlantic County Utilities Authority Sewerage Treatment Plant

c. Equivalent Population Serviced -348,718 gpd

d. Water Usage Per Cap -0.268 gal/cap/day

e. County Water Usage - 29,453 mgd

f. Percentage of County Usage -0.311%

* While information on the proposed facility undergoing or already receiving PEHIS approval has been presented, the date is preliminary and subject to modification upon submittal of a final application package. The PEHIS requires a review at peak or maximum anticipated usage/demand/impact.

TABLE 11

CAPE MAY COUNTY 750 TPD

STATUS: PRELIMINARY ENVIRONMENTAL AND HEALTH IMPACT STATEMENT*

a. Water Supply - from Woodbine Municipal Utilities Authority

b. Water Usage - 750,000 gpd

c. Wastewater Discharge - 5,500 gpd to on-site septic system

d. Equivalent Population Serviced - 307,692

e. Water Usage Per Cap - 2.438 gal/cap/day

f. County Water Usage - 16.593 mgd

g. Percentage of County Usage - 4.520%

TABLE 12

MERCER COUNTY, 975 TPD

STATUS: PRELIMINARY ENVIRONMENTAL AND HEALTH IMPACT STATEMENT*

a. Water Supply - City of Trenton, Delaware River, on-site well, City of Trenton - wastewater effluent

b. Water Usage - Air-cooled condenser, once through cooling wet-cooled tower

TABLE 13

MIDDLESEX COUNTY 2250 TPD

STATUS: PRELIMINARY ENVIRONMENTAL AND HEALTH IMPACT STATEMENT*

a. Water Usage - 1,300,000 gpd, Utilities Authority, Middlesex County Wastewater Treatment Facility 1,000,000 gpd treated effluent 300,000 gpd, Boro of Sayreville

b. Wastewater Discharge - 230,000 gpd to MCUAWWTF

c. Equivalent Population Serviced - 923,077 gpd

d. Water Usage Per Cap - 1.408 gal/cap/day

e. County Water Usage - 65.646 mgd

f. Percentage of County Usage - 0.457%

TABLE 14

OCEAN COUNTY 1500 TPD

STATUS: PRELIMINARY ENVIRONMENTAL AND HEALTH IMPACT STATEMENT*

a. Water Supply - On-site well

b. Water Usage - 1.25 mgd (wet tower system)
0.1 mgd (air cooled system)

c. Wastewater Discharge - 72,000 gpd Ocean County Utilities Authority

d. Equivalent Population Serviced - 615,385 gpd

e. Water Usage Per Cap - 2.031 gal/cap/day (wet)
0.163 gal/cap/day (air-cooled)

f. County Water Usage - 56.143 mgd

g. Percentage of County Usage - 2.226% (wet)
0.178% (air)

TABLE 15

SOMERSET COUNTY 700 TPD

STATUS: PRELIMINARY ENVIRONMENTAL AND HEALTH IMPACT STATEMENT*

a. Water Supply - Elizabeth Water Co.

b. Wastewater Discharge - Somerset Raritan Valley Sewerage Authority

c. Equivalent Population Serviced - 287,179 gpd

d. Water Usage Per Cap - 1.393 gal/cap/day

e. County Water Usage - 3.529 mgd

f. Percentage of County Usage - 11.335%

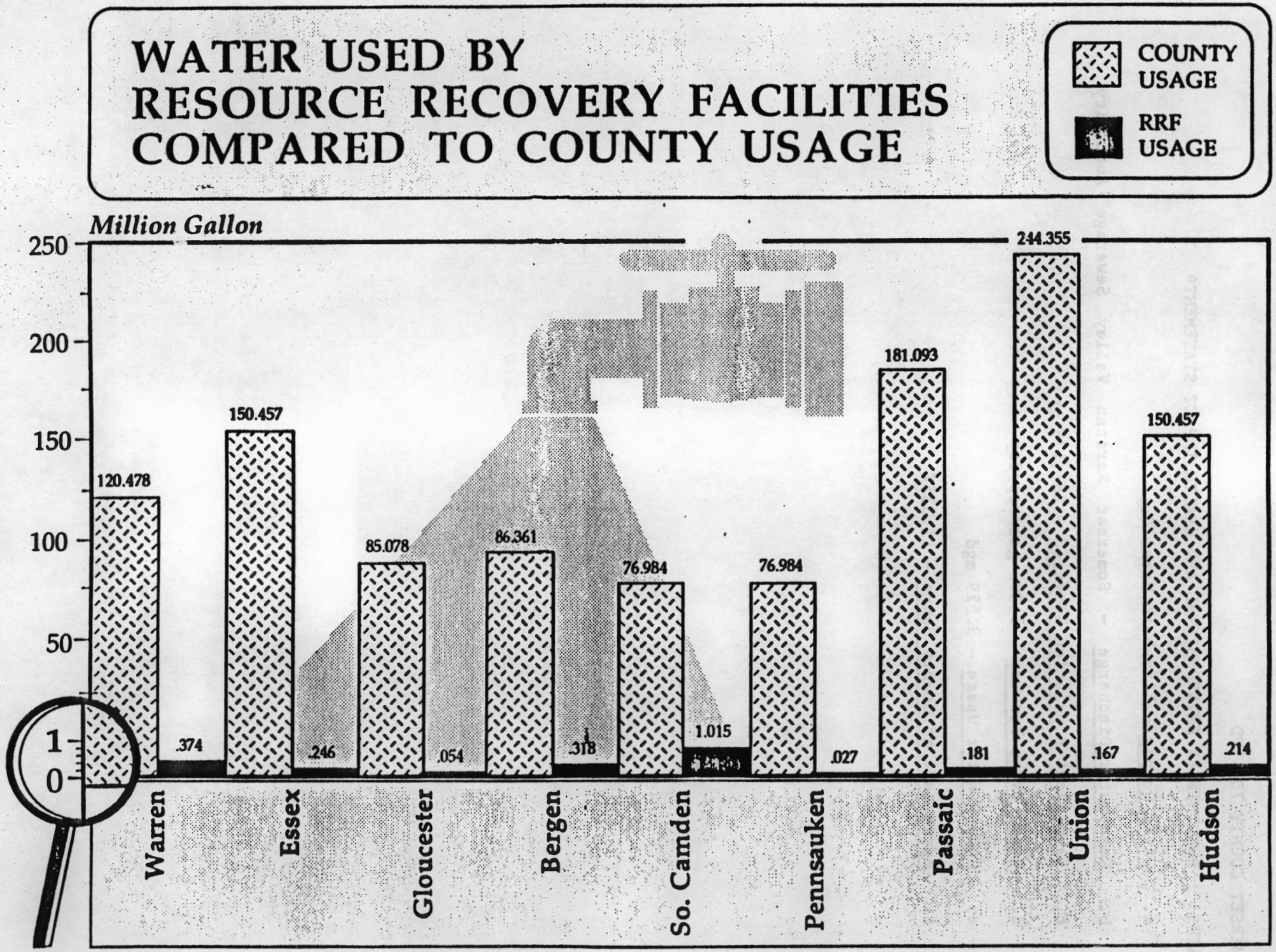
WATER USED BY
RESOURCE RECOVERY FACILITIES
COMPARED TO COUNTY USAGE
COUNTY USAGE
RRF USAGE
Million Gallon
250
200
150
100
50
1
0
120.478
.374
150.457
.246
85.078
.054
86.361
.318
76.984
1.015
76.984
.027
181.093
.181
244.355
.167
150.457
.214
Warren
Essex
Gloucester
Bergen
So. Camden
Pennsauken
Passaic
Union
Hudson

FIGURE 10

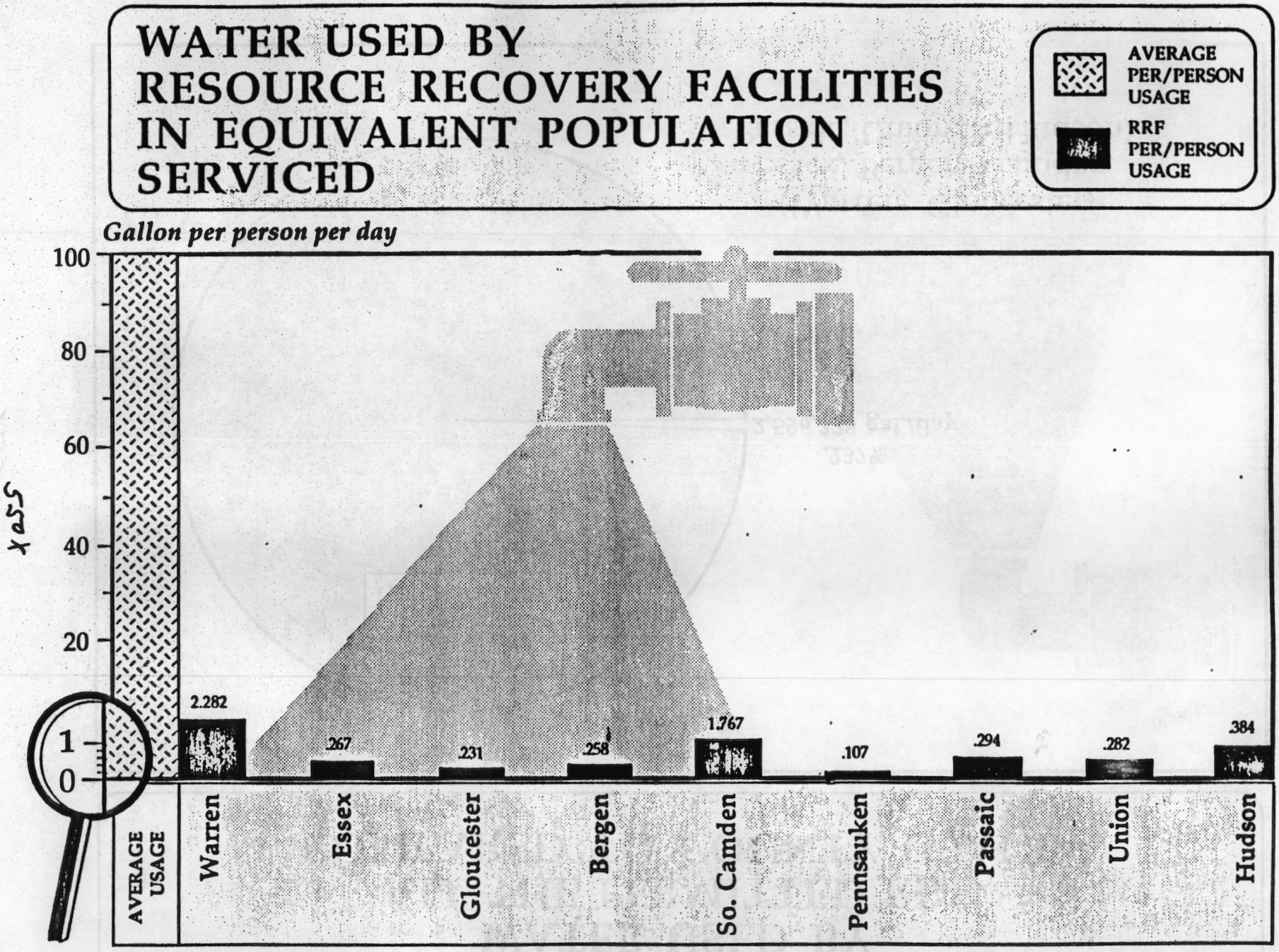
WATER USED BY
RESOURCE RECOVERY FACILITIES
IN EQUIVALENT POPULATION
SERVICED
AVERAGE PER/PERSON USAGE
RRF PER/PERSON USAGE
Gallon per person per day
100
80
60
40
20
1
0
2.282
.267
.231
.258
1.767
.107
.294
.282
.384
AVERAGE USAGE
Warren
Essex
Gloucester
Bergen
So. Camden
Pennsauken
Passaic
Union
Hudson

FIGURE 11

WATER USED BY ALL THE PERMITTED RRF COMPARED TO COUNTY USAGE

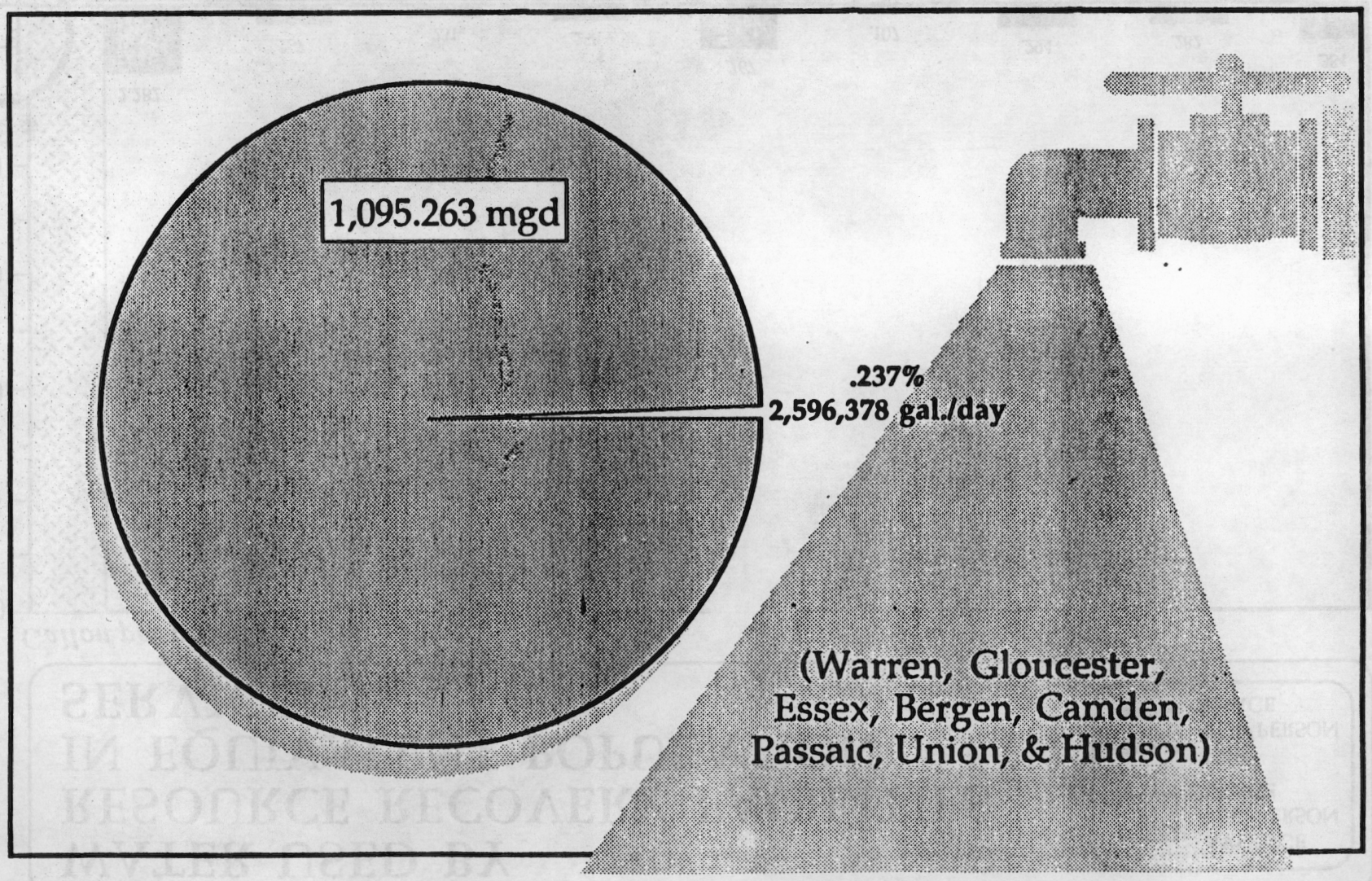

FIGURE 12

RESOURCE RECOVERY FACILITIES

ESTIMATED AIR IMPACTS

552X

AIR QUALITY EFFECTS OF RESOURCE RECOVERY FACILITIES

The Department of Environmental Protection air pollution control permit process for resource recovery facilities (RRF) is designed to ensure that air contaminant emissions do not adversely affect public health or welfare. As a potential major source of air contaminants, the RRF must satisfy the Prevention of Significant Deterioration (PSD)[1] requirements pursuant to the Code of Federal Regulations, 40 CFR 52.21, and the New Jersey air pollution control regulations codified as N.J.A.C. 7:27-1 et.seq. Each facility must control emissions of affected pollutants with Best Available Control Technology (BACT), and must demonstrate that the maximum concentrations of air contaminants will not exceed the National Primary and Secondary Ambient Air Quality Standards (NAAQS) and will not consume more than the available clean air increment.

Air Quality effects are generally considered significant at levels of about one to two percent of the ambient air quality standards for protection of public micrograms per cubic meter of air (ug/m^3), and the threshold effect level is 1 ug/m^3. Air quality effects under these levels are so low that ambient air quality monitors cannot distinguish them from background air quality.

Such threshold levels in ambient air concentrations are defined in federal and state air pollution control regulations and used to determine if multisource air quality modelling is required. All major sources (over 100 tons per year of emissions of any criteria pollutant) that are within the area of significant air quality effect must be included in the air quality model. An evaluation of cumulative air quality effects is already routinely required for those RRF's and any other major sources which have significant air quality effects.

Attached is a table which shows the area of significant (threshold) effect for each criteria pollutant emitted by all nineteen potential RRF's. The projected significant impact areas for each facility range from zero to six kilometers. Most facilities have no significant air quality effects or only a significant effect for some pollutants within a two to three kilometer range. Some of the distances, as in the case of Essex RRF, reflect an impact on only one small area of high terrain (where the plume hits the higher ground at higher concentrations). The high terrain in Warren County contributed to its RRF having the largest air quality impact area. Even this effect is relatively small compared

to the NAAQS.

There are no areas where significant air quality effects from a permitted or planned resource recovery facility overlap. In other words, no RRF in New Jersey produces cumulative effects from overlapping significant ground level concentrations of criteria pollutants.

[1] The PSD requirements for emissions include: PM-10 (particulate matter with an aerodynamic diameter of less than ten microns), total particulate matter, sulfur dioxide, nitrogen oxides, sulfuric acid mist, mercury, lead, fluorides and carbon monoxide.

WARREN COUNTY
RESOURCE RECOVERY FACILITY
NITROGEN OXIDE CONCENTRATIONS

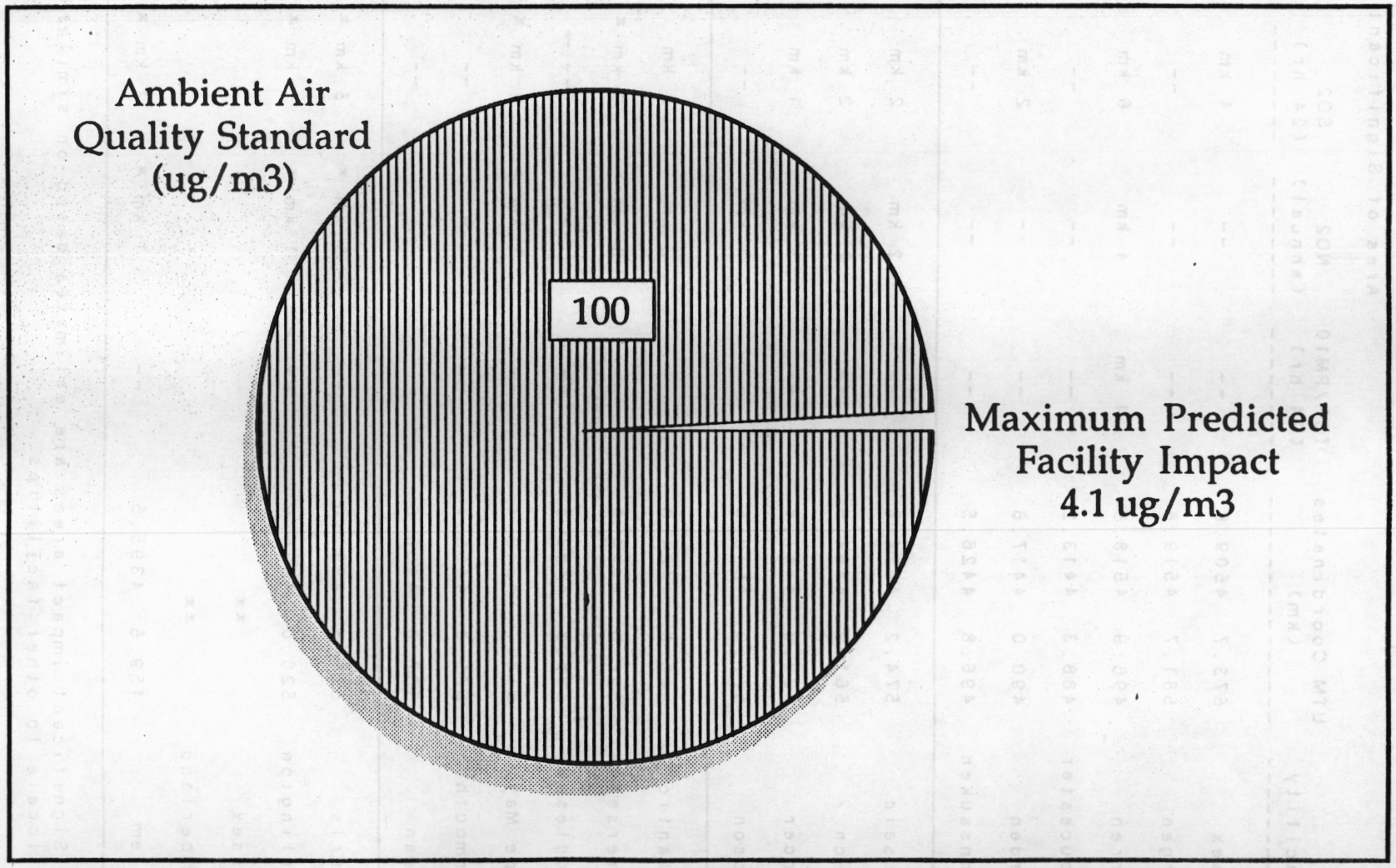

FIGURE 13

TABLE 16

New Jersey Resource Recovery Facilities - Projected Significant Impact Areas

Facility	UTM Coordinates (km)		Area of Significant Impact				
			TSP/PM10 (24 hr)	NO2 (annual)	SO2 (24 hr)	Lead (24 hr)	CO (8 hr)
Essex	573.7	4509.8	--	--	4 km	--	--
Bergen	581.7	4519.8	--	--	--	--	--
Warren	498.9	4518.5	1 km	4 km	6 km	1 km	--
Gloucester	488.3	4413.2	--	--	--	--	--
Camden	490.0	4417.6	--	--	2 km	--	--
Pennsauken	496.8	4426.5	--	--	--	--	--
Passaic	574.2	4524.8	--	2 km	2 km	--	--
Union	561.9	4494.5	--	2 km	2 km	--	--
Mercer	522.3	4447.8	--	2 km	1 km	--	--
Hudson	577.0	4510.5	--	3 km	--	--	--
Atlantic	540.0	4464.0	--	2 km	2 km	--	--
Somerset	536.0	4489.5	--	3 km *	3 km *	--	--
Middlesex	558.3	4482.8	--	--	--	--	--
Cape May	518.7	4342.4	--	2 km *	2 km *	--	--
Monmouth	575.8	4455.7	--	--	--	--	--
Ocean	567.0	4406.0	--	--	--	--	--
Morris	539.5	4532.0	--	5 km *	5 km *	--	--
Burlington	520.0	4436.0	--	1 km *	1 km *	--	--
Sussex	**						
Cumberland	**						
Salem	459.5	4395.5	--	1 km *	1 km *	--	--

* Significant impact areas are estimates based on similarity in size and locale to other facilities.

** No information is available on the size or location of resource recovery facilities for these counties.

BERGEN COUNTY UTILITIES AUTHORITY

LARRY McCLURE
Executive Director

VERNON F. COX, Chairman
MICHAEL P. RINKO, Vice Chairman
EUGENE J. MURPHY
MARTIN J. HAYES
ROGER LANE
SHERWIN D. LESTER
FRANK C. LONGO
MICHAEL B. SCADUTO

May 23, 1989

New Jersey Assembly County Government
and Regional Authorities Committee
State House Annex, CN-068
Trenton, New Jersey 08625

Attention: Cindy A. Lombardi

My Dear Chairman and Committee Members:

Please be advised that the undersigned serves as Executive Director for the Bergen County Utilities Authority, the Agency responsible for resource recovery implementation in Bergen County.

I respectfully enclose for your consideration a certified copy of the resolution of the Commissioners of the Bergen County Utilities Authority adopted on March 16, 1989, expressing our Authority's position with regard to A-4105 for your public record.

Thank you for your cooperation, I remain,

Very truly yours,

BERGEN COUNTY UTILITIES AUTHORITY

Larry J. McClure
Executive Director

LJM:sk
Encl.

557k

BERGEN COUNTY UTILITIES AUTHORITY

R E S O L U T I O N

INTRODUCED BY: Commissioner Sherwin Lester

SECONDED BY: Commissioner Michael Scaduto

UNANIMOUSLY ADOPTED

BE IT RESOLVED by the Commissioners of the Bergen County Utilities Authority that;

WHEREAS, there has been proposed in the New Jersey Assembly County Government and Regional Authorities Committee, legislation concerning the impact of resource recovery facilities on the environment and which seeks to make an appropriation of $75,000.00 for the New Jersey Department of Environmental Protection to develop a methodology with which to assess the cumulative impacts of the operation of resource recovery facility and to conduct a study of said impacts (A-4105); and

WHEREAS, proposed A-4105 imposes a one-year moratorium, prohibiting NJDEP from issuing any permits required pursuant to law to any resource recovery facilities for a period not to exceed 12 months, pending the results of the study required pursuant to Section 3 of this proposed legislation; and

WHEREAS, a hearing has been scheduled by the New Jersey State Assembly, County Government and Regional Authorities Committee on March 2, 1989 with regard to proposed A-4105 and further hearing(s) shall be conducted with regard to the possible adoption of A-4105; and

WHEREAS, the Authority, in preparation for the hearing date, evaluated the impact of the proposed legislation upon the Bergen County Resource Recovery project and is of the opinion that proposed A-4105 would adversely affect Bergen County Resource Recovery implementation in that:

a) If enacted, A-4105, would impose a minimum one year delay in the construction of the project, exposing the Authority to a substantial escalation in the cost of the construction price and operation and management fee associated with the Authority's full service vendor;

b) If enacted, A-4105, would increase the Bergen County Solid Waste Management District's dependence upon out-of-state solid waste disposal strategies which, depending on market and regulatory conditions, may visit upon the rate-payers of Bergen County increased costs associated with dependency on out-of-state solid waste disposal;

c) It is unclear whether A-4105 will be viewed by Financial Rating Agencies as an additional barrier to implementation of comprehensive solid waste management plans relying on resource recovery technologies, leading to the erosion of investor confidence in, and greater costs associated with, such projects;

d) If enacted, A-4105, may have further adverse financial impacts upon permits previously issued, which expire during the period the proposed moratorium would be in effect; re-application for such permits could delay the project beyond the one-year moratorium period; and

e) Proposed, A-4105, however laudable, may be superfluous in that issues of cumulative degradation of the environment are addressed in the NJDEP Environmental Impact Statement Application process and, for air quality in the NJDEP's Prevention of Significant Deterioration regulations; and

WHEREAS, the Bergen County Utilities Authority, as the agent responsible for resource recovery implementation in Bergen County, has engaged in the planning and development of resource recovery technology to serve the Bergen County Solid Waste Management District for over 10 years; many millions of dollars have been expended on environmental and engineering studies, permitting initiatives, bonding, financing, and preliminary engineering design and related activities; the project implementation date is anticipated to commence by years-end; re-application for permits and approvals expiring during a proposed moratorium period would have a significant adverse impact on project implementation; and

WHEREAS, the Authority is desirous of expressing its opposition to A-4105 by this resolution,

NOW, THEREFORE, BE IT RESOLVED as follows:

1. The BCUA, as the agency responsible for resource recovery implementation in the Bergen County Solid Waste Management District, opposes A-4105;

2. The Executive Director shall be and is hereby authorized to forward certified copies of this resolution to the Assembly County Government and Regional Authorities Committees' Chairman and members thereof and the Bergen County Legislative Delegation.

I HEREBY CERTIFY THAT THE ABOVE IS A TRUE COPY OF A RESOLUTION ADOPTED BY THE BERGEN COUNTY UTILITIES AUTHORITY AT ITS REGULAR MEETING HELD ON MARCH 16, 1989.

Larry J. McClure
Executive Director

5/23/89

Donna Prickitt
3542 Union Avenue
Pennsauken, NJ 08109
(609) 662-8218
May 24, 1989

Ms. Cindy Lombardi
Office of Legislative Services
CN-068
Trenton, NJ 08625

Dear Ms. Lombardi:

I, unfortunately, was not able to stay for the entire hearing which took place on May 23 in the Palmyra Borough Hall as I had to go to work. By the time I returned to Borough Hall the hearing had just ended. Fortunately written testimony is able to be submitted until next week. Enclosed is my testimony and supporting documents.

Sincerely,

Donna Prickitt

Enclosures

560X

Members of the Assembly:

I very much support Assembly Bill A-4105 which calls for a one (1) year moratorium on trash incinerators.

State of the art incinerators that use state of the art pollution control devices are regarded by the New Jersey Department of Environmental Protection as significant sources of pollution. They will spew tons of pollutants into our already overburdened air.

The University of California at Irvine reports that the health risk from air pollution is as much as six (6) times greater for young children than for adults. Robert Phalen, director of the University's Air Pollution Health Effects Laboratory explains " young bodies are more vulnerable because their are passages are smaller and collect more pollutants" and "children must breathe more air per unit of body weight to maintain proper metabolism and body temperature. During pollution alerts, children should be considered among the sensitive groups."

Supporting this claim is the Clean Air Council which states in its brochure "When air quality is unhealthful, it irritates the eyes and respiratory system, and increases the occurrence and severity of respiratory diseases. Sensitive people are affected most--the very young, the elderly, and those with existing pulmonary or respiratory problems--but all of us suffer. Even when air pollution is not bad enough to be unhealthful, it puts a constant stress on our bodies."

There are also differences over how much of the trash stream incinerators actually handle. When non-processible and by-pass waste are added to the ash residue of incinerators, the actual percentage of the trash stream which incinerators are promoted to handle decreases.

Ash disposal poses yet another problem. Philadelphia, PA, Commerce, CA, Baltimore, MD, Marion County, OR, and Warren County, NJ have all had ash that tested hazardous. Over the industry's assurances that this would rarely happen, it is happening too frequently. The cost of disposal of ash that is hazardous is very expensive. New Jersey has no hazardous waste landfills so hazardous ash must be shipped out of state.

While the New Jersey Department of Environmental Protection (NJDEP) advocates incineration as an environmentally safe solution to our solid waste problem, the state of "New Jersey is joining other states in pressuring the federal government to relax regulations governing the disposal of ash from garbage incinerators even though a new study has found the residues often exceed federal limits for hazardous waste."

Redefining hazardous waste as "special waste" is not a solution to the problem. It only further serves to undermine the credibility of the government and the industry.

The leachate generated from landfills or ash monofills poses yet another disposal problem that has not yet been adequately addressed.

561K

In the midst of so many unanswered questions regarding the use of incinerators to handle our solid waste problems, the industry and its lobbying groups are launching aggressive public relation campaigns to sell their product and services. They, however, only highlight the theoretical hypotheses which have been generated in the sanctity of a consultants office and fail to address/recognize the situations, problems, and crises that arise from the everyday application of a technology which they fail to admit is flawed. They are doing a disservice to us all.

Meanwhile, the industry is becoming a who's who of former government officials.

Among those who have been connected are former DEP Commissioner Robert Hughey later gainfully employed by Printon, Kane, and Company, an investment banking team hired by the Mercer County Improvement Authority to investigate opportunities for financing an incinerator.

Brenda Davis prior to becoming Director of Legislation and Regulatory Affairs for Signal Resco was a former Special Assistant to Robert Hughey and also New Jersey's Director of Policy and Planning.

Other Signal Resco allies include Norman Steisel who as the former head of New York City's Sanitation Department persuaded the New York Board of Estimates to solve New York's garbage problem by the use of eight (8) incinerators. Employed by Lazar-Frere, a financial consultant to Signal Resco.

As Lt. Governor of New York State, Alfred Del Bello was influential in arranging for Signal Resco to sign a contract for the construction of an incinerator in Peekskill, NY. Mr. Del Bello made it to the office of President of Signal Resco.

Instead of recommending that Signal Resco install scrubbers on the Peekskill incinerator to reduce emissions, Ed Davies, formerly Public Works Commissioner for Westchester County, NY recommended relaxed guidelines for sulfur and nitrous oxide emissions. Ed Davies was later employed by Signal Resco.

Locally, John Jacobs ran for Pennsauken Township Committee in 1977 opposing the building of an incinerator in Pennsauken Township in general, the Delair section of town in particular. Mr. Jacobs was elected and was an advocate of Pennsauken Township buying what is now the Pennsauken Landfill. Now as Executive Director of the Pennsauken Landfill, Mr. Jacobs is an advocate of incineration and is promoting the construction of the proposed Pennsauken incinerator which would be built on the grounds of the Pennsauken Landfill.

Bill Paul, staff reporter of The Wall Street Journal wrote an article which appeared in The Authority View which is the Newsletter of the Authorities Association of New Jersey. The article points out how problematic incinerator useage is.

"The Environmental Protection Agency estimated that the existing incinerators together cause between three and 38 cancer cases a year through

inhalation of highly toxic dioxin emissions. The EPA also found that other chemicals, metals, and acid gases emitted by incinerators 'pose health and environmental risks, based on lifetime exposures.'"

"The EPA's proposed regulations, which focus on air-pollution controls, should significantly reduce those risks. But they aren't scheduled to take effect until 1991, by which time dozens of incinerators may have been built without the extra emission-control equipment, which can add up to 10% or more to the cost of a facility."

"Moreover, retrofitting existing facilities will be at the discretion of the states. That's ironic, given that EPA acted only after three states (New York, Connecticut, and Rhode Island) petitioned the agency to establish federal emission standards because they worried about other states' lax standards."

"Some of those in the pro-incinerator camp say the problem isn't incinerators themselves, but the people who run them. Steven Jaasund, president of Jaasund AirTech Inc., a Mesa, Ariz.-based seller of air pollution-control equipment, says: 'The (pollution-control) devices are getting very good. Unfortunately, (incinerator) operators don't maintain them properly.'"

"Training is the weak link, says Mr. Jaasund. Operators 'need a background in chemical engineering" to solve the typical problems that arise, he says."

"In other countries, the training is often extensive. German incinerator operators devote six months' classroom study to combustion efficiency and dioxin formation and reduction, says Allen Hershkowitz. As solid-waste research director for the New York nonprofit group INFORM, Mr. Hershkowitz has studied garbage disposal in Europe and Japan. The German program, he says, which also includes two years of on-site training, is run by the German Boiler Manufacturers Association. By contrast, Mr. Hershkowitz says, the U.S. has no training institute, although the American Society of Mechanical Engineers is working to establish one."

"Mr. Jaasund, the maker of pollution-control equipment, says operators must first homogenize and pulverize the garbage so that the waste can be fed into the boiler evenly. Unfortunately, he adds, at many incinerators, operators 'just throw it all in'".

"That ash must be buried in a landfill--a process that poses perhaps the most serious health risk related to incinerators." Anthony Licata, vice president, technology, for Dravo Corp.'s Dravo Energy Resources unit, which builds incinerators says "you don't want to mix ash and ordinary garbage because toxic metals including lead can leach into the ground and air. Yet says Mr. Licata, most incinerator ash is currentlly mixed with ordinary garbage, due to a scarcity of new landfills dedicated to ash."

Joyce M. Thibodeau wrote testimony which was submitted at the public hearing for the proposed Pennsauken incinerator which took place in February 1988. In her testimony she relates the experiences she has had with two (2) on-line incinerators and one (1) proposed incinerator. Camden County is proposing to build two (2) incinerators and Gloucester County is proposing to build one (1) incinerator, however, it is very close to the Camden County border.

David Schreiner also wrote testimony for Pennsauken's February 1988 public hearing. The Marion County incinerator is called the sister plant to the incinerator proposed for Pennsauken. The Marion County incinerator came on-line in September 1986 and Mr. Schreiner relates the litany of broken promises and problems that he and the citizens of Brooks, Oregon have had to endure.

David B. Smith, a Former Chairman of the Saugus Board of Selectman, Saugas, Massachusetts, wrote one letter recommending a RESCO plant to a town in New Hampshire, however, two (2) months later he wrote a letter to the editor to his hometown paper painting a very different picture of the same RESCO plant. He ended his letter by urging his hometown selectmen and the residents to "find another solution to our refuse needs and problems, especially a way that will not deprive us of our clean air, water, and land."

Unlike many, such as the companies that make and build incinerators and their representatives, incinerator lobbying groups, consultants, etc., whose interest is not of an environmentally safe trash disposal method but in the money that they can derive from it; my only interest is that of the health of my family.

Respectfully submitted,

Donna Prickitt
3542 Union Avenue
Pennsauken, NJ 08109
(609) 662-8218

"AIR POLLUTION THREAT 6 TIMES GREATER FOR CHILDREN. The health risk from air pollution is as much as six times greater for young children than for adults, say medical researchers at the University of California at Irvine. Young bodies are more vulnerable because their air passages are smaller and collect more pollutants, says Robert Phalen, director of the University's Air Pollution Health Effects Laboratory. Also, children must breathe more air per unit of body weight to maintain proper metabolism and body temperature. Phalen advises parents: 'Be more aware of the quality of air your children breathe, both indoors and out. During pollution alerts, children should be considered among the sensitive groups.'" NATIONAL WILDLIFE, Vol. 24, No. 1, Dec-Jan. 1986.

→ "NY SEEKS TO SHUT DOWN INCINERATOR NEAR SCHOOL. Citing doctor's letters that indicate the Old Bethpage incinerator may be causing health problems for children attending school nearby, state officials say they are seeking to have the incinerator closed. In a letter sent this week to Nassau Health Commissioner John Dowling, the State DEC asked that he declare a health emergency, said Harold Berger, regional director for the DEC...In an informal survey, the PTA found that students were complaining of headaches, nausea, skin rashes and other ailments, which their parents contend are caused by emissions from the landfill incinerator. As a result of the survey and complaints in September that children became sick after being exposed to a cloud of black smoke, the PTA asked parents to get letters from their doctors. School board President Philip Stern told parents earlier this month that the board had asked the state to test emissions at the incinerator." NEWSDAY, November 29, 1985, Page 35.

SAN ANTONIO LIGHT THURSDAY, APRIL 17, 1986

One year of mother's milk has lifetime dose of dioxins

NEW YORK (UPI) — A nursing American infant will receive 18 times the recommended lifetime dose of dioxins within the first year of life, according to a report released Wednesday.

Most cows' milk, in comparison, has only a trace of the dioxins found in a nursing mother's milk, said Dr. Arnold Schector, professor of preventive medicine at the State University of New York Medical Center.

"As a physician, I know human breast milk is extremely desirable," said Schector at the conclusion of his report during an American Chemical Society conference. "On the other hand, I think physicians should be obligated to tell this (news of dioxins) to a nursing mother."

The report that human breast milk is laced with dioxins, toxic agents known to cause liver damage and believed to cause cancer, comes three years after another report that Americans everywhere have undesirable levels of dioxins in their bodies.

Before the 1983 report, it was commonly believed only people who lived near chemical waste dumps or who had been exposed to deadly Agent Orange during the Vietnam War were contaminated with dioxins.

The high levels of dioxins in Americans now is believed to be so widespread, the Centers for Disease Control in Atlanta is considering raising its "unacceptable" level, Schector said.

Schector, using a complicated CDC mathematical formula, said an average American infant will receive 65 nanograms of dioxins from nursing in the first year of life — or 18 times the recommended lifetime average of 3.6 nanograms. A nanogram is one billionth of a gram.

The effects on human health of long-term exposure to dioxins are disputed, although short-term high doses of the chemicals cause the skin ailment chloracne.

Some Vietnam veterans who were exposed to the dioxin-laden defoliant Agent Orange claim dioxins are responsible for a statistically high incidence of cancer among their ranks.

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For Many of Us, Pollution is a Daily Fact of Life.

Indoors, we may be exposed to fumes from a kerosene heater, or asbestos fibers from the pipe insulation in the basement. Outdoors, although it can't always be seen, the air in the Delaware Valley is polluted. Sometimes the pollution reaches unhealthful levels, especially during the hot summer months. *In 1983, in the Delaware Valley, there were 56 days when air pollution reached levels considered unhealthful by the federal government.*

When air quality is unhealthful, it irritates the eyes and respiratory system, and increases the occurrence and severity of respiratory diseases. Sensitive people are affected most -- the very young, the elderly, and those with existing pulmonary or respiratory problems -- but all of us suffer. Even when air pollution is not bad enough to be unhealthful, it puts a constant stress on our bodies.

-- Air pollution is expensive because it damages the natural and man-made environment. It is estimated that ten billion dollars is spent annually on air-polution-related sickness and death; and that ten billion dollars of damage is done to crops and buildings and other structures annually by air pollution.

What You Can Do About Air Pollution

Your concern about air pollution has already made a difference. Public outcry resulted in the passage of the Clean Air Act in 1970. Since then, the Act has reduced targeted pollutants by over 40%!

Your concern and involvement is essential to maintaining and improving air quality. Not only will your concern influence your elected representatives, but air pollution control agencies depend on citizen's complaints to identify and control pollution problems.

The next time you see or smell air pollution, follow the suggestions below, and you will realize that the quality of the environment is in your hands.

Complain when your right to healthful air has been violated. Call the Clean Air Council at 545-1832 when someone is polluting in your area. The Council will work with you to correct the problem.

- Ask for information about either an indoor or outdoor air pollution problem that is of concern to you. The Council is happy to provide resources.

- Request a speaker from the Council to come to your next community meeting.

- **Join the Clean Air Council! Your membership contribution will help make the Delaware Valley a healthier place to live and breathe. As a member, you will become informed about air pollution issues through our newsletters and special alerts.**

The Clean Air Council Is Taking Action ... And Getting Results!

The Clean Air Council is a citizens' organization devoted to defending every individual's right to breathe clean, healthful air. Formed in 1967 by regional American Lung Associations to deal with the growing air pollution problem, the Clean Air Council has carried out its mandate to inform citizens about the adverse effects of air pollution, to oversee the activities of government agencies concerned with the environment, and to organize citizens to lead the fight for clean air.

Educating The Public:

Most air pollution is either invisible or odorless, and on a bright sunny day appearances can be deceiving. Air pollution causes serious problems whether people can see it or not. The Clean Air Council keeps millions of people informed about air pollution levels in the Delaware Valley with the daily Clean Air Report, carried by over 25 radio stations and newspapers in the area, and by providing speakers to community organizations and classes.

Overseeing Government And Working For Clean Air Legislation:

Even when laws exist to protect us, political pressures often lead to inaction and violation of the law's intent. The Clean Air Council watches the air pollution control agencies -- and they know we're watching. When the Commonwealth of Pennsylvania refused to carry out a legally-required auto emissions testing program in 1975, the Council went all the way to the U.S. Supreme Court to require its implementation and won. In 1983 the Clean Air Council, together with a local union, exposed the illegal -- and environmentally unsound -- practice on the part of the Philadelphia Department of Police to remove pollution control equipment on police vehicles. This practice has now been stopped.

The Clean Air Council works for clean air legislation. As a leader in a broad-based coalition effort, the Clean Air Council helped obtain Right to Know legislation in Philadelphia. As a result, Philadelphia was the first municipality in the country to permit workers and residents the right to know their exposure to toxic substances. The Clean Air Council is a strong voice at the U.S. Congressional level, educating our elected officials about the need to strengthen the Clean Air Act to address such problems as acid rain and toxic air pollution.

Assisting With Indoor Air Pollution Problems:

In May of 1983 the Clean Air Council formed the Indoor Air Pollution Center to respond to the growing awareness of the health threat caused by indoor air pollution. The Council now responds to dozens of requests each month for information on specific indoor air pollution problems -- everything from asbestos to pesticides. The Council continues to research this emerging field, and works to better inform the public through conferences and publicity.

Advocating Mass Transit:

Motor vehicles are the largest source of air pollution in the region, accounting for nearly half the region's air pollution. Yet the mass transit systems in the region are constantly being threatened with cut-backs or discontinuation of service. The Clean Air Council is a strong advocate of mass transit. By serving on the Citizens Advisory Committee to SEPTA, testifying at hearings, and organizing individuals to speak out in favor of mass transit, the Clean Air Council insures that the demand for continued and improved mass transit is heard.

Organizing In Pollution Hot Spots:

Industry continues to violate air pollution laws in a number of communities in the Delaware Valley. Where governments are not moving to correct the health-threats, the Council works closely with concerned residents to demand that responsible action is taken. *For example,* with the help of the Clean Air Council, residents of Roxborough have been successful in substantially reducing air pollution from Philadelphia's Northwest Incinerator. The Council's efforts extend to other neighborhoods in Philadelphia, Chester, Conshohoken, Wilmington, DE; Cherry Hill and Pennsauken NJ and many other areas.

Jersey requests relaxed standards on disposal of trash incinerator ash

Newark Star Ledger 10/9/87

By TOM JOHNSON

New Jersey is joining other states in pressuring the federal government to relax regulations governing disposal of ash from garbage incinerators even though a new study has found the residues often exceed federal limits for hazardous waste.

The issue is viewed as important since if the ash is classified as hazardous waste, as many environmentalists insist it should be, it would increase the cost and difficulty of disposal.

Currently, if the ash fails a special toxicity test the federal government requires it to be treated as hazardous waste. New Jersey wants to categorize the ash as a "special" waste that could be disposed in solid waste landfills so long as the facilities are equipped with double liners and leachate collection systems to prevent leaks from entering water supplies, according to Donald Deieso, an assistant commissioner for the state Department of Environmental Protection (DEP).

The policy is not to the liking of some environmentalists, who argue it reflects the state's avoidance of dealing with serious health concerns related to the operation of trash-burning incinerators. Eventually, New Jersey expects at least a half-dozen incinerators to be built by counties to address the deepening trash disposal problem.

"In my mind, New Jersey is making a serious mistake," said Jim Hilbert, a member of the Statewide Movement Opposing Killer Environments (SMOKE), a group opposed to construction of garbage incinerators. "They're doing it only for the sake of expediency to get these incinerators on line."

What makes the issue more contentious is a study released last week by the New York State Department of Environmental Conservation (DEC) which found that more than half the ash tested from a half-dozen waste-to-energy incinerators exceeded the federal toxicity levels for lead and cadmium.

New York, like New Jersey, is one 15 states urging the federal Environmental Protection Agency (EPA) to revise its policy so that a special category of waste can be established for ash from waste-to-energy incinerators, according to John Moore, a spokesman for the DEC.

"The issue of hazardous or not is basically one of just how high a hurdle should you have to jump over to implement the project," noted John Gaston, another assistant DEP commissioner. "But I think New Jersey's in a fairly good position on this because we have fairly conservative landfill standards for solid waste facilities."

Should the environmentalists prevail in their argument, added Michael DeBonis, director of the DEP's Division of Water Resources, "all this ash is going to have to go to Buffalo or Alabama because we don't have a hazardous waste landfill."

With at least a half-dozen large incinerators expected to be built in the state during the next decade, the decision of whether the ash should be treated as hazardous or not is likely to have a significant impact on both the cost and difficulty of disposal.

Deieso said he is confident that ash from New Jersey's yet to be constructed incinerators more than likely will pass the EPA toxicity test because the facilities will be newer than the ones involved in the New York study.

Deieso also said the state is not totally comfortable with the EPA toxicity test, saying it produces erractic results because of the variability of the incoming waste into incinerators. With mandatory recycling and source separation becoming a fact of life in New Jersey, Deieso also argued that the state's waste stream will likely have less heavy metal content than other states.

For instance, he said newspaper ink contributes some lead to the waste stream, but it is likely that most New Jersey communities will be recyicing papers.

If categorized as a "special waste," the state would still require ash to be disposed in landfills equipped with double liners and special leachate collection systems designed to recapture any contaminant that seeps from the dump, Deieso said.

"If we can guarantee that it is collected and properly handled, then I don't see what the concerns are," he said.

SMOKE - Statewide Movement Opposing Killer Environments

May 12, 1986

FOR IMMEDIATE RELEASE **FOR IMMEDIATE RELEASE**

contact: Madelyn Hoffman (201) 743-1483
Jim Hilbert (201) 625-9147
Susan Wisniewski (201) 238-6585

The connection between the garbage incinerator industry and those who stand to benefit from that industry's progress in New Jersey has gotten tighter and more apparent. New Jersey is following the pattern already established by New York City and New York State.

In New Jersey, former Commissioner of the Department of Environmental Protection (DEP), Robert Hughey, is now working for Printon, Kane and Company, a team of investment bankers. This company was recently hired by the Mercer County Improvement Authority to investigate opportunities for financing a garbage incinerator proposed for the City of Trenton. Robert Hughey was Commissioner of the DEP in 1983 when the site was initially approved by the DEP. He now stands to gain by construction of this incinerator.

However, the Mercer County Freeholders voted against locating an incinerator at that site because it is in a flood hazard area, less than 1/2 mile away from an elementary school in the middle of a densely populated low income neighborhood. They still stand firmly in opposition to the site.

On April 16, Governor Kean announced that Brenda Davis, a former special assistant to former DEP Commissioner Robert Hughey, would be the state's new director of policy and planning. While with the DEP, Brenda Davis worked to develop ways to encourage private industry to invest in garbage incinerators.

For the past year, Brenda Davis has been director of legislation and regulatory affairs for Allied Signal, Inc., the parent company of Signal-Resco, a company that has been trying to gain permission to construct garbage incinerators in New Jersey.

In New York, Norman Steisel, former head of the New York City Sanitation Department, Alfred Del Bello, former Lieutenant Governor of New York State, and Ed Davies, formerly Public Works Commissioner for Westchester County, are all currently connected to Signal Resco.

As Lieutenant Governor, Alfred Del Bello was influential in arranging for Signal Resco to sign a contract to construct a garbage incinerator in Peekskill, New York. Del Bello is now president of Signal Corporation.

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Ed Davies may have saved Signal Resco millions of dollars by recommending that guidelines for emissions of sulfur oxides and nitrous oxides be weakened so that the Peekskill incinerator could conform to the guidelines. This recommendation was made instead of recommending that Signal Resco install scrubbers on the incinerator to reduce emissions. Ed Davies was recently hired by Signal Resco.

Norman Steisel was in the position of trying to convince New York City that the only way to "solve" their garbage disposal problem was to build 8 garbage incinerators. In a close vote, the New York Board of Estimates agreed to do just that. Now, Norman Steisel is working for Lazar-Frere, financial consultant for Signal Resco on the construction of a garbage incinerator at the Brooklyn Navy Yard site in New York.

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PENNSAUKEN NEWS

NOVEMBER, 1977 SERVING PENNSAUKEN

LOCAL DEMOCRAT LEADER JOHN JACOBS ONCE OPPOSED AN INCINERATOR . . . BUT THAT WAS BEFORE HE WAS PAID $34,000.00

(Following is an article which is a reprint from The Pennsauken News, the Democratic political newspaper supporting John Jacobs in 1977.)

THE DELAIR INCINERATOR PLANT

Republican Mayor Ben Cardone has recently announced (Courier-Post, 9-27-77, p. 42) that he would like to see an incinerator plant built in Pennsauken to serve all of Camden County. Cardone added quite casually that the plant is "likely to be constructed on about one acre in the Delair section, on the far side of Derousse Avenue.

But why is the Delair area automatically picked out when an unattractive dump or plant of some kind is under consideration? Were the residents of Delair consulted about this? Was anyone at all consulted about this? Or does Cardone just consider Delair to be the natural place for a garbage incinerator to go?

Actually, there are many important reasons why such a plant should not be shoved down the throats of the Delair community. To begin with, Delair is already overburdened with trucks, traffic and industry. The daily onslaught of garbage trucks hauling trash from the 37 municipalities of Camden County to Delair would add vastly to the traffic and noise situation of the area. Crossing the street would become a genuine hazard for school children, the elderly and everyone else; and the smell of the entire county's garbage all in one place would probably be unbearable.

What is more, Delair already contributes much more than its fair share in industrial revenue to the Township of Pennsauken, while the services provided to the community in return are minimal.

PERHAPS, CAMDEN COUNTY WILL NEED AN INCINERATOR PLANT SOMETIME SOON. BUT WHY DOES IT HAVE TO BE IN PENNSAUKEN TOWNSHIP AT ALL? Certainly there are other more suitable sites within the county where an incinerator plant would not be so offensive to so many people. Ben Cardone says the plant ought to be in Delair because "I'd like to see Pennsauken be the leader." BUT SUCH CALLOUS DISREGARD BY THE LOCAL REPUBLICANS OF THE FEELINGS AND VIEWS OF THE PENNSAUKEN COMMUNITY SHOULD NOT BE TOLERATED. We don't need public officials such as Cardone who dictate to the residents by means of a newspaper article his goals for the township and the people's feelings be damned. We need officials who will discuss the problems and needs of the people of this town with them, and who will develop public policy through public participation.

DO IT—

ember 8th—Reject Arrogance, Deceit & Waste

SUPPORT COLUMN 2

COBS - BENOWITZ

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As Trash Burning Spreads, Communities Face Fight Over Potential Health Effects

by Bill Paul
Staff Reporter of
The Wall Street Journal

"I'm frightened," says Debbie Heywood of Bridgewater, N.J. "It's horrible."

"It" is a proposed trash incinerator that would stand just a few hundred feet from the Heywoods' home in Bridgewater, a prosperous suburb of New York City.

"We'll get the dioxins and the pollution," says Mrs. Heywood, whose seven-year-old son, Richard, attends elementary school near the proposed site. "Why don't they put (the incinerator) in a forest? Maybe the deer will die, but sooner Bambi than my son."

Having heard environmentalists' reports that garbarge incinerators could endanger the health of those nearby, Mrs. Heywood has joined a citizens' group protesting the incinerator, even though local officials insist it is perfectly safe.

Countless communities across the country are similarly embroiled, as garbage problems escalate and harried municipal officials embrace trash burning as their best hope. Some 110 municipal incinerators are already operating, with another 210 under construction or planned for the next several years. Experts say that in another decade, most American cities will have built or planned for an incinerator.

Contradictory Claims

Contradictory claims by environmentalists and incinerator builders make it hard to know what to believe. Most of these experts "have an ax to grind," complains Sue Kelly of Bedford, N.Y., who recently organized a forum on garbage burning for her local garden club.

Still, both the environmentalists and incinerator builders agree on several points. Trash burning, they say, is a technology with real health risks. Still, it is preferable to other methods of trash disposal, and the health risks can be considerably lessened if proper procedures are followed.

Burning is less harmful, for example, than burying, says Frank McManus, publisher of the trade newsletter Resource Recovery Report. And yet 90% of the 400,000 tons of trash disposed of in the U.S. daily is buried. Even recycling, which some see as a panacea, has some health risks.

Less dangerous it may be, but federal officials are increasingly aware that burning must be done under strictly controlled conditions. Last month, the Environmental Protection Agency estimated that the existing incinerators together cause between three and 38 cancer cases a year through inhalation of highly toxic dioxin emissions. The EPA also found that other chemicals, metals and acid gases emitted by incinerators "pose health and environmental risks, based on lifetime exposures."

The EPA's proposed regulations, which focus on air-pollution controls, should significantly reduce those risks. But they aren't scheduled to take effect until 1991, by which time dozens of incinerators may have been built without the extra emission-control equipment, which can add 10% or more to the cost of a facility.

Moreover, retrofitting existing facilities will be at the discretion of the states. That's ironic, given that EPA acted only after three states (New York, Connecticut and Rhode Island) petitioned the agency to establish federal emission standards because they worried about other states' lax standards.

"There are a few clunkers (incinerators) out there," says Anthony Licata, vice president, technology, for Dravo Corp.'s Dravo Energy Resources unit, which builds incinerators.

Some of those in the pro-incinerator camp say the problem isn't incinerators themselves, but the people who run them. Steven Jaasund, president of Jaasund AirTech Inc., a Mesa, Ariz.-based seller of air pollution-control equipment, says: "The (pollution-control) devices are getting very good. Unfortunately, (incinerator) operators don't maintain them properly."

Training is the weak link, says Mr. Jaasund. Operators "need a background in chemical engineering" to solve the typical problems that arise, he says.

In other countries, the training is often extensive. German incinerator operators devote six months' classroom study to combustion efficiency and dioxin formation and reduction, says Allen Hershkowitz. As solid-waste research director for the New York nonprofit group INFORM, Mr. Hershkowitz has studied garbage disposal in Europe and Japan. The German program, he says, which also includes two years of on-site training, is run by the German Boiler Manufacturers Association. By contrast, Mr. Hershkowitz says, the U.S. has no training institute, although the

American Society of Mechanical Engineers is working to establish one.

Even if operators are trained and the latest pollution-control devices are used, an incinerator can still become a health risk if the garbage is burned improperly. The key is a fire that burns evenly at a high temperature; anything less creates excess dioxins, metal residues and other pollutants. Mr. Jaasund, the maker of pollution-control equipment, says operators must first homogenize and pulverize the garbage so that the waste can be fed into the boiler evenly. Unfortunately, he addes, at many incinerators, operators "just throw it all in."

When garbage is burnt, the ash residue roughly equals about 10% of the original volume. That ash must be buried in a landfill—a process that poses perhaps the most serious health risk related to incinerators.

"You don't want to mix ash and ordinary garbage," says Dravo's Mr. Licata, because toxic metals including lead can leach into the ground and air. Yet, says Mr. Licata, most incinerator ash is currently mixed with ordinary garbage, due to a scarcity of new landfills dedicated to ash.

'Magic Powder Dust'

Mr. Licata says Dravo has a large research project under way to find what he calls a "magic powder dust." The dust, which he describes as similar to concrete hardeners, would be mixed with the ash to immobilize the metals in it and prevent them from leaching. The Japanese frequently mix their ash with cement, says Mr. Licata, but Dravo hopes to have something less bulky out, perhaps before the end of this year.

Still, whatever the risk of garbage burning, "the alternative—landfill—is worse," says Mr. McManus, the publisher of Resource Recovery Report. Indeed, many older landfills weren't properly constructed to contain the toxic substances now leaching from decaying trash. In many states, water and air quality is threatened. New York City's Fresh Kills landfill on Staten Island, for one, dumps four million gallons of toxic liquid into nearby freshwater streams every day.

(Source: Wall St. Journal 9/4/87)



The stars of the Legal Seminar compare notes before the conference. From left to right are Edward Buzak, Edward Kondracki, Richard Salsberg, John Kraft and Alfred Porro. Absent from the photo is William Westling. 572X

Joyce M. Thibodeau
18 Essex Av. RFD#6
Haverhill, Ma. 01830

To Whom It May Concern;

As a resident in a location nearby "regional" incinerators (2 on line, one proposed) I feel compelled to respond to a few not-so-humorous comments contained in Vol.3 No.3 of POWER FROM WASTE.

Regarding the N.E.S.W.C.(North East Solid Waste Committee) in North Andover, Massachusetts...

*The plant came on line in September, 1985. Daily, it consumes 1500 tons of commercial and municipal "waste" thereby negating any possibility of recycling any materials brought to the facility.

*Although this is a Signal Resco plant, it utilizes the "Martin" combustion technology system.

*Pollution control is limited to an electrostatic precipitator and an array of devices designed to acquire a "controlled" burn. It is not currently equipped with an acid gas scrubber or a fabric filter baghouse. Therefore, although the plant "meets their permitted emissions levels" the air of much of Haverhill (we are directly down-wind) is constantly polluted.

*Many homes in this "stable middle-class" neighborhood have been placed on the market throughout the past few years due to the near constant problem which now exists with "dust". Some of the "homes" that were sold have been returned to the market, and I've been told that some were sold at a loss. Also, some nearby "homes" wouldn't sell at all and were removed from the market. I've been looking for another house myself, but haven't had much luck. (I am less than 2 miles away from the site and can see the smoke [not just "steam"] from my house.)

*The accusation that the presence of the facility could have a positive effect on property values due to controlled costs of trash removal is therefore obviously a remark of either sheer stupidity or propaganda. Until recently, I knew of no one who questioned trash removal methods as a priority in the process of selecting their "home". I would rather pay a higher tax towards a responsible resource reduction process than to wonder about what the vendor is doing to the environment.

Also, a very important factor in the costs is the fact that it is becoming increasingly more expensive to dispose of the tons of ash produced daily by these plants. the argument continues over whether it is "toxic" or "hazardous", either way the definition doesn't sound promising to the environment.

*The prices of homes near the facility <u>were</u> escalating. As stated before, some homes placed on the market remained stagnate long enough that they were eventually removed from the market. In many cases, "asking" prices were gradually reduced.

*There <u>are</u> new condominiums being built in the immediate vicinity of the site which are selling. In fact, the condominium associations have expressed their thoughts about incineration publicly as recently as Tuesday, January 12th this year by joining area residents in a picket line in front of our State House <u>against</u> incineration.

The position they have expressed is <u>not</u> of ready acceptance, but of betrayal. Since they did not ask if there were plants nearby, they were not told. If they <u>were</u> told, they would not have purchased their unit. As the saying goes...."There's a sucker born every minute".

Aside from clarifying the propagandized information I've read in the pamphlet, I feel that it is important to inform interested parties of a few other "incidentals".

Although a local pediatrician refuses to state publicly, due to

the possibility that he could be subpoenaed, he has noticed an increase in the number of patients suffering respiratory infections since the NESWC plant has opened. I found this out when I called his office requesting advice involving the care of my own child who had repeated bouts of bronchitis and asthma during the winter of 1986/87.

Also, this past Sunday, January 17,1988, the NESWC plant experienced a fire in the tipping area of the facility. Approximately 80' of refuse was aflame reportedly due to a "hot load" of waste (waste which was already smoldering when brought into the plant). Assistance was needed from surrounding communities to bring the fire under control, which took 4-5 hours. Firemen remained at the scene throughout the night since the refuse continued to smolder.

Obviously, what pollution control equipment NESWC does have in place had no bearing that day. Smoke spewing from openings in the sides of the structure certainly had not passed through any device designed to clean the emissions. This heavy black cloud of smoke passed directly over the downtown Haverhill area and continued down the Merrimack River valley. It smelled like burning rubber.

I would like to believe that this is an isolated incident, but it is not. Other "resource recovery" facilities have also caught on fire in the past. At least one of these such fires in another area of the country resulted in explosions and fatalities.

I urge citizens in or near Pensauken to demand a thorough and exhaustive investigation of the areas surrounding the site, including but not limited to such things as cancer rates, exposure to the food chain & water supplies, lead levels in childrens blood, death rates attributable to pulmonary disorders, and current statistics relative to respiratory illness. Don't assume that this has been done, it probably hasn't.

You must also consider the destination of the "sterile & inert" ash which is laden with toxic, and often hazardous levels of heavy metals, dioxins, furans, etc. .

The "magic machine" approach of waste management is not the answer to the ever increasing problem of volume reduction. It is, however, the newest form of alchemy. The vendors charge us money to burn our refuse, sell the electricity produced at the plants, and laugh all the way to the bank.

As a society, we must begin to take responsibility for our trash. We have taken the situation too lightly in the past and the day of reckoning has come only too late for many of us (myself included).

Regards,

Joyce M. Thibodeau

Joyce M. Thibodeau

POWER FROM WASTE

Pennsauken Resource Recovery Newsletter Vol. 3, No. 3



Effect of Trash-to-Energy Plants on Property Values

A national telephone poll by the Associated Press and Media General in April of 1987 showed that on methods of trash disposal 67% preferred trash-to-energy over continued landfilling of raw waste.

On the East Coast, where the population is critically dense and available land is increasingly scarce, the waste disposal problem is the most severe. Presently less than 5% of landfills remain open and there are many environmental concerns about raw landfilling of waste. Because of all these factors, recycling and trash-to-energy facilities is the favored answer to the trash disposal question.

Adding further confidence to this decision is the fact that it is also the choice of the national and state environmental agencies as well as independent groups such as the Sierra Club and the College of Physicians.

As people have become more aware and accepting of this solution to the trash crisis, a question is often asked as to how all this impacts on property values.

First, it must be realized that although we now have verifiable data on projects that have been operating in the United States since the early and mid-70's, Pennsauken is somewhat different that the norm. Usually a plant is

Continued on page 2

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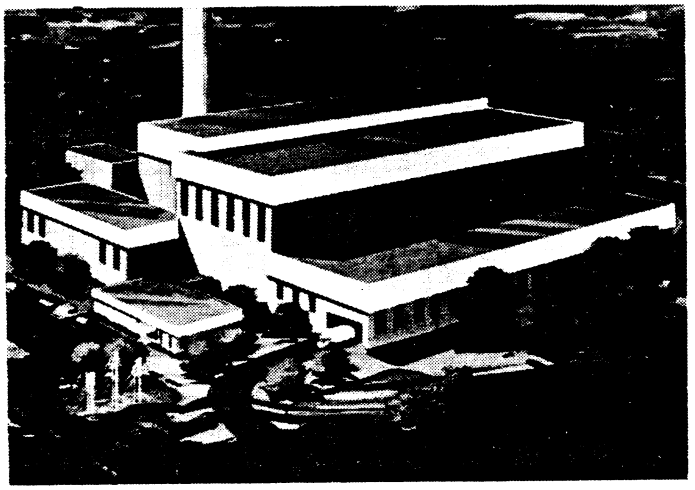
Effect of Trash-to-Energy Plants on Property Values

Continued from front page

designed and built and becomes a new industry within a community. Since Pennsauken has already been handling waste at the landfill since the early 70's, the addition of a trash-to-energy process is considered by most as a more desirable operation than burying tons of raw garbage in the ground as is presently being done.

Secondly, another major factor affecting communities because of Resource Recovery projects is also quite different in Pennsauken. That is truck traffic. Our plant is to be built at the landfill site which is in a heavy industrial zoned area. Nine of the eleven towns to utilize the plant already use the landfill. With increased efforts to recycle, there could actually be a decrease in traffic when the plant begins operations in 1990.

To research the communities in which Resource Recovery projects have been built and are operating, the appropriate Chambers of Commerce and/or Boards of Realtors were contacted. The brokers were then interviewed by phone and the following represents their comments:

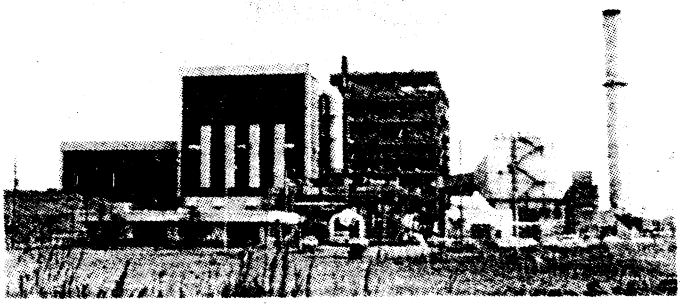


North Andover, Massachusetts
1500 tons per day

- The plant has been operating for 2 years.
- Local neighborhoods are described as stable middle-class areas.
- The facility existence could actually have a positive effect on property values since residents would not anticipate large tax increases for their trash removal.
- The prices of homes near the facility are continuing to escalate.
- There are new condominiums being built in the immediate vicinity of the site which are selling normally.

St. Petersburg, Florida
2000 tons per day

- The plant has been operating for 2 years.
- It takes an average of 45 to 90 days to move a home.
- The turnover rates and appreciation of property values have nothing to do with Resource Recovery facility.
- Real estate prices have remained steady.
- The area near the plant is the fastest growing in that portion of State.



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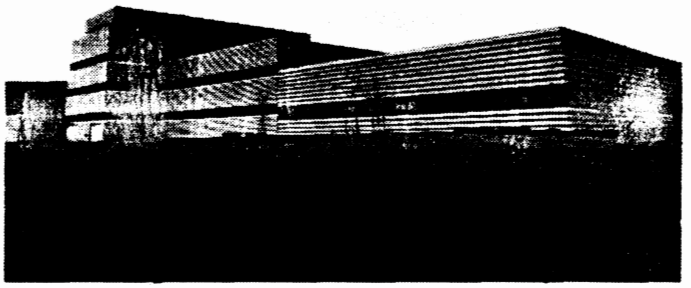
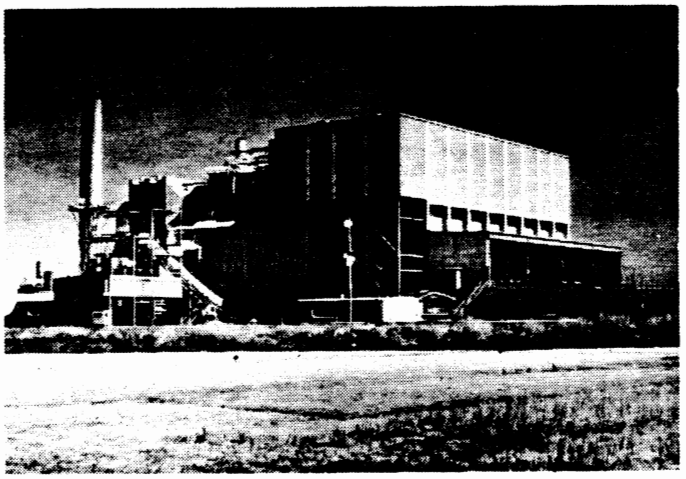
Peekskill, New York

2250 tons per day

- The plant has been operating for almost 3 years.
- Residential real estate has moved generally in 2-4 weeks.
- Investors are the most active buyers in the area.
- The plant has had no noticeable impact on real estate transactions.
- The residential area that is immediately adjacent to the plant has appreciated approximately 20% in last 12 months.





East Saugus, Massachusetts

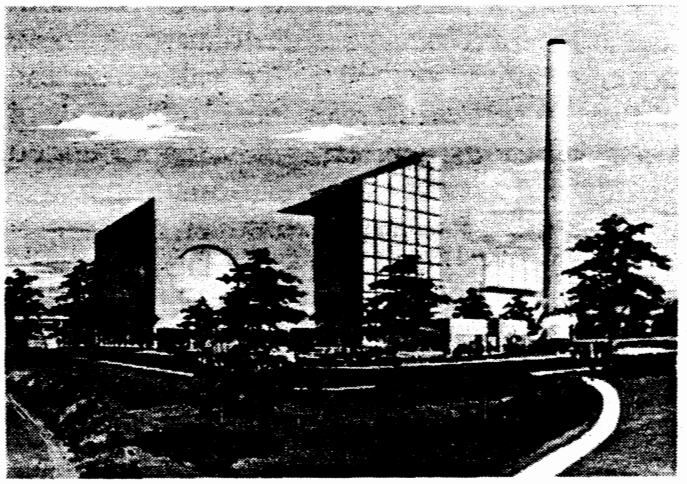
1200 tons per day

- The plant has been operating for 10 years.
- Many new homes have been built in the vicinity of the plant.
- Lenders have had no hesitancy in providing mortgages.
- The plant has had **no** effect on property values of homes including those located within a quarter mile of the site.
- When nearby properties were reevaluated and reassessed pursuant to State law, the report did not even include the presence of the plant when mentioning the factors influencing real estate values.

Baltimore, Maryland

2250 tons per day

- The plant has been operating for 2 years.
- The condition of a home and the neighborhood determines the length of a transaction, not the Resource Recovery plant.
- Homes are sold in 40-50 days average.
- The turnover rate of homes next to the plant is similar to other locations without ı facility.
- We are not aware of any problems of sellable property due to the presence of the Resource Recovery facility.



Continued on back page

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Effect of Trash-to-Energy Plants on Property Values

Continued from page 3

The above comments were obtained from 14 different brokers who all agreed on the same points. First, that the construction and operation of these trash-to-energy plants in and adjacent to heavy residential areas had no adverse affect on property values or the ability to sell properties. Secondly, in all of these locations, properties have experienced steady and healthy appreciation.

It is interesting to note that of the plants used in the above research, the smallest is almost 2½ times larger than our proposed project. The two largest are both 4½ times larger than PSWMA's plant.

Another contributing factor to the absence of impact on our town's property values is the nature of housing supply and demand here. Homeowner vacancy rates for Pennsauken are well below one percent (.8%), indicating a high demand for housing. According to data from the Pennsauken Assessor's Office, property values in Delair, the closest residential community to the landfill, have not been influenced by the existing solid waste disposal facility and have experienced steady appreciation. The trash-to-energy project will be even cleaner and less intense than the present operation.

PSWMA is confident that our planning and the lessons learned from plants such as those noted above will assure all Pennsauken residents of a safe, clean, problem solving and profitable project for Pennsauken Township.

5801

MARION COUNTY'S GARBAGE BURNER

I have been asked to comment on the Ogden Martin Waste to Energy Facility at Brooks, Oregon. The plant came "on line" in September of 1986 and has been in operation for a little over one year. Since that time I have seen and heard several reports that the Brooks facility is "state of the art technology" and that there have been "no problems". Such reports of no problems are not factually accurate. The Brooks burner indeed has had its problems. As those of us who have to live with it on a daily basis know, they raise serious public policy, health and safety issues to Marion County residents and their property. What then are our concerns about this facility?

ECONOMICS

We were told that the mass burn facility would be a economically practical solution to our solid waste problem. The cost to bring the burner on line more than doubled from its original estimate of $20 million to the present investment of $47 million. Since the start of construction on the mass burn facility our local "tipping fees" have quadrupled. Present fees are only kept below the $30 per ton level by importing trash from the Portland metropolitan area and Clark County Washington--some 35 to 40 miles away. Economically it has turned out to be a capital intensive investment which by contract requires that we generate some 145,000 tons of burnable garbage per year. This "feed the machine" mentality effectively inhibits real progress on recycling. It has not turned out to be an economically practical solution. We pay ,and will pay, for this white elephant for years to come with our pocketbooks.

AIR POLLUTION

We were told that the burn plant would be held to strict air pollution emission standards. Yet in December of 1986 annual source tests showed that the incinerator was exceeding Department of Environmental Quality Emission standards for nitrogen oxides. Despite these findings the Department of Environmental Quality did not require additional pollution control equipment to make the plant conform to the standards. Instead the state raised the emission limits from 94 lbs/hr to 122.2 lbs/hr. Effectively Oregon fitted the emission standards up to the levels being put out by the plant. This unique display of Alice in Wonderland logic is conveniently labelled "best available control technology". We pay again with the continued degradation of our air quality.

ASH DISPOSAL

We were told that the mass burn incinerator would solve our landfill problems. The combustion ash residues from the Brooks

burner are presently being held in storage in monofills at the Woodburn landfill. Leachate from the monofills is being spray irrigated onto farmland adjacent to the landfill. Has there been adequate testing as to the toxicity of the ash itself or the leachate? After six months of testing the incinerator ash the Department of Environmental Quality last May decided that results were inconclusive as to the hazardous nature of this ash.
Ash samples were found to be sometimes over the EPA hazardous waste threshold for lead and sometimes under. In short, the Department of Environmental Quality is not sure if the residue ash is a hazardous material requiring disposal at an appropriate facility. Yet despite these uncertainties Marion County is continuing with it present disposal policies at the Woodburn municipal landfill. Have we replaced one sort of groundwater pollution problem with another far more dangerous one?

CONCLUSION

I would caution all New Jersey residents not to believe all that they may have heard about Oregon's reputation as an environmental "paradise". Our Department of Environmental Quality is not all that it has been cracked up to be. It has been lax on this particular issue. In Oregon, as in New Jersey, we are living in a world that is constantly balancing such variables economic costs on one hand against environmental protection on the other. Unfortunately, I am sorry to say, in our case protection of human health, safety and environmental livability has ended up on the losing side. I would urge your public officials not to make the same mistake.

David Schreiner
6233 13th Ave.
Salem, Oregon 97303

David Schreiner

PS: I am enclosing herewith an article from the Portland Oregonian. Portland, like Pennsauken, is trying to solve its own garbage problem. Please note that Portland's independent panel of physicians and scientists after a two month health impact study of the proposed Portland garbage burner unamimously concluded that the plant "will not be safe" and that Portland would be better off to expand recycling programs than to build a garbage burning plant. The members of the scientific panel were especially concerned with the long-term effects of air pollution on human health both directly and through the food chain. If the Marion County's choice to build a burner was such a good decision why would Portland, our closest neighbor, conclude the against building a burner in their study?

Obituary, B4 Forum, B5,7
Editorial, B6

The Oregonian, Tuesday, January 26, 1988 B

Health panel recommends not building garbage burner

☐ The scientists aren't convinced a plant to burn Portland-area waste would not emit harmful air pollution

By HARRY BODINE
of The Oregonian staff

The Metropolitan Service District should not build a garbage-burning plant in Columbia County, an independent panel of physicians and scientists has concluded.

Metro released a report Monday that was prepared by a special health-impact review panel after a two-month study of the proposed plant and its pollution-control equipment. Metro Executive Officer Rena Cusma concurrently issued a statement saying she disagreed with the panel's conclusion.

The regional government should continue negotiations that could lead to the plant being built, because issues raised by the group already have been addressed, Cusma said.

Metro created the panel in November to assess the short- and long-term health and environmental impacts of a proposed plant that would burn 365,000 tons of Portland-area and Columbia County garbage per year. After examining locations in and near St. Helens, Combustion Engineering Inc. now proposes building the plant in the rural Port Westward area on the Oregon side of the Columbia River west of Longview, Wash.

Members of the panel were chosen by a three-member committee representing proponents and opponents of the plant and the Metro Council.

Its members included physicians and scientists from a range of disciplines who shared one common trait — no previous involvement in the garbage-burning issue and no vested interest in whether or not the plant was built.

Please turn to BURNER, Page B8

5T3K

Burner: Metro advised to expand recycling

■Continued from Page B1

In a summary statement the panel concluded unanimously that it cannot say the proposed plant "will be safe."

In reaching that conclusion, the panel noted:

- Given the lack of air-quality monitoring information available, erring on the side of caution is advisable because damage caused by airborne pollutants from the proposed plant could be irreversible.
- It is skeptical about the ability of any company — even Combustion Engineering, with $2.5 billion in sales annually — to maintain extremely low levels of emissions from a refuse-derived-fuel plant over a 20- to 25-year period.
- It is especially concerned about the long-term effects of air pollution on human health, both directly and through the food chain.

Metro would be better off to expand recycling programs than to build a garbage-burning plant, the panel concluded.

During the course of the panel's deliberations, the proposed location of the plant changed three times, Trygve P. Steen, its co-chairman, said Monday. The committee never was given full or complete siting information, and this deficiency put the panel in an "extraordinarily awkward" position in carrying out its assignment, he said.

Not knowing an exact site made it impossible to determine the plant's impact on both people and dairy farms. The latter is a key factor since there is ample evidence that cows can deliver substantially elevated levels of dioxin in their milk, Steen said.

An associate professor of biology at Portland State University and a specialist in environmental health and toxicology, Steen said the proposed levels of emissions proposed by the Windsor, Conn.-based company were "impressively low."

The problem is that Combustion Engineering assumes the best possible operating conditions over a long period of time, when its refuse-derived-fuel technology has a history of not being successful in maintaining low emission standards, he noted.

If the emission standards projected by Combustion Engineering "became their bond," with the company pledged either to meet them or to shut down the plant, then he and other members of the panel might have reached a different conclusion, Steen said.

As matters stand, there is a great deal of concern on the part of the committee. "The numbers are just too good," he said.

In response, Cusma said she agreed with facts cited by the health panel but disagreed with its conclusions.

As the panel noted, the proposed plant would meet federal and state atmospheric emission standards, Cusma said.

As the panel noted, more emission data soon will be available from a similar plant that is just starting to operate in Hartford, Conn., she said. That information, coupled with more research at Port Westward, should be conducted as part of the process of applying to the Oregon Department of Environmental Quality for permits to operate the plant, she added.

Ted Stanwood, a spokesman for an anti-burner group, the Columbia County Alternatives to Burning Committee, said he had anticipated Cusma's reaction. "She has been committed to the project since the beginning," he said.

"Having sat through every meeting (of the panel)," he said, "I have to agree with the doctors and scientists. We won't know for 20 to 30 years what the true effects of the plant would be."

Stanwood added that he had anticipated "dirty tricks" from Metro in dealing with the health panel but in the end had concluded that the "process was fair."

James A. Aiello, Western regional manager for business development for Combustion Engineering, said Monday he had not had a chance to read the panel's report.

Aiello noted that if the project should go forward, a detailed environmental study would be conducted using appropriate meteorological data on the Port Westward site as part of the process of obtaining DEQ permits to operate the plant.

That review in turn will provide answers to questions the panel has raised, he said.

The health-impact review panel will receive public comment on its report Feb. 4 from 7 to 9 p.m. at St. Helens High School, 2375 Gable Road, St. Helens.

A TALE OF TWO LETTERS !

Note : RESCO refers to the 1500 ton per day refuse incinerator built in the town of Saugus, Mass in 1975 by Signal (now called Wheelabrator).

For more information on the ongoing problems experienced by the RESCO plant and the people of Saugus, contact selectman, Peter Manoogian 617-233-4715 .

December 8, 1987

Mr. Robert Deshaies - Chairman
Zoning Board of Adjustment
Exeter Town Hall
Exeter, New Hampshire 03333

Dear Mr. Chairman:

First let me take a moment to introduce myself to you and your board. My name is David B. Smith, former Chairman of the Saugus Board of Selectmen, Saugus, Massachusetts, home of RESCO. I am unable to appear before you tonight in person due to personal commitments. However, I would like to offer my personal feelings as to the relationship that the Town of Saugus and RESCO had while I sat on this board for eight years.

During the eight years, I have had first hand knowledge and experience with RESCO and their management, most recently with their present manager Mr. Dan Maddigan. During this time period I found RESCO's management to be cooperative, helpful and responsive to any and all requests that the Town placed upon them. At no time did the management of RESCO ever not live up to their word once it was given. It was not always a bed of roses, we did have some problems, but they were always worked out and rectified to the satisfaction of the majority concerned. It is a known fact that RESCO could not please everyone, however it is also a known fact that they responded to every situation with the utmost of professionalism.

Overall, RESCO has been what I would consider a "good neighbor" to the Town of Saugus, which also supplied the town with over one million dollars of tax revenue, which helped us keep our tax rate low. Taking into consideration all the good and bad times, I would have to say that the good outweighs the bad and that RESCO was a plus for the Town of Saugus. And based upon the facts that I know from on hand experience, I would have to say that a plant such as RESCO would be a benifit to Exeter.

If I can be of any future assistance to you and your board during your decision process, I would be happy to answer any of your questions. I can be reached at (603)432-0955.

Sincerely yours,

David B. Smith - Former Chairman
Saugus Board of Selectman

5854

LETTERS-TO-THE-EDITOR, THE BOSTON GLOBE, N.H. EDITION, Feb 14 1988.

Say no to refuse plant

Londonderry doesn't need a refuse plant located within its boundaries. Having lived in Saugus, Mass., and having served as one of their selectmen for eight years (six as chairman), I personally lived through and experienced nothing but problems with the Resco incinerator, which is located in Saugus. Speaking from experience, I will guarantee that the Londonderry town fathers will experience many, if not all of the complaints and problems we had in Saugus while I was a selectman.

Having been in attendance at the public hearing on Jan. 21, 1988 at South School, I listened to the promises that Waste Management made to the selectmen and residents present as to what this plant will and will not do for the area, environment and tax base. In listening, I felt as if I were watching an instant replay of the same promise made by Resco to the selectmen and residents of the town of Saugus back in 1972, many of which ended up broken or not met. Times were not good with Resco Management and the town of Saugus. Residents complained constantly about fly ash falling into their swimming pools causing a black sticky substance that clogged filters; ash constantly falling on cars, homes and other outside items; a pungent odor always prevailing over the town; constant smoke from the stacks; a humming noise from the plant disturbing residents at night, especially during warm months when windows are open; increased volume of trash trucks travelling over and through town streets. These are just a few, not to mention when Resco challenged the town over their assessed value before the state Appellate Tax Board – which could have cost the taxpayers $8 million of tax revenue, which luckily was settled by the Massachusetts Legislature passing a bill making Resco a manufacturing plant and not an environmental plant. I raise all these issues to point out that once Londonderry erects a similiar plant, many of these same types of issues, including air quality, will be facing us.

I urge the Londonderry selectmen and residents to find another solution to our refuse needs and problems, especially a way that will not deprive us of our clean air, water and land.

DAVID B. SMITH
Londonderry

Note : David B. Smith LIVES in Londonderry, NH !

ANOTHER FAMOUS NIMBY : Jeffrey Hahn, Vice President for Environmental Engineering, for OGDEN-MARTIN , OPPOSED the building on an incinerator in his home town of Berkeley, California .

CITIZENS FOR A BETTER HAMILTON, INC.
P.O. BOX 4282 • TRENTON, N.J. 08610

May 20, 1989

Assemblyman John Rooney
Chairman
Assembly County Government and
Regional Authorities Committee
State House Annex
Trenton, New Jersey 08625

Dear Assemblyman Rooney:

Citizens for a Better Hamilton, Inc., is a social welfare organization comprised of Hamilton Township citizens within the area of the proposed Mercer County incinerator on Duck Island. We were formed because we were concerned about the health and safety factors associated with mass incinerators.

On behalf of all of members of CBH, I want to express to you our very strong support for the passage of Assembly Bill Number 4105 that is seeking to regulate mass incinerators. I have been informed that your Committee will be holding a public meeting on this Bill next Tuesday. In case we are not able to attend that meeting, I wanted our views about this Bill made part of the public record.

Our experiences with the proposed Mercer County incinerator leads us to believe that the Department of Environmental Protection is surely not protecting our health and safety. The DEP has consistently been approving preliminary plans for construction of the incinerator even though the County did not conduct a site or health study of the proposed location. Duck Island is adjacent to the Delaware River and is located in a flood plain area. Despite our numerous requests, no health studies have ever been conducted within the area.

Another reason why our residents do not have much faith in DEP protecting our health concerns the PSE&G plant that is located within the immediate area of the proposed incinerator on Duck Island. Just recently, the emissions from the PSE&G plant coated the area with a thick cloud of black dust. These "minor problems" have occurred many times over the years and conveniently seem to occur only at night or on weekends. When many of our residents called DEP to seek relief, they were told that they could not test emissions at night or during the weekend. Representatives from the local government and DEP have often indicated that they cannot do anything because they do not want to close the PSE&G plant which is probably what would have to occur. Informally, representatives from PSE&G have admitted that they are violating air emission standards..

587X

Our neighborhood is skeptical of the claims that the DEP and our governments will not allow dangerous emissions to be coming from the proposed incinerator. We are skeptical because nothing has been done about the PSE&G plant nor the township's sewage disposal plant that is also located in our area. Whenever it is found that such plants are violating emission standards, the DEP seems to just raise the minimum standards so that the plants are allowed to continue as usual. We have no doubt that the same procedure will occur with the incinerator.

In summary, we are opposed to mass incinerators because we feel that they are unsafe and more studies should be conducted before the proliferation of such potential dangerous plants are built in New Jersey. We have offered plans to our local governments to reduce the waste problem by recycling and composting. We cannot see why New Jersey needs the approximately 18 mass burners that have been proposed.

For example, there is an incinerator being proposed in Fairless Hills, Pa., directly across the Delaware River from the proposed Mercer County incinerator that will be three times larger than the Mercer County incinerator. Do we really need that many incinerators in that close proximity? The Warren County incinerator is experiencing financial and emission problems. Even the model incinerator in Florida to which Mercer County provided tours has had to purchase pine trees to raise the temperature and provide odor control.

Before these mass incinerators spring up like rabbits across New Jersey, we better make sure that we are not creating monsters that can kill us. We are told that mass incinerators are safe and DEP will protect us to insure that they are safe. Based upon the history of our area, those types of statements scare me. If studies made by disinterested parties indicate that some incinerators are necessary, why not reduce the amount of such incinerators on a regional basis to make them a financial success rather than a possible financial drain upon taxpayers?

Again, on behalf of CBH and all citizens concerned about their health and safety, I cannot express the magnitude of our strong opposition to the mass incinerators and our support for the passage of Assembly Bill Number 4105. The bill seems to seek reasonable restraints or limits upon the proliferation of the potentially dangerous multi-million dollar structures.

I hope that you, your Committee and the entire Legislature will seriously consider our concerns. We do not seem to be getting such treatment from the DEP or our local representatives.

Sincerely,

Peter J. Gorman
President, CBH

588X

TOWNSHIP OF HANOVER
P.O. BOX 250
1000 ROUTE 10
WHIPPANY, N.J. 07981

Office of the
MAYOR

Telephone
201-428-2466

March 15, 1989

Hon. John Rooney, Chairman
County Government and Regional
Authorities Committee
70 Kinderkamack Road
Emerson, New Jersey 07630

Hon. J. Edward Kline, Assemblyman
1333 Atlantic Avenue, Suite 303
Atlantic City, New Jersey 08401

Hon. John T. Hendrickson, Jr., Vice Chairman
County Government and Regional
Authorities Committee
157 North Main Street
Manahawkin, New Jersey 08050

Hon. Thomas Duch, Assemblyman
117 Midland Avenue
Garfield, New Jersey 07026

Hon. George Hudak, Assemblyman
24-52 Rahway Avenue
Elizabeth, New Jersey 07202

Re: Letter of Support For A-4105

Dear Chairman Rooney and Members of the
County Government and Regional Authorities Committee:

The Township Committee of the Township of Hanover in Morris County would like to go on record as strongly endorsing and supporting Assembly No. 4105 which is cosponsored by Assemblymen Pascrell and Rocco. You may be aware that our Township is under consideration as the prime location for Morris County's planned $130 million resource recovery incinerator in the heart of our community. We are opposing the siting of the resource recovery facility in our Township for several important reasons. First of all, we strongly believe that the siting of the incinerator in our community poses an extreme danger to the health and safety of our residents because of the probable carcinogenic and toxic by-products that would be released into the atmosphere. The types of pollutants that might be emitted from a resource recovery plant include dioxin, cadmium and other organic pollutants. Second in importance to the human impact factor, is the danger to our air, water, wildlife and freshwater wetlands. Resource recovery should mean exactly that. It should not mean human or environmental destruction.

Mass burn incineration has not been thoroughly examined and disected to examine all of the deliterious effects that would threaten our society. It appears that the State of New Jersey is intent on committing more than $5 billion in taxpayer money on a technological process that has not been scientifically proven

to be safe and effective. Before New Jersey embarks on a construction program to build 18 mass burn facilities, we need "to apply the brakes" and conduct the necessary research and examination of this methodology before society makes yet another tragic mistake. Let us not forget some of the lessons we hopefully have learned from the construction of nuclear power plants. We believe these reasons are sufficient justifications to abandon any plans for incineration in any place in the State of New Jersey for the foreseeable future.

The introduction of A-4105 is a reasonable and logical approach to a very complex issue. This Bill would impose a one year moratorium on the licensing and construction of any additional resource recovery facilities until an exhaustive study of the technology is conducted and other options are discussed in full. It is up to the Legislature in setting the tone and the pace in formulating a comprehensive solid waste master plan to help guide our counties and municipalities.

We view the release of A-4105 as an important foundation stone or prerequisite to the preparation of a solid waste plan. The State of New Jersey through its agent, the Department of Environmental Protection, should think before it acts. Then, and only then, can we begin to address the entire issue of solid waste disposal from the points of view of stepped up recycling, composting, new packaging laws or other viable options that will adequately address our solid waste problems without adversely impacting humanity and our environment.

The Township Committee respectfully requests that the Assembly County Government and Regional Authorities Committee permit the release of A-4105 as quickly as possible so that its spirit and intent might be fully debated and weighed by all the members of the Assembly and Senate.

Very truly yours,
FOR THE TOWNSHIP COMMITTEE

S. C. Iannaccone
Mayor

SCI/JAG/ci
cc: Hon. William J. Pascrell, Jr., Assemblyman
Hon. John A. Rocco, Assemblyman and Speaker Pro Tem
Hon. Chuck Hardwick, Assembly Speaker
Hon. Garabed Haytaian, Majority Leader
Hon. Arthur R. Albohn, Assemblyman
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Hon. John S. Penn, Assemblyman
Hon. Richard Kamin, Assemblyman
Hon. Bill Schluter, Assemblyman
Hon. Robert Martin, Assemblyman
Hon. Alex DeCroce, Assemblyman
Hon. Edward Tamm, President, Morris County
League of Municipalities
Mr. John E. Trafford, Executive Director, New Jersey
State League of Municipalities
Ms. Cindy Lombardi, Committee Aide 590X
All Morris County Municipalities

Study: 1 in 7 Vietnam veterans suffers stress

ATLANTA (AP) — One in seven Vietnam veterans suffers from post-traumatic stress disorder, a rate seven times that estimated by a government study earlier this year, a researcher reported yesterday.

The 15 percent rate, listed in the latest study, translates to about 470,000 cases.

The discrepancy with the 2.2 percent rate reported earlier by the federal Centers for Disease Control (CDC) arises mostly from differences in the criteria for diagnosis.

In contrast to a single yardstick used in the CDC study, the new estimate relied on several measures, said researcher William Schlenger, of the Research Triangle Insitute in Research Triangle Park, N.C.

He described the study at the annual meeting of the American Psychological Association and in interviews.

Post-traumatic stress disorder can appear months or years after a traumatic experience. Symptoms include sudden reliving of the experience, nightmares and intense distress.

The new estimate says the disorder afflicts 15 percent of male Vietnam veterans and 9 percent of females, Schlenger said.

The estimate was developed by researchers at Schlenger's institute, a private not-for-profit research firm; San Diego State University, and the University of California at San Francisco.

The "National Vietnam Veterans Readjustment Study" included interviews with 1,600 veterans who served in Vietnam, Laos or Cambodia or surrounding waters or airspace.

For comparison, researchers interviewed veterans who served elsewhere during the Vietnam era, and a group of civilians of similar age.

Son of Naval officer who ordered defoliation dies

FAYETTEVILLE, N.C. (AP) — Elmo R. Zumwalt III, son of the admiral who ordered the spraying of Agent Orange in Vietnam and who was exposed to the defoliant himself, died at his home yesterday from cancer. He was 42.

Zumwalt, a lawyer, said he never blamed his father for his disease. The two co-wrote a book titled "My Father, My Son," which was made into a television movie.

Agent Orange contains highly toxic dioxin. Veterans had contended that exposure to it causes cancer and other illnesses. They said it caused miscarriages by wives of servicemen and birth defects in their children.

Zumwalt's son, Elmo Russell Zumwalt IV, suffers from a congenital dysfunction that confuses his physical senses.

dents," according to Brett B. Lambert, an American student returning from Rangoon. "People are smiling and happy."

News reports said students in the capital continued passing out leaflets urging protests to win democracy.

"Burma's Hitler was brought down by the might of all the people," Japan's Kyodo News Agency quoted one Burmese as saying.

Rangoon, a city of 3.5 million, had been under a daytime curfew since early last week.

The diplomats said prices were soaring, food was running low and hospitals, which normally function at threadbare levels, were reported seriously short of blood, bandages and other vital supplies.

Sein Lwin stepped down after reports that Burmese soldiers were turning against the government and allowing people to march through some towns in support of democracy and economic reforms.

Agent Orange cuts short Vietnam War veteran's life at 37

By KEN SHUTTLEWORTH 2-27-89
Courier-Post Staff 2-B

GLOUCESTER CITY — In comparison with the guys who went out on patrol night after night, Freddy Bauer thought he had things easy during his two tours in Vietnam.

He loaded chemicals into keg-like drums attached to the rear of aging airplanes. Those planes would then depart on spray missions to defoliate the enemy's land with Agent Orange and other herbicides.

"He thought of himself as having a less dangerous job and when he got back he looked out for the other Vietnam veterans," Bauer's boyhood friend, Bob Grier, recalled yesterday.

"He looked up to the guys he considered combat veterans," added Grier, himself a disabled Vietnam veteran.

It developed, though, that the risks Bauer took were at least as great as those taken by soldiers who sweated out patrol duty.

Last Wednesday, Bauer died as a result of exposure to the lethal chemicals he handled during his service with the U.S. Army.

The Gloucester City resident was 37 and is survived by his wife, the former Victoria Larwa, and sons Jacob, 13, Matthew, 11, and Thomas, 8.

Grier said Bauer, a maintenance mechanic, sometimes "tapped" the keg and, almost always, he would have to clean out the containers once the plane touched down.

Grier described the Gateway Regional High School graduate as happy-go-lucky, not given to worry about the bleeding from his ears, the headaches and the memory loss that occurred after his homecoming.

"He never went for treatment. He just accepted it," Grier said.

Last year, doctors discovered a brain tumor.

Grier said Bauer underwent chemotherapy treatments most of last spring and summer before things turned worse. He was operated on in December and even returned to his job as a maintenance supervisor at the GE-RCA facility in Moorestown for a time before everything caught up with him.

Just before he died at Cooper Hospital-University Medical Center in Camden, Grier said he made sure Bauer signed a document he hopes the Veterans Administration will accept to support a claim that provide benefits for his family under special programs for those considered disabled. Grier said his friend was not classified as a disabled vet.

However, Grier said Bauer is part of a class action suit against the government seeking compensation for injuries resulting from Agent Organge exposure. Grier said Bauer's death certificate says he died "due to exposure to dangerous chemical herbicides in Vietnam."

Grier said Bauer joined the army in 1969 and was assigned for a one-year tour in West Germany as an aviation mechanic before being sent to Vietnam. He returned in 1971 and worked as a crane operator for 11 years at the Budd Company's Hunting Park plant in Philadelphia.

Unusual behavior and frequent absences, presumably caused by the massive brain tumor, led to his dismissal from the Budd Co., according to Grier.

Bauer was about 5 feet 5 inches tall and Grier remembers that his outgoing personality, along with his diminutive size, gave him access to all the teen-age cliques in the Brooklawn-Westville-Gloucester City area.

The nearby Big Timber Creek was Bauer's favorite boyhood playground, a place where the avid fisherman-hunter could always find a strong tree limb to tie a rope to and then swing out Tarzan-style over the water.

"He loved to explore the woods and swamps," said Grier. Sometimes, when he got bored and needed a few bucks, Bauer would sign on for a few days of picking vegetable crops at Andolora's farm.

In winter, Westville Pond was Freddy Bauer's favorite hangout, especially around glowing campfires teen-agers lit after ice skating to talk of happy futures.

"And after a heavy snow you could always find Freddy body surfing through the streets of Westville on the back bumper of a car," said Grier, a computer technician with Conrail.

In addition to his widow and children, Bauer leaves his mother Evelyn Bauer of Brooklawn and a sister, Eileen Mancuso of Marlton. A mass of Christian Burial will be 10:30 a.m. tomorrow at St. Mary's Roman Catholic Church, Monmouth and Atlantic Streets, here. Burial will be in New Jersey Veterans Cemetery in Arneytown.

Friends may call after 9 a.m. at the McGuinness Funeral Home, 34 Hunter St., Woodbury. Memorial donations may be made to the Frederick P. Bauer Memorial Fund, P.O. Box 672, Woodbury, 08096.

Del., N.J., Pa. high on cancer list

By Kitty Dumas
Inquirer Staff Writer

New Jersey, Pennsylvania, Delaware and Maryland are expected to be among the top seven states with the highest cancer death rates this year, according to projections released by the American Cancer Society.

According to the society's booklet, "Cancer Facts and Figures — 1988," published earlier this year, Delaware is expected to be the state with the highest cancer fatality rate, 246 deaths per 100,000 people; Maryland is expected to be second with 241, New Jersey third with 227, and Pennsylvania seventh with 218.

While not a state, the District of Columbia is listed as having the highest estimated rate, 264, and Utah the lowest with 118.

According to the booklet, about 483,000 people died of cancer nationally in 1987 and 472,000 in 1986. It is estimated that 494,000 will die this year, or about 1,350 people a day.

Bruce J. Trock, assistant director of the Cancer Control Program at the University of Pennsylvania, said in an interview this week that although the statistics are useful, they are not cause for panic among the top-rated states.

Because the risk of getting cancer increases with age, the statistics are computed taking into account the aging of the population of each state. They are also based on the 1970 U.S. Census. The total number of deaths for the states often remain nearly unchanged, while the death rate per 100,000 people changes each year with changes in the number of older Americans.

Trock pointed out that both New Jersey and Pennsylvania have had among the highest cancer death rates for some time; in 1987, New Jersey had the sixth highest and Pennsylvania the fourth.

Many of the rates estimated for this year differ only slightly from each other. Massachusetts' rate differed from Pennsylvania's by one person per 100,000.

It is clear, though, that the Northeast of the United States has a higher cancer death rate than other areas, and Trock said that has been true traditionally, apparently because of the large number of industrial plants.

While Delaware has fewer industrial facilities than New Jersey or Pennsylvania, Trock said, many Delaware residents work in those states.

Researchers conclude that a change in behavior — such as altering diets or stopping smoking — is likely to reduce the risk of getting the disease, but other factors that apparently contribute to getting cancer are more difficult to modify. For example, some people cannot readily change their working environment. If they must work with cancer-causing chemicals, their risk of getting the disease is greater.

While some types of cancer are decreasing, Trock said, the rates of two types of cancer are still rising. Lung cancer and melanoma, or a skin cancer, are increasing, Trock said.

The main culprit is smoking, researchers say. Another is overexposure to the sun. It has taken years, sometimes decades, for the habits of some Americans to catch up with them, he said, but doctors are seeing the results of years of smoking and sunbathing.

Melanomas are visible on the skin in the form of moles, he said. If treated, the success rate is high. If the cancer is not treated, Trock said, it spreads and is deadly. Before and right after World War II, Americans did not sunbathe as they do today, he said, and skin cancer was rarer.

"People didn't go to the extremes people go through now to get a tan," he said.

"We're seeing rates of melanoma that reflect the trend of sunbathing in this country over the years," Trock said. "We're seeing the effects of people's smoking habits over the last 20 or 30 years."

Estimated cancer deaths by state — 1988 *

Per 100,000 people

1.	Delaware	246
2.	Maryland	241
3.	New Jersey	227
4.	Ohio	224
	Rhode Island	224
6.	Michigan	222
7.	Pennsylvania	218
8.	Massachusetts	217
9.	Alaska	216
	Virginia	216
11.	Connecticut	214
12.	Indiana	213
13.	Alabama	211
	Nevada	211
15.	Louisiana	209
16.	South Carolina	207
17.	North Dakota	206
18.	Kentucky	204
19.	Illinois	200
	North Carolina	200
21.	West Virginia	199
	Tennessee	199
	New York	199
	Georgia	199
25.	Maine	198
26.	New Hampshire	196
27.	Oregon	194
	Vermont	194
	Missouri	194
	Wisconsin	194
31.	Arkansas	188
32.	Hawaii	187
	Iowa	187
34.	Mississippi	185
35.	Montana	183
36.	Florida	182
37.	California	180
38.	Arizona	179
	Minnesota	179
	Washington	179
41.	South Dakota	177
42.	Nebraska	172
43.	Kansas	170
44.	New Mexico	167
45.	Oklahoma	163
46.	Idaho	157
47.	Texas	156
48.	Colorado	141
49.	Wyoming	128
50.	Utah	118

(District of Columbia, while not a state, had highest rate: 264)

*Adjusted to age distribution of the 1970 census population

SOURCE: American Cancer Society

593K

THE NEW YORK ... TIMES, THURSDAY, MARCH 23, 1989

U.S. Calls Poisoning of Air Far Worse Than Expected and Threat to Public

By PHILIP SHABECOFF
Special to The New York Times

WASHINGTON, March 22 — The first national survey of toxic chemicals poured into the air by industry shows they are being emitted at rates that threaten public health, members of Congress and Federal officials said today.

The survey, based on data the Environmental Protection Agency collected from industry last year, was released today by the House Energy and Commerce Committee's Subcommittee on Health and the Environment. It covered more than 320 chemicals, only seven of which are currently regulated by the E.P.A. The agency said 60 of the chemicals were listed by the Government as causing cancer.

The 320 chemicals covered by the survey include such substances as carbon tetrachloride, butadiene, acrylonitrile, and cadmium, all widely used in various manufacturing processes. Other chemicals listed are known to cause neurological disease or birth defects.

The agency said the survey found 2.4 billion pounds of the chemicals were emitted in 1987. But E.P.A. officials said the situation could actually be far worse because the survey did not include pollution from automobiles, releases from toxic waste dumps and pollution from companies that produce less than 75,000 pounds of the toxic substances annually.

"The magnitude of this problem far exceeds our worst fears," said Representative Henry A. Waxman, a California Democrat who is subcommittee chairman.

Agency officials said, that while data on the health effects of most of the toxic chemicals were limited, the Administration would support changes in the Clean Air Act to deal with the problem, possibly requiring industry to redesign plants and equipment to reduce emission, for example.

Jeffrey C. Van, a spokesman for the Chemical Manufacturers Association, said, however, that "to suggest a national health problem based on the raw numbers in the survey is very misleading and troubling."

But he added, "It is becoming apparent that the current approach to air toxics isn't doing the job." He said the chemical industry would support new legislation to deal with the problem.

Sources Are Many

The chemical industry is the largest single source of airborne toxic substances reported in the survey. The industry released about 886 million pounds in 1987.

Other emissions come from plants that produce metals, paper, rubber and plastics, electric equipment, petroleum and coal products, furniture and a wide variety of other manufactured products.

No specific maximum levels were established for the 320 chemicals by the Clean Air Act of 1970. The agency was instead charged with assessing the risks of these chemicals and then drafting rules for controlling each one.

Progress and Setbacks

But the act did set maximum levels for other pollutants: lead, sulfur dioxide, nitrogen oxides, carbon monoxide, ozone and particulate matter such as dirt, dust and soot.

In a separate report, the E.P.A. said today that these pollutants had abated from 1978 to 1987, but that levels of ozone and particulate matter had increased between 1986 and 1987 and that improvements in controlling nitrogen oxide emissions had leveled off.

E.P.A. officials said that the provisions of the Clean Air Act governing airborne toxics were so cumbersome and expensive to carry out, and so vulnerable to legal challenge, that they have not been able to issue more than the seven regulations in the 19 years since the law was enacted.

Mr. Waxman and three other Democrats, Representatives Mickey Leland of Texas, James J. Florio of New Jersey and Gerry Sikorski of Minnesota, said they planned to introduce legislation in the near future that would amend the Clean Air Act to require that industry make sharp reductions in its emissions of toxic substances.

Information on toxic air pollution is now available because of 1986 amendments to the 1980 toxic waste law requiring industry to report all releases of toxic substances into the air, water and land to the E.P.A. as well as to state and local authorities.

Data on concentrations of airborne air pollution at the local and regional level should now be obtainable from these authorities, Mr. Florio said today.

Don R. Clay, the E.P.A.'s acting Assistant Administrator for Air and Radiation, said that, while little was known about the health effects of most of the chemicals surveyed, "the data suggests there is a public health problem."

Mr. Clay said that some progress had been made in reducing toxic substances in the air, but that emissions continue to constitute a serious problem that requires new legislation. He said he expected the Bush Administration to support such changes.

Mr. Van of the Chemical Manufacturers Association, a leading industry trade group, said that the survey figures based on 1987 data are already out of date because many chemical companies are substantially reducing their emissions of the toxic air pollutants.

He said that companies had begun to reduce their emissions even before the public-disclosure amendments to the toxic waste law were passed because the accident at Bhopal, India, where more than 3,000 people were killed by an release of methyl isocyanate, had "shocked the industry down to our toes."

Caution Against Panic

He said that the high numbers in the survey do not mean there is a national health problem and added, "If the data is misused, people will be needlessly frightened."

The E.P.A. had previously estimated that toxic air pollution accounts for some 2,000 cases of cancer a year. But that estimate was based on an analysis of only 20 chemicals. Nor did the agency's study consider the combined effects of the chemicals.

The National Wildlife Federation, the nation's biggest conservation organization, issued its own study on toxic air pollution, which was also based on the information submitted to the E.P.A. and had results similar to those reported by the House Health and Environment Subcommittee. Dr. Jerry Poje, a toxicolgist for the group, that the reports present, "for the first time, a snapshot of toxic pollution" across the country, and that the results "speak to a nation at risk."

The federation called for passage of national air toxic legislation that would reduce routine emissions of dangerous chemicals, control such pollution from smaller sources and require stringent action to prevent chemical accidents that could produce acute poisoning episodes. It also called on industry to set goals for reducing its toxic emissions and pointed as an example to the Monsanto Chemical Company, which has pledged to reduce such emissions by 90 percent by 1992.

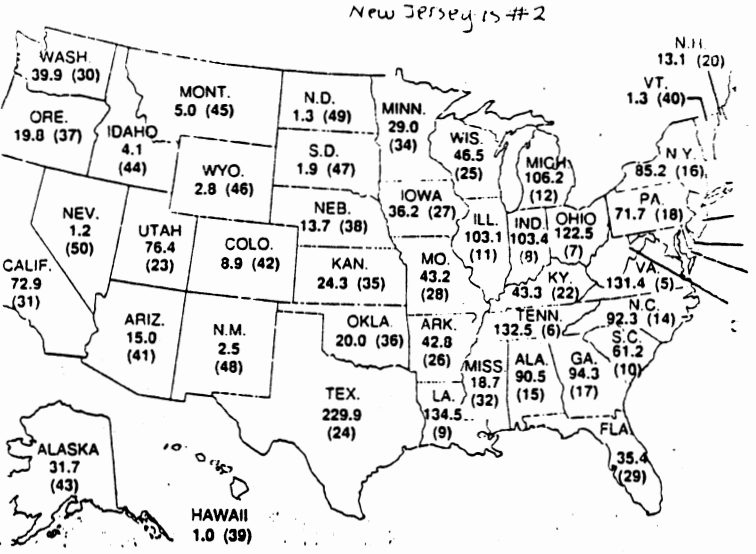
Other environmental groups joined today in demanding new legislation to reduce toxic air pollution.

"You can stop eating apples and grapes, but Congress has to stop toxic air pollution because, you can't stop breathing," said Daniel Becker of Environmental Action, a Washington-based group.

Poisoning the Air: State by State

Millions of pounds of toxic industrial pollutants released into the air in each state. Number in parentheses is state's ranking in terms of pounds per square mile.

New Jersey is #2



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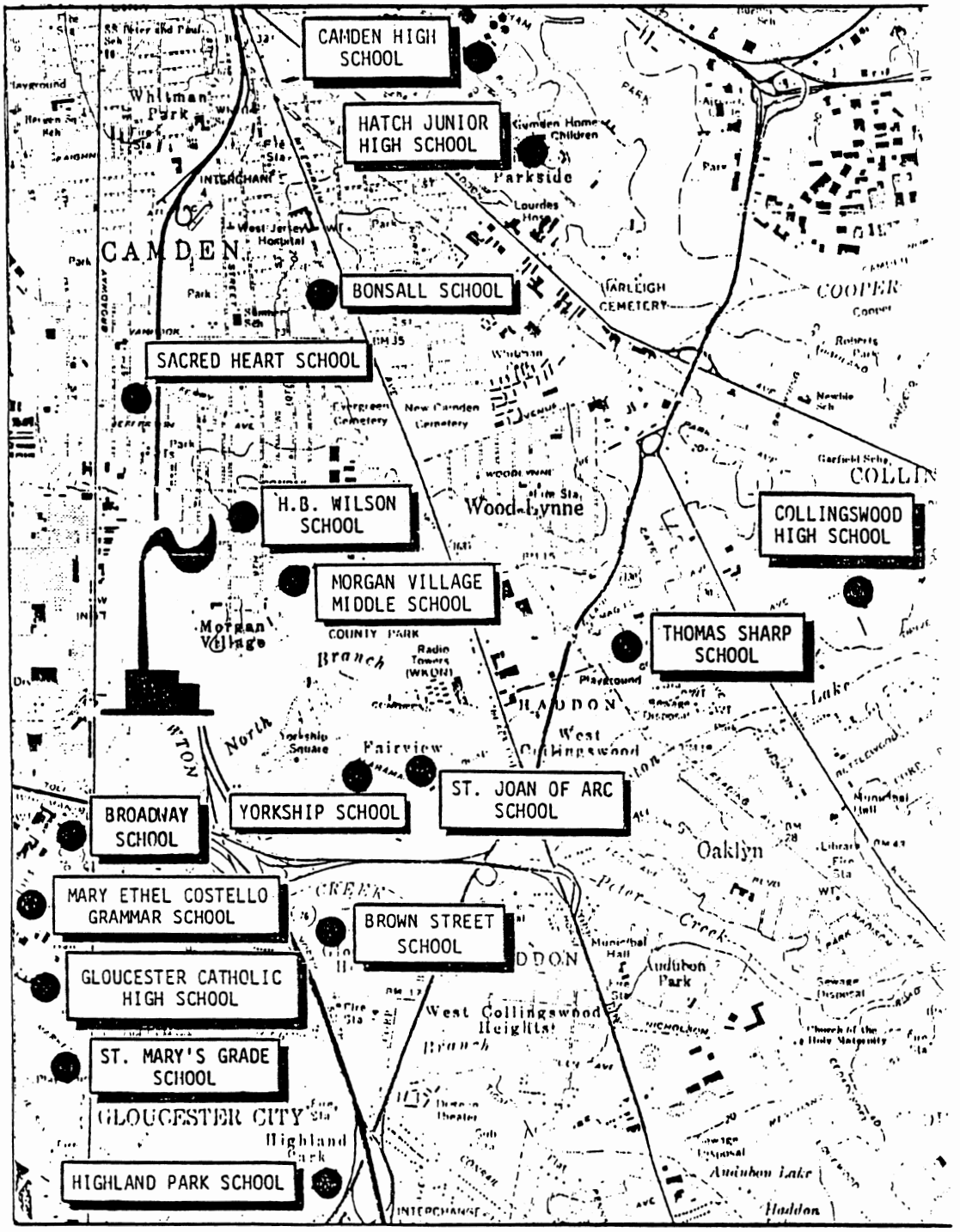
Incinerator will pollute schools



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- [illegible] Securities Co., Ltd. is one of the [illegible]
- Backed by an extensive network of 120 domestic and [illegible] overseas offices, Daiwa provides a full spectrum of [illegible] international banking and other financial services [illegible] around the world.
- In light of Black Monday, Daiwa registered a credit[illegible] performance in fiscal 1988, ended September 30, 19[illegible] reductions, both revenues and net income, at ¥702.4 [illegible] ($5,224 million) and ¥119.1 billion ($886 million), [illegible] were second only to the previous term's record [illegible]

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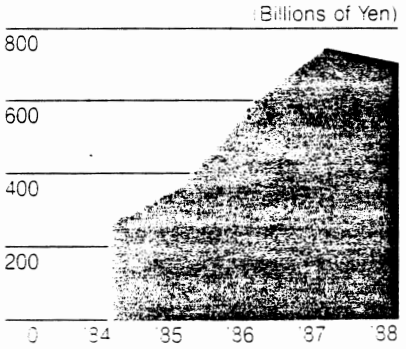
Financial Highlights

[illegible] and its consolidated subsidiaries
Years ended September 30

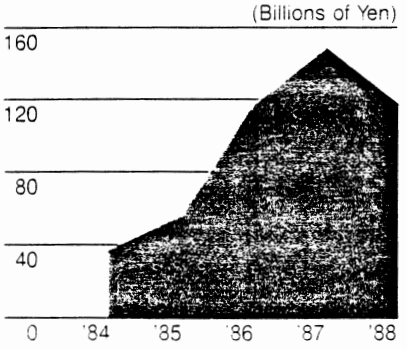
	Millions of yen			Thousands of U.S. dollars
	1988	1987	1986	1988
Revenues	¥ 702,377	¥ 750,106	¥ 595,018	$ 5,224,076
Income before income taxes	254,459	333,778	276,802	1,892,592
Net income	119,149	148,969	111,776	886,196
Total assets	4,716,672	4,390,672	3,110,883	35,081,235
Shareholders' equity	740,440	624,027	454,293	5,507,177
	Yen			U.S. dollars
Per share:				
Net income	¥ 94.23	¥ 118.89	¥ 91.21	$ 0.70
Cash dividends paid	12.00	9.00	7.50	0.09
Shareholders' equity	583.90	498.03	370.69	4.34

Notes: 1. Unless indicated otherwise, all dollar figures herein refer to U.S. currency. Dollar amounts represent translations at the rate of ¥134.45 = US$1, the rate prevailing on September 30, 1988. *Billion* is used in the American sense of one thousand million.
2. Net income and shareholders' equity per share are computed based on the average number of shares outstanding during the year appropriately adjusted for free stock distributions.

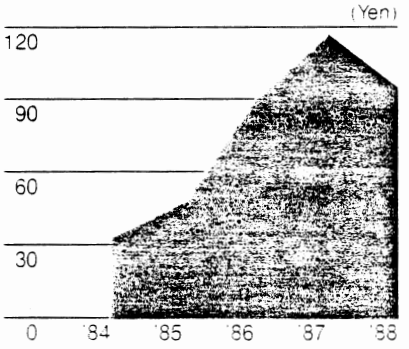
Revenues



Net Income



Net Income per Share



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Yoshitoki Chino,
Chairman

Fiscal 1988 in Perspective

Black Monday, market correction, crash... The events surrounding October 19, 1987, spawned memorable phrases and sent people scrambling for their textbooks to discover parallels to the infamous "Crash of '29" and its ensuing depression.

Fortunately, most stock markets swiftly regained much ground, despite lower volume, and in recent months some—such as Japan's—have rebounded to reach all-time highs.

Nevertheless, the bears of Black Monday left no financial institution unscarred, Daiwa included, and this is reflected in the Company's performance in fiscal 1988. But the October crash was not the only challenge Daiwa faced during the year. Bond markets worldwide remained generally unencouraging. Currency markets were extremely difficult to predict. Interest rates rose significantly in most advanced nations. Most important, commission rates for securities on the Tokyo Stock Exchange (TSE) were slashed at the beginning of the term.

A Solid Performance

Let us look at Daiwa's consolidated results for fiscal 1988. Revenues were down 6.4%, to ¥702.4 billion ($5,224 million). Commissions declined 14.2%, accounting for 60.9% of total revenues. Interest and dividend income increased 17.5%, amounting to 34.3% of total revenues. Net gain on trading fell 29.8%, constituting 4.5% of total revenues. As a result, net income dropped 20.0%, to ¥119.1 billion ($886 million), and net income per share was ¥94.23 ($0.70), compared with ¥118.89 a year earlier. Although down on fiscal 1987, both revenues and net income were nevertheless the second highest in Daiwa's history. Cash dividends applicable to fiscal 1989 were raised to ¥12.5 ($0.093) per share, from ¥12.0 ($0.09) in fiscal 1988.

Change and Response

Japan's financial services sector was again reshaped by dramatic regulatory change in fiscal 1988. Following are the year's notable developments and Daiwa's response to them.

- As cited before, commission rates on TSE-listed stocks were reduced. Although this move initially hampered Daiwa's operations, we successfully cut costs in all aspects of transaction activities.

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- The Ministry of Finance lifted constraints on the domestic issuance of commercial paper and permitted the establishment of markets in Tokyo and Osaka for stock index futures based on the Tokyo Stock Price Index (TOPIX) and the Nikkei 225 Stock Average, respectively. Daiwa swiftly captured substantial shares of these markets.

> *"Although down on fiscal 1987, both revenues and net income were nevertheless the second highest in Daiwa's history."*

- *Maruyu*, Japan's system of tax-exempt interest on small savings deposits, was abolished. This allowed us to broaden our customer base through the introduction of such innovative products as Step, a customized 10-year-term investment plan.
- Revisions of Japan's Securities and Exchange Law governing the management of confidential corporate information were slated for April 1989. Daiwa's swift response was to launch a sweeping reorganization of brokerage and corporate finance departments to eliminate the possibility of insider trading. The Company also produced an educational video and conducted seminars to inform the public about the proposed law.

Pioneering Investment Alternatives

Daiwa is renowned for its ability to create imaginative investment products and services that satisfy customer requirements. In fiscal 1988, Daiwa reinforced this reputation. The Company was among the first to underwrite domestic commercial paper. It was also the first Japanese securities house to issue warrants on Japanese government bonds. In addition to Step, we brought out the widely acclaimed My Trade—a 24-hour home trading system that allows owners of a computer games terminal to make stock transactions easily.

A Truly Global Competitor

Fiscal 1988 was a period of expansion for Daiwa's international operations. Highlights included the elevation of Daiwa Securities America Inc. to clearing-member status on the



Sadakane Doi, President

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world's largest futures and options exchanges—the Chicago Board of Trade and the Chicago Mercantile Exchange. Daiwa Europe (Gilts) Limited, a wholly owned subsidiary of Daiwa Europe Limited, received permission from the Bank of England to make markets in U.K. gilt-edged bonds. In addition, we established Daiwa Europe (Belgium) S.A.—formerly the Brussels office—as a universal bank. We also upgraded the Toronto and Bahrain offices to subsidiary status and created a representative office in Madrid.

Daiwa is committed to the internationalization of Japan's capital markets and has long been the top sponsor of listings by foreign companies on the TSE. We enhanced this record in fiscal 1988 by sponsoring 14 of 35 TSE listings, for such well known clients as the Broken Hill Proprietary Co., Ltd. (BHP), Dixons Group plc, Ford Motor Co., The Goodyear Tire and Rubber Company, Hewlett-Packard Co. and Swiss Bank Corp.

Daiwa's assistance to such clients extends beyond listings. During the year under review, for example, we concluded a Samurai commercial paper dealing agreement with Sears, Roebuck and Co.—a company we helped list on the TSE in 1984.

A New Fiscal Period

Daiwa plans to change its fiscal year-end from September 30 to March 31. To implement this change, the fiscal period beginning October 1, 1988, will close on March 31, 1989.

> ***"... Daiwa is gearing up for growth. International expansion, the introduction of superior products and services, the advancement of our communications network—all will continue to receive full management support."***

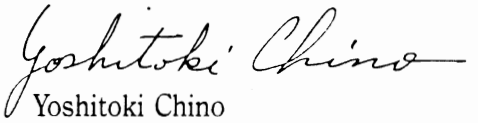
Confident of Progress

Since the second half of fiscal 1988, the operating environment has improved significantly. With Japan's economy having largely overcome the high yen's adverse effects, demand for capital funds by domestic companies is growing rapidly. Tokyo's position as the world's largest capital market, a subject discussed at length in last year's annual report, is attracting borrowers from overseas as never before. This role has been enhanced significantly by the recent opening of local futures markets.

To take advantage of these opportunities, Daiwa is gearing up for growth. International expansion, the introduction of superior products and services, the advancement of our communications network—all will continue to receive full management support. We look forward, therefore, to an even better performance on behalf of our shareholders in the period ahead.

As we prepare for the future, however, we will retain uppermost in our minds our employees and clients—people who are vital to Daiwa's continued success, not just slogans in a tired sales pitch. We invite you to read the following pages, where we introduce some of these people.

January 1989



Yoshitoki Chino
Chairman



Sadakane Doi
President

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The Dynamics of Achievement at Daiwa Securities

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An Aggressive Mergers and Acquisitions Strategy

"We feel that this deal has definitely proved that it's possible to bring Japanese and American companies together."



When Michio Miyamoto joined Daiwa Securities Co. Ltd. in 1986, he brought with him an excellent reputation in M&A. He is assistant general manager, Mergers and Acquisitions Department.

I'd say that the M&A deal for Bristol-Myers and Sumitomo Metals was easily the most satisfying and one of the fastest—from introduction to conclusion—we've ever done. It was made a lot easier because Sumitomo had a clear idea of what they wanted. Their strategy was extremely well mapped out. That made it much simpler to look for a partner. Soon after talking with Sumitomo, we heard from our people in New York that Bristol-Myers was looking for a partner in the laboratories business, particularly in medical diagnostic services. So we evaluated the quality of their people, their organization, their strategy, and we knew we had a great chance of concluding a deal.

Their personalities were well matched right from the beginning of negotiations. And that's important in M&A, just as important as strategy. We felt trusted by both sides, and I believe we gave them our best. We had four people in Tokyo and two in New York working on the deal. Bristol-Myers and Sumitomo also worked hard, very hard, and I was most impressed with their commitment.

M&A is in its infancy in Japan. Most Japanese companies are still very wary about it, and U.S. corporations, too, have been hesitant about creating such close business links with Japanese firms. But I think that's changing. Our experience shows that. We feel that this deal has definitely proved that it's possible to bring Japanese and American companies together. As well as being a plus for our marketing efforts, it's also personally satisfying.

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Mitchell P. Cybulski: We've only been associated with Sumitomo Metals for a short time. We met to discuss business relationships about six months ago and we have been formally joined in a business relationship for approximately two months.

This was one of the easiest major deals our corporation has ever made. It was easy because Bristol-Myers has tremendous respect for Sumitomo Metal Industries. The way they conduct business—their vision—is very similar to ours. We believe we've identified a partner that can help us realize our future goals.

Daiwa was an excellent marriage broker. They used both their financial expertise and people expertise in an environment in which we could do business.

Business is conducted by people. Personalities and understanding are of paramount importance. That is why Sumitomo and Bristol are compatible, and I believe that is why Daiwa was an important part of the chemistry in bringing us together.

As for dealing with Daiwa, I can only say I've been extremely impressed. They have treated us fairly and professionally. And Bristol-Myers would happily use them again. I'm sure they're creative enough to come back to us in the future with a good proposal.

"Daiwa was an excellent marriage broker. They used both their financial expertise and people expertise in an environment in which we could do business."



Mitchell P. Cybulski (left) is president of Bristol-Myers K.K. He is also a director of the parent company which he joined in 1971 after completing his MBA at Columbia University in New York City.

Yoshihiro Kato has been with Sumitomo Metal Industries Ltd. since graduating from Tokyo University in 1962. He holds the position of general manager, Planning and Administration Department, New Business Division.

Yoshihiro Kato: I'm very satisfied with our relationship with Bristol-Myers. The deal moved quickly and efficiently, partly because we found we could get on well with each other. Also, we both had clear ideas about what we wanted to do in the laboratories business. Daiwa was very helpful because they were able to scout out this opportunity for us. So that saved us a lot of wasted time and the difficulties of talking with many potential partners. No one needs drawn-out negotiations, particularly in M&A. Daiwa was a good middleman.

Unmatched Expertise in Sponsoring TSE Listings

"Obviously, the listing itself shouldn't be the sole objective... a company's strengths must be spotlighted through effective marketing."



Hiroshi Yoshida entered the International Investment Service Department of Daiwa Securities Co. Ltd. in 1983. He is now vice president, Corporate Finance Department, at Daiwa Securities America Inc.

Daiwa has sponsored 29 of the 68 U.S. companies listed on the TSE as of December 1988. Our record is unmatched. We sponsored the first two companies to list on the TSE in 1973—Citicorp and First Chicago Corporation. Most important, none of the companies we have sponsored has delisted from the TSE...

Our competitors have not been so fortunate. It's more than just luck, though. It's really a question of vision and commitment. Strategy. You see, when we began our listing business, Japanese investors weren't really interested in foreign stocks. Today, that has changed, partly because we have long strived to promote understanding between the American and Japanese business communities. And we have emphasized the importance of marketing in creating interest in Japan and in establishing a solid investor base there.

Obviously, the listing itself shouldn't be the sole objective. To build and maintain that investor base, a company's strengths must be spotlighted through effective marketing. That's where our experience counts. Supported by extensive research and sales programs, we arrange roadshows in Tokyo aimed at telling clients' stories to Japanese investors. Obviously, clients must be totally committed—and ours are—to help ensure the long-term success of these efforts.

Of course, the merits of listing go beyond the shareholder question. For many clients, listing increases exposure to the Japanese financial community, and therefore improves fund-raising potential. Others, like Du Pont, already have a big market presence in Japan. For them, it was a natural step in raising their corporate profile, a kind of corporate citizenship. Having the name listed as well as the stock is really important in Japan.

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Du Pont has been in Japan almost 30 years. Our business there is broad-based. We have over 1,000 employees, excluding our affiliates, and our investment is rising dramatically. We expect sales to exceed $1 billion in 1988.

Our decision to list on the TSE was consistent with our increased business thrust in Japan. We wanted more visibility as a local multinational firm. And we wanted to signal our commitment to the Japanese market, to a long-term presence there. We're happy with the results. Du Pont is now second only to IBM in name recognition in Japan. We're able to recruit better—one initial goal. At this stage, we don't need to raise large amounts of long-term capital. However, we are well placed should that be required in the future.

Daiwa did an excellent job of selling the idea of a TSE listing to us here. It was crucial that Daiwa also convinced our Japanese organization. And we felt comfortable with them because of their proven track record. We felt Daiwa had demonstrated its ability to cut through the initial red tape and to assist down the road. Like the meetings with securities analysts and individual institutions, for example, which we've found very effective. Throughout the process, Daiwa has given us extremely good customer service. On the personal level, too, we really feel good about everybody we've met at Daiwa. Particularly those more directly involved in the listing. They just did an outstanding job.

"We felt Daiwa had demonstrated its ability to cut through the initial red tape and to assist down the road."



John J. Quindlen's career at E.I. du Pont de Nemours and Company spans more than three decades. He is senior vice president finance and chief financial officer. Mr. Quindlen is a prominent member of such professional organizations as the SEC and Financial Reporting Institute, University of Southern California.

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An Innovator in Eurobond Underwriting

"...deals don't take place overnight. They require a lot of groundwork, as well as a good relationship between us and our clients."



Yoshio Maruyama joined Daiwa Securities Co. Ltd. in 1972. He currently holds the position of assistant general manager, International Investment Banking Department, at Daiwa's head office. He was posted to London-based Daiwa Europe Limited for two periods totaling more than seven years, during which time he dealt in several highly regarded issues for SEK.

Working in London was extremely challenging for me. The City has been a hive of activity since the Big Bang, with new products coming out constantly. There's also been rapid deregulation in other major European markets... and it's the same in Japan.

Such change has allowed us considerable scope in underwriting new debt products. We've achieved numerous firsts. There was the Euroyen bond offering for the European Investment Bank in 1977. And in 1988 we issued the first warrants on Japanese government bonds and led our competitors into the Euroyen commercial paper market with an issue for SEK. Perhaps our best-known innovation was a bull-side bear-side issue in 1986 linked to the Nikkei Stock Average—also for SEK, incidentally. We were awarded Deal of the Year by *Institutional Investor* for that...

We also arranged a highly complex amortizing cross-currency swap for SEK in 1988. The swap was written against a $250 million bond issue utilizing the issuer's call options on existing yen liabilities.

Of course, such deals don't take place overnight. They require a lot of groundwork, as well as a good relationship between us and our clients. It's like that with SEK. Our people get on well with them, and that's important. They're also willing to listen, which makes us feel confident when we take new product proposals to them. That's partly because they have such a sophisticated understanding of debt financing. They look way beyond the commonplace. Naturally, great products are the result. It's not a matter of developing gimmicks. It's about trying as hard as possible to provide a package that's truly acceptable and beneficial to all parties.

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Our dealings with Daiwa began in late 1980. At that time, SEK was trying to establish its credit rating with U.S. rating agencies. We understood that Japan was a potential provider of funds, because of its huge current-account surplus. So we started to meet with insurance companies, long-term credit banks, city banks and securities houses...

Daiwa has been very responsive to our needs. Basically, I would say our relationship with them has been personally oriented. It stemmed from personal contacts with their people in London and led to deeper contacts with Daiwa in Japan.

One of the good things we have with Daiwa is that we throw ideas off each other. We try to do transactions a little bit outside the norm. We try to invent ideas, establish new markets. It has always been that kind of contact.

Relationships always depend on the people first of all. I think people in this business are instrumental in maintaining relationships. People have to devote time in finance. So I hope Daiwa can continue to find the right kind of people to keep covering us in the future.

"One of the good things we have with Daiwa is that we throw ideas off each other. We try to do transactions a little bit outside the norm."



We're constantly working on the development of new products to broaden our borrowing possibilities internationally. We are also looking for new borrowing techniques to tap Japan's capital market—that's our major ambition right now. I hope and believe that Daiwa will help us.

Bernt Ljunggren is executive vice president of Swedish Export Credit Corporation ("SEK") which he joined in 1979. Under his direction, SEK has become one of the world's most professional and innovative borrowers. In 1989 Euromoney Corporate Finance named him Financial Officer of the Year.

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Customized Brokerage Services

"Although many customers are attracted initially because of the Daiwa name, they stay because of our people."



Akira Sakiyama has almost 18 years of experience in serving individual investors for Daiwa Securities Co. Ltd. He is deputy general manager, First Sales Department, at Daiwa's head office in Tokyo.

I've seen a lot of change since I joined Daiwa. We've gone from the fourth to the second largest in the industry. Although we deal mainly in domestic stocks, we're finding foreign issues increasingly popular. And we're continuing to grow. There are 48 people in my department alone, and we expect about 20 more over the next few months.

About 70% of our customers are individuals. They're so different from our corporate clients... only to be expected, I suppose. For corporations, all that seems to matter is the bottom line. Individual clients—in my experience at least—focus more on the personalities of our salespeople—the people they deal with on a day-to-day basis, the people they come to know and trust. Although many customers are attracted initially because of the Daiwa name, they stay because of our people. Of course, individuals want results, too, and that's how we maintain their trust—over years with many of them.

I'm positive the work I do, we do, is vital in helping Daiwa target emerging client needs. We're on the front line, after all. To give you an example, we fill out questionnaires twice a year. This is in addition to exchanging regular information. These questionnaires are used by our development people in the creation of new products—the sort of thing Daiwa has become particularly well known for in Japan. Million has been really popular, and now we've got Step. My Trade has also been a big hit, because it's made investment simpler than ever before.

609X

My contact with Daiwa goes back more than 20 years. In those days, as now, I was extremely well looked after. I stopped investing in stocks, however, after I joined Marubeni. That didn't necessarily reflect on Daiwa. Being completely immersed in work, I guess I shied away from the market.

When I met Mr. Sakiyama a few years back, he convinced me it was worth investing in stocks again. I have to emphasize that it wasn't the Daiwa name itself that attracted me initially. The most important thing is honest, personalized service, no matter what organization you're dealing with. If I didn't feel that with Daiwa, I'd immediately go somewhere else. I don't want to have to worry about my investments. I'm too busy running my own business now. So that makes trust and personal attention doubly important.

Mr. Sakiyama reminds me very much of the person I knew at Daiwa before. Very conscientious. Trustworthy. He was particularly helpful during the October crash and kept in constant contact. It was very reassuring. Thankfully, he persuaded me to keep my holdings.

I trade a lot of Japanese stocks, of course, which I usually turn over quite fast. I've bought many foreign stocks through Daiwa as well, for longer-term investments—they're quite good in that area. I particularly like companies with technologies and services not found in Japan.

"The most important thing is honest, personalized service, no matter what organization you're dealing with."



Kazuhiro Ohashi is president of Hakubunkan Shinsha Publishers Ltd., a producer and importer of diaries. He started investing in stocks through Daiwa more than two decades ago.

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Review of Operations

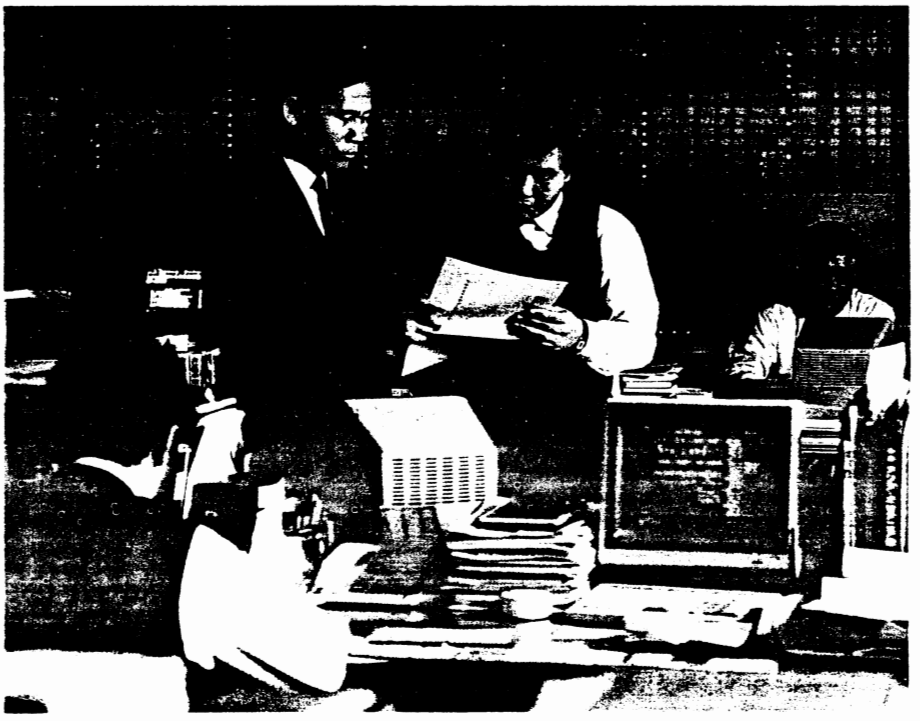
Underwriting and Distribution

In fiscal 1988, Daiwa consolidated its position as one of the world's leading underwriters and distributors of securities for government and corporate clients. Commissions from these activities were almost unchanged, slipping 0.7%, to ¥121.5 billion ($903 million), accounting for 17.3% of total revenues.

Commissions from underwriting domestic bond issues—especially convertibles—increased as corporate borrowers took advantage of relaxed issuance restrictions and low coupon rates. Furthermore, Daiwa underwrote many Eurodollar warrant bond offerings during the year, including $500 million and $400 million tranches for Sumitomo Metal Mining Co., Ltd., and Kumagai Gumi Co., Ltd., respectively.

Services for foreign clients remained a core activity in fiscal 1988. Daiwa lead managed 39 bond issues totaling ¥634 billion ($4,715 million). In the Euroyen market, the Company also underwrote 25 issues worth ¥339 billion ($2,521 million), prominent among which were offerings for Austria and Norway.

Throughout the year under review, the Daimyo bond enjoyed a high profile among foreign borrowers. Pioneered by Daiwa in 1987, this instrument is a hybrid of a traditional Samurai bond and a Euroyen bond. Daimyo bond issues underwritten by Daiwa during the year included a ¥60 billion ($446 million) offering for



In fiscal 1988, Daiwa became one of the first companies in Japan to underwrite domestic commercial paper issues.

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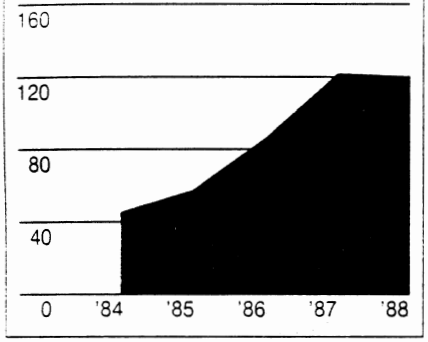
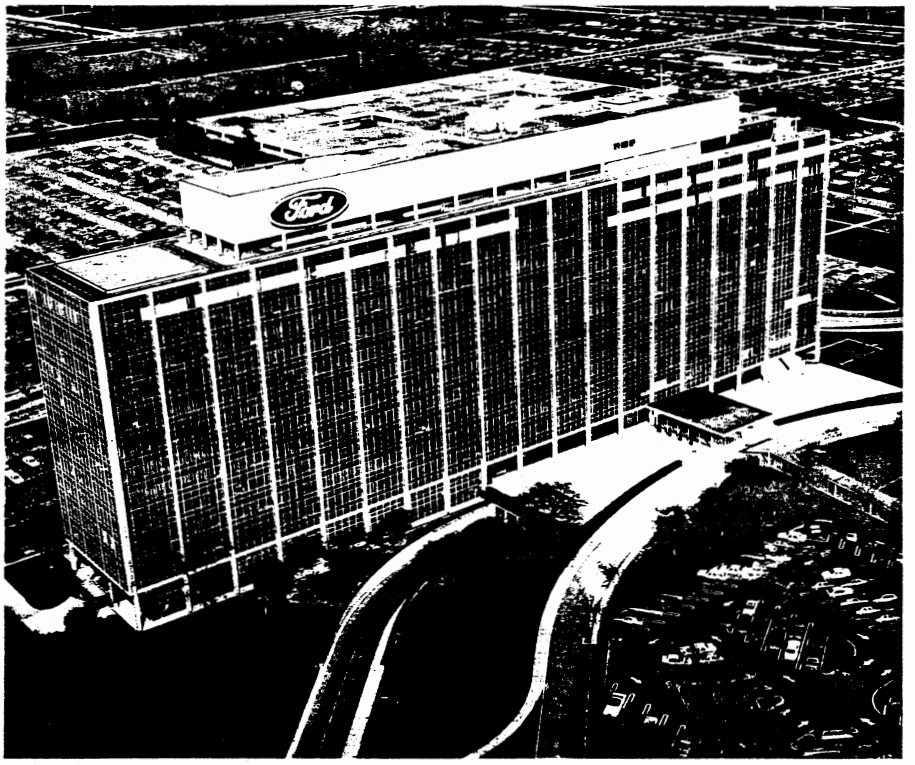
the World Bank. In addition, Daiwa lead managed three of the 10 Samurai bond offerings in which it participated in fiscal 1988.

During the year, Daiwa sponsored the listings of 14 of the 35 foreign companies on the Tokyo Stock Exchange, including BHP, Dixons, Ford, Goodyear, Hewlett-Packard and Swiss Bank Corp.

Underwriting and Distribution Commissions (Billions of Yen)





Lead sponsored by Daiwa in September 1988, Ford's TSE listing has already boosted its profile in Japan's massive capital market.

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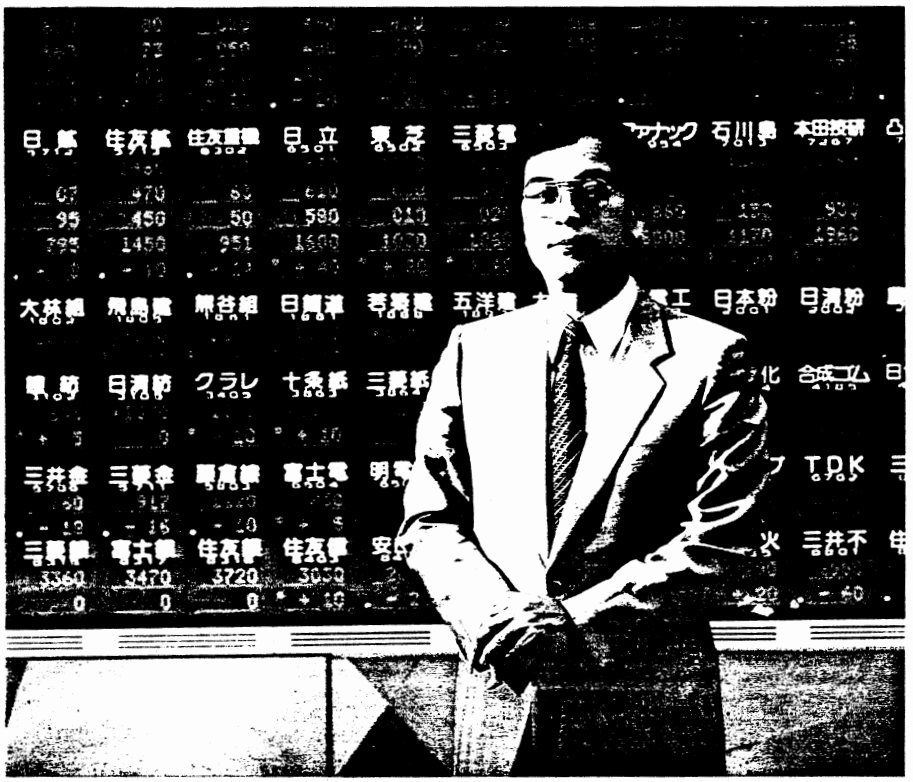
Brokerage

Fiscal 1988 saw brokerage commissions fall 22.3%, to ¥272.9 billion ($2,029 million), accounting for 38.8% of total revenues. This showing was due primarily to sagging turnover worldwide following Black Monday, and the introduction of lower commission rates for securities transactions on the TSE in October 1987.

Several factors partly offset these difficult operating conditions. The popularity of two public offerings of Nippon Telegraph and Telephone Corp. shares surpassed predictions: leading Japanese banks issued stocks vigorously to help satisfy the capital-adequacy standards set by the Bank for International Settlements; and stock futures based on TOPIX and the Nikkei 225 Stock Average were launched on the Tokyo and Osaka stock exchanges, respectively, late in the fiscal year.

Daiwa's overseas subsidiaries realized several goals in fiscal 1988. The Bank of England designated Daiwa Europe (Gilts) Limited a market maker in July 1988. A month later, Daiwa



Despite fiscal 1988's generally difficult operating environment, Daiwa further reinforced its brokerage activities—the Company's core source of revenues.

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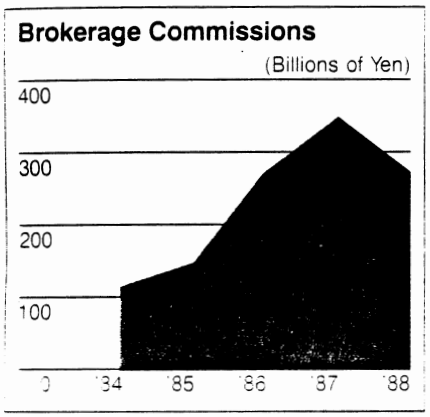
Dealing

Securities America Inc. gained clearing-member status on the Chicago Board of Trade and became the first Japanese financial institution to obtain this rank on the Chicago Mercantile Exchange.

The coming fiscal period will be challenging. Nevertheless, Daiwa anticipates improved results as volume on stock markets around the globe recover from the October 1987 crash.



Daiwa is engaged in a wide range of dealing activities, of which bond trading is a key source of revenues. A 24-hour network linking trading rooms in Tokyo, London, New York and Hong Kong allows the Company to swiftly satisfy the requirements of clients around the globe.

Largely because of generally sluggish conditions in the straight bond market and intensified competition from other traders, Daiwa's net gain on trading dropped 29.8% in fiscal 1988, to ¥31.5 billion ($234 million). This amount accounted for 4.5% of total revenues. Partly offsetting this fall was a 30.2% leap in



Daiwa's dealing capabilities were bolstered during the year by the elevation of Daiwa Securities America Inc. to clearing-member status on the Chicago Board of Trade and the Chicago Mercantile Exchange.

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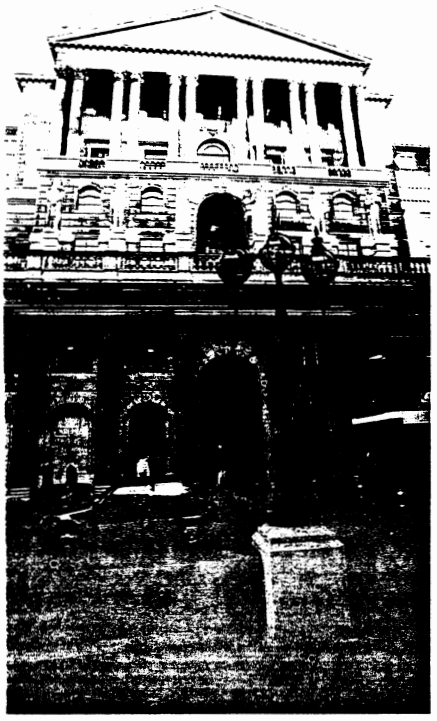
Banking and Other Financial Services

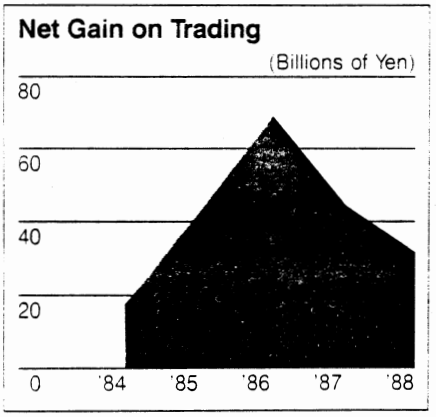
revenues from trading in warrants. At year-end, Daiwa's trading securities inventory stood at ¥905.2 billion ($6,733 million), down 18.3%.



In July 1988, Daiwa Europe (Gilts) Limited was given approval by the Bank of England to make markets in U.K. gilt-edged bonds.

Daiwa's activities during fiscal 1988 benefited from deregulations implemented by the Ministry of Finance. These included the lifting of the ban on the domestic issuance of commercial paper, the introduction of auctions for 20% of new issues of 10-year-term Japanese government bonds and the establishment of a futures market on the TSE for ultralong-term government bonds. Daiwa achieved a first among securities companies with the float of ¥40 billion ($298 million) in warrants on Japanese government bonds by Daiwa Europe Limited.

During the year, Daiwa bolstered its activities in markets for government bond futures. These markets underwent swift expansion during the year in line with low interest rates on bonds.



Banking

Four of Daiwa's 14 overseas subsidiaries possess full banking licenses and several others have quasi-bank status. The latest addition to Daiwa's international banking network is Daiwa Europe (Belgium) S.A., formerly the Brussels office, which gained a banking license in September 1988.

Daiwa Europe Bank plc, Daiwa's first banking subsidiary to provide a full range of wholesale banking services, has grown rapidly since opening in March 1987. During fiscal 1988, the bank created the Financial Engineering Department to provide clients with such customized risk-management products as interest-rate and cross-currency swaps, as well as swap options. To diversify its sources of funds, the bank issued pound sterling and U.S. dollar denominated certificates of deposit. At the end of fiscal 1988, the bank received additional share capital of £50 million as well as approximately £90 million in subordinated loan capital from Daiwa.

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New Jersey-based Daiwa Securities Trust Company launched a commingled pension fund during the year for U.S. pension funds and Japanese companies.

Of Daiwa's other banking subsidiaries, Amsterdam-based Daiwa Europe N.V. is a universal bank that accepts deposits, handles foreign exchange transactions and manages and participates in syndicated loans. Daiwa Securities (H.K.) Ltd. is active in brokerage, dealing and underwriting. It also provides foreign exchange services, deals in such money market instruments as interbank deposits, accepts time deposits, and extends and arranges loans for public and private customers. Daiwa Singapore Limited is prominent in offshore lending and merchant banking. Daiwa Securities Trust Company, situated in New Jersey, has earned an excellent reputation in serving corporate and municipal pension funds and other institutional clients in the United States and abroad. During fiscal 1988, the company was rated top transactor for accuracy and efficiency by the Depository Trust Company, the central securities depository for U.S. stock and bond certificates.

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Mergers and Acquisitions

The traditional aversion of Japanese companies to mergers and acquisitions is eroding rapidly. In line with this progress, Daiwa pursues M&A opportunities worldwide.

Daiwa's M&A activities went from strength to strength in fiscal 1988. The Company helped coordinate the $345 million takeover of U.S. cosmetics manufacturer Zotos International Inc. by Shiseido Co., Ltd., Japan's cosmetics giant. As well as being one of the year's largest acquisitions, this deal is the biggest yet for a securities house.



New Products

During the year under review, Daiwa continued to broaden its customer base through the introduction of imaginative products and services.

First was the widely praised Step, a customized, high-return, 10-year-term investment plan that allows customers to withdraw funds periodically. This plan has been particularly well received among people seeking to reinvest funds previously held in *Maruyu* accounts.

Second was the highly popular My Trade, a simplified variant of a computer-based home trading system introduced by Daiwa three years ago. My Trade allows investors to buy and sell stocks using a computer games terminal, more than 12 million of which are in homes throughout Japan.

To satisfy the diverse needs of individual investors in Tokyo, Daiwa opened Plaza Eight in September 1988, which offers comprehensive securities and advisory services.

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Financial Section

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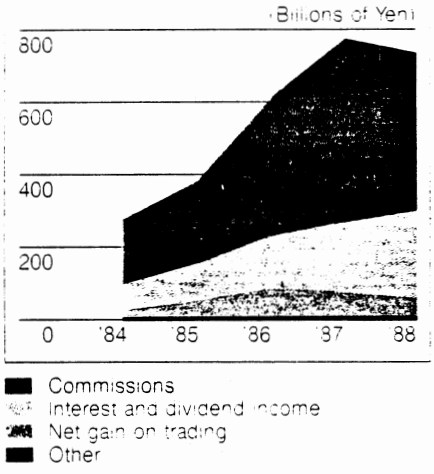
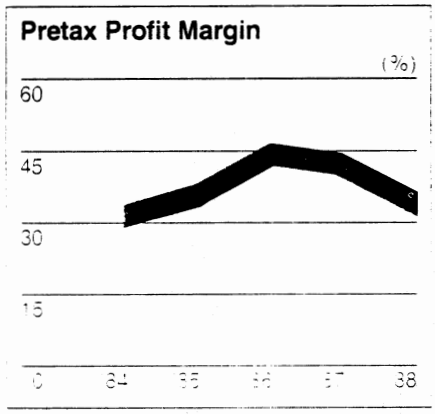
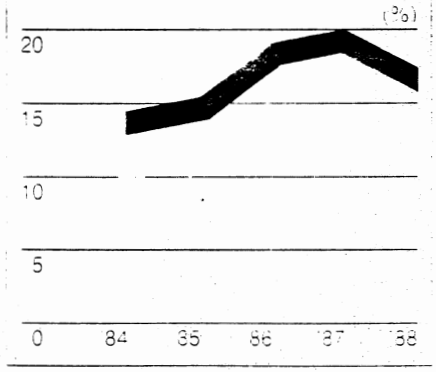
Composition of Revenues



Pretax Profit Margin



Net Profit Margin



In fiscal 1988, ended September 30, 1988, Daiwa Securities emerged from one of the world's worst stock market crashes with lower revenues and earnings that were nonetheless the second highest in the Company's history.

Total revenues were down 6.4% from the previous year's high, to ¥702.4 billion ($5,224 million). *Commissions* fell 14.2%, to ¥427.6 billion ($3,181 million), and constituted 60.9% of total revenues, compared with 66.5% a year earlier. *Brokerage commissions* were down 22.3%, reflecting a significant reduction in rates on the Tokyo Stock Exchange at the start of fiscal 1988, and constituted 63.8% of total commissions. This compared with 70.4% a year earlier. *Commissions from underwriting and distribution* were almost unchanged, slipping 0.7% and representing 28.4% of total commissions, up from 24.5% in fiscal 1987. In contrast, *other commissions* surged 32.6% and constituted 7.8% of total commissions, up from 5.0% a year earlier.

Owing largely to expanded financial activities, *interest and dividend income* reached ¥240.8 billion ($1,791 million), a 17.5% gain, and constituted 34.3% of total revenues, up from 27.3% in fiscal 1987. *Net gain on trading* dropped 29.8%, to ¥31.5 billion ($234 million). This accounted for 4.5% of total revenues, down from 6.0% a year earlier. *Other revenues* jumped 37.0%, to ¥2.4 billion ($18 million).

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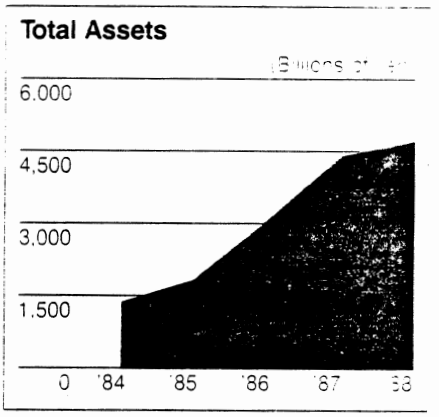
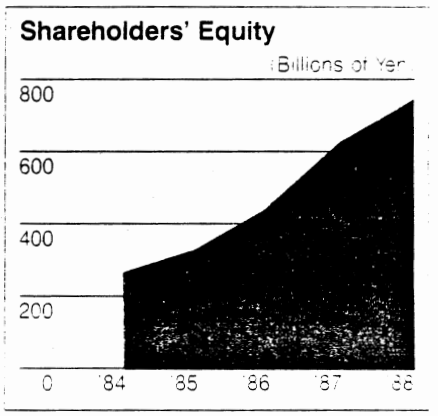
Total expenses for fiscal 1988 reached ¥445.3 billion ($3,312 million), an 8.5% rise. *Selling, general and administrative expenses* were almost unchanged in fiscal 1988, owing to reductions in commissions and floor brokerage and taxes other than income taxes. Increased financial activities caused *interest expenses* to rise 14.9%, to ¥184.0 billion ($1,369 million), or 41.3% of total expenses. *Other expenses* surged to ¥12.4 billion ($92 million). These included expenses for convertible issues of ¥4.2 billion ($31 million).

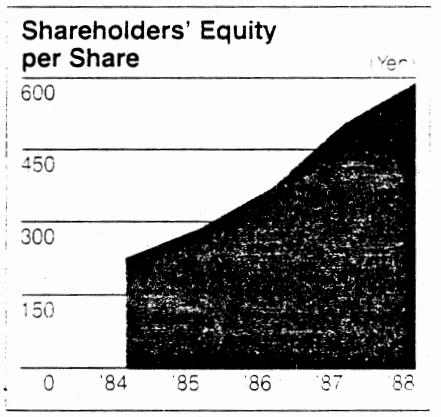
Income before income taxes declined 23.8%, to ¥254.5 billion ($1,893 million). Reflecting these results, *net income* fell 20.0%, to ¥119.1 billion ($886 million). *Net income per share* decreased to ¥94.23 ($0.70), from ¥118.89. *Cash dividends paid* were ¥12.00 ($0.09), up from ¥9.00 ($0.07) a year earlier.

Financial Position

At the close of fiscal 1988, *total assets* stood at ¥4,716.7 billion ($35,081 million), a 7.4% rise over a year earlier. This was due primarily to *cash and cash deposits*, which rose 29.9% following the receipt of proceeds from bond issues. Also contributing to this gain was *securities in custody*, which expanded 10.2%, mainly because of increases in securities deposited by customers as collateral for margin and futures transactions.







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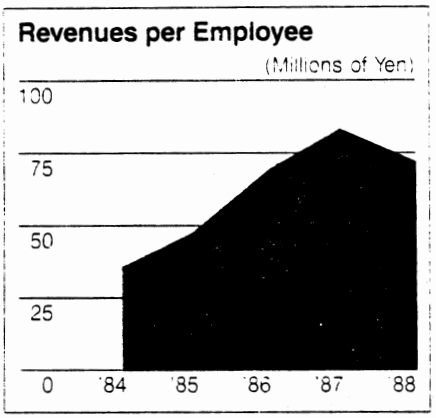

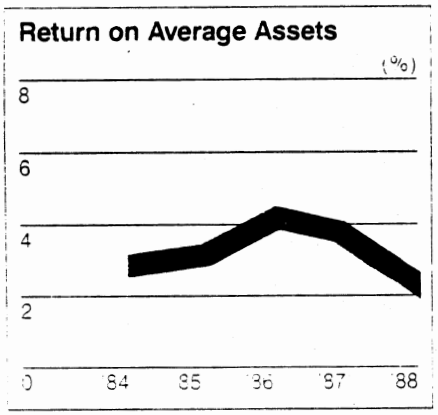

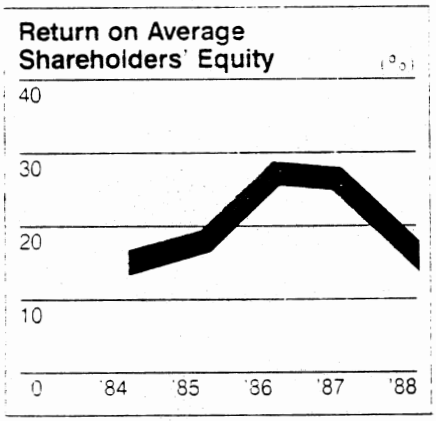

Securities owned totaled ¥1,127.2 billion ($8,384 million), a 6.6% decrease from the previous year. *Trading securities*, which accounted for 80.3% of this amount, were down 18.3%, to ¥905.2 billion ($6,733 million), from 91.8% in fiscal 1987. This reflected significant reductions in holdings of corporate and other bonds, which offset a surge in commercial paper, certificates of deposits and other such instruments. In contrast, an almost sixfold surge in holdings of corporate and other bonds caused *investment securities* to increase 123.4%.

Total liabilities at the end of fiscal 1988 were up 5.6%, to ¥3,976.2 billion ($29,574 million). This reflected substantial rises in long-term debt and bonds outstanding, the proceeds of which were deployed to upgrade Daiwa's computer capabilities and expand the Company's overseas network, and increases in other liabilities.

At the close of the term, *total shareholders' equity* stood at ¥740.4 billion ($5,507 million), an 18.7% gain. *Shareholders' equity per share* rose to ¥583.90 ($4.34), from ¥498.03 ($3.70).

Key Financial Ratios

- *Pretax profit margin* (income before income taxes to total revenues) declined to 36.2%, from 44.5% a year earlier.
- *Net profit margin* (net income to total revenues) was 17.0%, down from 19.9%.
- *Asset turnover* (total revenues to total assets) was 0.15 times, a drop from 0.17 times.
- *Return on assets* (net income to average total assets) dropped to 2.6%, from 4.0%.
- *Return on shareholders' equity* (net income to average shareholders' equity) dwindled to 17.5%, from 27.6%.
- The *equity ratio* (shareholders' equity to total assets) improved to 15.7%, from 14.2%.

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Five-Year Financial Summary

Daiwa Securities Co. Ltd. and consolidated subsidiaries
Years ended September 30

	Millions of yen					Thousands of U.S. dollars
	1988	1987	1986	1985	1984	1988
Operating results:						
Revenues:						
Commissions	¥ 427,636	¥ 498,587	¥ 381,794	¥ 229,708	¥ 183,925	$ 3,180,632
Interest and dividend income	240,828	204,909	143,336	101,151	67,804	1,791,209
Net gain on trading	31,497	44,847	68,993	42,150	17,982	234,266
Other	2,416	1,763	895	698	581	17,969
Total	702,377	750,106	595,018	373,707	270,292	5,224,076
Expenses	445,303	410,346	311,102	225,894	176,646	3,312,031
Income before income taxes	254,459	333,778	276,802	143,336	92,091	1,892,592
Net income	119,149	148,969	111,776	57,218	38,816	886,196
Financial position:						
Total assets	¥4,716,672	¥4,390,672	¥3,110,883	¥1,846,298	¥1,401,786	$35,081,235
Shareholders' equity	740,440	624,027	454,293	334,310	261,730	5,507,177
	Yen					U.S. dollars
Per share amounts:						
Net income	¥ 94.23	¥ 118.89	¥ 91.21	¥ 48.31	¥ 33.82	$ 0.70
Cash dividends paid	12.00	9.00	7.50	6.50	7.00*	0.09
Shareholders' equity	583.90	498.03	370.69	282.27	228.07	4.34
Financial ratios (%):						
Pretax profit margin (Income before income taxes to total revenues)	36.2%	44.5%	46.5%	38.4%	34.1%	36.2%
Net profit margin (Net income to total revenues)	17.0	19.9	18.8	15.3	14.4	17.0
Return on shareholders' equity (Net income to average shareholders' equity)	17.5	27.6	28.3	19.2	16.3	17.5
Equity ratio (Shareholders' equity to total assets)	15.7	14.2	14.6	18.1	18.7	15.7
Other data:						
Number of employees	9,784	9,102	8,540	7,828	7,469	

Notes: 1. Dollar amounts represent translations at the rate of ¥134.45 = US$1, the rate prevailing on September 30, 1988.
2. Net income and shareholders' equity per share are computed based on the average number of shares outstanding during the year appropriately adjusted for free stock distributions.

*In fiscal 1984, cash dividends per share included an additional ¥1.00 in commemoration of the 40th anniversary of the Company.

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Consolidated Balance Sheet

Daiwa Securities Co. Ltd
September 30, 1988 and 1987

ASSETS	Millions of yen		Thousands of U.S. dollars (Note 1)
	1988	1987	1988
Cash and cash deposits:			
Cash and time deposits	¥ 753,472	¥ 580,201	$ 5,604,106
Cash segregated as deposits related to securities transactions	9,911	9,071	73,715
	763,383	589,272	5,677,821
Receivables:			
Loans receivable from customers	914,080	768,528	6,798,661
Loans receivable from other than customers	123,162	166,305	916,043
Other	209,690	228,981	1,559,613
Less—allowance for doubtful accounts	(11,731)	(9,724)	(87,251)
	1,235,201	1,154,090	9,187,066
Securities owned (Note 3)	1,127,231	1,206,752	8,384,016
Securities in custody (Note 4)	1,485,074	1,347,472	11,045,549
Other assets:			
Property and equipment, at cost	33,665	30,053	250,390
Less—accumulated depreciation	(15,513)	(11,639)	(115,381)
	18,152	18,414	135,009
Lease deposits	24,416	19,329	181,599
Investments in an unconsolidated subsidiary and affiliated companies	3,147	2,337	23,407
Loans to employees for housing	4,250	4,532	31,619
Other	55,818	48,474	415,158
	105,783	93,086	786,783
	¥4,716,672	¥4,390,672	$35,081,235

See accompanying notes.

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LIABILITIES AND SHAREHOLDERS' EQUITY	Millions of yen		Thousands of U.S. dollars (Note 1)
	1988	1987	1988
Loans:			
Short-term bank borrowings	¥1,110,531	¥1,151,354	$ 8,259,806
Loans from securities finance companies for margin transactions	64,988	66,192	483,362
Long-term debt	20,257	11,764	150,666
Bonds (Note 5)	262,206	122,337	1,950,212
	1,457,982	1,351,647	10,844,046
Payables:			
Customers	476,374	519,789	3,543,131
Other	204,788	255,890	1,523,154
	681,162	775,679	5,066,285
Accrued and other liabilities:			
Income taxes payable	67,977	106,635	505,593
Accrued employees' bonuses	13,908	14,970	103,444
Accrued severance indemnities (Note 6)	19,633	19,978	146,025
Other	217,371	119,114	1,616,742
	318,889	260,697	2,371,804
Securities borrowed and deposited by customers (Note 4)	1,485,074	1,347,472	11,045,549
Special reserves (Note 7)	28,299	25,683	210,480
Translation adjustment	4,424	5,165	32,904
Minority interests	402	302	2,990
Contingent liabilities (Note 8)			
Shareholders' equity (Note 9):			
Common stock (par value ¥50 per share) Authorized—2,000,000 thousand shares Issued—1,269,840 thousand shares (1,256,811 thousand shares—1987)	102,542	95,002	762,678
Additional paid-in capital	81,731	74,196	607,891
Legal reserve	18,266	15,249	135,857
Retained earnings	537,943	439,668	4,001,063
Less—treasury stock, at cost	(42)	(88)	(312)
Total shareholders' equity	740,440	624,027	5,507,177
	¥4,716,672	¥4,390,672	$35,081,235

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Consolidated Statement of Income

Daiwa Securities Co. Ltd.
Years ended September 30, 1988, 1987 and 1986

	Millions of yen			Thousands of U.S. dollars (Note 1)
	1988	1987	1986	1988
Revenues:				
Commissions (Note 11)	¥427,636	¥498,587	¥381,794	$3,180,632
Interest and dividend income	240,828	204,909	143,336	1,791,209
Net gain on trading	31,497	44,847	68,993	234,266
Other	2,416	1,763	895	17,969
	702,377	750,106	595,018	5,224,076
Expenses:				
Selling, general and administrative expenses (Note 12)	248,884	247,229	205,670	1,851,127
Interest expenses	184,004	160,131	103,146	1,368,368
Other	12,415	2,986	2,286	92,339
	445,303	410,346	311,102	3,312,034
Income before special reserves and income taxes	257,074	339,760	283,916	1,912,042
Provision for special reserves (Note 7)	2,615	5,982	7,114	19,450
Income before income taxes	254,459	333,778	276,802	1,892,592
Income taxes	135,503	185,193	167,274	1,007,832
	118,956	148,585	109,528	884,760
Minority interests in a subsidiary	(100)	(6)	—	(743)
Equity in earnings of affiliated companies	42	348	760	312
Translation adjustment	251	42	1,488	1,867
Net income	¥119,149	¥148,969	¥111,776	$ 886,196
	Yen			U.S. dollars (Note 1)
Per share amounts (Note 13):				
Net income	¥ 94.23	¥ 118.89	¥ 91.21	$ 0.70
Cash dividends paid	12.00	9.00	7.50	0.09

See accompanying notes.

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Consolidated Statement of Shareholders' Equity

Daiwa Securities Co. Ltd.
Years ended September 30, 1988, 1987 and 1986

	Number of shares of common stock (thousands)	Millions of yen			
		Common stock	Additional paid-in capital	Legal reserve	Retained earnings
Balance at September 30, 1985	1,122,987	¥ 69,934	¥48,196	¥11,420	¥204,773
Net income	—	—	—	—	111,776
Cash dividends paid—¥7.50 per share	—	—	—	—	(8,422)
Directors' bonuses	—	—	—	—	(240)
Transfer to legal reserve	—	—	—	1,685	(1,685)
Shares issued upon conversion of bonds	34,156	9,873	10,587	—	—
Free stock distribution (3%) (Note 9)	33,690	—	—	—	—
Translation adjustment	—	—	—	—	(3,578)
Balance at September 30, 1986	1,190,833	79,807	58,783	13,105	302,624
Net income	—	—	—	—	148,969
Cash dividends paid—¥9.00 per share	—	—	—	—	(10,717)
Directors' bonuses	—	—	—	—	(300)
Transfer to legal reserve	—	—	—	2,144	(2,144)
Exercise of common stock warrants (Note 5)	7,542	5,404	5,404	—	—
Shares issued upon conversion of bonds	22,711	9,791	10,009	—	—
Free stock distribution (3%) (Note 9)	35,725	—	—	—	—
Translation adjustment	—	—	—	—	1,236
Balance at September 30, 1987	1,256,811	95,002	74,196	15,249	439,668
Net income	—	—	—	—	119,149
Cash dividends paid—¥12.00 per share	—	—	—	—	(15,082)
Directors' bonuses	—	—	—	—	(330)
Transfer to legal reserve	—	—	—	3,017	(3,017)
Exercise of common stock warrants (Note 5)	3,450	2,472	2,472	—	—
Shares issued upon conversion of bonds	9,579	5,068	5,063	—	—
Translation adjustment	—	—	—	—	(2,445)
Balance at September 30, 1988	1,269,840	¥102,542	¥81,731	¥18,266	¥537,943

	Thousands of U.S. dollars (Note 1)			
	Common stock	Additional paid-in capital	Legal reserve	Retained earnings
Balance at September 30, 1987	$706,597	$551,848	$113,417	$3,270,122
Net income	—	—	—	886,196
Cash dividends paid—¥12.00 per share	—	—	—	(112,176)
Directors' bonuses	—	—	—	(2,454)
Transfer to legal reserve	—	—	22,440	(22,440)
Exercise of common stock warrants (Note 5)	18,386	18,386	—	—
Shares issued upon conversion of bonds	37,695	37,657	—	—
Translation adjustment	—	—	—	(18,185)
Balance at September 30, 1988	$762,678	$607,891	$135,857	$4,001,063

See accompanying notes.

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Consolidated Statement of Changes in Financial Position

Daiwa Securities Co. Ltd.
Years ended September 30, 1988, 1987 and 1986

	Millions of yen			U.S.
	1988	1987	1986	1988
Source of funds:				
Net income	¥119,149	¥148,969	¥111,776	$ 886,196
Charges to income not requiring funds:				
Depreciation and amortization	5,631	4,006	2,521	41,881
Provision for accrued severance indemnities	1,702	3,015	1,010	12,659
Provision for special reserves	2,615	5,982	7,114	19,450
Funds provided by operations	129,097	161,972	122,421	960,186
Increase (decrease) in loans, excluding bonds	(33,534)	296,647	238,219	(249,416)
Increase (decrease) in payables	(94,517)	370,033	206,170	(702,990)
Increase in accrued and other liabilities	56,490	29,723	110,255	420,156
Proceeds from issuance of bonds	150,000	84,805	50,112	1,115,656
Issuance of common stock upon conversion of bonds	10,131	19,800	20,460	75,352
Exercise of common stock warrants (Note 5)	4,944	10,808	—	36,772
	¥222,611	¥973,788	¥747,637	$1,655,716
Application of funds:				
Increase (decrease) in cash and time deposits	¥173,271	¥ (6,858)	¥248,862	$1,288,739
Increase in receivables	81,111	447,135	189,130	603,280
Increase (decrease) in securities owned	(79,521)	472,494	280,765	(591,454)
Increase in other assets	19,021	14,666	4,777	141,472
Conversion of convertible bonds into common stock	10,131	19,800	20,460	75,352
Cash dividends	15,082	10,717	8,422	112,176
Directors' bonuses	330	300	240	2,454
Translation adjustment	3,186	15,534	(5,019)	23,697
	¥222,611	¥973,788	¥747,637	$1,655,716

See accompanying notes

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Notes to Consolidated Financial Statements

Daiwa Securities Co. Ltd.
September 30, 1988, 1987 and 1986

1. Basis of Financial Statements

The Company, a Japanese corporation, maintains its records and prepares its financial statements in Japanese yen. The accompanying financial statements have been translated from the financial statements that are prepared for Japanese domestic purposes, in accordance with the provisions of the Securities and Exchange Law of Japan and filed with the Ministry of Finance of Japan and stock exchanges in Japan. Certain modifications, including presentation of the statements of shareholders' equity and changes in financial position, have been made in the accompanying financial statements to facilitate understanding by readers outside Japan.

For convenience only, 1988 U.S. dollar amounts presented in the accompanying financial statements have been translated from Japanese yen at the rate of ¥134.45 to $1, the exchange rate prevailing on September 30, 1988.

2. Significant Accounting Policies

Consolidation

The consolidated financial statements include the accounts of the Company and its significant subsidiaries. All significant intercompany balances and transactions have been eliminated.

Investments in 20% to 50% owned companies are carried at cost adjusted for equity in undistributed earnings or losses since acquisition.

Recognition of income

Securities transactions and related commission income thereon are recorded on a settlement date basis in Japan, generally the third business day following the day of transaction. In certain foreign countries, securities transactions and related revenues and expenses are recorded on a trade date basis.

Securities

Securities listed on stock exchanges are principally valued at the lower of cost or market. Cost and market are compared on an item-by-item basis. Unlisted securities are valued at cost. Cost is determined on a weighted average basis.

Securities sold under repurchase agreements are recorded as sales of the securities and the related securities are not reflected in the accompanying balance sheet. Also, repurchase and resale agreements of the same securities, which are self-liquidating commitments, are not reflected in the accompanying balance sheet.

In certain foreign countries, securities owned are recorded at market value and unrealized gains and losses are reflected in the income statement. Securities sold under repurchase agreements are accounted for as financing transactions.

Property and equipment

Property and equipment are stated at cost. Depreciation is computed principally by the declining balance method over estimated useful lives. In accordance with the Accounting Standards for Securities Companies, depreciation of buildings is computed on the declining balance method at 160% of the amounts permitted by corporate tax regulations. Depreciation of equipment is computed on the declining balance method as stipulated by corporate tax regulations.

Bonuses

The Company follows the Japanese practice of paying bonuses to employees in June and December. Accrued employees' bonuses represent liabilities estimated as of the balance sheet date. Bonuses to directors, which are subject to approval at the shareholders' meeting, are accounted for as an appropriation of retained earnings.

Income taxes

Income taxes, consisting of corporation, enterprise and inhabitants taxes, are based on taxable income and provided for on the basis of amounts currently payable for each period. Deferred income taxes pertaining to timing differences between financial and tax reporting purposes are not recognized. Certain foreign consolidated subsidiaries recognize deferred income taxes in accordance with local accounting principles.

Translation of foreign currencies

Foreign currencies and current receivables and payables denominated in foreign currencies are translated into yen at year-end current exchange rates. Securities and noncurrent receivables and payables in foreign currencies are translated at historical exchange rates by the Company and at year-end current exchange rates by the consolidated subsidiaries.

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Foreign currency items with forward exchange contracts are translated at the contracted rates.

Translation of foreign currency financial statements
Financial statements of foreign consolidated subsidiaries are translated into Japanese yen on the basis of the year-end rates for monetary current assets and liabilities and retained earnings, and at historical rates for other balance sheet accounts. The average rates for the years are used for translation of income and expenses except that net income is translated at year-end rates. The resulting translation adjustments are presented separately in the consolidated financial statements.

Free stock distributions
Free stock distributions are allowed under the Commercial Code of Japan. Certain free distributions of shares, including those which have been made by the Company, do not purport to be distributions of earnings and, in Japan, are not taxable to shareholders.

3. Securities Owned

Securities owned at September 30, 1988 and 1987, consisted of the following:

	Millions of yen		Thousands of U.S. dollars
	1988	1987	1988
Trading securities:			
Corporate shares	¥ 63,742	¥ 54,111	$ 471,094
Corporate and other bonds	707,186	985,949	5,259,844
Beneficiary certificates	11,222	12,191	83,466
Commercial paper, certificates of deposit and other	123,099	55,150	915,575
Investment securities:			
Corporate shares	129,858	82,888	965,846
Corporate and other bonds	87,612	14,239	651,632
Other	4,512	2,224	33,559
	¥1,127,231	¥1,206,752	$8,834,016

4. Securities in Custody

Securities in custody are the securities borrowed from certain financial institutions under contracts, which allow the Company to use the securities as temporary collateral for loans, and the securities deposited by customers as collateral for margin and futures transactions. Securities in custody account is presented in the accompanying consolidated balance sheet as a contra item, which is entitled as "securities borrowed and deposited by customers" account. Securities in custody are stated at market value on the respective dates when such borrowings or deposits are made.

Securities in custody at September 30, 1988 and 1987, consisted of the following:

	Millions of yen		Thousands of U.S. dollars
	1988	1987	1988
Securities borrowed for less than one year	¥ 106,149	¥ 103,372	$ 789,506
Securities deposited by customers as collateral for margin and futures transactions	1,378,925	1,244,100	10,256,043
	¥1,485,074	¥1,347,472	$11,045,549

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5. Bonds

Bonds, which were unsecured, at September 30, 1988 and 1987, consisted of the following:

	Millions of yen		Thousands of U.S. dollars
	1988	1987	1988
Convertible bonds payable in U.S. dollars:			
5.5%, convertible into common stock at ¥416.20 ($3.10) per share, due 1996	¥ 228	¥ 230	$ 1,696
5.5%, convertible into common stock at ¥432.50 ($3.22) per share, due 1998	175	579	1,302
Convertible sinking fund bonds payable in Japanese yen, convertible into common stock at ¥567.50 ($4.22) per share:			
3.4% due 1994	300	689	2,231
3.3% due 1992	486	1,386	3,615
3.2% due 1990	227	931	1,688
Convertible bonds payable in Japanese yen, convertible into common stock at ¥1,433.00 ($10.66) per share:			
1.9% due 1998	2,852	5,253	21,212
1.9% due 1996	2,148	4,566	15,976
1.8% due 1994	3,291	5,500	24,478
Convertible bonds payable in Japanese yen, convertible into common stock at ¥3,127.00 ($23.26) per share:			
1.5% due 2002	19,582	20,000	145,645
1.5% due 1999	19,888	20,000	147,922
1.5% due 1997	19,870	20,000	147,787
1.4% due 1996	9,956	10,000	74,050
Convertible bonds payable in Japanese yen, convertible into common stock at ¥2,438.00 ($18.13) per share:			
1.4% due 2003	40,000	—	297,508
1.4% due 2000	40,000	—	297,508
1.4% due 1998	30,000	—	223,131
1.3% due 1997	20,000	—	148,754
1.2% due 1995	20,000	—	148,754
7.375% bonds payable in U.S. dollars, due 1992	14,806	14,806	110,123
2.625% bonds with warrants payable in U.S. dollars, due 1991	18,397	18,397	136,832
	¥262,206	¥122,337	$1,950,212

The indentures and trust deeds covering the convertible bonds, among other things, provide for (1) conversion at prices as currently shown above, subject to adjustments in certain circumstances, (2) certain sinking fund requirements and (3) a limitation on payment of cash dividends.

On May 21, 1986, the Company issued $120 million of 2.625% unsecured bonds due 1991 with detachable warrants. One warrant is attached to each $5,000 bond and entitles the holder to subscribe ¥826,000 for shares of common stock, currently at a price of ¥1,433.00 ($10.66) per share (subject to adjustments in certain circumstances). The warrants are exercisable up to May 7, 1991. If the outstanding warrants had been exercised at September 30, 1988, 2,842 thousand shares of common stock would have been issued.

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6. Severance Indemnities

The Company has an unfunded lump-sum benefit plan and a funded pension plan, generally covering all employees.

Under the terms of the lump-sum benefit plan, eligible employees are entitled, under most circumstances, upon reaching mandatory retirement age or earlier voluntary termination, to a lump-sum severance payment based on compensation at the time of severance and years of service. The amount of severance indemnities to be paid by the Company is reduced by the benefits payable under the pension plan. The accrued severance indemnities are stated at an amount which would be required, reduced by the funded amounts under the pension plan, if all employees covered by the retirement benefit plan voluntarily terminated their employment as of the balance sheet date. Unamortized prior service costs, which are being amortized over five years, are reflected in the accrued severance indemnities.

As is customary in Japan, no provision for retirement benefits for directors and statutory auditors is made, since such payments require shareholders' approval.

7. Special Reserves

Special reserves at September 30, 1988 and 1987, consisted of the following:

	Millions of yen		Thousands of U.S. dollars
	1988	1987	1988
Reserve for securities transaction liabilities	¥ 5,114	¥ 4,275	$ 38,037
Reserve for possible trading losses from stock and bond transactions	23,185	21,408	172,443
	¥28,299	¥25,683	$210,480

The Securities and Exchange Law of Japan requires a securities company to set aside a reserve in proportion to its securities transactions and other related tradings to cover possible customer losses incurred by default of the securities company on securities transactions.

The Securities and Exchange Law of Japan also requires a securities company to maintain reserves for possible losses from stock and bond transactions for its own account at a fixed percentage on net trading gains.

8. Contingent Liabilities

At September 30, 1988, the Company was contingently liable as a guarantor of various loans amounting to ¥3,265 million ($24,284 thousand).

9. Shareholders' Equity

The Company made a 3% free stock distribution in November 1986 and November 1985. These free stock distributions were made without any change in common stock and additional paid-in capital.

The Securities and Exchange Law of Japan provides that amounts equivalent to at least 20% of cash dividends paid be appropriated to a legal reserve until such reserve equals 100% of the issued capital. The reserve is not available for dividends, but may be used to reduce a capital deficit by resolution of the shareholders' meeting or may be capitalized by resolution of the Board of Directors.

10. Net Capital Requirements and Dividend Limitation

The Securities and Exchange Law of Japan requires that aggregate indebtedness of securities companies should not exceed 10 times net worth.

The accounting guidelines set by the Ministry of Finance of Japan provide that the appropriation of retained earnings requiring cash outlay, including cash dividends, be limited to the higher of 40% of the current net income or 40% of the total net income or loss of the past five years including the current year less such appropriations made during the past four years.

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11. Commissions

Commissions earned for 1988, 1987 and 1986 consisted of the following:

	Millions of yen			Thousands of U.S. dollars
	1988	1987	1986	1988
Brokerage	¥272,857	¥351,134	¥274,474	$2,029,131
Underwriting and distribution	121,463	122,335	87,088	903,406
Other	33,316	25,118	20,232	247,795
	¥427,636	¥498,587	¥381,794	$3,180,632

12. Selling, General and Administrative Expenses

Major elements of the expenses for 1988, 1987 and 1986 are summarized as follows:

	Millions of yen			Thousands of U.S. dollars
	1988	1987	1986	1988
Employees' compensation and benefits	¥ 90,970	¥ 91,360	¥ 76,784	$ 676,608
Commissions and floor brokerage	22,247	30,734	36,459	165,467
Communications	18,272	15,500	12,840	135,902
Occupancy and rental	26,315	22,547	18,048	195,723
Taxes other than income taxes	42,613	45,638	30,415	316,943
Other	48,467	41,450	31,124	360,484
	¥248,884	¥247,229	¥205,670	$1,851,127

13. Net Income per Share

Net income per share of common stock is based on the average number of shares of common stock outstanding during the year, appropriately adjusted for subsequent free stock distributions.

For convenience of readers outside Japan, primary net income per share for 1988, 1987 and 1986 were ¥92.26 ($0.69), ¥117.27 and ¥89.72, respectively.

Primary earnings per share are computed based on the average number of shares of common stock and common stock equivalents outstanding during the year. Common stock equivalents include the convertible bonds payable in Japanese yen, with interest rates ranging from 1.2% to 3.4%, and the 2.625% bonds with warrants. Fully diluted earnings per share are not presented since the dilutive effect is not significant.

14. Subsequent Event

Appropriation of retained earnings

Under the Commercial Code of Japan, a plan for appropriation of retained earnings proposed by the Board of Directors must be approved at a shareholders' meeting to be held within three months after the end of the fiscal year. Appropriation of retained earnings for the year ended September 30, 1988, was approved by the shareholders' meeting held on December 16, 1988, as follows:

	Millions of yen	Thousands of U.S. dollars
Cash dividends	¥15,873	$118,059
Directors' bonuses	280	2,082
Transfer to legal reserve	3,175	23,615
	¥19,328	$143,756

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Report of Independent Public Accountants

ASAHI SHINWA & CO.

CERTIFIED PUBLIC ACCOUNTANTS JAPAN

[illegible] ACEB[illegible] CHO
SHINJUKU-KU [illegible] TOKYO
JAPAN [illegible]

The Board of Directors
Daiwa Securities Co. Ltd.

We have examined the consolidated balance sheets of Daiwa Securities Co. Ltd. at September 30, 1988 and 1987, and the related consolidated statements of income, shareholders' equity and changes in financial position for each of the three years in the period ended September 30, 1988, all expressed in Japanese yen. Our examinations were made in accordance with auditing standards generally accepted in Japan and, accordingly, included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances. The financial statements of certain consolidated subsidiaries and affiliated companies located outside Japan have been examined by other independent auditors; insofar as our opinion on the consolidated financial statements relates to data included for such subsidiaries and affiliated companies, it is based solely on their reports. The statements of such consolidated subsidiaries show total assets constituting 24% and 28% of the consolidated totals at September 30, 1988 and 1987, respectively, and total revenues constituting 25%, 20% and 15% of the consolidated totals for 1988, 1987 and 1986, respectively. The statements of such affiliated companies include the equity constituting 66% and 96% of total investments in an unconsolidated subsidiary and affiliated companies at September 30, 1988 and 1987, respectively.

In our opinion, based upon our examinations and the reports of the other independent auditors, the accompanying consolidated financial statements, expressed in Japanese yen, present fairly the consolidated financial position of Daiwa Securities Co. Ltd. at September 30, 1988 and 1987, and the consolidated results of operations and changes in financial position for each of the three years in the period ended September 30, 1988, in conformity with accounting principles generally accepted in Japan applied on a consistent basis during the period.

We have also reviewed the translation of the accompanying 1988 financial statements into U.S. dollars on the basis described in Note 1. In our opinion, such statements have been properly translated on such basis.

Asahi Shinwa & Co.

January 23, 1989

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International Operations

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Daiwa's International Organization

- **Board of Directors**
  - Office of the President
    - Personnel Department
    - Education and Training Department
    - Secretariat
- **Executive Committee**
  - Administration Division
    - International Planning and Administration Department
  - Finance Division
    - Finance Department
    - Daiwa Europe Bank plc *(London)*
  - Supervision Division
  - Equity Division
    - Foreign Equity Department
  - Bond Division
    - International Bond Department
  - Investment Programs Division
  - Capital Markets Division
    - Capital Markets Department
    - International Investment Banking Department
    - China Department
    - Mergers and Aquisitions Department
  - International Division
    - International Investment Service Department
    - International Corporation Department

International Division



Jiro Yamana
Deputy President



Masahiro Dozen
Senior Managing Director



Katsuhiko Fujimoto
Director



Tetsuo Yoshino
Director

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Europe and the Middle East

- Daiwa Europe Limited *(London)*
- Daiwa Europe (Gilts) Limited *(London)*
- Daiwa Europe N.V. *(Amsterdam)*
- Daiwa Europe (Deutschland) GmbH *(Frankfurt)*
- Daiwa (Switzerland) Ltd. *(Zurich)*
- Daiwa Europe (France) S.A. *(Paris)*
- Daiwa Europe (Belgium) S.A./N.V. *(Brussels)*
- Daiwa Middle East E.C. *(Bahrain)*
- Milan Office
- Madrid Office

North and South America

- Daiwa Securities America Inc. *(New York)*
- Daiwa Finance Corp. *(New York)*
- Daiwa Securities Trust Company *(New Jersey)*
- Daiwa Securities Canada Limited *(Toronto)*
- São Paulo Office

Asia and Oceania

- Daiwa Securities (H.K.) Ltd. *(Hong Kong)*
- Daiwa Singapore Limited *(Singapore)*
- Daiwa Futures Pte Ltd *(Singapore)*
- Daiwa ANZ International Limited *(Melbourne)*
- Seoul Office
- Beijing Office
- Shanghai Office
- Sydney Office

Capital Markets Division



Ichiro Yamanaka
Deputy President



Koichi Kimura
Senior Managing Director



Noboru Sugitani
Director



Tomohiro Abe
Director

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Europe and the Middle East



Daiwa Europe Limited



Makoto Kasui,
Chairman



Minoru Mori,
Managing Director

5 King William Street,
London EC4N 7AX, U.K.
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Daiwa's presence in London dates back to 1964, when it opened a representative office there. Upgraded to subsidiary status as Daiwa Europe Limited in March 1981, the office is the hub of Daiwa's activities in Europe.

Daiwa Europe Limited provides a full spectrum of financial services to corporations and governments and their agencies in Western and Eastern Europe. A leading Eurobond syndicate manager, the company has lead managed and participated in an array of issues denominated in U.S., Canadian and Australian dollars, yen, and European currency units. Daiwa Europe Limited is a leading market maker in Euroyen issues, maintains a significant presence in the Eurodollar sector and makes markets in U.S. Treasury bonds. In addition, it is active in futures and options and is a major player in all sectors of the Eurocommercial paper market. The company is also one of the leading market makers in Japanese equity warrants and provides an impressive range of brokerage services in international and Japanese equities. On the Continent, Daiwa Europe Limited is highly regarded for the quality and accuracy of its research and investment advice.

In fiscal 1988, Daiwa Europe (Gilts) Limited, a wholly owned subsidiary of Daiwa Europe Limited, began making markets in U.K. gilt-edged bonds. Following the relaxation of controls by Japan's Ministry of Finance during the year, Daiwa Europe Limited became the first Japanese securities house to issue warrants on Japanese government bonds. In addition, it initiated the Euroyen commercial paper market and developed a new type of futures and options fund designed to produce high returns for investors.

Throughout the year, Daiwa Europe Limited ranked consistently among the top Eurobond underwriters, co-lead or lead managing issues totaling almost $20 billion as of September 30, 1988.

The company maintained its high profile in U.K. privatization issues during the year. For instance, it lead managed the public offering in Japan of part of the U.K. government's remaining stake in The British Petroleum Company p.l.c.—the largest issue of its kind for a foreign company in the Japanese market—and was selected to co-manage the Japanese public offering of British Steel plc. The company also worked on behalf of leading non-U.K. corporations, including Swedish Export Credit Corporation, for which it arranged a sophisticated amortizing cross-currency swap. Toward the end of fiscal 1988, Ferruzzi Finanzaria appointed Daiwa Europe Limited as the sole Japanese co-lead manager for a substantial rights issue.

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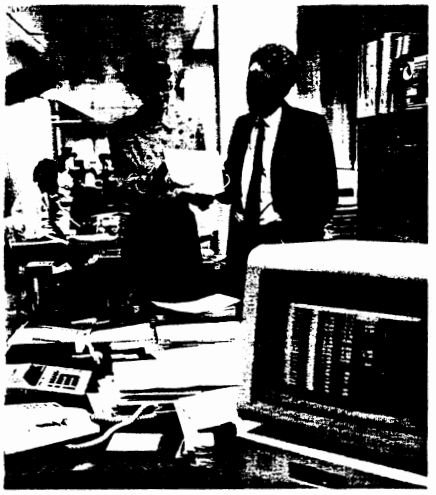
London-based Daiwa Europe Bank plc, originally established as Daiwa Europe Finance PLC, began operations in March 1987. Authorized by the Bank of England, this subsidiary provides wholesale commercial banking services to a diverse range of multinational companies, including large Japanese concerns.

Fiscal 1988 was a period of progress for Daiwa Europe Bank, despite intense competition from the rapidly growing number of institutions with operations in the United Kingdom. As part of a strategy aimed at raising the contribution to income of fee-based businesses, the bank established the Financial Engineering Department, which provides clients with tailor-made risk-management products, such as interest-rate and cross-currency swaps and options on swaps.

During the year, the bank took steps to diversify its deposit base by issuing sterling- and dollar-denominated certificates of deposit. To support further growth, the bank doubled capitalization to £100 million and issued £90 million in subordinated debt to Daiwa Securities.



Daiwa Europe Bank plc



Geoffrey Taylor,
Chairman



Colin Monk,
Chief Executive



Toshio Kamigane,
Managing Director

Level 19, City Tower,
40 Basinghall Street,
London EC2V 5DE, U.K.
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Fax: (01) 782-0875

Established in Amsterdam in 1973 as a wholly owned subsidiary of Daiwa Securities, Daiwa Europe N.V. is a universal bank, offering a wide range of banking and securities-related services. Daiwa Europe N.V. maintains two wholly owned subsidiaries: Daiwa Europe (Deutschland) GmbH and Daiwa (Switzerland) Ltd.

Fiscal 1988 was a difficult year for the company, owing largely to the October 1987 crash and a sluggish international loan market. Nevertheless, Daiwa Europe N.V. maintained high transaction volumes in Japanese equities to Dutch investors and expanded its business in swaps and foreign exchange. Further contributing to the internationalization of the

Daiwa Europe N.V.



Katsunari Renbutsu,
Managing Director



Georges Berasma,
Managing Director

6 38X

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Dutch capital market, the company co-lead managed the issue of guilder-denominated warrant bonds for Mitsubishi Petrochemical Co., Ltd. In addition, the company arranged presentations aimed at Japanese investors for such top-ranking Dutch corporations as Akzo N.V.

Daiwa Europe (Deutschland) GmbH



Katsuyuki Takahashi,
Managing Director

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Frankfurt-based Daiwa Europe (Deutschland) GmbH enjoys a solid reputation in the West German market as one of the few successful market makers of deutsche mark denominated straight bonds, convertible bonds and warrant bonds issued by Japanese corporations. Furthermore, the company is highly regarded among Japanese, West German and Austrian institutional investors for its expertise in providing investment strategies and capital-market information.

In fiscal 1988, Daiwa Europe (Deutschland) faced a difficult business environment in the wake of the October 1987 stock recession and intensified competition from West German banks with operations in Japan. Nevertheless, the company made headway in marketing Japanese equities and offering advisory services to institutional investors in West Germany and Austria. It also arranged several issues of deutsche mark denominated straight bonds with warrants on behalf of Japanese corporations.

Daiwa Europe (Deutschland) also achieved high trading volumes of West German securities, including deutsche mark denominated stocks, straight and warrant bonds and Euromark bonds, to Japanese investors.

As Japan's economy is expected to expand substantially in the near future, demand for investment financing will swell. To service this demand the company is aggressively upgrading its capabilities in the underwriting of deutsche mark denominated bonds. Daiwa Europe (Deutschland) is also deepening its involvement in merger and acquisition activities in anticipation of the 1992 integration of the Economic Community.

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Zurich-based Daiwa (Switzerland) Ltd. was established in 1978 as a finance company. The company offers Swiss institutional investors full investment advisory services, emphasizing Japanese stocks and yen-denominated convertible bonds. It is also an active dealer in straight, convertible and warrant bonds denominated in Swiss francs, U.S. dollars and other currencies.

Black Monday made fiscal 1988 a challenging period for Daiwa (Switzerland). Nevertheless, it continued to aggressively market stocks and yen-denominated bonds issued by Japanese corporations. In addition, the company served as co-lead manager in the placement of several issues of Swiss franc denominated bonds by Japanese corporations. Market making activities in Swiss franc bonds with warrants were also strong.

The Geneva branch of Daiwa (Switzerland) primarily markets Japanese stocks, yen-denominated convertible bonds and Swiss franc denominated bonds. The Lugano branch keeps clients in the Italian-speaking region of Switzerland apprised of developments in world capital markets.

Daiwa (Switzerland) Ltd.



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Carlo Hauck,
General Manager

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Established in 1972 as a representative office and made a wholly owned Daiwa subsidiary in 1987, Paris-based Daiwa Europe (France) S.A. keeps French institutional investors up to date with Japanese economic trends and investment opportunities in the Tokyo capital market.

Despite Black Monday, fiscal 1988 was a good year for Daiwa Europe (France), reflecting the swift recovery of Japanese capital markets and heightened interest in Japan by French investors. Assisting our activities was increased demand on the Eurobond warrant market, which reopened in January 1988.

In recent years, the deregulation of French capital markets has accelerated in line with preparations for the Economic Community's integration in 1992. Daiwa Europe (France) is therefore actively engaged in promoting securities and participates regularly in French government bond auctions.

Daiwa Europe (France) has organized numerous presentations in Tokyo for leading French corporations as well as assisting Japanese companies planning to list on the Paris Stock Exchange.

Daiwa Europe (France) S.A.



Masayasu Ohi,
President

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Daiwa Europe (Belgium) S.A./N.V.



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Daiwa upgraded the Brussels office to subsidiary status as Daiwa Europe (Belgium) S.A. in October 1988, following the granting of a universal banking license by the Belgian Banking Commission. In addition to providing an array of wholesale banking services, the bank markets securities to institutional investors in Belgium and Luxembourg seeking access to Japanese capital markets.

To broaden its information, advisory and brokerage services and to prepare for its launch into wholesale banking, the bank relocated to larger premises, which feature state-of-the-art seminar facilities, and raised the number of employees to 25. Daiwa Europe (Belgium) is confident that these changes will allow the bank to play a key role in Belgium's rapidly transforming financial services industry.

Daiwa Middle East E.C.



Ikuo Mori,
President

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In July 1988, Daiwa upgraded its office in Bahrain—the financial capital of the Middle East—to subsidiary status, broadening international securities investment services to the Middle Eastern financial community. Daiwa Middle East E.C. serves institutional and individual investors in Kuwait, Saudi Arabia, the United Arab Emirates and other countries in the region. The company offers an array of portfolio management and investment banking services, together with advice on trends in the Euromarket, and on the Japanese economy and capital market.

Milan Office



Kotaro Nakajima,
General Manager

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Daiwa established the Milan office in 1986 to provide Italian clients with investment banking services and to advise Japanese and Italian institutions on investment opportunities in each other's capital markets.

In fiscal 1988, interest from both local and Japanese investors rose following the Italian government's continuing relaxation of restrictions on foreign currency transactions and the start of online dealing in Italian government bonds.

To raise awareness of the attractiveness of Italian stocks and explain the implications for Italy of the unification of the European Community in 1992, the office held a series of seminars for Japanese investors.

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Opened in February 1988, the Madrid office provides liaison and advisory services on investment opportunities available in the Spanish and Japanese capital markets.

To prepare for the integration of the European Community in 1992, the Spanish government has launched programs designed to deregulate, restructure and revitalize the nation's economy. During fiscal 1988, for example, the government announced the lifting of controls on overseas portfolio investment by Spanish investors.

Japanese investment in Spanish securities was up considerably in fiscal 1988. In July 1988, Daiwa sponsored a seminar in Tokyo on Spanish stocks, which was very well received.

Located in one of Europe's best performing markets, the Madrid office is confident of achieving a position of influence in the years ahead.

Madrid Office



Tadanori Urabe,
General Manager

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North and South America

Daiwa Securities America Inc. comprises the New York-based head office and the Los Angeles and Chicago branches. It is a widely respected broker, dealer, underwriter and financial adviser to numerous private and government clients in North and South America, and has helped Daiwa arrange more listings of U.S. corporations on the Tokyo Stock Exchange than any other securities company.

Daiwa Securities America is one of the most active primary and secondary market dealers in U.S. government securities. Furthermore, it is involved in the markets for government agency securities and U.S. corporate bond issues. The company also manages a mergers and acquisitions business.

Since its establishment as the parent company's first overseas operation more than 20 years ago, Daiwa Securities America has worked toward becoming a full-fledged U.S. brokerage house. In line with this goal, it has successively obtained membership of most leading U.S. stock exchanges and of the Chicago Board of Trade (CBT) and the Chicago Mercantile Exchange (CME).



Daiwa Securities America Inc.



Tasuro Isoda,
Chairman



Kei Yamamoto,
President

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Yutaka Nakai,
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Hideo Tasaki,
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Fiscal 1988 saw the fulfillment of Daiwa Securities America's mission. The company qualified as a clearing member on the CBT. It subsequently became the first subsidiary of a Japanese financial institution to achieve this status on the CME. Through these appointments, Daiwa Securities America can offer investors an array of futures and options contracts in the world's largest center for these transactions.

In the coming year, Daiwa Securities America will prepare for the introduction of TOPIX futures and Japanese government bond futures on the CBT.

Daiwa Securities Trust Company



Masaomi Mogi,
Chairman and
President

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The launch of Daiwa Securities Trust Company (DST) in 1986 marked Daiwa's entry into the U.S. trust banking market. The first such company established by a Japanese securities firm, DST specializes in the provision of trust and custodial services to institutional clients in the United States and abroad.

Fiscal 1988 was a year of growth for DST, with staff increasing to almost 30. During the year, DST introduced a cash management service for its custodial clients and established a commingled pension fund to meet the needs of U.S. pension funds and Japanese corporations. DST also developed an automated corporate reorganization information system, the first of its kind among U.S. custodian banks.

Demonstrating DST's swift rise to prominence in the United States was its recognition during the fiscal year as top transactor for accuracy and efficiency by the Depository Trust Company, the central securities depository for U.S. stock and bond certificates.

Daiwa Securities Canada Limited



Hiroshi Watanabe,
Chairman and President

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In May 1988, Daiwa upgraded the Toronto office to subsidiary status as Daiwa Securities Canada Limited. The new company was created out of extensive negotiations with the Canadian government to help Daiwa more efficiently meet the needs of its growing Canadian client base.

Daiwa Securities Canada provides comprehensive financial and investment services. Its activities include assisting Canadian government entities and corporations raising capital abroad. In addition to the company's longstanding record as a source of sound and reliable investment advice on the Japanese market, Daiwa Securities Canada is an active trader on behalf of new Canadian investors in that market.

To serve clients in western Canada more effectively, Daiwa plans to open a representative office in Vancouver in March 1989.

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The primary objectives of the São Paulo office are to gather and disseminate the latest information on Central and South America, the Caribbean and other countries to investors in Japan and elsewhere. In addition, the office provides clients in the region with data on trends in Japanese financial markets.

São Paulo Office



Koji Yonetyama,
General Manager

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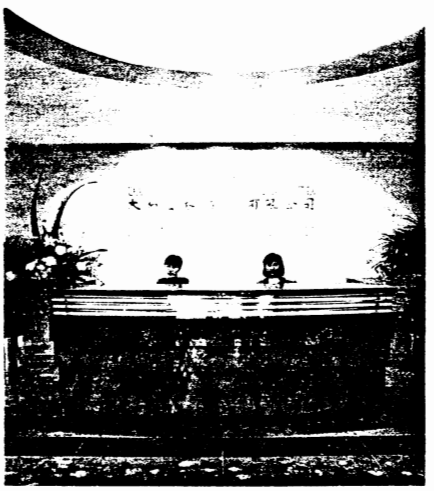
Asia and Oceania

Established in 1970, Daiwa Securities (H.K.) Ltd. is Daiwa's fastest growing office in the rapidly developing economies of the Pacific Basin. The company offers clients a full complement of securities-related and banking services. Together with the Hong Kong office of the Daiwa Securities Research Institute, the company also provides comprehensive financial advisory and information services.

In fiscal 1988, the company was again Daiwa's most profitable operation overseas and was largely unaffected by the turmoil following Black Monday. This solid performance reflects the company's balanced securities and banking operations.

In line with plans to raise staffing levels and upgrade its computer systems, the company moved to a new office in October 1988.

Daiwa Securities (H.K.) is committed to a long-term presence in Hong Kong in the belief that the territory will remain one of Asia's leading financial markets. Released during 1988, a white paper on representative government after Hong Kong's return to the People's Republic of China in 1997 has reinforced this conviction. Daiwa Securities (H.K.) is therefore confident of contributing further to the progress of Hong Kong's financial markets as well as to Daiwa's growth in the Pacific Basin for many years to come.



Daiwa Securities (H.K.) Ltd.



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Managing Director

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Daiwa Singapore Limited



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President

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Daiwa Singapore Limited was incorporated as a merchant bank in 1972, becoming a wholly owned Daiwa subsidiary in 1984. The company specializes in brokerage, underwriting, banking, fund management and investment advisory services.

Daiwa Singapore performed solidly in fiscal 1988 despite Black Monday. Trading in Japanese securities was particularly brisk. During the year, the company began making markets in several U.S. stocks following the inauguration of the NASD-SES Market Linkage, which joined the U.S.-based NASDAQ (National Association of Securities Dealers Automated Quotations) system and the SESDAQ (Stock Exchange of Singapore Dealing and Automated Quotations) system.

Complementing Daiwa Singapore's activities is Daiwa Futures Pte Ltd, a wholly owned subsidiary of Daiwa Securities, which trades the Nikkei Stock Average, three-month Eurodollar futures and currency options. Daiwa Futures has expanded remarkably since its inception in August 1985. Made a corporate member of the Singapore International Monetary Exchange during the previous year, Daiwa Futures was elevated to clearing-member status in February 1988.

Daiwa ANZ International Limited

In February 1989, Daiwa ANZ International Limited will be renamed Daiwa Securities Australia Limited.



P.G.F. Henderson A.C.,
Chairman



Masaru Arai,
Managing Director

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In November 1985, Daiwa established Daiwa ANZ International Limited in a joint venture with Australia and New Zealand Banking Group Ltd., a major Australian bank, and Nippon Life Insurance Co., Japan's largest insurance company. Daiwa ANZ International offers brokerage, dealing and underwriting services to clients in Australia and neighboring regions seeking access to the increasing investment and fund-raising opportunities in Japan and other overseas markets.

Fiscal 1988 was another successful year for Daiwa ANZ International, highlighted by the listing of BHP on the Tokyo Stock Exchange, in which the company played an important role. Moreover, Daiwa ANZ International was active in underwriting offerings by such clients as the State Government of Victoria and the R&I Bank of Western Australia. Taking advantage of growth opportunities provided by the ongoing deregulation of Australia's financial markets, Daiwa ANZ International will continue to expand its services in the year ahead.

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The Seoul office primarily helps arrange overseas bonds and floating-rate note issues for government and private institutions in the Republic of Korea and supplies clients with information on trends in world capital markets.

In fiscal 1988, the Seoul office moved swiftly to seize opportunities provided by the ongoing deregulation of the Korean financial services sector. The office helped Daiwa lead manage a $30 million floating-rate note issue by Hyosung (America) Inc. and co-manage a convertible bond issue for Saehan Media Corporation.

Following the removal of barriers to indirect foreign securities purchases by local investors, Daiwa received the Republic of Korea's first order for Japanese stocks from Hyundai Securities Co., Ltd.

After the close of fiscal 1988, the office played a central role in helping Daiwa International Capital Management Co., Ltd., become the first foreign firm to provide asset management services to a Korean organization. In fiscal 1989, Daiwa anticipates continued expansion in Korea in line with accelerating purchases of foreign securities by Korean investors.

Seoul Office



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General Manager

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The Beijing office provides clients in the People's Republic of China with consulting services and up-to-date information. It also assists in the establishment of joint ventures between Chinese and Japanese corporations, promoting closer ties between the two countries.

Early in fiscal 1988, the office helped Daiwa Europe (Deutschland) co-lead manage a DM300 million Eurobond offering, the first foreign currency denominated government bond issued in China since the revolution. In addition, the office assisted in the flotation of several major bond issues for Chinese businesses and government entities. These included a Euroyen bond issue by China International Trust and Investment Corp. and the Bank of China.

The selection of Beijing for the 22th annual meeting of the Asian Development Bank in May 1989 underlines China's growing importance in the world economy. To meet the nation's rising demand for development funds, the office is striving to broaden overseas fund-raising alternatives for Chinese businesses and central and regional government bodies.

Beijing Office



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Shanghai Office



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Opened in 1986, the Shanghai office offers the latest financial information from around the globe to government organizations and financial institutions in the city and the surrounding economic zone. The office also helps Chinese concerns raise funds abroad and supplies Japanese corporations with information on local investment opportunities.

The Shanghai office enjoyed another year of growth in fiscal 1988. It helped Daiwa lead manage a $100 million bond issue for the Bank of Communications (BOCOM), the first such offering for the nation's largest comprehensive bank. During the year, the office also made arrangements for a delegation from the Shanghai municipal government and BOCOM representatives to visit Japan.

Sydney Office



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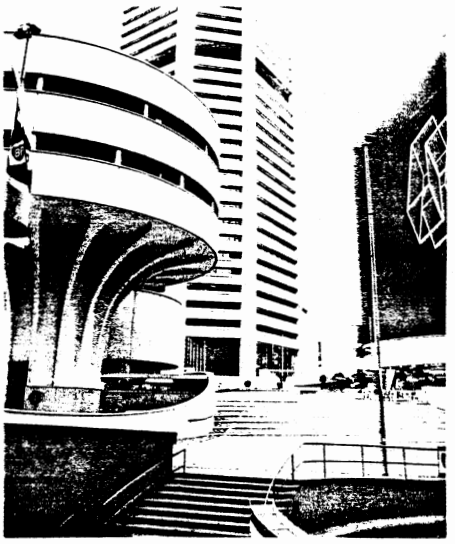
The Sydney office plays a key role in expanding Daiwa's activities in the southwest Pacific region. The office arranges bond issues for businesses and government-related entities in the area and supplies those clients with information on offshore financing and investment opportunities in international capital markets. In addition, it offers services in Eurocurrency commercial paper, is active in the promotion of mergers and acquisitions and helps arrange venture capital funding.

In fiscal 1988, the Sydney office helped lead manage several Eurobond issues for prime-rated borrowers in Australia and New Zealand. One highlight of the year was the Tokyo Stock Exchange listing of BHP—Australia's largest company—in which the office played a key role.



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The Daiwa Group

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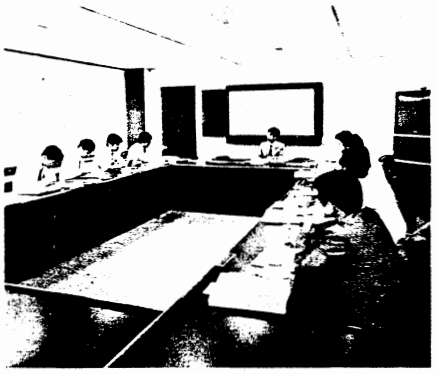
Research



Daiwa Securities Research Institute provides clients with the latest economic and industrial information.

Daiwa Securities Research Institute (DSRI) exemplifies Daiwa's enduring commitment to provide clients with timely and accurate information. Supported by DSRI, Daiwa has earned an outstanding reputation for economic forecasting and simulation analysis through the Daiwa Quarterly Econometric Model of Japan. Developed by Daiwa and compiled since 1970, this model employs almost 200 equations to forecast economic trends.

Daiwa also conducts in-depth analyses of economic, financial, industrial and regulatory trends in major world markets for clients around the globe. Findings are distributed through Daiwa's offices and through DSRI personnel stationed in key financial centers. The Portfolio Management System (PMS), developed by Daiwa in cooperation with DSRI, is primarily marketed to institutional clients overseas, who use the system in conjunction with Daiwa's global on-line communications network. Through PMS, clients can obtain the latest information on industrial and economic trends, as well as on the Tokyo and other stock exchanges.

To meet foreign investors' growing interest in the Japanese economy, Daiwa and DSRI publish several English-language periodicals, including the *Monthly Economic Report, Investment Monthly* and *Daiwa's Watched Stocks.*

Asset Management

Asset management is an important and expanding part of Daiwa's business. This service is provided by Daiwa International Capital Management Co., Ltd. (DICAM). Founded in 1973, DICAM is one of Japan's largest private asset management organizations, with ¥2.1 trillion ($16 billion) in assets under management as of September 30, 1988. DICAM's employees work closely with DSRI, combining comprehensive research with extensive expertise to provide quality services to investors worldwide.

DICAM's activities include investing both in Japan and in major overseas markets. DICAM

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serves a wide range of foreign and Japanese investors, including national and regional governments, pension funds, insurance companies and mutual funds. Overseas business is handled by its Tokyo headquarters and subsidiaries in New York, London and Singapore, as well as by the Hong Kong-based DICAM (H.K.) Limited, established in February 1988.

In fiscal 1988, DICAM added to its product lineup when the Hong Kong office launched the Daiwa J.F. Pacific Fund, a private investment trust. During the year, DICAM's chairman, Yasuyoshi Fujisaki, was appointed vice chairman of the Japan Investment Advisory Association. Joining DICAM as vice chairman in October 1988 was Shigeru Uemura, formerly senior managing director, International Operations, at Daiwa.



Daiwa International Capital Management Co., Ltd., is one of Japan's largest private asset management organizations.

Unit Trusts

Unit trusts are a key source of revenues for Daiwa. Founded in 1959, the Daiwa Investment Trust and Management Co., Ltd., is one of Japan's four largest managers of unit trusts, which account for about three-fourths of the domestic market. At the end of fiscal 1988, total assets under management stood at ¥8.2 trillion ($61 billion), up 16.6% from a year earlier.

In recent years, Daiwa Investment Trust and Management has broadened its business to serve companies outside the Daiwa Group. Our activities on behalf of such organizations include offering investment advisory services, managing funds sold by securities companies, assisting fund managers in developing and structuring portfolios and instructing trust banks to implement their investment decisions.

Fiscal 1988 was another year of expansion for Daiwa Investment Trust and Management. The company opened a branch in Osaka in November 1987 and founded Daiwa Investment Advisors (H.K.) Ltd. in August 1988. In line with increasingly sophisticated investor requirements, the company launched several investment vehicles, such as Step, a 10-year-term unit trust that permits periodic partial redemption.

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Venture Capital Activities



Nippon Investment & Finance Co. Ltd. was the first in Japan to create investment enterprise partnerships for investment in foreign companies.

Established in 1982 by Daiwa—its major shareholder—Nippon Investment & Finance Co. Ltd. (NIF) ranks second in Japan's booming venture capital industry in terms of the number and volume of investments. The company provides both local and foreign venture businesses with diverse consulting services and financial and management assistance. To facilitate fund-raising for its clients, NIF provides a number of services, such as arranging stock offerings and evaluating bond interest rates and issue prices. NIF also sets up general loans secured by stocks or real estate and offers leasing, factoring and other services that help new businesses expand. At the end of fiscal 1988, NIF had investments in 241 companies, up 38 from fiscal 1987, totaling ¥27.2 billion ($202 million), a 27.1% rise over a year earlier.

During the year, NIF helped nine clients take their shares public, compared with 15 in the previous corresponding period. In addition, NIF achieved a first in Japan through the establishment of two enterprise partnerships for investments in foreign companies.

Information Services

Daiwa maintains one of the world's finest and most comprehensive financial information networks. Central to the network is Daiwa Computer Service Co. Ltd. (DCC), established in 1975 to assist Daiwa Group members and their clients with computer systems management. As well as developing its own financial software, DCC disseminates data worldwide from the Daiwa Quarterly Econometric Model of Japan, providing invaluable support to the Daiwa Securities Research Institute. DCC also operates Daiwa's highly regarded Portfolio Management System.

In fiscal 1988, work progressed on strengthening Daiwa's international communications network to help manage business volume generated through global 24-hour trading. DCC completed the installation of equipment at the

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computer center in Tokyo, which became fully operational during the year. In 1989, DCC will open a backup computer center in Osaka.

One highlight of fiscal 1988 was DCC's establishment of a wholly owned subsidiary, Daiwa Computer Service America Inc., in New York, capitalized at $5 million.

Through DCC, Daiwa completed systems development work for Group member companies. In addition, it launched several services on the domestic market during the year, including a widely acclaimed 24-hour home trading system that allows investors to buy and sell stocks using a computer games terminal.



Daiwa Computer Service Co. Ltd. completed a state-of-the-art computer center in Tokyo in December 1988.

Other Services

Also belonging to the Daiwa Group are several companies outside the securities industry. Daiwa System Service Co. Ltd. supplies software services for the Group's information processing systems. The Daiwa Building Co., Ltd., manages commercial property leased to Daiwa Group companies, and the Daiwa Real Estate Co., Ltd., engages in real estate brokerage and development. Other Group members include Daiwa Mortgage Co. Ltd., Daiwa Credit Service Co. Ltd. and Daiwa Business Service Co. Ltd.

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The Daiwa Investment Trust and Management Co., Ltd.	1-3, Nihonbashi 2-chome, Chuo-ku, Tokyo 103, Japan	Telephone: (03) 272-1011
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Daiwa Computer Service Co. Ltd.	14-1, Nihonbashi-Koamicho, Chuo-ku, Tokyo 103, Japan	Telephone: (03) 669-4551
Daiwa System Service Co. Ltd.	5-4, Hatchobori 4-chome, Chuo-ku, Tokyo 104, Japan	Telephone: (03) 553-8131
Daiwa Mortgage Co. Ltd.	4-21, Yaesu 1-chome, Chuo-ku, Tokyo 103, Japan	Telephone: (03) 243-3611
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The Daiwa Building Co., Ltd.	3-5, Yaesu 1-chome, Chuo-ku, Tokyo 103, Japan	Telephone: (03) 243-3374
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Board of Directors

Chairman

Yoshitoki Chino

President

Sadakane Doi

Deputy Presidents

Takami Sano
Equities, Retail Customers, Investment Services

Naoji Kawamura
Osaka Office

Jiro Yamana
International Operations

Eiichiro Okumoto
Administration, Finance, Supervision, Bonds, Investment Programs, Financial Institutions

Ichiro Yamanaka
Capital Markets, Corporate Finance

Senior Managing Directors

Takao Okubo
Osaka Office

Yawara Tazaki
Retail Customers

Masahiro Dozen
International Operations

Yuzuru Ishida
Corporate Finance

Koichi Kimura
Capital Markets

Takuro Isoda
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653X

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Date of Foundation:
May 1, 1902

Date of Incorporation:
December 26, 1945

Shares of Common Stock:
Authorized: 2,400,
Issued and Outstanding:
1,271,967,187

Paid-in Capital:
¥103,824 million

Domestic Network:
120 Offices

9.5%

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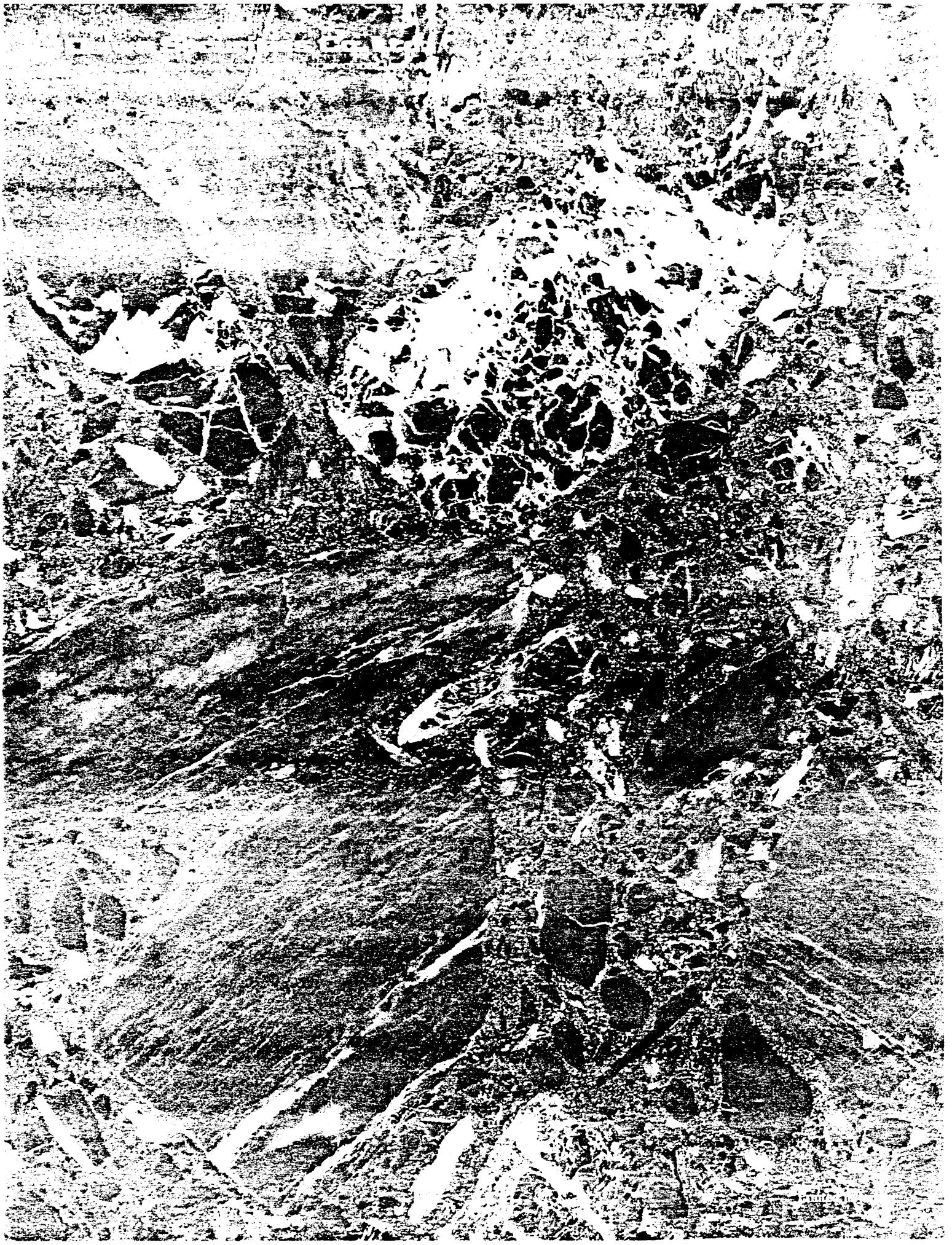

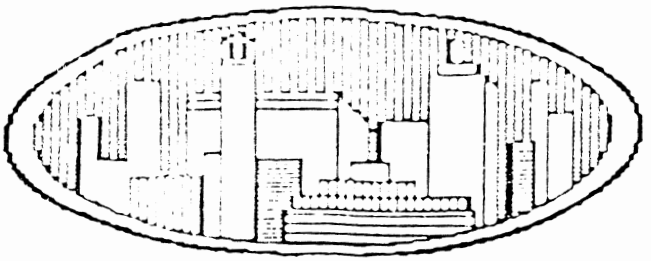

CAMDEN AWAKE COMMITTEE

June 14, 1989

TO: NJ Assembl. County Government and Regional Authorities Committee

RE: A-4105

FROM: Tom Knocne, 644 State Street, Camden, NJ 08102 609-966-4536
Representing the Camden Awake Committee, a city-wide, non-partisan group dedicated to achieving reform in Camden municipal government

I attended the hearing on May 23, 1989 in Palmyra. I was there from 4 PM until 7 PM, but was not called on to speak. I could not stay after the dinner break so that I could speak in person.

The Camden Awake Committee supports Assembly Bill NO. 4105. Trash-to-steam generally and this bill in particular were an issue in the May local election, where the Camden Awake Committee's independent slate of candidates for City Council ran a close second to Mayor Primas's slate of 2 incumbents and one newcomer.

Mayor Primas has been a long-time supporter of trash-to-steam, we believe largely because of the host benefits it provides to the City and because of his general insensitivity to neighborhood concerns. We believe the Camden trash-to-steam plant should not be built because it will cause environmental hazards, will use scarce water supplies, and will be a financial boondoggle.

A-4105 is particularly concerned about the cumulative effects of trash-to-steam plants. This is especially important in the City of Camden. Three facilities already planned or under construction fall within a 10 mile radius of downtown Camden (Camden, West Deptford, Pennsauken). They all will take large amounts of water from local aquifers. Many of these aquifers are already contaminated, and the Delaware Valley Region already experiences water shortages which required water use limitations during much of last year. The Camden plant alone is projected to use 1.25 million gallons of water per day. Air pollution in Camden is already a problem: State and federal standards for ozone are exceeded on many summer days (Source: 1987 Air Quality Report, NJDEP). Lead is not measured in Camden, so we cannot be sure how significantly lead emissions from the trash-to-steam plant will impact on ambient levels. We do know that children are most vulnerable to the toxic effects of lead (because of their lower body weight). The Camden plant will emit an estimated 2000 pounds of lead/year into the atmosphere and FIVE ELEMENTARY SCHOOLS ARE LOCATED WITHIN A ONE-MILE RADIUS OF THE CAMDEN TRASH-TO-STEAM FACILITY.

A-4105 is also important to Camden residents because local politicians do not have the guts to stop the Camden plant and re-evaluate the situation on their own. At the Camden County Freeholder

meeting on May 11, 1989, the Republican Freeholders introduced legislation to stop construction of the Camden plant until the State's Solid Waste Plan could be re-evaluated. The Democrats, ignoring the virtually unanimous pleas of a full-house of County residents who supported the moratorium, killed the moratorium because they had consistently supported trash-to-steam. They made a mockery of politics, defeating the moratorium on the basis of party politics rather than passing it in response to citizens' concerns and scientific fact. That is sad, but too often the case with Camden politics.

Section 5b of A-4105 gives county government the clear authority to stop construction of resource recovery facilities pending the outcome of the study required in A-4105. Perhaps it will give the Camden County Freeholders the guts to do what they sholuld have done on May 11. We suggest that Section 5b might even be strengthened, requiring certain counties to stop construction of plants already underway. The counties which should be subject to a required moratorium are those clearly located in NJ's portion of "cancer alley" and where the new plant is within a designated radius of already constructed plants that would not be affected by the moratorium.

Trash-to-steam proponents often minimize the potential for recycling to significantly reduce the solid waste stream, decreasing the need for mass burn facilities. Recycling has been a success, even in Camden, the kind of place where many people argued recycling could never succeed. Eventhough a poor and poorly educated City (60% of the families depend on some form of public assistance as their principal source of income), Camden's recycling saved the City approximately $160,000 in 1988. 3,000 tons of recyclables were collected, saving $85/ton ($255,000 total) which would have been paid to the trash collection contractor (O'Connor Corp.). The recyclables were sold for a total income of $45,000. The cost of labor and equipment to collect the recyclables totalled $140,000, resulting in a net savings to the City of $160,000. This success comes eventhough the City of Camden does an extremely poor job of marketing and motivating people to recycle.

Many who oppose stopping construction of the Camden plant point to the City's need for the host benefits which are being paid. $1 million has already been given to the City, and $1.4 million/year will follow. The host benefit concept is bankrupt. It explains why Camden has a State prison (and perhaps another one, twice as large, in the same neighborhood as the first), a trash to steam plant and a sewage treatment plant. Such facilities should be located where they are economically efficient to operate and where they cause least harm to the general population -- not where the local population is poorest and most vulnerable to a host-benefit bribe.

We believe the Committee should consider charging some other entity than DEP with the responsibility for developing the methodology required under Section 2 and the study in Section 3 of the proposed legislation. A more neutral body would seem more appropriate -- one that has not been so agressive in recommending trash-to-steam as a king pin of NJ solid waste disposal policy. DEP's uncritical support for trash-to-steam is reminiscent of the Atomic Energy Commission's role in developing nuclear power. When the energy crisis hit, AEC encouraged the development of nuclear power plants all over the country, eventhough issues of financial viability, radioactive waste disposal and environmental safety were far from resolved. DEP's advocacy of trash-to-steam is ominously reminiscent, and the issues facing mass burn technology parallel those which have plagued the use of nuclear

technology to generate electricity.

Some of us in North Camden (where I live) learned about DEP the hard way. When the State rammed the Riverfront Prison down our throats using valuable waterfront property, we challenged it on environmental and land use grounds. Eventhough use of scarce waterfront land for a use clearly contradicts the federally mandated NJ Coastal Zone Management Plan, DEP supported that use of the site. DEP advocated State corrections policy far more enthusiastically than State environmental policy.

In summary, do Camden a favor. Recommend passage of A-4105 with neutral agent to perform the study. Strengthen Section 5b to require certain counties to stop construction of plants already underway.

Thank you for your consideration.

cc: Senator Walter Rand
Assemblyman Wayne Bryant

Waste Not

for rational resource management

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A publication of *Work On Waste USA, Inc.*, 82 Judson, Canton, NY 13617 315-379-9200

March 7, 1989

CALIFORNIA: FIRE AT FOSTER WHEELER'S 330 TPD MASS-BURN INCINERATOR IN COMMERCE. The Commerce incinerator suffered a major fire on the evening of March 7, 1989. The fire started in the garbage pit and went out of control. Apparently the sprinkler system didn't work and the fire department, donning 'moonsuits' after arriving on the scene, worked for 5 1/2 hours to quell the fire. The incinerator is shut down. According to Will Baca the fire department directed their water hoses for five hours into the garbage pit and what is left is a 'soupy waste' that the Commerce Refuse-to-Energy Authority (CREA) plans to burn with new waste. This must come as a blow to CREA which is fighting to continue to burn after the Calif. South Coast Air Quality Management Board denied CREA a permit-to-operate on 1-27-89. (See **Waste Not #39-40**).

MINNESOTA POLLUTION CONTROL AGENCY (MPCA): "DIOXINS MAY FORM WITHIN THE ELECTROSTATIC PRECIPITATOR" EQUIPMENT IN SOLID WASTE INCINERATORS. The following are excerpts from a MPCA News Release dated February 24, 1989. "Two years ago, the **Red Wing** municipal solid waste incinerator had unacceptable levels of dioxin coming from its stacks. We knew why --the plant was not being maintained and operated well. Now we find that the emissions are improved, but they are nowhere near low enough. This is a serious problem that has got to be fixed,' said MPCA Commissioner Gerald Willet. A study of dioxins in the stack of the incinerator was a requirement of a stipulation agreement between the city and the MPCA in February 1988. Because of concerns that dioxin compounds might form within the stack, the agency required testing for dioxins in the air emissions before they entered the electrostatic precipitator (a pollution control device) and as they left the system. In the three tests, conducted last June, the **average level of dioxins in the emissions entering the device was 2.2 nanograms (ng) per dry standard cubic meter (dscm). The average leaving the device was 23.8 ng/dscm.** (Enquiries from **Waste Not** revealed that the dioxin levels were recorded as 2,3,7,8 TCDD toxic equivalents calculated using the US EPA methodology. **The 23.8 ng/dscm is at least 230 times greater than the Swedish dioxin guidelines for new incinerators**). Minnesota Department of Health staff have reviewed the data and have not indicated an immediate concern for human health. However because eating quantities of contaminated fish over time would be the most likely route by whichpeople would be affected, the agency plans to work with the Department of Natural Resources and the city of Red Wing to begin immediately to collect fish from that area of the Mississippi so that their tissue can be analyzed and more information can be made available before the start of heavy fishing this spring...Red Wing's municipal incinerator has been operating since 1982 to produce steam...A stipulation agreement with the MPCA in January 1985 required the city to add the electrostatic precipitator to trap the particulates. In September 1986, air emissions from the Red Wing incinerator were tested as a part of a municipal solid waste incineration study...At that time it was learned that relative high levels of **dioxins were being released (30 ng/dscm).** Upon examination of the maintenance and operating conditions, the MPCA discovered seriously corroded equipment and poor operating practices..." Red Wing has a 72 tpd mass-burn **Consumat** incinerator. For more information, or a copy of the MPCA's New Release, contact Susan Brustman, 612-296-7769.

PLASTICS: THE FRONT-END POLLUTION. **British Petroleum's (BP)** plant in Lima, Ohio, produces one-fourth of Ohio's hazardous wastes. In Lima, **BP** operates a crude oil refinery coupled with a chemical productions plant, where farm fertilizer and the plastic resin **Barex** (tradename) are produced. There are several chemicals produced at **BP's** Lima plant, chemicals that are needed for the production of **Barex**. The volume chemical used to manufacture **Barex** is **acrylonitrile**, a known carcinogen and an EPA-listed priority pollutant. Because the plastic resin **Barex** is patented the process is a 'secret', i.e., **BP** will not reveal the catalyst used in the process. In the 1970's the catalyst **BP** used in the manufacture of the plastic resin **Barex** was **URANIUM U235.**

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One of **BP's** buildings in Lima was contaminated by uranium and is still undergoing decontamination. Some holding ponds on the **BP** site are contaminated with uranium. The pollutants from the manufacture of **Barex** account for **58 million pounds of toxic waste each year**, much of it **deep well injected. BP** received permission in 1988 for a $30 million expansion to its **Barex** production. In an effort to understand and document the enormous amounts of hazardous waste produced in the manufacture of plastic resins and its health and environmental impact on the local community, **Waste Not** plans to publish, over the course of the year, a series of reports concerning **BP's** operations in Lima,Ohio

HAZARDOUS WASTE INCINERATORS: HUGH KAUFMAN SAYS THAT EPA'S REGULATIONS ARE "NOT PROTECTIVE OF THE PUBLIC'S HEALTH AND ENVIRONMENT." British Petroleum (BP) is conducting test burns of hazardous waste in Lima, Ohio. The portable hazardous waste incinerator being used is run by **Waste Tech Services**, now owned by **Amoco**. The Ohio **Allen County Citizens for the Environment (ACCE)** are opposing **BP's** plans to build a hazardous waste incinerator in Lima. The group fears that **BP's** long-term plans are to build an incinerator in Lima for hazardous waste from **BP's** nationwide plants. **BP** refuses to reveal its intentions to the community. **ACCE** invited Hugh Kaufman, director of US EPA's hazardous site control division, toLima to address the concerns of the community. According to Kaufman: "The EPA science advisory board in 1985 found that our regulatory approach is inadequate. Conse itly Congress strengthened the laws requiring us to write more stringent regulations, but that's something we haven't done under the Reagan administration...The EPA was supposed to have more stringent regulations out by 1987, but we stillhaven't even proposed them to the Federal Register. So in the area of incineration of hazardous wastes, EPA's regulations do not meet the Congressional mandates and are not protective of the public's health and environment...In the last eight years, the EPA has served more as a deregulatory agency rather than as a regulatory agency and we've got to turn that around...Basically, the regulations are based on a destruction efficiency of 99.99%,' he said. 'Because of the creation in the combustion process of new toxic compounds, destruction efficiency is not an accurate mechanism to protect the environment and the public health. On top of that...we don't even know all the compounds that are coming up the smokestacks of these incinerators. There's no way for us to even extrapolate how safe these incinerators are...The question that naturally follows is, 'What is the track record of the regulatory agencies in controlling air pollution from that particular plant? Only one time was the facility (BP) fined a large amount of money because of air pollution...And what did the regulatory agencies do after that fine? They moved the air monitoring devices 25 miles away'...(Kaufman) was asked why, if US EPA scientists oppose test burns in incinerators, the permits were granted to BP...'You've got powerful companies that are the main contributors to candidates and elected officials in both political parties. That buys access and smoothes the way for things to happen in a political environment..." Lima News, Ohio, February 6, 1989, Front page. For more information from ACCE contact Noreen Christoff, 1122 Rice Avenue, Lima, Ohio 45805, tel: 419-227-4495.

Waste Not # 45
A publication of
Work On Waste USA,
a non-profit corporation dedicated to the promotion of sound resource management policy.

Annual Subscription Rate: $25.
Students & Seniors: $15
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"INCINERATION: TECHNOLOGY VS. SCIENCE?" This paper discusses the scientific problems posed by hazardous waste incineration. It is available from the author: Professor Richard Cook, Chemistry Dept., Kalamazoo College, Kalamazoo, MI 49007.



Dick Bidlack
237 Crown Road 96
Boonton, NJ 07005

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Waste Not

The Weekly Reporter for rational resource management

#52

A publication of *Work On Waste USA, Inc.*, 82 Judson, Canton, NY 13617 315-379-9200

April 27, 1989

MAINE: LEWISTON CITY COUNCIL VOTES 7-0 TO "INDEFINATELY POSTPONE" PROPOSED KTI INCINERATOR. "...the City Council on Tuesday (May 2nd) voted 7-0 to indefinitely postpone negotiating with **KTI Energy Inc.** on a proposed waste incinerator here. In the same motion, made at its regular meeting, the council directed Mayor Maurice Labbe to appoint a task force to investigate methods of solid-waste disposal...(Dr. Klaus Kuck) presented the mayor with petitions opposing the incinerator. Kuck said the petitions have about 2,000 signatures, including those of 66 area physicians who were concerned about the potential health effects of the facility...An ash spill Saturday at **KTI's** Biddeford incinerator also helped influence him against the company's plans, Labbe said. Problems at that plant were cited again Tuesday night by councilors as reasons for opposing negotiating on a host-city agreement with **KTI** to locate an incinerator here. Noise, ash spills and odor are problems **KTI** has acknowledged at the Biddeford plant but says it is working to fix..." Sun Metro, Maine, 5-3-89, pg. 13.

MINNESOTA: MINNEAPOLIS 1,000 TPD BLOUNT INCINERATOR, NEARLY BUILT, HAS OFFICIALS WORRIED ABOUT MERCURY EMISSIONS. This **Blount** 1,000 tpd mass-burn incinerator has been constructed against a backdrop of intense resident-opposition. IT is due to go on line in August 1989. Residents and environmental groups have continued throughout its construction to inform county and state officials about the previously-unexamined dangers of this incinerator which will be sited in the heart of Minneapolis. "Hennepin County officials for the first time are admitting they are concerned that mercury that will come out of the new Hennepin County garbage incinerator may violate air pollution standards. As a result, the county is trying to get a bill through the Legislature that would put a special sales tax on household batteries, with the money to be used by counties to set up battery collection and recycling systems. Batteries for everything from portable radios and flashlights to hearing aids contain mercury, and the **battery manufacturing industry is the largest mercury user in the U.S.**, siad Rep. Jean Wagenius, DFL-Minneapolis, who is sponsoring the **battery recycling bill.** Garbage incinerators do not destroy the mercury, but rather, release it into the air, she said. That situation has not excaped the attention of incinerator opponents. Leslie Davis of **Earth Protectors** environmental group has asked the Minnesota Pollution Control Agency (PCA) to revoke the permit for the incinerator, which will burn 1,000 tons of garbage per day when it begins operating near downtown Minneapolis this summer. He plans to argue at a PCA committee hearing next month that 1,000 to 2,000 pounds of mercury a year will come out of the incinerator and that because the mercury attacks the central nervous system and the brain, it represents a health hazard. Wagenius told a House committee earlier this month that pollution control devices grab about 99% of the heavy metals such as lead and cadmium coming out of incinerator smokestacks. They capture only 50% to 80% of the mercury, she added. 'State-of-the-art incinerators do not remove mercury as efficiently as they remove other metals and pollution,' Wagenius said. The alternative is to kep as much mercury as possible out of the incinerator, she said. Her bill would place a 2% sales tax on household batteries, and the money would go to help counties set up battery recycling and disposal facilities. There are plants in the U.S. that remove and reuse the mercury from batteries, Wagenius said. Charles Dayton, who was hired by Hennepin County to lobby for the battery recycling bill, told the legislative committee that tests at two of the newest incinerator built, in Marion County, Ore., and Commerce, Calif., released more mercury than would be allowed under the Hennepin County permit. Those findings raised questions on how well the Hennepin County incinerator would do, said Hennepin County Commissioner Jeff Spartz, an incinerator proponent. 'Based on Marion County **(Ogden Martin)** being state of the art, I would have some concern,' he said. Commissioner Mark Andrew, another incinerator proponent, said he thinks the mercury standard will be met, but if it fails, 'We will have to shut the

facility down..." St. Paul Pioneer Press Dispatch, 4-27-89. For further information contact Leslie Davis, **Earth Protector Inc.**, 1138 Plymouth Building, Minneapolis MN 55402. Tel: 612-375-0202.

CALIFORNIA: OGDEN MARTIN WANTS ASH FROM 800 TPD MASS-BURN INCINERATOR IN STANISLAUS COUNTY DECLARED NON-TOXIC. "The owner (**Ogden Martin**) of Stanislaus County's garbage burning plant has asked the state to classify the ash produced as non-toxic despite initial tests that show the ash contains higher than allowable levels of lead. It would cost Stanislaus residents $7 million a year if the request is denied and the 52,000 tons of ash produced each year at the Crows Landing plant had to be taken to a special landfill licensed to accept hazardous waste, said Gordon Dewers, county Environmental Resources Department director...**Ogden Martin**, which built the plant and operates it for Stanislaus County and Modesto, has asked the state Department of Health Services and the Regional Water Quality Control Board for the variance. If the state agrees, the ash could be dumped in a regular landfill. But even with the non-hazardous ash classification the county is banking on, the ash will go to lined and monitored 'monofills' that would prevent any chemical from the ash from leaching into the ground and perhaps into the groundwater, Dewers said. The monofill is one huge hole - 40 to 50 feet deep and covering 6 1/2 acres - at the Fink Road landfill next to the garbage plant. That one hole is expected to take five years' worth of ash. Five more will be dug over the 30-year life of the plant, Dewers said. The garbage plant, the first of its kind in the San Joaquin Valley and the third in the state, began burning its full complement of 800 tons a day of garbage last September. Last December, samples of the remaining ash were tested by two laboratories for toxic materials. The only compound found in higher than allowable levels was lead. It measured 38 parts per million in a test that exposed the ash to acid...The state starts to get concerned about ash lead content when it is higher than 5 parts per million, but in the past has allowed other waste, like shredded automobile parts and lead-contaminated soil from construction sites, to be dumped in regular landfills. The county doesn't want to dump the ash in a regular landfill because it would take up too much room. But a reclassification to a non-hazardous material would remove the 'stigma' from the hazardous ash, Dewers said... the state's Solid Waste Management Board (is) a staunch supporter of burning garbage instead of dumping it in landfills...(Board spokesman, Christopher Peck) acknowledged **it's unlikely more garbage burners will be built in the state in the next five to ten years because of the public's concern over air emissions and toxic-ash disposal."** Modesto Bee, CA, 2-28-89.

INCINERATORS PRODUCE FEWER JOBS THAN ENVIRONMENTALLY SOUND ALTERNATIVES. "A 1986 study by the New York State Recycling Forum estimated that recycling 10,000 tons of material would produce 36 jobs. By contrast, an equivalent amount of landfilling would produce six jobs, and an incinerator would create about 0.9 jobs per 10,000 tons of burned trash." (Craig McDonald, director of Public Citizen's Congress Watch, Washington, DC) Newsday, NY, 9-28-88.

Waste Not # 52

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