

WATER POLLUTION

Collected by Stanton S. Miller.

WATER POLLUTION

Articles from Volumes 4-7 of
ENVIRONMENTAL SCIENCE & TECHNOLOGY

Collected by **Stanton S. Miller,**
Managing Editor

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Preface

"Water Pollution" is the fourth in a continuing series of reprinted articles from *ES&T*. It compliments the earlier *ES&T* reprint books on solid waste and air pollution. Reaction to these books was good, indicating that there is a real need for understandable teaching and reference books on environmental topics.

This book is a collection of 106 articles that appeared in *ES&T* from 1970 to mid-1973 and cover most aspects of the subject of water pollution. Federal and state policy are discussed in detail to give a basic understanding of the long and short term goals we are trying to achieve in our water quality. How and to what extent the military, business, and industrial communities are acting to implement the new (and often not so new) laws and standards is covered. Several controversial issues that are still under study are presented in the last section of the book.

With environmental concern growing daily, it is hoped that this collection of articles will bring the reader up to date on the important aspects of the large subject of water pollution. New developments in the field will be covered in current issues of *ES&T*.

STANTON S. MILLER
Managing Editor, *ES&T*

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The business of water pollution

ES&T editors Stan Miller and Carol Lewicke discuss the roles of leading firms, consulting engineers, and equipment manufacturers in this growing field

Reprinted from ENVIRON. SCI. TECHNOL., 6, 974 (November 1972)

Times have never been better for the water pollution control industry, one of the fastest growing industries in the U.S. today. Most newer companies in the business have doubled their sales volume in the past five years and will more than likely redouble that volume in the next five years; established firms likewise are doing quite well.

This ES&T special report covers the companies in the business; how their spokesmen view the company's role; equipment suppliers and their trade association, Waste Water Equipment Manufacturers Assoc.; and consulting engineering firms and technical experts, who basically are members of the Water Pollution Control Federation.

Together, this team stands ready to make progress on cleanup of the nation's most vital resource—water. Several indicators point to the fact that business in the field will definitely increase in the short-term future:

- At the beginning of 1972, there was, collectively in the U.S., a construction backlog of about \$7 billion worth of waste water treatment facilities for which federal assistance has been committed and for which construction is incomplete
- In 10 years (1971–1980), an expenditure of more than \$86 billion will be needed in the water pollution control category, according to the Council on Environmental Quality's third annual report
- The renewed challenge for waste water treatment was incorporated in this year's Federal Water Pollution Control Act amendments.
- In 1971, actual business investment in water pollution control was \$1.4

billion, and the planned business investment for 1972 was \$2.04 billion, a 42% increase, according to a survey by McGraw-Hill Publishing Co.

But what can be misleading to the casual water pollution control watcher is that business opportunities in this industry lie somewhere between the optimistic, pie-in-the-sky CEQ figures, the congressional promise but undelivered support of the federal construction program, and the hard-fact, in-plant construction figures of the Department of Commerce. Obviously, somewhere within these limits industry leaders see their future.

In the business

By now, a number of major U.S. companies listed on the major stock exchanges have devoted a portion of their operation to the waste water treatment business along with, in many cases, the companion business of water treatment. Many have design engineering, equipment manufacturing, and construction capabilities. They can and do handle an array of waste water treatment services and products for both industrial and municipal markets. In addition, other companies handle only one or two segments of the three capabilities. Some companies concentrate solely on municipal markets while others concentrate only on industrial markets. Over 300 companies supply equipment for the water industry.

Companies such as Peabody-Galion and Zurn Industries, of course, cut across all segments of the environment, including water pollution control. On the other hand, a group of companies dealing only with water, such as Eco-

dyne, Envirotech, Dorr-Oliver, and others, handle all three aspects of engineering, equipment supplies, and construction.

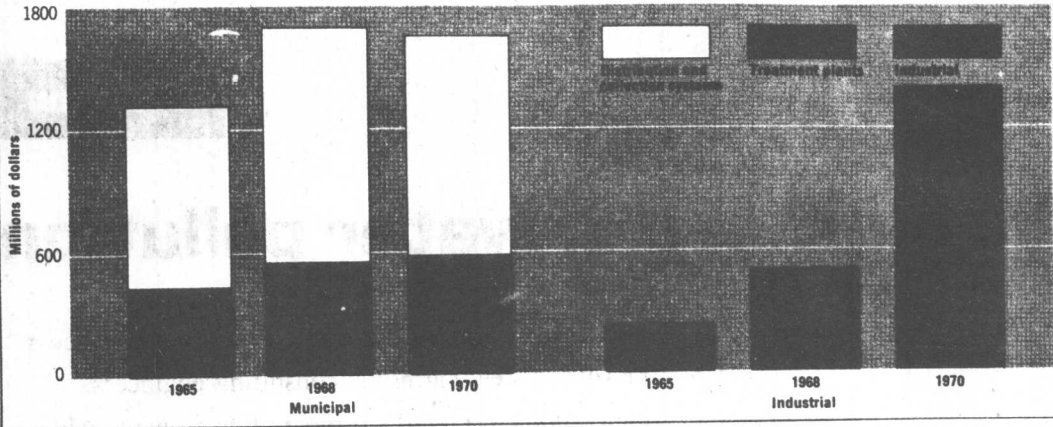
Then again, companies in the companion water treatment industry take available water and make it usable for industrial use. For example, the Graver division of Ecodyne Corp., Cochrane division of Crane, Infilco division of Westinghouse, and the Permutit division of Sybron Corp., to mention a few, are in this end of the business.

Growth is forecast in both municipal and industrial water pollution control markets. Expansion in waste water treatment will most likely occur in the industrial segment before it does in the municipal area. Industries are not hampered by financing arrangements such as the sale of municipal bonds or the vagaries of federal support which confront the municipal users; however, funds for industrial water pollution abatement programs must come out of profits. In other words, it's an unproductive use of money.

Here are a few companies representative of the water pollution control industry: **Calgon Corp.**, a subsidiary of Merck & Co., Inc., markets a number of projects in water pollution control and water reclamation. Calgon's major sales items are water treatment polymers and granular activated carbon for water purification and water pollution control. An adsorption service for waste water treatment was recently announced by Calgon officials. The Calgon Adsorption Service for on-site industrial pollution control, say Calgon officials, promises to reduce dissolved organic content by passing wastes

Construction expenditures for waste water disposal

Source: Department of Commerce, Bureau of Domestic Commerce



through columns of activated carbon. The process avoids large initial capital investment costs associated with other approaches. Calgon currently has a multiple hearth regeneration facility, a \$12 million installation for carbon reuse, in the Pittsburgh area which will be ready the first quarter of next year.

With sales reaching \$100 million in 1971, 94-year-old Clow Corp. (Oakbrook, Ill.) is "devoted to serving the country's water treatment and pollution control needs." They offer products and services for both municipal and industrial water and waste water systems. By product groups, clay pipe and waste treatment equipment accounted for 27% of their 1971 sales, pressure pipes accounted for 45% of sales, and valve products 14%.

One of seven operating divisions of Clow, the waste treatment division is headquartered at Richwood, Ky., and has a main plant at Melrose Park, Ill. In this division, sales have increased at a 6-7% annual rate over the past 10 years. Clow recently increased the plant's capacity by 50% for fabrication and assembly of packaged treatment plants and lift stations. In 1971, Clow spent more than \$1 million on R&D; the company maintains one of the country's largest waste treatment test facilities at Rockford, Ill., at which actual sewage can be used to test waste treatment products in a 1-million gal. tank.

Although a precise breakdown of water pollution control activities is not possible for Crane Co. (New York City), consolidated sales for 1971 hit \$792 million, an increase of 16.4% over the previous year, according to the 1971 annual report. Spokesmen for the Cochrane division (King of Prussia,

Pa.) believe that increasing emphasis on pollution control by municipalities and industries points to future sales.

Crane's Engineered Products Division designs and manufactures fluid control and treatment equipment including a wide range of pumps, meters, valves, and other equipment used in industrial processing, power generation, and municipal water and waste water systems. Formed in 1970, the company's Environmental Systems Division showed increased profitability in 1971, largely due to increased activity in the electrical generating industry, pulp and paper industry, and pollution control markets.

Dravo Corp. (Pittsburgh, Pa.) reported that 1971 earnings hit a record \$428 million, up 37% from the previous year. Its Process, Construction & Engineering Group (involved in water pollution control) accounted for 23.4% of the total, or \$100 million. This group was recently raised to divisional status to "properly recognize the level of activity this operation has achieved."

In addition to deep-bed filter systems for the steel industry, new Dravo bookings in pollution control include facilities to treat wastes from paper and pulp mills and oil refineries as well as a catalytical oxidation process to dispose of liquid waste sludges from industrial and municipal plants. Dravo's Super Aeropack is used widely in removing phosphate and nitrate from waste waters. Other nutrient removal systems are in the planning stage, according to Dravo. For example, the company will supply the filtration sections for the advanced physical-chemical treatment plant at Garland, Tex.

Dorr-Oliver Inc. (Stamford, Conn.)

in business for over 50 years, provides systems and equipment for waste water treatment to cope with both industrial and municipal problems. Dorr-Oliver's 1971 sales hit \$90 million, according to the annual report, and increasing emphasis on environmental issues by both industry and government resulted in a sharp increase in demands for equipment and systems.

In the private sector, Dorr-Oliver activities include industrial waste treatment, industrial water purification, and in-plant water and waste water recovery. In the public sector, the company handles municipal sewage treatment and municipal water purification. Basically, the company offers systems, equipment, and processes for both municipal and industrial water management.

Two recent Dorr-Oliver customers are Brunswick Pulp and Paper Co.'s mill in Georgia; there, a giant 320-ft diameter Dorr-Oliver clarifier removes 90% of suspended solids from 50 million gal. of plant effluent each day. At Holland, Mich., a Dorr-Oliver fluosolids handling process went on-stream this year for incinerating sludges from a phosphate extraction process.

With sales of \$145 million in 1972 (fiscal year ending March 31), Envirotech Corp. (Menlo Park, Calif.) markets a broad line of equipment, processes, and expertise for both industrial and municipal water and waste water treatment. The company, founded only three years ago, was listed on the New York Stock Exchange in August. Envirotech has had an annual growth of 15% per year. Municipal equipment sales hit \$10 million in 1970 with a \$25 million backlog.

Frank Sebastian, vice-president of Envirotech, maintains that the South Lake Tahoe water reclamation plant, which began operations in early 1968, is still perhaps the company's best showcase item. In 1970, the company completed a smaller waste water treatment plant, similar to the Lake Tahoe operation, at Colorado Springs, Colo. However, at Colorado Springs, industry will use some of the water produced by the plant. (Tahoe effluent is used for recreation.)

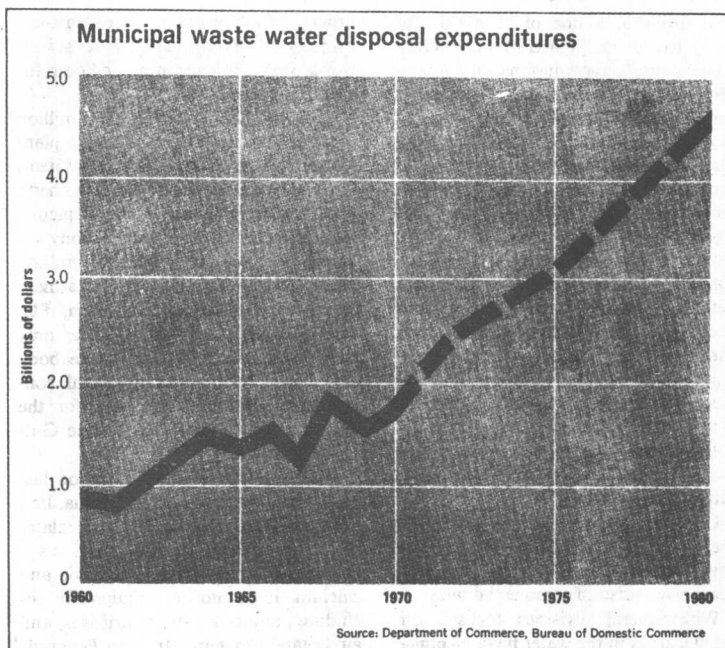
Envirotech also offers the Z-M process, a physical-chemical waste water treatment system which is now ready for the commercial market. "Using the Z-M process, a 10-mgd plant would cost about a third less to construct than a primary-secondary-tertiary treatment plant and 40% less in amortization and operation costs," Sebastian claims. "If land must be acquired, the capital cost savings may approach 50%."

Envirotech also tackles industrial waste water problems. For example, Envirotech provided the equipment for treating metal finishing wastes at the Guide Lamp Division of General Motors Corp. in Anderson, Ind., which produces plated die castings and molded plastic parts for automobiles. The 2.5-mgd waste treatment plant softens all incoming process water and batch treats metals and cyanide rinse waters.

In June 1970, Envirotech organized a Municipal Equipment Division (MED) which is solely a marketing division for about 40 Envirotech engineers. MED does not design systems for specific municipal installations. Instead, it advises and assists consulting engineers who are typically commissioned to design and develop specifications for competitive bidding on publicly funded sewage treatment systems. Generally, the company sells its equipment to the municipality or the general contractor. For the year ending March 31, 1972, MED sales amounted to \$10.3 million and unfilled orders to \$24.4 million.

Ecodyne Corp. (Chicago, Ill.) claims to be the largest diversified company devoted exclusively to water treatment water cooling, and waste water treatment. Ecodyne's 1971 sales hit \$75 million, out of \$255 million total for Trans Union.

Ecodyne's president Thomas O'Boyle told *ES&T* readers in last month's *ES&T* Interview that the company has a history in the water treatment field running back to the 1920's. "There have been prior pilot plants using the physical-chemical process," O'Boyle further



explains, "but the Ecodyne plant at Rosemount, Minn. will be the first commercial physical-chemical plant which starts with raw sewage and winds up with water of potable quality except for chlorination."

In the water treatment field, Ecodyne's Powdex (ion exchange) process was considered a breakthrough for ultra high purification of boiler feed water and could become increasingly important as nuclear power plants develop. In addition, Ecodyne's introduction of high-rate solids contact clarifiers, packaged treatment plants, factory-built pump stations and tertiary filters are well recognized in the U.S.

Environment/One Corp. (Schenectady, N.Y.) is a small but growing company which devotes part of its business operation to water pollution control. Environment/One makes package sewage treatment plants with capacities up to 100,000 gpd and now plans to market a pressurized sewage transport system utilizing grinder and pump combinations.

Hercules, Inc. (Wilmington, Del.) has been actively involved in waste treatment for five years. Basically, Hercules has two environmental operations in its Environmental Systems group. The Environmental Services Division markets water-treating services and chemicals, including flocculants, corrosion inhibitors, and boiler water treatment chemicals. The second divi-

sion is involved in turn-key operations. The 1972 top dollar sales item is the "Hercofloc" flocculant polymer. This item was not sold five years ago, but Hercules expects to triple 1972 sales in the next five years.

Advanced Waste Treatment Systems Inc. (including the recently acquired consulting engineering firm of Black, Crow, and Eidsness) is a partially owned subsidiary of Hercules and is involved with turn-key operations.

Hercules' most outstanding treatment plant is still under construction at Freehold, N.J. The plant, located in the shell of a home similar to one in the community that the plant will serve, will treat 50,000 gpd of waste water. The system will eliminate 99% suspended solids, 98% phosphates, and 95% of BOD.

Authur G. McKee & Co. (Cleveland, Ohio) engages in activities involving the process industries. Ninety-nine percent of their \$1 million-plus earnings in 1971 was due to industrial contracts, with a mere 1% being municipal jobs. Senior environmental control consultant, W. A. Parsons, explains that McKee specializes in engineering and construction of plants for process industries, and that about 5% of the current cost is allocated to water pollution control facilities.

Met-Pro Water Treatment Corp. (Lansdale, Pa.) has five manufacturing centers: Stiles-Kem Corp. blends, mixes,

and furnishes a line of chemicals for water treatment; Sethco Manufacturing Corp. manufactures in-tank circulators, filter systems, and adsorption equipment for removing suspended and dissolved organic contaminants. Met-Pro Systems Division manufactures domestic and industrial waste water treatment systems and water treatment systems designed for flows up to 250,000 gpd, while Keystone Filter Corp. is a major supplier of pleated fiber for filtration. Sethco products include vertical and horizontal process pumps for use in chemical, petrochemical, paper, steel, automobile, refining, and waste treatment industries. Met-Pro's president Walter Everrett believes that the "anti-pollution programs related to water and waste treatment now appear to be gaining momentum."

Until recently, approximately 75% of Met-Pro's sales were to the federal government; however, 80% of its business now consists of commercial sales.

With several divisions focused on specific areas in the water field, Neptune Meter Co. (Atlanta, Ga.) is involved with treatment plants for raw water purification, meters for potable water conservation, and tertiary treatment processes for waste water reclamation. As a result, Neptune purification products include Micro-FLOC water treatment systems, tube settlers, and mixed media filtration beds.

Formed July 1, 1970, Peabody-Galion Corp. (New York City), an environmental improvement company, derives as much as 70% of its revenues from balanced positions in all major sections—air, water, and land—and reported sales of \$90 million in 1971. Peabody-Galion's water group accounted for 17% of the 1971 sales—40% of which was to municipal customers and 60% to industrial. Peabody acquired four companies, each recognized as a division, giving the firm a well-rounded position in the environmental field. Petersen Co. has been in the construction business (sewage and waste water treatment systems) for 11 years. Barnes Co. has 77 years of experience in sludge, slurry, and water pumps. Hart has dealt with packaged industrial waste treatment units for more than 10 years; and Welles has manufactured aeration systems for 13 years.

In 1967, sales from the acquired companies were \$10 million, in 1972 they will hit the \$22 million mark; and by 1977, they will, Peabody-Galion hopes, again redouble. In August, the company had a booming \$12 million backlog of

orders. Peabody has no pure turn-key projects in its operations; it always works with the consulting engineer for municipal contracts.

Peabody completed a \$1.5 million industrial waste water treatment plant (which the firm considers a show item) for Armour Products (Montgomery, Ala.) earlier this year. In the municipal category, perhaps the best Peabody example is the combined \$1 million biological/physical-chemical treatment plant for the city of Bradenton, Fla. The plant treats municipal wastes only and went on-line this spring. Peabody also has a \$5 million municipal construction contract under way for the city of Port St. Joe, Fla., on the Gulf Coast.

With total sales of \$405 million last year, Pennwalt Corp. (Philadelphia, Pa.) estimates that 9% of its 1971 sales relates to environmental control products—chemicals including ferric chloride and calcium hypochlorite; equipment including pumps, meters, centrifuges, and air flotation systems. In fact, Pennwalt was the first (and is the only) domestic producer of the anhydrous type of ferric chloride and the first producer of the liquid type. The material is used as a sludge conditioner, coagulant, and precipitant. The industrial market accounts for 90% of the firm's sales, municipalities for 10%.

Pennwalt's Wallace & Tiernan division markets measuring and feeding devices for the addition of solids, liquids, and gases used in water and waste water treatment. The Sharples Stokes division markets centrifuges for separating waste solids from liquid suspension and dewatering the resulting sludges before disposal.

Sybron Corp. (Rochester, N.Y.) with 1971 sales of \$355 million, has three major operating divisions—Permutit Co., Leopold Co., and Barnstead Co.—which accounted for 23% of the sales in the water purification and waste treatment markets. In addition, the Pfaudler division handles plating waste treatment systems, and the Ionac Chemical division produces some specialty items.

Permutit Co. (Paramus, N.J.), manufactures "a complete range of water treatment equipment of virtually every treatment process type," according to A. W. Pieper, manager of marketing services. Products include aeration and degasification equipment, controls, instruments, clarification, ion exchange, and reverse osmosis equipment. In 1971, 6% of Sybron's net corporate sales

(near \$20 million) was for such equipment. A major portion of the sales went to industry, but a respectable volume was attributed to municipal plants in construction of clarification, filtration, and water-softening systems.

On a direct purchase basis, the Permutit and Leopold divisions are most intimately involved in water and waste water treatment. Industrial waste treatment systems are purchased in proportion to new plant construction and also to provide pollution control for existing plants. Permutit has turn-key capability but does very little business of this nature. Leopold, in the municipal water treatment market, produces ceramic tile for filter bottoms and related gravity filter equipment for purifying water for potable use.

Pollution Control Industries, Inc. (Stamford, Conn.) is basically an equipment manufacturer of systems for ozone generation, water disinfection, and waste water treatment. Although sales volume in 1972 was only \$600,000, company officials expect that to jump to \$3 million by 1977. At this point, sales are 70% municipal and 30% industrial contracts.

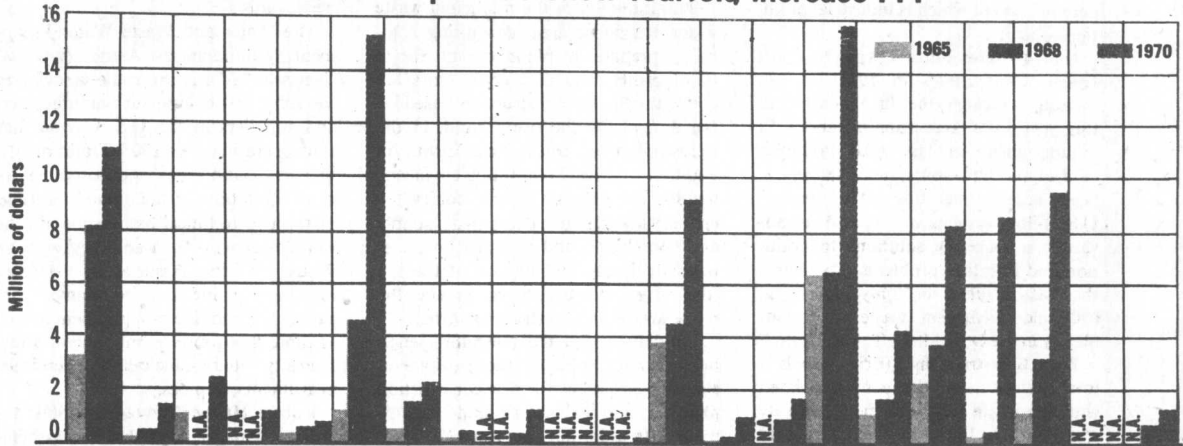
Rex Chainbelt Inc. (Milwaukee Wis.), one of the leading water pollution control equipment companies, reported sales of \$339 million in 1971, \$22 million of which was attributed to environmental control equipment sales. This equipment-oriented company claims to have a record of 5000 major pollution control system installations in the U.S., Canada, and throughout the world.

During 1971, Rex formed the Ecology division, a research arm of the organization, which serves as a single source for water pollution problem-solving for industrial and municipal planners. One item the team of 20 researchers is looking over is reverse osmosis applications, efficiencies, and economics in the municipal and certain industrial fields.

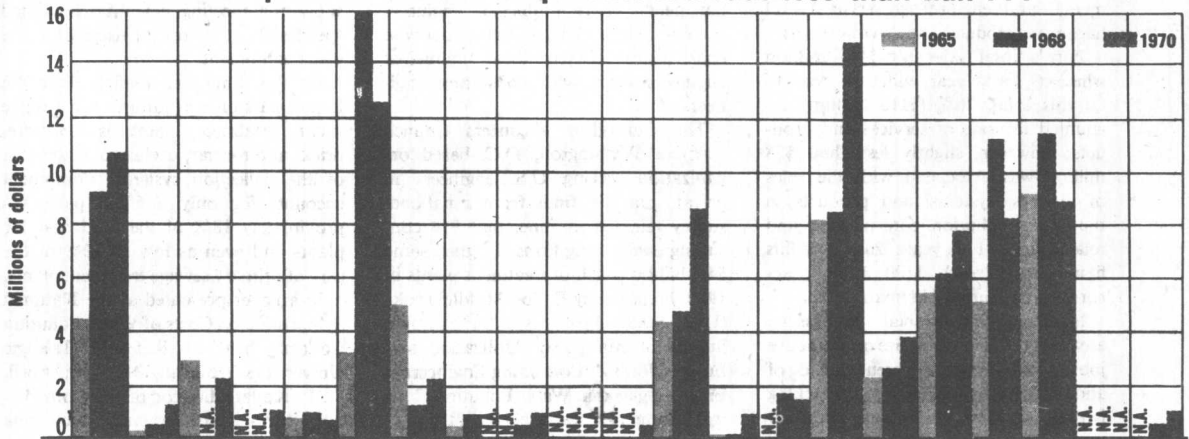
Rollins International, Inc. (Wilmington, Del.) had \$135 million sales in 1971, but the company's environmental control system handles only a very small, unidentifiable part of the business. In fact, Rollins-Purle, a subsidiary, handles waste disposal for other companies. Rollins-Purle currently operates three central disposal plants on a regional basis—Logan, N.J., Baton Rouge, La., and Houston, Tex.; future plans call for a network of such disposal centers to be located in industrial centers across the U.S. Rollins International

Equipment shipments over 5-year period

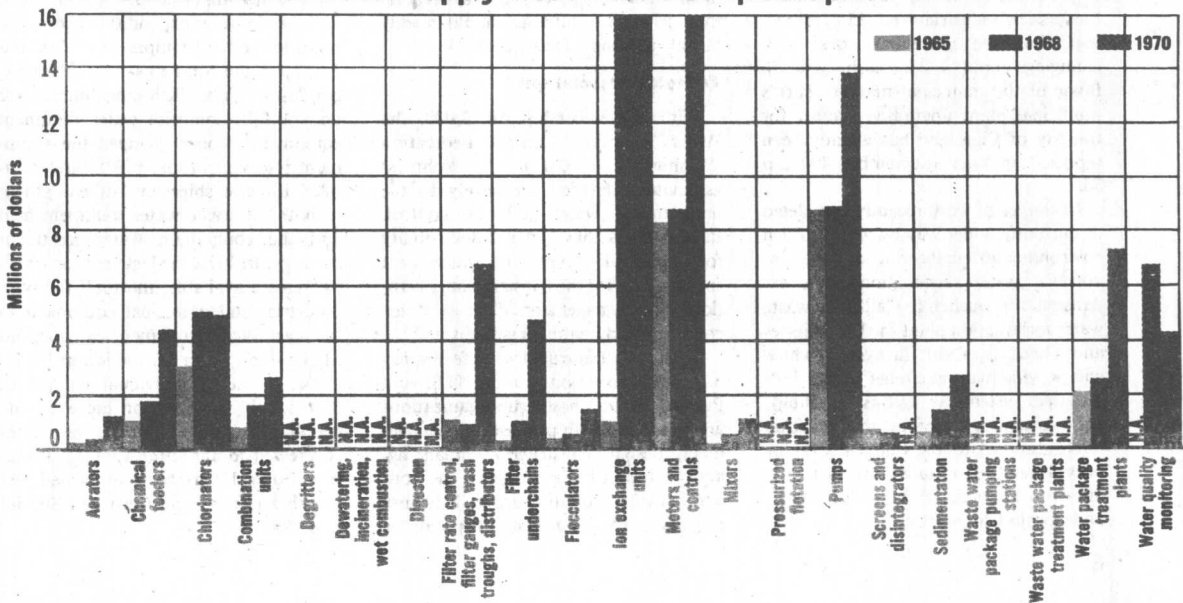
Industrial waste water shipments show fourfold increase . . .



. . . as municipal waste water shipments increase less than half . . .



. . . but industrial water supply treatment also quadruples



N.A.: Figures not available

Source: Department of Commerce, Bureau of Domestic Commerce

sees four areas of growth in its business activity, one of which is industrial pollution control.

United States Filter Corp. (Newport Beach, Calif.) sales in 1971 hit \$30 million. Through the first quarter of this year sales were running about \$1 million ahead of last year. Pollution control and filtration systems sales have been accelerating this past quarter. U.S. Filter systems are touted as advanced engineering solutions to pollution and filtration problems. The firm's showcase facility is the "only" operating, full-scale advanced waste treatment facility in the U.S.—Lake Tahoe, Calif.

Zurn Industries, Inc. (Eric, Pa.) is a total environmental company associated with the waste treatment field since its inception in 1900, Frank Zurn told readers in *ES&T's* June 1972 Interview. Zurn offers both software (environmental and engineering services) and hardware (products and services) items.

Zurn's total sales hit \$178 million when its fiscal year ended in March. Of this total, 76% (\$118 million) accounted for sale of services and products; however, slightly less than \$78 million was associated with the sales of services, systems, and products in the water pollution control area and related fields. Five years from now this figure could reach \$100 million, according to a Zurn spokesman.

In the environmental engineering area alone, 240 projects are on the active job list, constituting a current backlog of about \$10 million. Construction backlog is approximately \$28 million, with new sales for the current fiscal year expected to reach \$33 million.

Generally speaking, 75% of Zurn's business is industrial and 25% municipal, but the percentage has been changing about 1-2% each year in favor of the municipal market. Zurn's municipal plant upgrading project for the city of Cleveland has already been reported in *ES&T* (September 1972, p 782).

Examples of work recently completed or currently under way by various Zurn environmental engineering affiliates involve a water reclamation plant expansion for Burbank, Calif.; a waste water reclamation plant for Los Angeles and Glendale, Calif. (a system which will provide hydraulic relief to the city's sewerage systems as well as recycling); and consulting services in industrial waste disposal to the Sun Oil Co. for several refinery installations including those of Yabucoa, P.R., Tulsa, Okla., and Corpus Christi, Tex.

Consulting engineers

Traditionally, in the municipal waste water treatment area, consulting engineers prepare a plant design for a municipality, and then contractors bid competitively for construction based on the design. On the other hand, in the industrial area, construction firms, in addition to private consulting engineers, handle all phases of the contract—engineering design, equipment supply and purchase, and construction—depending usually on the size of the job (the larger the project the greater the tendency toward construction firms).

Fundamentally, the consulting engineer usually specifies the equipment, supplies, processes for new construction projects, and extensions and replacements. In addition, he normally prepares the design and specification. However, certain municipalities operate departments whose municipal engineers prepare design plans and also supervise construction. Often these municipal engineers work with consulting engineers.

The Consulting Engineers Council (CEC), a Washington, D.C.-based organization serving U.S. engineers in private practice, finds from a national survey released in June, that 914 consulting engineering firms designed some \$4.5 billion worth of treatment plants in 1970. Prepared by E. Joe Middlebrooks (Utah State University), "A National Survey of Manpower Utilization and Future Needs of Consulting Engineering Firms Engaged in Water Pollution Control" is the first real analysis of the consulting engineer's role in design and construction of U.S. waste water treatment plants. The CEC survey reports that private consultants should readily be able to handle increased work.

Technical associations

With a membership of 23,000, the Water Pollution Control Federation (Washington, D.C.) is the technical association devoted exclusively to the problems of water pollution control. Its members have the responsibility for technical detail and equipment specification for the construction, operation, and management of waste water collection and treatment systems.

There are 39 so-called wpcf federation member associations in the U.S. and Puerto Rico; these suborganizations are concerned with promotion, management, design, construction, financing, and operation of facilities for the control of water pollution through proper collection and treatment, disposal, or

reclamation of domestic and industrial waste waters.

The Water and Waste Water Equipment Manufacturers Assoc. (wwema) (Newark, N.J.) is the trade association for some 300 equipment manufacturers and suppliers in the U.S. wwema has been operating since 1908. Traditionally, this association has sponsored equipment exhibitions at the annual meetings of the two technical associations in the water category—wpcf and the American Water Works Association. wwema membership includes companies that supply a broad line of equipment as well as those that produce only one or a few specialty items including chemicals, instruments, or pipes.

Robert Hughes, wwema's public relations manager, says that the association is looking ahead and will sponsor an industrial waste water equipment show and meeting next March, aimed specifically at industrial users of waste water equipment.

By this time one realizes that the largest part of expenditures for a waste water treatment plant is concrete, brick, and mortar, exclusive of the cost of the collection systems. Equipment accounts for only a small part—approximately 18% of the total cost for plants and even as low as 12% in the case of primary sewage treatment plants.

In a paper presented at the National Symposium on Costs of Water Pollution Control, held at Research Triangle Universities (Raleigh, N.C.) in April, K. L. Kollar, director of the Construction, Water Resources, and Engineering Division of the Bureau of Domestic Commerce in the Department of Commerce noted that only 5.4% of the total U.S. waste water expenditures comprise pollution control equipment while about 15.3% of the total treatment plant expenditures (not including interceptor and outfall) comprise water treatment equipment. Kollar grouped the equipment into items (box, p 978) and compiled in-plant shipments of equipment in both the waste water treatment field and the companion water treatment industry. In 1970, the last year for which figures are available, the total for both industrial and municipal equipment in the waste water treatment category hit \$184 million, from \$77 million in 1965.

For a list of individual companies that supply any one or more of the specific 21 equipment items, the reader is referred to the 1972-73 *ES&T* Pollution Control Directory, published last month and available from ACS Special Issue Sales.

Water pollution in the states

Success for the nation's water quality program hinges on state involvement.

Associate editor Stanton Miller canvassed state officials, focused on grass-roots issues, and found signs for renewed optimism

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The U.S. has more than 3 million miles of streams, 88,633 miles of tidal shorelines, and millions of lakes, ponds, and bayous. Certainly, these waters cannot all be monitored, protected, and restored from Washington. So the key to success in the fight against pollution is state participation.

The action in water pollution control is at the state level. In fact, under existing federal legislation, states have the responsibility. Their programs are the crux of the nation's water pollution control effort. It is at this level that the day-to-day exchange of blows between state officials and their counterparts in industries and municipalities takes place.

Progress on water pollution abatement is being made, but certainly not at the rate envisioned by legislators when they wrote the 1965 and 1966 amendments to the Federal Water Pollution Control Act. Nor, for that matter, is it proceeding at a rate that pleases the public.

The lack of progress mainly is due to understaffing, underfunding, and undervisibility of antipollution programs. Differences of opinion between state and federal officials have developed over the last five years. Deterioration of federal-state relationship has also hampered progress.

There are numerous issues in the water pollution control game. Some are old, some are new; not one has been completely resolved. Basin planning, new financing schemes, permits, and certification requirements are a few of the new issues, while the old

ones of standards, secondary treatment, enforcement, grants, and the need for new legislation are still around. Certainly, the whole list of issues affords ample opportunities for state and federal administrators to argue.

Before delving into the issues, it is important to consider the federal-state relationship. The ray of hope for improved relations between states and the federal government entered the picture only recently. But it is perhaps safe to say that, for the first time in the last five years, things are looking up.

Five years ago, the federal water pollution activity had no visibility. It then existed as the Division of Water Supply and Pollution Control in the Department of Health, Education and Welfare. Prior to the enactment of the 1965 Federal Water Pollution Control Act, the feds were accused of playing footsie with the states people. They were accused of not putting the heat on the states people to act. However, when the program was elevated in stature and moved to the Department of Interior in 1966 as the Federal Water Pollution Control Administration (FWPCA)—based on President Johnson's reorganization plan—problems began.

First, there was severe attrition of key personnel. Many of the old-time Public Health Service employees preferred to maintain their status rather than transfer and accept Civil Service status—despite the fact that practically all of the personnel were seriously

committed and devoted to cleaning up water pollution.

Then, Interior had to put together its team of water pollution experts which, appropriately, was referred to as the "new, green federal team." They had little, if any, practical experience in trading blows with polluters. In those days, the state people dreaded seeing the federal officials coming.

Since then, federal efforts have been a series of faints and thrusts, most coming without warning. These unilateral actions kept the states defensive, sapped the states' manpower and efforts, and perhaps misdirected considerable attention and energies away from more mundane problems.

The feds have made the pitch for improved federal-state relations again and again. The most recent pitch was made at the meeting of the Association of State and Interstate Water Pollution Control Administrators (ASIWPCA), held in Portland, Ore., late last November.

Basin planning

Today, the biggest problem facing each state is basin planning. No administrator, federal or state, disagrees in principle that the job should be done. State administrators realize that it is a time-consuming and expensive requirement, but what plagues them now is the fact that such planning is a requirement for construction grant funds. FWQA (the Federal Water Quality Administration, formerly FWPCA, and now the Water Quality Office in the Environmental Protection

Agency) has publicly announced in the Federal Register that no funds for waste water treatment facilities would be approved unless they were tied into a comprehensive basin plan. It's a federal requirement much like an earlier requirement for secondary treatment or "no federal funds."

Certainly, state officials do not agree that the requirement for basin planning should be included as an amendment to federal law, as has been suggested by the administration. They argue that such a requirement would merely consume much of the money and manpower needed for more immediate problems, such as day-to-day work on their programs. In their opinion, the commitment of large sums of money for planning is hardly justified at this time.

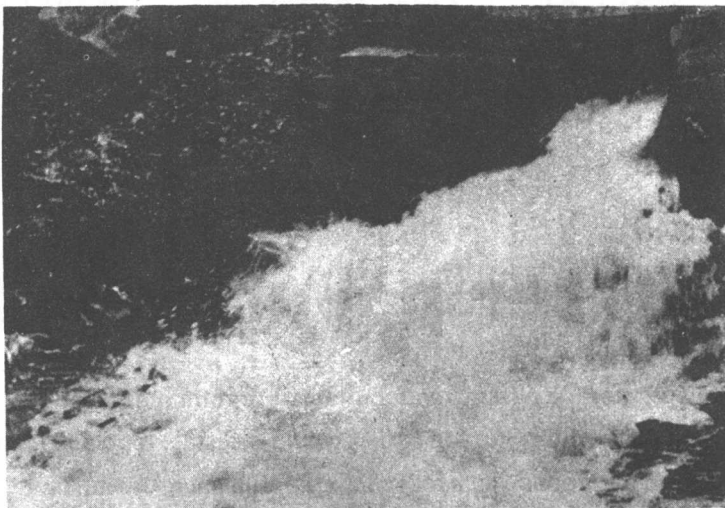
To do the basin planning job in Virginia alone would cost \$15 million, says A. H. Paessler, Virginia's water control official. To do justice to the comprehensive planning that should be done is well-nigh impossible at this time, according to Paessler. Similarly, in Texas, \$25 million and several years' work would be involved in the plan, estimates Joe Teller, deputy director of the Texas Water Quality Board. Nevertheless, Texas started its basin planning several years ago. The state contracted for the study and has already spent \$2.5 million, but the entire basin planning job would take another 10 to 15 years, Joe Teller says.

State administrators from Arizona, Connecticut, Iowa, and New York come out unequivocally in opposition to the idea of basin planning. Others from Colorado, Missouri, New Hampshire, South Dakota, and Texas admit to the desirability of basin planning, but feel that it is a bit unreasonable at this time.

Arizona's spokesman Joseph E. Obr notes that his state does not have any problems with water pollution control that would appear to lend itself readily to the basin approach, with the exception of the salinity problem in the Colorado River Basin.

California's Kerry W. Mulligan regards river basin planning as essential. This is true, he says, whether it is on the interstate rivers, such as the Colorado and Truckee, or on California's intrastate rivers, which include the Sacramento and San Joaquin.

Although Colorado concurs that basin planning is necessary, Colorado's Frank Rozich comments that, with a total population of 25,000 still in need



Outfall. Polluted waters continuously empty into the nation's waterways

of adequate sewage treatment, "it seems rather asinine to ask these people now to look into basin planning." Any money could be better spent in construction of treatment facilities, says Rozich. A similar situation exists in Wyoming and New Mexico.

On the positive side, Maryland's W. McLean Bingley, chief of the division of water and sewage, says river basin planning is an important part of the state's entire pollution abatement activity. In his opinion, this approach will help to solve problems that Maryland and other states may have in common (or, for that matter, that any group of political jurisdictions may have in common).

Missouri's Jack K. Smith admits that planning could help overcome some pollution problems, but he cautions that no amount of planning is going to make cooperation between cities a reality.

New Hampshire's C. W. Metcalf, director of municipal services, says that basin planning at this time will result in a slowdown of the state's program.

But a resounding voice of approval for this issue is heard from the New York official, Dwight F. Metzler. He notes that relatively small investments in comprehensive planning have yielded big dividends in improved systems at less cost, and have greatly strengthened the regional concept of solving environmental problems. New York already bases its comprehensive planning on the basin approach, according to Metzler.

Financing

Money is often the root of many arguments, and it is no exception in water pollution control. As a nation, the U.S. entered 1970 with a backlog of \$4.4 billion in waste treatment needs, according to one FWQA estimate.

The federal promise of \$3.4 billion to the states for construction of municipal waste treatment facilities, authorized under the 1966 amendments to the Federal Water Pollution Control Act, simply has not materialized. Slightly more than half (\$1.8 billion) has been appropriated by the Congress. Considering that statutory authority for these funds expires this fiscal year, state administrators are wondering what new direction the program will take.

In addition to construction funds, federal funds have been netted out in the past—to the tune of approximately \$10 million annually—for states to develop their water pollution control programs. These are provided on a matching basis. By Dec. 1, 1970, for example, some 31 states and three jurisdictions had had their programs approved by the feds; the federal contribution was more than \$5.5 million.

One well-founded criticism of the federal role is that construction grant awards were made not on the basis of states' needs, but on a first-come-first-served basis. Another criticism is the lack of guarantee for prefinancing.

Surprisingly, not all states need federal funds. However, a large majority

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do. In fact, many have actually pre-financed the needed construction with the hope that part of the outlay would be refunded by the federal government.

Quite obviously, more funds will be needed in the future, and several estimates have been made of just how much money will be required. The Nixon administration says \$10 billion is needed in the next five years. The National Association of Counties says \$34 billion for the same time span, while the U.S. Conference of Mayors-National League of Cities says \$33 to \$37 billion over the next six years. The estimates are not directly comparable since different assumptions are made in each, but the need for considerable sums is apparent.

Most states need federal funds, but a few have more than they can use. One state, Colorado, plans to return money to the federal treasury. Another, Iowa, cannot use all the federal funds available to it. A few are satisfied with their share of federal funding. Generally, these are the small states that are neither heavily urbanized nor industrialized, such as Wyoming, South Dakota, and Utah. But most other states are not satisfied.

For heavily industrialized and urbanized areas, particularly in the coastal states—where 75% of the nation's population lives—the federal share has been too little and too late.

Many states still need federal funds to keep their water pollution control programs on schedule. Certainly, the unofficial federal goal—clean water by 1972—will not be reached.

New Hampshire's Metcalf notes that, even with his state's modest pre-financing program, federal funding continues to be inadequate. New York's Metzler says the state is not getting the authorized 30% federal participation, to say nothing of the maximum of 55% Congress had authorized. Of the 481 municipally owned waste water treatment plants in the state, 236 have been upgraded. The rub is that 358 additional plants will be needed to get the whole job done in New York.

Permits

Most states have some type of permit system. But permits differ. Are they for discharges? Construction? Operation? Or all three? For whom? Municipalities or industries, or both?

The states without permit systems include Arizona, California, Colorado, and Wyoming, for example. To say that a state has a permit system is not to imply that the system is exactly the same as that of another state. (Nor, for that matter, does it guarantee that the permit system is enforced, reviewed, or operated at the same level of excellence in any two states.)

But the one big thing that is new to state administrators is a federal requirement for them to pass judgment on construction and operations, so that their state water quality standards are not violated. The new requirement for certification by state officials was contained in the 1970 Water Quality Improvement Act. North Carolina adopted its procedure in this regard on Oct. 13, 1970; other states are in

the throes of writing this language into their state laws. Although Arizona does not issue permits for industrial discharges at the present time, rules and regulations requiring permits are being considered.

Rather than a permit system, California has established requirements for waste discharges which include a monitoring program and quarterly monitoring reports. These requirements are periodically reviewed for consistency. Colorado has no type of permit system; Connecticut reviews its permits at no more than five-year intervals; Missouri reviews its permits annually.

States with actual industrial discharge permits include Iowa, Maryland, and Ohio. Others with permits include South Dakota and Texas. But many states having industrial discharge permits simply do not have the necessary manpower to make the system work.

Other states require permits for construction and operation. Florida's new permit rule, which became effective March 3, 1970, requires both construction and operation permits for new facilities and operating permits for pre-existing sources of air and water pollution. Operating permits for these sources may be issued temporarily when it is found that the facility does not meet the state pollution control codes. Temporary permits are then issued, provided that the facility will take steps to meet the codes within a reasonable period, which is spelled out in the temporary permit.

In New York, construction permits are issued to an industry for a specific

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project to treat a specific waste water stream. After a treatment facility is constructed, an application is made for an operation permit. The permit is issued if the facility has been constructed in accordance with the approved report and plans. It's good for five years or less, says New York's Metzler. In many cases, permits are limited to one year or less, because of the types of treatment proposed and their lack of proven success.

Standards

Water quality standards have been a perennial issue, at least since the deadline of June 30, 1967, when they were originally due. All states have standards approved, but they are laced with exceptions. Many basic issues regarding the importance of temperature and dissolved oxygen have not been settled. Consequently, exceptions in standards have not been resolved, despite the fact that resolution was a priority item slated by FWQA for completion by the beginning of 1969.

The first 10 standards were approved with reasonable dispatch. But shortly after the 1967 deadline for state standards, former Secretary of Interior Udall's team of consultants announced its guidelines for criteria (usually referred to as the green book). Then, Interior's interdepartmental task force—comprising other in-house agencies, such as its Bureau of Commercial Fisheries, Bureau of Sport Fisheries and Wildlife, and others—began to look also at state standards. With the green book in hand, Interior's "new, green team" began, in effect, to interpret the

guidelines as standards. In any event, the point has been made repeatedly that the task force became the tail wagging the FWQA dog. The result was that standards were then being approved with many exceptions. The exceptions in many standards for dissolved oxygen, temperature, and salinity exist to this day.

One valid complaint of state administrators is that considerable manpower, time, and money were consumed in the discussion of these issues. Of course, during this time, state energies were directed away from the day-to-day water pollution activities.

The question that remains unanswered—if not down right impossible to answer—is how can state administrators pass judgment on certification issues until the basic issues of temperature, dissolved oxygen, and salinity are resolved? Perhaps not until basin plans are completed can we have a standard for a particular body of water. The consensus maintains that states should be permitted to set stricter standards than those indicated in the federal guidelines, perhaps with certain exceptions. Specifically, the exceptions might be in the situation where an industry is one which operates nationally, and where individual state controls would pose a nonuniform standard for the industry in certain states.

Secondary treatment

In the unending round of water pollution control gamesmanship, secondary treatment is an old issue. It stems from the now infamous (to state officials) guideline No. 8, which was only

one in a series of unilateral moves that the Johnson administration took. The guideline required treatment of waste waters to a level which would not degrade the quality of the receiving stream. In practice, this has been interpreted by FWQA to mean secondary treatment. Secondary treatment subsequently became a requirement which had to be fulfilled before a state could receive federal construction funds.

Although it was a requirement for funds, secondary treatment is by no means practiced throughout the U.S. Certain coastal states, including California, Massachusetts, and Washington, are to this day exempt from the requirement.

It was the issue of secondary treatment over which the first federal enforcement action was taken against a municipal polluter. As early as 1957, a court decision ordered the city of St. Joseph, Mo., to install secondary treatment facilities for its waste waters. However, according to one official, only 50% of its municipal wastes receive such treatment today.

In an earlier review of water pollution control progress in the U.S. ("Water pollution—coast to coast," *ES&T*, September 1969, page 804), federal officials noted that several large cities did not provide secondary treatment for their wastes. These included Pittsburgh, Cincinnati, and Louisville. To do so would cost considerable sums of money. There are small towns in Colorado and Utah, for example, that do not presently provide secondary treatment. But on the whole, wastes from these towns are adequately treated.