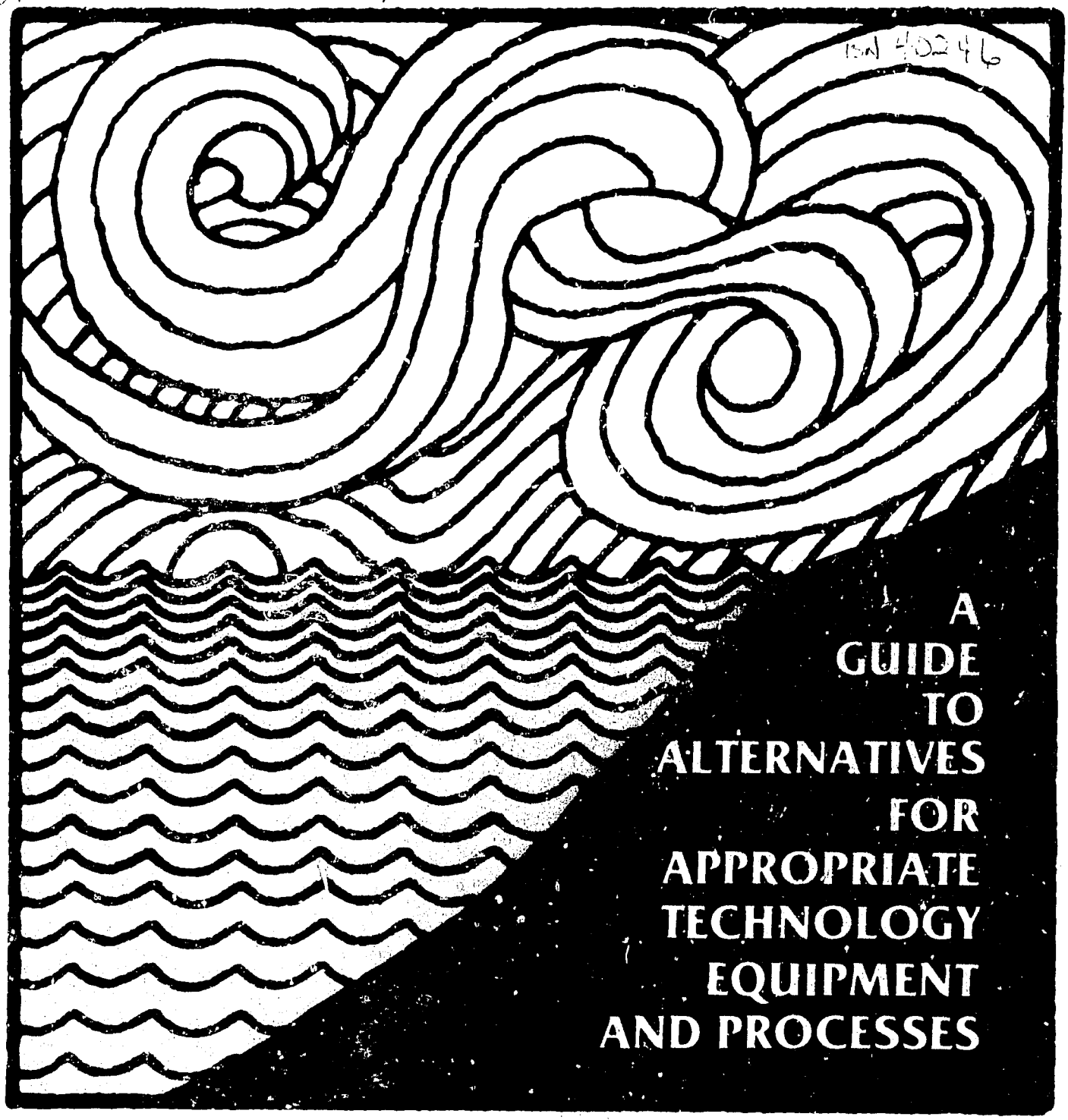


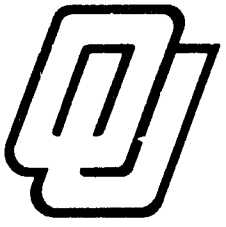
CATALOG OF WATER AND WASTEWATER TREATMENT PROCESSES, EQUIPMENT AND MANUFACTURERS

THE UNIVERSITY OF OKLAHOMA
BUREAU OF WATER AND ENVIRONMENTAL RESOURCES RESEARCH
Sponsored by: U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C.

PN-AAC-841

CATALOG OF WATER AND WASTEWATER TREATMENT PROCESSES, EQUIPMENT AND MANUFACTURERS

Prepared by:
George Reid
Charles W. Unsell
Thomas E. White



BUREAU OF WATER AND ENVIRONMENTAL RESOURCES RESEARCH
THE UNIVERSITY OF OKLAHOMA, NORMAN, OKLAHOMA, 1978
Sponsored by: U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C.

ACKNOWLEDGEMENTS

This catalog was prepared by the staff of the Bureau of Water and Environmental Resources Research, University of Oklahoma and with technical assistance from the Office of Health, Agency for International Development (U.S. AID), U.S. Department of State. Funding was provided by U.S. AID through a contract with the Bureau of Water and Environmental Resources Research.

Appreciation is given to the hundreds of manufacturers of water and wastewater equipment in the United States and Overseas who responded to the request for technical literature. Although we were unable to include all the information received all manufacturers are listed in the "Directory Section" of this catalog.

CONTENTS

LIST OF TABLES

SECTION I

INTRODUCTION

For the typical person working in a technological field, it has become increasingly difficult to maintain a complete knowledge of the latest technologies and related equipment. Such is the case in water treatment and wastewater treatment. Up to now, the knowledge of the industry, as a whole, has rested primarily with trained engineers and technicians. It is very likely that many of these engineers and technicians do not have the latest and most complete view of the industry, simply because of the wide diversification of products and rapid innovations. The user of a particular technology is placed in a position of evaluation and selection and must weigh many factors before allocating funds to provide a water treatment or wastewater treatment facility. The most obvious factor is the accomplishment of the desired goal along with an appropriate economic evaluation. However, unless the user can evaluate all possible alternative technologies and available equipment, he is placed at an obvious disadvantage. Without a complete view of all technologies, there is no means of evaluating the appropriateness of the alternatives.

This catalog is an attempt to acquaint the potential user of water and wastewater treatment technologies with the latest in processes and alternative equipment requirements. With a guide to alternatives, the user should become more knowledgeable and better able to communicate with experts in the field. The catalog is intended as a companion for Appropriate Methods Of

Treating Water And Wastewater In Developing Countries.* This book provides a means to select the most appropriate alternative treatment processes based primarily on a community's needs and ability to provide for these needs. After preliminary determinations are made, the catalog can be used to provide technical information.

The catalog is basicaliy a resource for water and wastewater treatment equipment and manufacturers. Process descriptions are given along with equipment descriptions. More importantly, however, the equipment requirements for each process are detailed in an effort to provide a precise description of each process. To furnish this information to the user, manufacturer's brochures are included in part of this catalog. It should be emphasized that the catalog is not an inclusive listing of all equipment and manufacturers in the water and wastewater treatment field. The information was obtained through written correspondence with United States, European, and Japanese manufacturers identified primarily through manufacturer guides and advertisements in trade journals. The response was excellent and every effort was made to let the technical literature from the manufacturer provide the descriptive information for the catalog. Not every brochure received could be placed in the catalog, but a representative selection for each specified equipment listing was chosen for inclusion. The brochures provide both visual and technical specifications of equipment, and some describe complete treatment processes. In some instances detailed drawings and schematics provide the user with invaluable information related to design.

The catalog includes a listing of the manufacturers that responded to

---

* APPROPRIATE METHODS OF TREATING WATER AND WASTEWATER IN DEVELOPING COUNTRIES, Bureau of Water and Environmental Resources Research, The University of Oklahoma, Norman, Oklahoma. Developed under contract with U.S. Agency for International Development.

inquiries concerning their products and services. The listing provides the manufacturer's name, address, and equipment. This should provide a valuable bridge between user and manufacturer, particularly when costs are required. Specific costs are not provided for all products in the catalog and the user is urged to obtain this particular information from the source.

As supplemental information, the catalog also provides a general description of skill levels, manpower requirements, and community levels for each identified process.

SECTION II

CATALOG USE

The primary function of the catalog is to provide a guide to available equipment for each of the water and wastewater treatment processes identified. The emphasis is placed on equipment manufacturer and technical descriptions. A code system is utilized for both process and equipment identification.

The "Process Summary" section provides the user with a brief overview of the processes, along with the corresponding codes. Information concerning skill levels, manpower requirements, and equipment needs are provided in general terms to allow for a first stage comparison between processes. It is assumed that the selection of alternative processes has been previously accomplished before the catalog is to be utilized.

The detailed process and equipment listings in Section IV is the primary functioning section of the catalog. The user should first become familiar with the equipment categories identified, the corresponding code designations, and detailed descriptions for each category. The user can then identify the required equipment for each process with the Process/Equipment matrix (Table IV.2). Identification is by code (code identifier, Section III), for process and equipment. Representative manufacturers' brochures are provided to complement the equipment listing. These are a valuable source for descriptive, visual, and technical information. An attempt was made to provide a wide range of equipment capability and complexity. Descriptions of processes by manufacturers are also included. Manufacturers are listed for each category of equipment.

Section V, "Manufacturer Directory", provides a reference source to identify potential manufacturers. Included are addresses and a listing of equipment manufactured. If additional information is required from manufacturers not specifically referenced in the catalog, the user should consider alternative sources such as trade journals and publications, manufacturers' indexes, and governmental listings.

The following summarizes the use of the catalog:

1. Alternative processes are selected before actual use of catalog.
2. The Process Summary provides:
   a. Process identification summary and code identifiers.
   b. Process skill levels.
   c. Process manpower requirements.
3. Familiarization with equipment categories, codes, and descriptions.
4. Selection of appropriate equipment for each process matrix.
5. Reference back to equipment listing for specific equipment requirements and alternatives by manufacturers.
6. When potential equipment is identified by manufacturer, Section V provides the address.

The catalog provides a bridge between process alternative identification, and the specific identification and selection of equipment by manufacturer for each process. Cost comparisons for each process can be found in "Prediction Methodology for Suitable Water and Wastewater Processes", Technical Paper No. 8, WHO International Reference Center for Community Water Supply, September 1976. This publication also includes per capita cost parameters in U.S. dollars.

SECTION III

PROCESS SUMMARY

This section gives the user a concise reference to the types of water and wastewater treatment processes. Included are brief descriptions of each process, the major categories of equipment requirements and community level identifiers for each process. Detailed information for each process and required equipment will be found in Section IV. It should be noted that a code identifier is used for each process. The process codes are taken from the categories developed in the WHO Technical Paper No. 8, "Prediction Methodology for Suitable Water and Wastewater Processes". The code identifiers for the equipment categories were developed specifically for this catalog.

Tables III.1 and III.2 identify the water and wastewater processes respectively with the appropriate codes.

TABLE III.1

WATER TREATMENT PROCESS/CODE IDENTIFIERS

CODE	PROCESS
PW1	No-Treatment
PW2	Pre-Treatment
PW3	Slow Sand Filtration
PW4	Rapid Sand Filter-Conventional
PW5	Rapid Sand Filter- Advanced
PW6	Softening
PW7	Disinfection
PW8	Taste-Odor - Fe, Mn
PW9	Desalting - Saltwater
PW10	Desalting - Brackish
PW11	Containment Filters

TABLE III.2

WASTEWATER TREATMENT PROCESS/CODE IDENTIFIERS

CODE	PROCESS
PS1	Primary - Conventional
PS2	Primary Stabilization Pond
PS3	Sludge - Conventional
PS4	Sludge - Advanced
PS5	Sludge Combined - Imhoff
PS6	Secondary - Standard Filter
PS7	Secondary - High Rate Filter
PS8	Secondary - Activated Sludge
PS9	Secondary Extended Aeration (Oxidation Pond)
PS10	Disinfection - Chlorine
PS11	Aqua-Culture
PS12	Dilution
PS13	Individual
PS14	Individual (Advanced)

PROCESS SUMMARY DESCRIPTION

WATER

PW1.-- No-treatment: Use of existing ground water or catchment control with no treatment before use.

PW2.-- Pre-treatment: Control of turbidity and algae through use of sand filters, thermocline control and chemicals.

PW3.-- Slow Sand Filtration: Separation of water and suspended matter through the use of a relatively large bed of unstratified sand resting on a gravel bed.

PW4.-- Rapid Sand Filter - Conventional: Separation of water and suspended matter through the use of a stratified sand bed using conventional, surface agitation, dual media, and upflow methods.

PW5.-- Rapid Sand Filter - Advanced: The use of multimedia, plate or tube settling, or polyelectrolytes with the rapid sand filter process.

PW6.-- Softening: The use of lime soda and zeolites to remove excess ions of calcium and magnesium.

PW7.-- Disinfection: The use of chlorine, iodine, ozone, ultra violet, lime, and heat to kill pathogenic organisms.

PW8.-- Taste, Odor, Fe, Mn: The use of aeration, zeolite, chlorine or absorbents to remove taste, odor, Fe, Mn., from a water supply system.

PW9.-- Desalting - Saltwater: The use of pressure, multiple effect evaporation or the freezing process to reduce a salt concentration of 35,000 mg/L to less than 1000 mg/L.

PW10.- Desalting - Brackish water: The use of electrodialysis, reverse osmosis and chemicals to reduce a salt concentration of 1000 mg/L - 35000 mg/L to less than 1000 mg/L.

PW11.- Containment filters: Specilized filter systems described as: coconut fiber/charred rice husks; asbestos/charred pine needle; pea-gravel; and Dunbar.

WASTEWATER

PS1.-- Primary; Conventional: The removal of suspended solids and some BOD through the use of clarifiers and sedimentation basins.

PS2.-- Primary; Stabilization Pond: Removal of suspended solids in a quiescent settling pond using basically no constructed facilities.

PS3.-- Sludge; Conventional: The dewatering of sludge from the primary treatment stage by sludge drying beds, incineration or other heating processes.

PS4.-- Sludge; Advanced: The dewatering of sludge utilizing a wet oxidation process or land application.

PS5.-- Sludge Combined; Imhoff: A constructed two-story tank used for both sedimentation and digestion of solids.

PS6.-- Secondary; Standard Filter: The use of a standard trickling filter and bacterial action to remove colloidal and dissolved organic matter from the primary clarifier effluent.

PS7.-- Secondary; High Rate: The use of higher loading rates accomplished through a recirculation process.

PS8.-- Secondary; Activated Sludge: System in which the flocculated biological growths are continuously circulated and contacted with organic wastewater in the presence of oxygen.

PS9.-- Secondary; Extended Aeration: More time is provided in the aeration process to allow for oxidizing the biodegradable portion of the sludge.

PS10.- Disinfection: Use of chlorine to kill pathogenic organisms.

PS11.- Aqua-Culture: Utilization of waste effluent as a food source for fish and plant life in controlled ponds and lagoons.

PS12.- Dilution: Reduction of waste levels by incorporation in large volumes of water.

PS13.- Individual: Sewerless system used primarily for individual dwellings or on-site systems.

PS14.- Individual-Advanced: Sewerless, individual system using chemical and thermal treatment of waste.

The Process versus Manpower Requirements matrices (Tables III.3 and III.4) give a listing by skill level of the number of people required for each process based on population level. The three manpower categories are unskilled, skilled and professional. The skill level population range is as follows:

Level 1:	500	-	2,499
Level 2:	2,500	-	14,999
Level 3:	15,000	-	49,999
Level 4:	50,000	-	100,000

The specific jobs for each skill level include the following:

Unskilled:	Laborer Custodian Automotive Equipment Operator Maintenance Helper
Skilled:	Clerk Typist Electrician Laboratory Technician Maintenance Mechanic Maintenance Supervisor Mechanic Maintenance Foreman Operations Supervisor Operator Painter Shift Foreman Storekeeper
Professional:	Chemist Assistant Supervisor Supervisor

TABLE III.3

WATER PROCESSES VS. MANPOWER REQUIREMENTS
FOR POPULATION LEVELS

PROCESS \ MANPOWER REQUIREMENTS	Level	Unskilled	Skilled	Professional
PW 1	1	1		
	2	2		
	3	4		
	4	8		
PW 2	1	1	1	
	2	1	1	
	3	3	2	
	4	5	4	
PW 3	1	1		
	2	2		
	3	5		
	4	8		
PW 4	1	1	1	
	2	1	1	1
	3	8	2	1
	4	10	3	1
PW 5	1	1	1	1
	2	1	1	1
	3	6	2	2
	4	10	5	2
PW 6	1	1	1	1
	2	1	1	1
	3	6	2	2
	4	10	5	2
PW 7	1	1		
	2	1	1	
	3	2	1	1
	4	4	1	1
PW 8	1	1	1	1
	2	1	1	1
	3	6	2	2
	4	10	5	2
PW 9	1	1	1	1
	2	1	1	1
	3	6	2	2
	4	10	5	2
PW10	1	1	1	1
	2	1	1	1
	3	6	2	2
	4	10	5	2
PW11	1			
	2			
	3			
	4			

TABLE III.4

WASTEWATER PROCESSES VS. MANPOWER REQUIREMENTS

FOR POPULATION LEVELS

PROCESS / MANPOWER REQUIREMENTS	Level	Unskilled	Skilled	Professional
PS1	1	1		
	2	1		
	3	2	1	
	4	4	2	
PS2	1	1		
	2	2		
	3	4		
	4	6		
PS3	1	1	1	
	2	1	1	
	3	2	1	
	4	4	2	1
PS4	1	1	1	
	2	1	1	
	3	2	1	
	4	4	2	1
PS5	1	1	1	
	2	1	1	
	3	2	1	
	4	4	1	
PS6	1	1		
	2	1	1	
	3	4	1	1
	4	6	2	1
PS7	1	1		
	2	2	1	
	3	4	1	1
	4	6	1	1
PS8	1	1	1	
	2	2	1	
	3	4	1	1
	4	8	2	2
PS9	1	1	1	
	2	2	1	
	3	4	1	1
	4	6	2	1
PS10	1	1		
	2	2		
	3	4	1	1
	4	6	1	1
PS11	1			
	2			
	3			
	4			
PS12	1			
	2			
	3			
	4			
PS13	1			
	2			
	3			
	4			
PS14	1			
	2			
	3			
	4			

SECTION IV

PROCESS AND EQUIPMENT DESCRIPTION

This is the primary working section of the catalog. It emphasizes the equipment requirements for each of the identified processes and provides information for the various categories of equipment for a wide range of costs and complexities. As defined in Section II the process and equipment listings enable the user to proceed from alternative process selections to the general selection of equipment. Included in the selection process are technical and verbal descriptions of equipment provided by the manufacturers.

The processes are described briefly, and manufacturer's brochures are included when they provide appropriate process descriptions. The reader is referred to Chapters VII and VIII, of Appropriate Methods of Treating Water and Wastewater in Developing Countries for descriptions of appropriate processes and operations of water and wastewater treatment.

As with the process identification, a code system (Table IV.1) has been developed for the equipment categories defined in the catalog. These detailed equipment listings provide brief descriptions of each equipment category along with selected manufacturer's brochures. It is assumed that the brochures will be used for specific equipment specifications and manufacturer identification.

A listing of manufacturers for each equipment category is given in an attempt to provide the user a quick reference to manufacturer and equipment. This list corresponds to those companies that have a strong interest in international markets and provided literature to accompany this catalog.

The detailed information for each manufacturer is given in Section V of the catalog.

The preliminary identification of equipment with process is given in Table IV.2 "Process versus Equipment". The codes are used for both process and equipment. The matrix should be used as the basic reference source in the catalog.

Process Descriptions

Water and wastewater treatment processes (with code identifier) are discussed below for user consideration. These processes represent alternative technologies available to developing countries for water and wastewater treatment coverage. The material and equipment limitations of particular processes are mentioned within the descriptions.

Water

PW1 No Treatment

Untreated water utilized for domestic purpose may be limited by the source's quantity, quality, and proximity to the consumer. Sources of water to be considered include precipitation, natural springs, and surface waters such as lakes and rivers. Man-made projects such as wells and river impoundments are often more realistic alternatives. However, considering sanitary and reliability factors, the preferred source will be groundwater or springwater recovered at short distances from the user.

The major consideration to a community is the transport and distribution of the water to the people. Equipment needed includes pumps (handpumps or submerged well types, for example), pipe and aqueduct systems, pipe appurtenances (valves, joints, stops, and fittings), storage facilities, and service connections and/or standpipes.

PW2 Pre-treatment

Pre-treatment of raw water consists of superficial clarification for reduction of contaminents such as float debris, suspended solids, algae, and undesirable gases and odors. The factors affecting the degree of pre-treatment necessary for a particular water source will depend on the type(s) and amount of pollution or contamination present. Treatment operations such as grating and screening, aeration and sedimentation are typical of pre-treatment. Algal control by chemicals, screening, thermocline or intake manipulation may be necessary for certain waters.

Screening operations, which are fundamental preliminary treatment processes, consists of bar screens, medium screening or microscreens, capable of removing minute particulates. Usually, screening is a prelude to sedimentation or another liquid-solid separation process by use in intake structures. Plain sedimentation is the simplest means of turbidity abatement. Alternatives include tube settlers or other clarifiers, with or without prior flocculation/coagulation treatment.

PW3 Slow Sand Filtration

This process separates suspended matter from water through the use of large beds of unstratified sand resting on gravel. The rate of operation is approximately 50 gpd/sq. ft. Solids which accumulate at the surface must be removed periodically to preclude the clogging of the filter. Normal filter runs are 20-30 days.

The filtration process is a function of several mechanisms including straining sedimentation, flocculation, and biological activity. The straining process occurs principally at the interface between the filter media and the water to be filtered. A mat deposit builds as the amount of material deposited increases. When considerable organic matter is

present in the water, bacteria will grow within the surface mat and use the deposits for food thus increasing the removal of objectionable material.

The conventional filter is manually cleaned and requires a relatively large surface area. The upflow process brings water in from the bottom of the filter and forces it out the top. The cross-flow filter brings the water horizontally across the filter. Present limitations include a high potential for clogging from leaves, clay and other similar material. The dual media process utilizes sand and coal as the media thereby providing a better gradation and longer runs between washing cycles. It is perhaps more economical in operation. The media should have an effective size of 0.15-0.35 mm and a uniformity coefficient of 1.5 and 3.0. The range of workable sizes for slow sand filters is approximately 100 m^2 to over 2000 m^2.

PW4 Rapid Sand Filter - Conventional

The rapid sand filter provides an increased rate of filtration, 2-5 gpm/ft^2, by the use of stratified media and other techniques such as surface agitation, dual media and upflow. The use of coagulation in pre-treatment is a requirement along with a backwashing process for cleaning with usually 50% expansion.

The filter run ranges from 12-72 hours with a head loss of from 1 ft to 10 ft final. A typical size for a rapid sand filter is 1 mgd. Aggregate is usually 0.6mm es, uc 1.6.

PW5 Rapid Sand Filter - Advanced

The basic process description is the same as for PW4. The advanced rapid sand filter utilizes different techniques of removal; primarily the media is a multimedia, of sand, garnet and coal. Tube settling is also used as a means to obtain more effluent run in a rather confined area. The use of polyelectrolytes, biflow, dynamic and valveless systems have also been used

to some degree of success in the rapid sand filter process.

Some are designed without settling called "in-depth" filtration.

PW6 Softening.

The softening process functions to reduce the content of calcium and magnesium cations of a hard water so as to remove its soap consuming properties and to minimize its scale-forming tendencies in hot water systems. Softeners or softening techniques are often used in municipal water treatment plants to produce a water of desired lower hardness for direct distribution to consumers or for blending with process waters.

The commonest method of removing temporary hardness (carbonate constituents) is with the addition of lime or calcium hydroxide. The basic equation is :

$$Ca(HC)_3)_2 + Ca(OH)_2 \rightarrow 2CaCO_3 + 2H_2O$$

The calcium carbonate is relatively insoluble in water and precipitates out. With this process complete mixing and ample time for sedimentation is necessary to produce the desired effect. Lime treatment does not remove permanent hardness (noncarbonate constituents) and must also incorporate soda ash if this removal is desired. This equation is :

$$CaSO_4 + Na_2CO_3 \rightarrow CaCO_3 + Na_2SO_4$$

Removal of magnesium hardness (temporary) requires two steps. The first:

(1) $Mg(HCO_3)_2 + Ca(OH)_2 \longrightarrow MgCO_3 + CaCO_3 + 2H_2O$

Since the magnesium carbonate is soluble a second step is required:

(2) $MgCO_3 + Ca(OH)_2 \longrightarrow Mg(OH)_2 + CaCO_3$

The magnesium hydroxide is relatively insoluble and precipitates.

The removal of permanent magnesium hardness is also a two step procedure involving the use of soda ash and calcium carbonate.

(1) $MgSO_4 + Na_2CO_3 \longrightarrow MgCO_3 + Na_2SO_4$

(2) $MgCO_3 + Ca(OH)_2 \longrightarrow Mg(OH)_2 + CaCO_3$

The quantities of reagents needed and other factors affecting the efficiency of the process must be determined by analysis of the water.

Ion exchange water softening involves the removal of calcium and magnesium ions by exchanging them with soluble sodium ions. This is done by passing the hard water through a bed of exchange media of zeolite or other exchange resins. When the softening capacity of the ion bed is exhausted, the unit is regenerated by a three step procedure: (1) backwashing, (2) brining, (3) rinsing.

PW7 Disinfection.

Disinfection of water supplies involves the removal of pathogenic organizms from process water using various chemical agents or unit processes. These mechanizms include coagulation, sedimentation, filtration, and chlorination or comparable treatment. Alternatives to chlorination include the use of other halogens such as bromine or iodine, the use of triatomic oxygen (ozone), or the use of ultraviolet or radioactive sources. Additionally, activated carbon has been reported to effectively remove pathogens.

Chlorination of water for purposes of disinfection normally involves the use of two forms: the gaseous element (Cl_2) or a solid or liquid chlorine containing a hypochlorite compound. Chlorine dioxide, a very powerful oxidant, has seen limited use as a disinfectant in recent years and may offer various advantages over chlorine in specific situations. In instances where limited amounts of disinfectant are required, or under conditions of intermittent usage, hypochlorite compounds are popular.

Chlorine reacts with water to form hypochlorous and hydrochloric acids in chlorine water from vacuum chlorinators. Depending upon the pH of the

process water, the hypochlorous acid will partially or wholly dissociate into a hypochlorite ion very rapidly. These compounds (hypochlorous acid and hypochlorite ion) contain the free chlorine residual which is available for interaction with pathogens or chemical constituents of the water. The free chlorine residual will readily react with nitrogenous compounds to form a combined residual. This is also available for germicidal action but on a much less efficient basis than the free residual, of which hypochlorous acid is the most effective. Break point chlorination is required if the water contains sufficient free ammonia to result in the formation of a combined available chlorine residual.

Hypochlorites such as sodium hypochlorite and calcium hypochlorite ionize in water to hypochlorite ion with a tendency to increase pH. The production of hypochlorites are generally on-site operations involving the use of brine or saltwater solutions and electrolytic generators. Facilities using gaseous chlorine should take precautions to insure elimination of risks involved in handling and storage of the element.

PW8 Taste-Odor - Fe, Mn.

The sources of taste and odors in water include the presence of organic material such as algae, fungi, protozoa, decaying vegetation and slime forming organisms. Dissolved gases and mineral substances from municipal and industrial sewage also constitute a large proportion of the problem.

The control of taste and odor include the use of aeration, which is particularly successful in the removal of volatile chemicals at the air-water interface. The use of oxidizing agents is also particularly successful. Chlorination and the use of chlorine dioxide helps control phenolic compounds by production of a non-odorous substance. The use of activated carbon in an absorption process also controls taste and odor successfully.

The removal of iron and manganese is either by a precipitation process or through the use of ion exchange or zeolite in a reduced soluble form.

PW9 Desalting - Saltwater

This process reduces a salt concentration of 35,000 mg/L to less than 1000 mg/L through the use of the multiple effect of evaporation, freezing process, or pressure. Operations with a capacity of up to 30,000 m^3/day are now in operation.

The evaporation process consists of heating the water to evaporation and then condensing the vapor to recover the pure water and salt solution. The multiple-effect process carries out a stage evaporation where the vapor is evaporated at lower temperatures.

The freezing process takes seawater to a temperature of 17°F where pure ice crystals are formed leaving a very highly concentrated salt solution.

The use of pressure increases the effects of temperature in an evaporation process, whereby the pure water is separated from the brine solution.

PW10 Desalting - Brackish

This process will reduce a salt concentration of 1000 mg/L through the use of electrodialysis and reverse osmosis.

Electrodialysis uses a series of cation-permeable membranes and anion-permeable membranes along with an electrical current to alternately attract the Na+ ions and Cl-. The ions will concentrate in a particular series of chambers with the result being pure water concentrated in an alternate series of chambers.

Reverse osmosis uses pressure to force fresh water through a membrane while rejecting dissolved salts through this same membrane.

PW11 Containment Filters

These are specialized filter systems developed primarily for use in countries without the ability to handle sophisticated treatment systems. These filters make use of available material in a country as the media. As examples of this media, coconut fiber/charred rice husks and asbestos/ charred pine needles have been utilized with some degree of success.

Wastewater

PS1 Primary - Conventional

The primary treatment process uses a clarifier or sedimentation tank to remove 40-70% of suspended solids. Flocculation is also used to increase the colloidal material removal. The BOD removal is approximately 20-40%. Sreeens, grit chambers, skimming tanks, comminuters, and fine screens are utilized in this removal process.

PS2 Primary - Stabilization Pond

This process is used primarily to remove 40 - 70% of the suspended solids through a quiescent settling pond. No outside material is used except a preliminary screening procedure.

Lagoons or ponds can be further classified as anaerobic, aerobic, mature and facultative.

PS3 Sludge - Conventional

Primary sludge is the solid material separated in the primary stage of treatment. The general process associated with sludge is a dewatering procedure to allow for adequate disposal. The conventional procedure is through the use of sludge-drying beds, where sludge is dried on open or covered sand beds. Other processes available include incineration, vacuum filtration, and various heating processes.

PS4 Sludge - Advanced

As with the conventional process the sludge is to be disposed of and must be dewatered. Incineration is the primary method of disposal. Also, conversion to a fertilizer product for a land application use is also part of the advanced sludge process. The Zimpro-Pyrolysis process is a wet oxidation method of incineration that uses a principal of wet combustion to degrade the organic matter in the sludges. Compressed air is forced into the system to supply the required oxygen.

PS5 Sludge Combined - Imhoff

The Imhoff tank consists of a two-story tank where sedimentation is accomplished in the upper compartment and digestion is accomplished in a lower compartment. The settled solids pass through slots into the unheated compartment for digestion. The digested sludge is dried on beds of sand similar to slow sand filters.

PS6 Secondary - Standard Filter

In a secondary treatment process, bacteria in combination with oxygen is utilized to remove colloidal and dissolved organic matter from the primary clarifier effluent. The bacteria are controlled in the standard trickling filter with a removal rate of 70 - 80% suspended solids and 40 - 75% BOD and requires secondary clarification. The usual depth is 8 - 10ft and the usual loading is 1 - 3 mgd.

PS7 Secondary - High Rate Filter

High rate filters, bio-filters, accelo-filters, and aero-filters allow for a continuous and higher loading rate. This is accomplished through recirculation in the filtering portion of the treatment process by various means, including secondary clarification. Loading rate is 10 - 30 mgd, aggregate 1 - 3" size, and recirculation ratio 1 - 6.

PS8 Secondary - Activated Sludge

The activated sludge process is defined as a system in which the flocculated, biological growths are continuously circulated and contacted with organic wastewater in the presence of oxygen. Settled biological sludge is recycled to the aeration tank for admixture with additional waste. The oxygen is usually supplied from air bubbles injected from diffusers into the sludge liquid mixture under turbulent conditions or from mechanical turbines or surface aerators. The major portion of the BOD is readily removed in a short detention period by flocculation and agglomeration of the suspended BOD and absorption of the colloidal BOD. These organics then undergo oxidation and synthesis. The BOD removal is 85 - 90%, and requires secondary clarification, recirculation of approximately 25% by volume. There are many variants, step-aeration, biosorption, etc. Hydraulic retention time of 4 - 8 hours, solid level 2,000 - 4,000 mg/1 are typical design criteria.

PS9 Secondary - Extended Aeration

The extended aeration process provides more time in the aeration process to allow for oxidizing the biodegradable portion of the sludge synthesized from the removed organics. Excess sludge is only the non-biodegradable residue remaining after complete oxidation. Retention time is several days.

PS10 Disinfection

The reduction of MPN coliform is accomplished by feeding hypochlorites or gaseous chlorine to effluent discharges. Chlorination may also be used during advanced treatment processes to control organizm population in situ.

PS11 Aqua-Culture

Waste effluents can be used as food sources through the application of fish and plant culture. Typically lagoons or ponds use waste effuents for culture of fishes and/or plants with dilutions of clean water to wastewater

varying from two to five. Some applications have used aquatic fowl, such as ducks, to remove plant and animal life associated with such ponds.

Although rough species appear to be more applicable to such processes, successful use of game fishes has been reported. Catfish, minnows of various types, and sunfish of various kinds are recommended. One particular species, Tilapia nilotrica, has demonstrated considerable ability to uptake sewage effluent.

Limiting factors involving fish culture concern dissolved oxygen, pH variations, suspended solids, pathogens, toxins and other properties of the effluent. Effluents exhibiting extreme BOD could have immediate detrimental effects. Vascular aquatic plants such as water hyacinth and various reeds are often grown in lagoons for economic and aesthetic reasons.

PS12 Dilution

The dilution process uses the basic concept of a large volume of water being able to reduce unacceptable levels of water contaminates by incorporating the contaminated water into the larger volume. Coarse removal by screening along with chemical precipitation is utilized before the dilution process.

Generally, primary treatment requires 20:1 dilution, no treatment 40:1, complete conventional treatment 4:1.

PS13 Individual

The individual treatment process is a sewerless system used primarily for individual dwellings. The two systems most commonly recognized are the septic tank and the sanitary pit privy. Systems have been developed which utilize an anaerobic process for waste decomposition. The Clivus Multrum is one of these.

The septic tank utilizes the soil in the immediate vicinity of the

dwelling as the disposal site. The pit privy also utilizes the ground as a disposal site. The Clivus Multrum, however, traps the wastes in a tank and provides for anaerobic digestion of the organic material.

Equipment Description

The following equipment characterizations are a guide to the manufacturer's advertising and specification literature. Each equipment "type" has been assigned an EW_i or ES_i number thereby identifying the listing for water or wastewater usage respectively. These types represent products available from manufacturers, but do not necessarily adhere to manufacturer's classification schemes. Within this context, the catalog user should understand that all of the listings are not intended as specific guidelines for equipment purchase or construction.

Each topic is followed by a brief description and definition of the equipment in question. These entries are further subdivided into categories indicative of available products and materials and their possible applications.

Detailed descriptions and illustration pertaining to product characteristics, specifications, operation, performance and installation can be found in the manufacturer's brochures.

The following tables are a quick reference to process equipment and manufacturers:

1. Table IV.1 Equipment Category Listings with Code Identifiers
2. Table IV.2 Water and Wastewater Treatment Processes Vs. Equipment
3. Table IV.3 Equipment/Manufacturer and Code

TABLE IV.1

EQUIPMENT CATEGORY LISTINGS WITH CODE IDENTIFIERS

Equipment	Code Identifier	Equipment	Code Identifier
1. Aerators	EW12, ES12	16. Flumes and Weirs	EW 6, ES 6
2. Biological Units and Reactors	ES28	17. Gates	EW 4, ES 4
3. Blowers	EW11, ES11	18. Mixers	EW 9, ES 9
4. Chemicals	EW27, ES27	19. Package Units and Systems	EW26, ES26
5. Chemical Feeders	EW10, ES10	20. Pipe and Pipe Appurtenances	EW 2, ES 2
6. Clarifiers and Reactors (Physico-Chemical)	EW17, ES17	21. Process Instrumentation	EW20, ES20
7. Coatings and Linings	EW13, ES13	22. Pumps	EW 5, ES 5
8. Comminutors and Separators	EW 8, ES 8	23. Screens, Grates and Sieves	EW 1, ES 1
9. Desalination Equipment	EW22, ES22	24. Settling Tanks and Units	EW16, ES16
10. Disinfection Equipment	EW14, ES14	25. Sludge Conditioning Units	EW23, ES23
11. Filtration and Adsorption Equipment	EW18, ES18	26. Sludge Dewatering Equipment	EW24, ES24
12. Filtration Media	EW19, ES19	27. Sludge Disposal Equipment	EW25, ES25
13. Flocculation Equipment	EW15, ES15	28. Softeners	EW28
14. Flotation Units	EW21, ES21	29. Valves	EW 3, ES 3
15. Flowmeters	EW 7, ES 7		

TABLE IV.2

WATER AND WASTEWATER TREATMENT

PROCESSES VS. EQUIPMENT

TREATMENT PROCESS \ EQUIPMENT	EW 1, ES 1	EW 2, ES 2	EW 3, ES 3	EW 4, ES 4	EW 5, ES 5	EW 6, ES 6	EW 7, ES 7	EW 8, ES 8	EW 9, ES 9	EW10, ES10	EW11, ES11	EW12, ES12	EW13, ES13	EW14, ES14	EW15, ES15	EW16, ES16	EW17, ES17	EW18, ES18	EW19, ES19	EW20, ES20	EW21, ES21	EW22, ES22	EW23, ES23	EW24, ES24	EW25, ES25	EW26, ES26	EW27, ES27	EW28	ES28
WATER													APPLICABLE TO MOST FACILITIES							APPLICABLE TO MOST PROCESSES	(1)					(3)			
PW 1	X	X	X	X	X	X	X																						
PW 2	X	X	X	X	X	X	X	X	X	X					X	X	X						X	X	X	X	X	X	
PW 3	X	X	X	X	X	X	X											X	X							X		X	
PW 4	X	X	X	X	X	X	X		X	X		X		X				X	X							X		X	
PW 5		X	X	X	X	X	X									X		X	X							X		X	
PW 6					X				X	X												X	X	X		X	X	X	
PW 7					X				X	X				X													X		
PW 8										X	X							X	X							X	X		
PW 9		X	X	X	X		X															X				X			
PW10		X	X	X	X		X															X				X	X		
PW11		X	X		X		X											X	X							X	X		
WASTEWATER																					(2)				(4)		(5)		
PS 1	X	X	X	X	X	X	X	X								X	X			X		X		X	X				
PS 2	X	X	X	X	X	X	X	X			X	X														X			X
PS 3		X	X		X	X														X		X	X	X	X				X
PS 4		X	X		X	X																X	X	X	X	X			X
PS 5		X	X																			X		X	X				X
PS 6		X	X															X	X			X	X	X	X				X
PS 7		X	X															X	X			X	X	X	X				X
PS 8		X	X								X	X										X	X	X	X				X
PS 9		X	X	X	X	X	X				X	X										X	X	X	X				X
PS10									X	X				X											X				
PS11	X	X	X	X	X	X						X													X				X
PS12	X	X	X	X	X			X		X															X	X			
PS13										X				X		X													X
PS14										X				X		X											X		X

1. Utilized within some water treatment processes.
2. Applicable to certain process wastewaters.
3. Available as complete water treatment plants.
4. Available as complete wastewater treatment plants.
5. Possible application to process wastewater.

TABLE IV.3

EQUIPMENT/MANUFACTURER AND CODE

Aerators (EW12, ES12)

1. Aqua Aerobic Systems Inc.
2. Bird Machine Company Inc.
3. General Filter Co.
4. Infilco Degremont Inc.
5. Lakeside Equipment Corp.
6. LFE Corporation
7. Permutit
8. Pielkenroad Separator Co.
9. Schramm Inc.

Blowers (EW11, ES11)

1. MD Pneumatics
2. Schramm Inc.
3. Whitewater Manufacturing Co.

Chemicals (EW22, ES22)

1. Allied Chemical
2. Calgon Corp.
3. Carus Chemical Co.
4. Dow Chemical
5. DuPont
6. Norit Co.
7. Petrolite Corp.
8. Philadelphia Quartz Co.
9. Taylor Chemicals
10. Union Carbide Corp.

Chemical Feeders (EW10, ES10)

1. Braukmann Controls Co.
2. Neptune Microfloc, Inc.
3. Pennwalt Corp.
4. Roberts Filter Manufacturing Co.
5. Stiles-Kem Corp.

Clarification Units (EW17, ES17)

1. Aqua-Aerobic Systems
2. Can-Tex
3. Crane-Cochrane
4. General Filter Co.
5. Hungerford & Terry, Inc.
6. Infilco Degremont Inc.
7. Met-Pro Systems
8. Parkson Corporation
9. Passavant Corporation
10. Zurn-Attisholz Industries

Coatings and Linings (EW13, ES13)

1. Atlas Minerals & Chemicals
2. B. F. Goodrich Products
3. Carlisle Corp.
4. Dow Chemical
5. DuPont
6. Rust-Oleum Corp.
7. Uniroyal
8. Watersaver Company, Inc.

Dewatering Equipment (EW25, ES25)

1. De Laval
2. Idrex Inc.
3. Infilco Degremont Inc.
4. Kason
5. Passavant Corp.
6. Pennwalt Corp.
7. Permutit
8. Resources Conservation Co.
9. Western States Machine Co.

Disinfection Equipment (EW25, ES25)

1. Aquafine Corp.
2. Badger Meter Inc.
3. Capital Controls Co.
4. Engelhard Industries
5. U. S. Ozonair
6. Wallace & Tiernan

Filtration/Adsorption Equipment (EW18, ES18)

1. Aqua-Aerobic Systems
2. Aqua-Jet
3. Crane-Cochrane
4. De Laval
5. Environmental Elements
6. Facet Enterprises Inc.
7. General Filter Co.
8. Met-Pro Systems
9. Neptune Microfloc
10. Permutit
11. Roberts Filter Manufacturing Corp.
12. Zurn-Attisholz Industries

Filtration Media (EW19, ES19)

1. B. F. Goodrich Products
2. ICI United States, Inc.
3. Neptune Microfloc
4. Norton Chemical Process Products
5. Sani-Filtration
6. Tetko

Flotation Units (EW24, ES24)

1. Envirotech
2. Petrolite Corp.
3. Pielkenroad Separator Co.

Flowmeters (EW7, ES7)

1. Badger Meter Corp.
2. Brooks Instrument Division Emmerson Electric Co.
3. Carlon Meter Co.
4. Cerad Corporation
5. Fischer & Porter
6. Gamon-Calmet Industries
7. Halliburton Services
8. Jaeco Pump Co.
9. Kent Meter Sales
10. Pennwalt (Wallace & Tiernan)

Flumes/Weirs (EW6, ES6)

1. Badger Meter Corp.
2. Filtration Equipment
3. Fischer & Porter
4. Free Flow

Gates (EW4, ES4)

1. Rodney Hunt
2. Traverse City Iron Works
3. Waterman Industries

TABLE IV.3 (Continued)

EQUIPMENT/MANUFACTURER AND CODE

Mixers (EW9, ES9)

1. Environmental Elements Corp.
2. General Filter Co.
3. Komax Systems
4. Neptune Microfloc Inc.

Instrumentation (EW20, ES20)

1. Autocon Industries, Inc.
2. Badger-Meter Inc.
3. Bausch & Lomb
4. Beckman Instruments
5. Delta Scientific
6. Ecologic Instrument Corp.
7. Endress & Hauser, Inc.
8. Envirotech
9. Fischer & Porter Co.
10. Great Lakes Instruments, Inc.
11. Neptune Microfloc
12. Pennwalt Corp.
13. Robert Shaw Instrumentation
14. Sigmamotor Inc.
15. United Electric Control

Package Units (EW21, ES21)

1. Andco Environmental Processes
2. Aqua-Jet
3. Bran & Lubbe
4. Can-Tex
5. Cromaglass Corp.
6. De Laval
7. Del-Pak Corp.
8. Environmental Elements Corp.
9. Facet Enterprises, Inc.
10. Flygt
11. General Filter Co.

Package Units (EW21, ES21) cont.

12. Gorman-Rupp Co.
13. Infilco Degremont Inc.
14. Marolf Corp.
15. Met Pro Systems
16. Neptune Microfloc
17. Parkson Corporation
18. Pennwalt Corp.
19. Permutit
20. Pielkenroad Separator Co.
21. Union Carbide Corp.
22. Zurn-Attisholz Industries

Pipe (EW2, ES2)

1. A. O. Smith-Inland
2. Calcut Pipe & Supply
3. CIBA-Geiby Corp.
4. Dickey Co.
5. Farnan Brass Works Co.
6. Fibercast Division of Youngstown Sheet & Tube Co.
7. Garlock
8. Independent Fitting Co.
9. J. G. Pollard Company, Inc.
10. McWane Cast Iron Pipe Co.
11. R & G Sloane Manufacturing
12. Russel & Foundry Company, Inc.
13. Victaulic

Pumps (EW5, ES5)

1. Allis Chalmers
2. Bran & Lubbe
3. Envirotech (Wemco)
4. Fairbanks Morse Pump Division Of Colt Industries
5. Flygt
6. Gorman-Rupp
7. ITT Marlow
8. Layne & Bowler Corp.
9. LFE Corporation
10. Neptune CPC
11. Peabody Floway
12. Pennwalt
13. Robbins & Myers

Reverse Osmosis (EW23, ES23)

1. DuPont
2. Permutit

Separators (EW8, ES8)

1. Crane-Glenfield
2. Envirotech
3. Hycor Corp.
4. Hydrocyclonics Corp.
5. Idrex Inc.
6. Laval Separator Corp.
7. Monarch Separators
8. Passavant Corp.
9. UOP Inc.
10. Zurn-Attisholz Industries

Settling Tanks (EW16, ES16)

1. Neptune Microfloc
2. Passavant Corporation

Sludge Disposal Equipment (EW26, ES26)

1. A. O. Smith Harvestore Products
2. Big Wheels
3. McDowell
4. Met-Pro Systems
5. Neptune Nichols

Softeners (EW27)

1. Bran & Lubbe
2. Cochrane Environmental Systems
3. Hungerford & Terry Inc.
4. Permutit
5. Roberts Filter Manufacturing Co.

Valves (EW3, ES3)

1. Asahi/America
2. Cla-Val Co.
3. De Zurik
4. Flexible Valve Corp.
5. Henry Pratt Co.
6. Mueller Co.
7. Ross Manufacturing Company, Inc.
8. Valve & Primer Corp.

Aerators (EW12, ES12)

Aerators provide mechanical mixing and oxygen transfer by action of air flow or agitation and will remove gases such as carbon dioxide, hydrogen sulfide, and methane and odors which may be dissolved or entrained in the water. Aeration also provides a method for the oxidation of dissolved metals such as ferrous iron and manganous manganese. Mechanical aerators are most often used to provide a supplementary source of oxygen during the biological treatment of wastewaters.

The performance of mechanical aerators can be rated in terms of oxygen transfer (lbs. oxygen (or) per horsepower-hour (hp-m).) at defined conditions. Standard conditions for rating are defined for a test liquid (pure water) as being zero dissolved oxygen and twenty degrees centigrade. Most mechanical aerators rate at 2-5 lbs. O_2/hp - hr. Compressed air systems are often compared in terms of oxygen actually dissolved under standard conditions in relation to the amount of compressed air delivered. This oxygen efficiency will be a function of various factors including type and placement of diffusers, depth of air delivery, air flow, dimensions of the system, and other factors.

Aeration may incorporate pressure systems and under certain conditions be improved by the use of oxygen. Operations and processes utilizing aerators are typically pre-treatment of water influent, activated sludge processes, extended aerated lagoons, digester conversion, and others.

Equipment Categories	Applications
1. Mechanical Aerators a. Surface b. Submerged c. Rotor or Brush	Activated sludge processes, extended aeration, aerated lagoons, sludge digestion, mixing or blending ponds, algae control, fish pond aeration, reservoir turnover.

2. Pressure Aerators	Physical, biological, chemical operations and processes, retardation of lake eutrophication, taste and odor removal.
3. Draft Aerators a. Induced b. Forced	Removal of gases and oxidation of iron and manganese, odor and taste reduction.

Biological Units and Reactors (ES28)

Biological processes convert biodegradable solids and liquids (organic) into removable sludges by utilizing microorganism populations. Since the microorganisms are sensitive to environmental conditions, factors such as pH, oxygen concentration, toxic elements and characteristics of the waste must be considered if the process is to obtain high efficiency.

Bio-processes are typically used in conjunction with physical and chemical wastewater treatment processes. Preliminary treatment should include operations designed for solid removal and some prior reduction of BOD. The effluent from the biological reactors must usually undergo final clarification for solids removal, chlorination, or perhaps further physical, chemical or biological treatment.

Units available for bio-processes are related to several specific process concepts and often employ proprietary mechanisms for enhancement or efficiency improvement of the system. The specific processes include: (1) lagoons, (2) activated sludge, (3) modified aeration, (4) trickling filters, (5) dispersed growth aeration, (6) wet combustion, (7) anaerobic digestion, (8) anaerobic filter (contact), (9) rotating disc, and (10) brush aeration. The two most important processes are activated sludge and its modifications, and trickling filters. Each process has its own design or economic advantages/disadvantages and specific applications. Most process modifications concern the mixing parameters, aeration techniques or sludge manipulation and retention mechanisms of the available units.

Factors which should be considered in the design of a trickling filter include the type of filter media used, characteristics of the underdrain system, mechanism of dosage distribution, and type of ventilation (if necessary) required. Trickling filters are normally used in conjunction

with settling tanks which produce a clarified effluent. The design of these tanks is similar to those used in primary clarification except the overflow rates are influenced by recycle to the filters.

Most bio-reactors of the activated sludge type are developed around considerations of aeration factors and mechanisms, sludge recycling, mixing characteristics, and other variables such as loading rates, sludge retention time, and microorganism ratios.

Biological treatment for the removal of nitrogen (nitrification-denitrification) occurs in one or two steps. If the waste contains a large portion of ammonia the ammonia must (1) be aerobically converted to nitrate and (2) the nitrates must be reduced to nitrogen gas. The mixed liquor volatile suspended solids in a nitrification reactor (activated sludge type) will be composed of those organisms responsible for nitrification in addition to those responsible for BOD conversion.

Anaerobic systems are commonly referred to as digestors, as in the case of sludge treatment or as anaerobic lagoons (unaerated). Two additional anaerobic units include the Imhoff tank and the anaerobic filter. The Imhoff tank, which is used for primary treatment, consists of a two-story tank in which settled solids collected in a upper compartment are digested in the lower compartments. Imhoff tanks are most often used in small treatment installations because of simplicity of design and operation. Anaerobic filters consist of columns filled with a medium (usually rock) through which the wastewater flows upward and the anaerobic organisms are retained on. The units are typically designed for short hydraulic retention times.

Equipment Categories	Application & Features
1. Lagoons (Oxidation Ponds) a. Aerobic b. Facultative Anaerobic c. Stabilization Ponds	Removal and oxidation of organics and other pollutants in wastwater by natural purification processes.
2. Activated Sludge a. Modified or Step Aeration b. Biosorption or Contact Stabilization c. Extended Aeration d. Conventional	Oxidation of organic wastes by biological active growth (sludge), nitrification of ammonia.
3. Oxidation Ditch (Brush Aerator)	An extended aeration process for oxidation of organic wastes by biological active growths, nitrification.
4. Trickling Filters a. High-Rate b. Low-Rate	Aerobic oxidation of organic and nitrogenous wastes by biological active growth retained on media.
5. Bio-Disc	Oxidation of organic wastes by biological active growths.
6. Land Overflow	Incorporation of sprayers for land overflow or irrigation with organic wastewater.
7. Wet Combustion	The use of elevated pressure for oxidation of high load organic wastewater and air.
8. Cavitation	Aeration and subsequent oxidation of organic wastes by use of cavitator vanes and draft tube.
9. Imhoff Tank	Primary treatment and sludge digestion.
10. Anaerobic Filter (contact)	Anaerobic decomposition of organic wastes by biological active growths.
11. Nitrification - Denitrification	Removal of ammonia nitrate and other nitrogenous pollutant's from process wastewater.

Blowers (EW11, ES11)

Blowers produce high volume low pressure currents of air conducive of operations and processes requiring aeration and mixing. There are two basic designs of blowers available: rotary positive displacement types and centrifugal types. Rotary type blowers provide a pulsating flow of air at pressures (psig) up to 10-15 psig for single stage machines and capacities up to 15000 cfm. Rotary positive displacement blowers should be equipped with suction and exhaust silencers and buffer chambers with other peripheral contamination control equipment if used for sewage gas pumping. Other common applications for rotary type blowers include grit chamber aeration, low capacity/rpm situations, especially around potential diffuser clogging situations.

Centrifugal blowers are normally applied to high capacity situations, i.e., where unit capacity of over 15,000 cfm free air exists. Centrifugal blowers exhibit a head-capacity curve not unlike that of specific speed centrifugal pumps. A comparison of the system curve with the head-capacity curve will determine the operating criteria. Surging, which results in blower capacity oscillations, can be avoided by arranging bypass controls to the ambient for situations in which the air flow is less than the surge point. Blowers should be protected against conditions of high temperature surroundings and careful consideration of power requirements must be undertaken to ensure adequate horsepower during cold weather.

Equipment Categories	Applications
1. Positive Displacement (Rotary)	Biological unit processes, reservoir destratification, sewer gas pumping, pneumatic conveying.
2. Centrifugal	
3. Natural Aerators a. Cascade	Iron and Manganese oxidation.

b. Slat and Coke Trays
c. Sprayers

4. Oxygenators (HYDRO-VAC)	Wastewater treatment, odor and corrosion control, dispersal of gases into tanks and lines.

Chemicals (EW27, ES27)

Chemicals and other reagents are used in water and wastewater treatment processes as initiating and propagating factors to ensure process effect and efficiency. Some reagents are synonymous with the treatment process per se. In most applications the reagent produces the desired effect by neutralizing or otherwise influencing or prohibiting undesired parameters. Those chemicals common to treatment processes can be classified as flocculants/coagulants, disinfectors and other oxidents, softeners and demineralizers, corrosion prohibitors, pH controllers, conditioners and other specific reagents such as catalysts and indicators. Although activated carbon is not actually a reagent, it is listed here because of its functional characteristics as an adsorptive agent. Other minerals and chemicals, such as zeolite and other ion exchange resins, function as specific task agents.

Equipment Categories	Application
1. Flocculants/Coagulants a. Alum ($Al_2(SO_4)_3$) b. Ferric compounds ($FeCl_3$) c. Lime (CaO) d. Potassium Permanganate ($KMnO_4$) e. Polymers f. Coagulant Aids (Polyelectrolytes) g. Soluble Silicates h. Copperous	Removal through precipitation turbidity, BOD, phosphorus, pathogens, and other contaminates, emulsification.
2. Disinfectants a. Chlorine (Cl_2, ClO_2, HOCl) b. Bromine (Br_2) c. Iodine (I_2) d. Hydrogen Peroxide (H_2O_2) e. Ozone (O_3)	Removal of pathogens, oxidation of organics, taste and odor control.
3. Oxidants a. Potassium Permanganate ($KMnO_4$) b. Hydrogen Peroxide (H_2O_2) and other peroxides c. Ozone (O_3)	Removal of organics and dissolved inorganics such as iron and manganese.

4.	Softeners a. Lime (CaO or $Ca(OH)_2$) b. Soda Ash (Na_2CO_3) C. Ion Exchange Resins (Zeolite and others)	Removal of hardness and other minerals.
5.	Corrosion Prohibitors a. Coatings and Linings b. Zinc and Orthophosphate c. Soluble Silicates	Potable and other wastewater distribution systems protection.
6.	Water Conditioning and pH Control	pH maintenance and water polishing, sequestering agents, softening enhancers.
7.	Activated Carbon	Removal of organics, suspended solids, pathogens, trace inorganics, taste and odor control, color enhancement.
8.	Fluorine	Promotion of dental health.

Chemical Feeders (EW10, ES10)

Feeders are devices which function as sources of supply and discharge for essential chemicals used in the treatment of water and wastewater. The techniques of feeding varies as to the process and property of the chemical involved. Often the assortment of machinery involved in the storage, distribution, dilution, and injection of reagents into the process waters are integrated portions of various biological and/or chemical process units. As such, the unit is an independent package unit and is listed under the appropriate topic.

Feeders are classified by the physical state of the substance being furnished, and as to the method of measurement employed. Dry chemical feeders, such as hoppers, are available to handle powders, pellets, flakes, or granules either volumetrically or gravimeterically. Most dry feeders have agitators or vibrators designed to prevent bridges or rat-holes, thus promoting smooth, continual flow. Wet feeders are proportioning equipment which inject, diffuse, or pour the liquid, slurry, or gas additive into the system.

Storage of reagents is dependent upon the physical properties of the substance. Bulk powders and solids may be stored in bags or other containers of various materials and sizes; or, if used in large quantities, they are typically held in hoppers or silos. Liquid reagents, depending on the quantity used, may be stored in drums, carboys, or large tanks. Some liquid reagents require specialized facilities with specific liners or materials of construction. Gaseous reagents are kept under pressure in the liquid state in metallic cylinders or tanks. Because of the inherent danger of many of these chemicals most are kept in separate facilities, this is especially necessary with chlorine.

Concentrated reagents may be distributed directly to the process waters or diluted to various concentrations before injection. Preparation or contact tanks which perform dilutions of reagents such as phosphates, fluorides, coagulant aids and other materials usually are equipped with proportioning pumps which pace with the process water.

Equipment Categories	Applications
1. Dry Feeders (Hopper) a. Volumetric c. Gravimetric	Dry chemical feed for treatment processes.
2. Wet Feeders	Liquid and gas feed for treatment processes.
3. Metering and Proportioning Pumps.	Liquid chemical feed for treatment processes.
4. Diffusers	Dispersion of gas feed within process units.
5. Ejectors	
6. Gas (Chlorinators)	Chlorine gas feed for disinfection.
7. Contact Tanks	Chemical and slurry mixing and feeding.
8. Lime Slakers	Slaking and feeding of quicklime for pH control, softening, sludge control.

Clarifiers and Reactors Physico-Chemical (EW17, ES17)

Clarification consists of removing suspended solids, turbidity, and floating materials in a wide variety of primary, intermediate, and final water and wastewater unit processes. Clarification units are referred to as clarifiers, thickeners, contacters, reactors, coagulators, and a variety of proprietary names. The actual process usually includes a multi-phase treatment consisting of flocculation (including the addition of coagulant aids), precipitation, sedimentation, and sludge removal. Accelerated clarifiers retain a portion of the sludge from previous treatment and recirculate this concentrate through forming floc; thereby increasing the coalescing properties of the colloidal matter within the process fluid.

Tank geometry, surface loading, and influent characteristics are taken into consideration when selecting the proper clarifier unit. Typically, two design alternatives (excluding specialized units) are circular and rectangular and are based upon settling basin arrangement.

Clarifiers exhibit three areas of treatment: (1) the inlet zone; (2) the theoretical treatment zone; and (3) the outlet zone. The inlet zone distributes the suspension over the cross-sectional area of the basin. The theoretical treatment zone or settling zone consists of the region where effective settling takes place resulting in a sludge which is stored or continuously removed. Often the outlet consists of a weir plate arrangement serving as a collection point for the supernatant. In addition to weirs, conventional units are equipped with a feedwell, skimmer, baffles, and a raking or scrapping device.

Equipment Categories	Applications
1. Clarifiers a. Rectangular b. Circular	Clarification of water and wastewaters by removal of suspended or floating solids.

	c. Hopper	
2.	Contact Reactors	Clarification of water and wastewater by catalytic effect of agitated solids.
3.	Thickeners	Clarification of water and wastewater by compression and settling of suspended solids, concentration of sludge from unit processes.

Coatings, Covers and Linings (EW13, ES13)

Coatings provide protection for steel, concrete, and other materials which are submerged, exposed to high humidity, or weathered by sunlight or the environment. Also, many facilities process materials which contain large amounts of caustic materials that equipment should be protected from. Under most circumstances the coating system should be applied during plant construction and maintained by periodic renovation programs.

Linings provide fluid retention and holding by covering, sealing, strengthening, and insulating ponds, pits, canals, and reservoirs. Materials are available with various properties and compositions mandated by the application. Installation and seaming conditions vary among manufacturers.

Comminutors and Separators (EW8, ES8)

Comminutors, which are used almost exclusively as pretreatment units for wastewater processes, are available with several design configurations. Most designs incorporate rotating disks or drums with cutting teeth and/or shearbars past which the wastes are carried on a stationary screen. The wastes are then rejected through slots or other openings into the downstream channel. Specifically the function of the unit is to grind and cut up (comminute) the materials present in the wastewater influent. Comminutors do not screen or otherwise remove any of the waste material from the process stream.

Separator units, other than conventional, are usually proprietary devices which may offer alternatives to sedimentation or other preliminary treatment. Some of the units are capable of removing minute particles, and reportedly, approach the efficiency of granular media filters. As with filters, the amount and the particulate size are definite qualifying factors. Other separators common to water and wastewater systems include settling chambers for the removal of grit, sand, sludge or other materials, filters, flotation units, clarifiers, and many other equipments discussed under the appropriate sections.

Equipment Categories	Application
1. Comminutors	Comminutation of waste influent.
2. Drum Separators a. Microstrainers b. Discostrainer c. Hydrogritter	Removal of suspended solids, living organisms and other particulates from sewage and other wastewaters, washing and dewatering of waste process waters; filtration of sewage effluents.
3. Screen Separators a. Vibrating	Classification of solid-solid and solid-liquid mixtures, dewatering, removal of

	b. Rotary c. Cross-Flo	degradable and nondegradable materials from process waters.
4.	Grit Collectors and Traps	Grit removal from sewage influent.
5.	Centrifugal Chambers a. Cyclones b. Laval c. Desanders	Removal of sand, clay, and other particulates from process waters, degritting of sewage influents, classification of suspended solids.
6.	Gravity Settling Basins	Removal of suspended solids from process waters and wastewaters.
7.	Traps (Grease)	Separate liquid phases in wastewater process effluents.

Desalination Equipment (EW22, ES22)

The removal of dissolved solids from brackish or saltwater is commonly accomplished by evaporation techniques, electrodialysis, reverse osmosis, or other mass transfer processes and operations. In the reverse osmosis process, pressure is applied to the concentrated salt solution (feedwater) and the water is forced through membranes leaving behind the dissolved impurities. The important element of the system is the membrane. This membrane should be able to withstand high pressure and offer a one to three year operational life. Desalination by reverse osmosis, as compared to distillation or evaporation techniques, can be cost effective in areas where energy costs (fuel or electricity) are relatively high. Depending upon the system used, potable water can be obtained in one pass. Pretreatment techniques should be developed to prevent the use of grossly contaminated feed water.

Two important distillation operations are the multiple-effect and flash evaporators. These processes utilize heat exchangers and pressure differentials (flash evaporations units) in various stages to separate pure water from brine. The removal efficiency of the system is directly related to the concentration of the salt in the feed water. The electrodialysis process utilizes an electrical potential to alternatively attract cations and anions through permeable membranes. The ions concentrate in alternating cells resulting in pure water concentrated in the remaining chambers.

Equipment Categories	Applications & Features
1. Distillation & Evaporation a. Flash b. Multiple Effect c. Recompressed	Separation of dissolved solids.
2. Reverse Osmosis	
3. Electrodialysis	

Disinfection Equipment (EW14, ES14)

The purpose of disinfection is to insure that no living pathogens are present in potable water supplies and controlled in wastewater treatment effluent. Although partial removal of pathogens is provided by coagulation, filtration, and adsorption, the primary disinfection characteristics of municipal treatment processes result from chemical additives or other procedures.

Chemicals used for disinfection are oxidants with various forms of halogens being the most important. Other alternative methods and agents include ozone, hydrogen peroxide, ultraviolet radiation, heat, activated carbon, and other chemical compounds and physical and mechanical techniques.

Controlling factors within any disinfection process include: (1) dosage of the agent, (2) contact time, (3) physio-chemical properties of the process water, and (4) types and concentration of the organisms.

Chlorine is primarily used in two distinct forms: as a gaseous element or as a solid or liquid chlorine containing hypochlorite compound. Small installations often employ drip-type or pot feeders (e.g. wells and catch basins). An alternative could consist of an orifice hypochlorite feeder fed by an elevated constant head tank or a low volume proportioning pump. Chlorinators most commonly use vacuum-feed devices which operate on pressure differentials established at an ejection or diffusion port. Chlorinators operate over a wide range of flow rates and usually can be converted to higher or lower rates very easily. The maximum flow rate of a gas chlorinator is often at least 20 times its minimum rate.

Ozonators are composed of two major components: (1) the electrodes and (2) the dielectrics. Other components and materials include a dryed

air or oxygen source, a power supply, and controlling mechanisms. The ozone is generated by passing an oxygen bearing gas through a high energy electrical discharge.

Ultraviolet sterilizers utilize mercury lamps designed with special glass which allows the passage of radiant energy. Water within contact chambers are manipulated to maximize the contact period.

Equipment Categories	Applications
1. Chlorinators a. Hypochlorite Feeders b. Vacuum (Gas) c. Contact Chambers	Solution and gas feed of chlorine for disinfection, slime and algae removal, taste and odor control.
2. Ozonators	Disinfection, taste and odor control, color removal, oxidation of organics and other agents.
3. Ultraviolet Sterilizers	Disinfection and sterilization.
4. Other Chemical Agents a. Hydrogen Peroxide b. Halogens (Iodine and Bromine) c. Activated Carbon d. Phenols and Alchols	Disinfection

Filtration Adsorption Equipment (EW18, ES18)

Filtration, a discrete form of sedimentation, is applicable to all facilities providing conventional or advanced treatment to potable or wastewaters. Depending upon the media incorporated, filters are applicable to a variety of processes. Filters are classified by their mode of operation and specifically by the type of media used and its function. Systems composed of series and or individual units are available.

A gravity filter is composed of a housing or casing, media, a false bottom or underdrain, inlet and outlet valves, backwash mechanisms, and control devices. Typically, water to be filtered enters at the top of the unit and passes downward through the graded filter bed. Loss of head by the system can be used to determine when backwashing is required, and may automatically initiate the cycle. Details of the many variations of filtration equipment and systems may be examined within the manufacturer's literature. Literature pertaining to two important filter (gravity) accessories has been included within the catalog.

Equipment Categories	Application
1. Pressure Filters	Removal of dissolved solids, turbidity, suspended solids, iron, manganese, hydrogen sulfide, taste, odor, organics, and pathogens from process water and wastewater.
2. Gravity Filters a. Rapid Sand b. Slow Sand	Removal of turbidity, suspended solids, iron, gases, odors, organics and pathogens.
3. Leaf Filters	Removal of suspended solids and other materials.
4. Carbon Adsorption Units	Removal of dissolved gases, taste and odor, specific organics, BOD, COD and other agents.

5. Accessories a. Underdrains b. Agitators	Retention and cleaning of filter media.

Filtration Media (EW19, ES19)

The media of a filtration system can be defined as that portion through which the desirable effect is transmitted during the process. Basically, the media or filter bed functions as a mechanical filtration base or as a biological "bedding" area. For a rapid sand filter the media should be of pure silica sand of a quartz type and the grains should be hard, durable, and spherical. The sand and support gravel should also be free of metallic traces such as iron and preferably not contain any lime. All filter media should conform to effective size and uniformity coefficients best suited to the filtration of the water in question.

Theoretically the upper stratum of the sand bed performs the filtering function. The lower stratum of the sand actually acts to support the filtering stratum. These different strata take the proper places on the initial hydraulic backwashing of a filter bed.

Type	Applications
1. Sand/Gravel	Gravity and Pressure sand filters
2. Rock	Trickling filter beds
3. Garnet	Advanced rapid sand filters.
4. Coal (anthracite)	Advanced rapid sand filters (dual media).
5. Activated Carbon	Dechlorination, deozonisation odor and taste improvement, absorption or micropollutants and other agents in water and wastewater.
6. Artificial Media	Trickling filter and bio-reactor beds.

Flocculation Equipment (EW15,ES15)

Flocculation occurs by enmeshment or bridging of the suspended solids present in the process water. This phenomenon is accomplished, after chemical feed, by a gentle and prolonged mixing which converts the small previously coagulated particles into a visible floc, large enough to settle or be filtered. Flocculation processes are normally used with difficult settling solids.

Typically, the flocculater mechanism consists of a series of paddles suspended in a mixing chamber. Paddle speed can be varied as "different" water characteristics appear, however a paddle (tip) speed of 2-3 fps will provide optimum mixing without breakup of the floc. The tank is usually designed with baffles to increase mixing efficiency. Velocity gradients within the basin are important operating and design criteria.

Flocculation should be preceded by vigorous rapid mixing (to ensure chemical dispersal) and consist of a slow mix of 15 to 30 minutes. It is important that the flocculated water enters the sedimentation basin slowly in order to prevent floc destruction.

Equipment Categories	Applications
1. Conventional (Paddle) a. Horizontal b. Vertical	Flocculation of process water and wastewater as an aid to precipitation of colloidal and suspended solids.
2. Corrugated Plate	
3. Diffused Air	
4. Sheer Plates	

Flotation Units (EW21, ES21)

Flotation is a form of liquid-solid or liquid-liquid separation generally applied to preliminary treatment of wastewaters for the removal of greases or other fine particulate matter. Most units utilize dissolved air, released as extremely fine bubbles, to facilitate the buoyance of particles. The air attach to the solids, become enmeshed. The released air attaches to the solids, becoming enmeshed in flocs, floating them to the surface. The concentrated materials at the surface of the water are continuously removed by a mechanical skimmer.

Flotation can be spontaneous with certain pollutants, but often the operation requires chemical additives in addition to dissolved air. These agents function to create structures which can absorp or entrap air bubbles; thereby enhancing flotation. Removal efficiencies of 97 percent are obtainable with the use of flotation aids.

Equipment Categories	Applications
1. Dissolved Air	Removal of suspended matter, concentration of biological sludges, grease and oil removal.
2. Vacuum	Removal of solid particulates.
3. Air	Aeration for the removal of grease and other solids.

Flowmeters (EW7, ES7)

Flowmeters are utilized to record by various mechanisms the flow of water and other liquids (or gases) through piping systems, channels, and other natural or manmade systems. These devices are designed for specific tasks and may be categorized by application. Often flowmeters are incorporated within equipment systems of various types or may be combined with special accesories to produce automated or independent systems. Conventioally, the meter will be connected to transmitters which may be electrical or mechanical. Process intake or discharge data may be obtained by application of meters to flumes and weirs.

Equipment Categories	Applications
1. Water Meters (Service) a. Magnetic b. Propeller c. Others	Recording, indicating and controlling of fluid flow through distribution systems.
2. Rotameter	Industrial piping installations.
3. Magnetic	Recording, indicating, and controlling of fluid flow.
4. Piston	Recording, indicating, and controlling of fluid flow.
5. Disk	Recording, indicating, and controlling of fluid flow.
6. Turbine	Recording, indicating, and controlling of fluids, high flow installations, extreme temperature.
7. Float	Channel or tank recording and indicating of fluid flow or level.
8. Propeller	Recording, indicating, and controlling of fluid flow.
9. Bubbler	Recording, indicating, and controlling of fluid flow, flume level recording.

10.	Open Stream	Stream, river, or other open system flow.
11.	Weirs & Flumes	Inlet and outlet fluid flow indicating.
12.	Venturi	In-line flow measurement.

Flumes and Weirs (EW6, ES6)

Flumes are standardized inclined troughs specialized for economical flow measurement. The metering system operates as a float-actuated instrument that measures the float rate in terms of head produced. Flumes, which may be fabricated sections, channel liners, or concrete channels, are basically composed of an inlet, throat, or outlet.

Weirs are standardized geometric plates designed for velocity control and flow control both in intake and outtake devices. The principle of control is a directly proportional relationship occurring between the depth of water behind plate and flow. Weirs are placed in-line for intake and generally on sides of troughs (or perimeter of basins) for outflow.

Equipment Categories	Application
1. Flumes a. Parshall b. Palmer-Bowlus c. Others	In-stream measurement of influent and effluent, measurement at site of chemical feed.
2. Venturi Flumes	In-line flow measurement by pressure differentials.
3. Proportional Weir	Geometric cut out in plate designed such that flow is directly proportioned to depth of water behind plate.
4. Trough or Process Weir	Control of outflow from outlet troughs.

Gates (EW4, ES4)

Water and wastewater control gates and equipment operate as flow control mechanisms for influent, process, and effluent containment, diversion, or drainage. Common applications for gates concern flow control in channels, canals, pipelines, troughs, basins, sluiceways, or flumes. Gates are classified by application and design (head seating), and to some extent, by the materials used for construction. Most gates are operated manually with some actuated (electrical or pneumatic) models available.

Equipment Categories	Applications
1. Sluice Gates	Irrigation, flood control, water and wastewater flow control.
2. Slide Gates	Irrigation, flood control, water and wastewater flow control.
3. Shear Gates	Irrigation, flood control, water and wastewater flow control.
4. Drainage Gates	Flood control, process fluid control, water and wastewater flow control.
5. Tide Gates	Backflow prevention drainage.

Mixers (EW9, ES9)

Mixers provide high rates of volumetric displacement by rapidly turning over the liquid volumes involved; thereby creating intermingling of the various phases. This effect is produced by turbulence existing within the flow program or created by mechanical action. Mechanical elements such as paddles, impellers, propellers, gas diffusers, and other such devices are representative of mixers employed in treatment units. Turbulent flow may also be induce by baffling, in-line devices, pumps, and venturi flumes. Theoretically, the greater the velocity and turbulence, the greater the mixing. The effectiveness of a mixing operation can be correlated to the power input.

Equipment Categories	Applications
1. Flash Mixers (Motor-Driven)	In-line and tank dissolution and distribution of chemicals and process fluids.
2. Baffles (In-Line)	Continuous dissolution of chemicals and dispersion of process waters.
3. Agitators	Mixing and stirring of slurries, scrubbing and washing of process fluids.
4. Flocculators and Coagulators	Horizontal and vertical agitation.
5. Batch Chemical Mixers	Mixing and feeding of hard-to-wet chemicals.
6. Aerator Mixers	Mixing and aeration of systems by impeller or diffusion units.
7. Venturi a. Injection b. Ring	Feeding and mixing of chemicals, flow measurement.

Package Units (EW26, ES26)

Through the extensive accumulation of equipment for water and wastewater treatment processes, a separate category has been identified. Some manufacturers have developed as product lines, complete package units to accomlish a specified task or complete process related to water or wastewater treatment. These units have been identified and the general categories are listed along with manufacturer's brochures.

For purposes of this catalog, a package unit is defined as being able to accomplish a specified treatment process or operation without supporting equipment. The unit is purchased complete from the manufacturer and can operate on an isolated basis or can be installed as a component of a facility and function within the system. It should be noted that some of these equipment systems have been identified in both the equipment listing and the Package Unit listing. Variations in equipment and manufacturer's definitions have led to these combined listings.

The following are the package units available for water and wastewater treatment:

1. Water Treatment Plants
2. Wastewater Treatment Plants
3. Pump Lift Stations
4. Dissolved Air Flotation Systems
5. Package Precipitators
6. Ion Exchangers
7. Carbon Adsorption Systems
8. Water Softener Package Units
9. Reverse Osmosis
10. Micro-strainers
11. Clarifiers
12. Bio-reactors
13. Flocculators
14. Taste-Odor Control Systems
15. Filtration/Ultrafiltration

Process Controllers, Processors and Other Instrumentation (EW20,ES20)

Many types and forms of instrumentation are employed by treatment facilities and equipment manufacturers to assure measurement, monitoring, recording and control of equipment and process parameters. The capital invested in instrumentation is usually justified on the basis that automated systems result in increased efficiencies, economics of operation and technique, and in reduced manpower. Often, much of the equipment involved in power distribution, motor control or process supervision of a particular treatment unit or system are integrated components and cannot be arranged independently. However, large scale, multi-system facilities will require centralized control, monitoring and supervisory capabilities. The nomenclature and specific applications of process instrumentation and components are extensive and not explored in detail within this catalog.

Equipment Categories	Applications
1. Controllers	Sensing and supervision of all phases of automated or synchronized equipment systems or components.
2. Processors	Monitoring, supervisory control, and distributed control of process parameters.
3. Telemetering	Measuring, transmission, and recording of treatment parameters.
4. Analyzers	Analytical measuring and determination of treatment parameters.
5. Monitors	Testing and checking of specified treatment parameters to insure designed limits. Warning devices.
6. Gauges	Parameter indicators.
7. Samplers	Extraction and testing of samples.

Pipe and Pipe Appurtenances (EW2, ES2)

Pipes are hollow tubular bodies which conduct liquids, gases, or solids (in certain cases) or function as support structures. The materials used in the manufacturing of pipe will pre-determine many of its characteristics and subsequent applications. Generally, the choice for pipe material will be steel, cast iron, prestressed concrete, asbestos cement, plastic or some other metallic or non-metallic elements. These materials offer pipe with a variety of weights and thicknesses, handling and laying conditions, corrosion resistance, dimensional stability and other properties.

In addition to construction materials and techniques, pipe classification terminology relates to mechanical, physical and dimensional factors. These factors include size designations, end preparations, tensile strength, and many other specifications adopted by the American Society for Testing Materials (A.S.T.M.) or American Petroleum Institute (A.P.I.). The pipe standards serve three functions: (1) prescribe methods of measuring the mechanical and physical properties of the pipe, (2) provide specification categories for pipe which provide known specific information, (3) certify that the pipe (if so categorized) is made according to specifications and warranted.

As used for the transport of water, pipe is usually laid where topographic conditions hamper the use of open channels or canals. As such, pipelines may be placed above or below ground or may be partially buried. Pipelines require gate valves, air-release valves, check valves, drains, joints, manholes, and other appurtenances to ensure safe and efficient operation. Air-release valves are placed at high points to allow blow-off while low points are typically located to permit the removal of sediment and allow the conduit to be drained.

Distribution networks are complex pipeline systems which serve population

centers (the consumers). Components of these systems include various fittings, stops, couplings, reducers, service connections and many other elements.

Equipment Categories	Applications
1. Iron a. Gray b. Ductile	Water and sewage distribution, collection or transmission, pipe galleries, conduit.
2. Steel	Line pipe for transmission of fluids, pipe galleries, conduit, unit components and plumbing.
3. Copper, Brass, Lead & Others	Plumbing, unit components.
4. Plastic a. Poly Vinyl Chloride (PVC) b. Polypropylene c. Polethylene d. Others	Sewer pipe, water supply, conduit, severe chemical and temperature uses, field lines.
5. Concrete a. Reinforced b. Prestressed	Sewer pipe, water supply or discharge, culverts, conduits, channels.
6. Asbestos Cement	Aquaducts, water and sewage distribution, collection, or tranmission, non-pressure flow.
7. Clay (Vitrified)	Sewer pipe, drainage, field lines.
8. Fiberglass	Water supply, wastewater transmission, severe chemical and temperature use, unit and process components.
9. Hose and Fittings	Pressurized fluid or gas lines.
10. Pipe Appurtenances:	Accessory items of pipeline systems.

Pumps (EW5, ES5)

Pumps are the machinery that raise, transfer, or compress liquids or gases by means of suction or pressure. Pump categories are determined by the mode of operation involved and further described by design characteristics and mechanisms. Each particular type of pump will offer operating characteristics dependent upon the unit's size and the speed involved. Characteristic curves, commonly called pump curves, relate the total head, the efficiency and the power input with flow. These relationships and others are used to determine the effect of speed changes or impeller diameter on the discharge, head, and power. The specific speed of a pump is related to that speed at which flow and head are taken at the point of maximum efficiency. Specific speed for a pump is dependent (only) upon the pump and as such is commonly referred to as the shape factor. Pump design factors, abnormal operating behavior and cavitation parameters can all be correlated with specific speed.

Degrees of progression initiated by a pump during the pumping process are referred to as stages. In a two stage pump the first stage delivers the liquid to the second stage for doubling of discharge head. Pumps are available as single, dual, or multi-stage units.

The components which "make up" a complete pump include the motor, frame, shaft, head (including the discharge ell and stuffing box), inlet, pump bowls (including suction nozzles, impellers and intermediate bowls) and assortment of bushings, bearing and couplings. Pumps are typically constucted from cast iron with either bronze or cast iron impellers.

Other terminology indicative of pumps may relate to material capacity, drive mechanisms, placement (submerged versus non-submerged or wet pit versus dry pit), impeller alignment and other specification or characteristics.

Equipment Categories	Applications
1. Displacement a. Piston b. Plunger c. Gear d. Diaphram e. Ejector	Raising or transferring of water and wastewater within piping system, wells, or processes, sludge handling and transfer, metering and proportioning, feeding of chemical solution, flood control.
2. Hydraulic	Water and wastewater transfer by impulse-momentum.
3. Centrifugal a. Radial-Flow (Volute) b. Axial-Flow c. Mixed-Flow	Water supply intake and circulation, sewage pumping, storm water pumping, fire service, booster service, back washing, wet or dry pit.
4. Air a. Jet b. Air-Lift	Small wells, sewage pumping, sludge circulation, priming of centrifugal pumps.
5. Screw Pumps	Water supply intake, sludge and grit transfer.
6. Grinder	Low pressure sewers.
7. Portable	Utility or emergency pumping.
8. Hand Pumps	Rural or agriculture well, fluid transfer.

Screens, Grates, Sieves, and Other Separators (EW1, ES1)

Initial liquid-solid separation of process water or wastewater influents is obtained by screening. Screen elements may consist of bars, gratings, mesh, or other openings of uniform shape and size. As such, screening devices are available as components or unit systems, with the specific application determining mesh size, shape, unit configuration, and other specifications.

Screens are typically referred to as "coarse" or "fine". Fine screens have media with openings or slots of 1/8 - 1/4 inches or less. Coarse screens have perforations greater than 1/4 inches and often are referred to as "racks". Cleaning operations for screening devices may be mechanical (self-cleaning) or manual. Most fine screens incorporate a self-cleaning mechanism and are available in a variety of configurations such as the disk or drum types. Racks used for preliminary treatment may consist of spaced steel bars mounted vertically or inclined, or mechanically cleaned bars with combing devices on one particular side or both sides.

Flow rates should be sufficient to carry solids against the screen face without causing excessive clogging. Head loss through various screens can be obtained from manufacturer's specifications or by calculation. The loss of head through a clean screen should be insignificant, but values obtained during operation are of greater consequence. Other factors of importance include the screen media size, strength, and materials of construction and other factors such as flow characteristics of the process stream and placement of the unit.

Sieves are used as classification and separation devices for various types of materials and media.

Equipment Categories	Applications
1. Screens, Bar Racks, and Strainers	Screening of water and wastewater process influent for removal of debris and coarse solids, pump protection.
2. Screen Underdrains, Drainage Screen, and Baskets	Treatment media retention.
3. Intake Devices	Screens, slats, boxes and other elements for screening of intake waters in reservoirs and streams.
4. Well Screens	Screening and straining of well water uptake.
5. Self Cleaning Screens	Screening of intake process influent.
6. Traveling Water Screens	Floating debris removal from intake or process water.
7. Sieves	Testing, grading, particle retention.

Sludge Conditioning and Treatment Units (EW23, ES23)

Sludge treatment generally involves one or more of the following processes: (1) concentration or volume reduction, (2) digestion, (3) conditioning or (4) oxidation or incineration. Conditioning of sludge is performed for the express purpose of improving its dewatering characteristics. The two most common methods of conditioning involve chemical additives and heat treatment. Chemical addition is sometimes preceded by elutriation, a washing operation designed to reduce chemical-conditioning requirements. Conditioning is typically follow by dewatering or disposal alternatives.

The digestion of sludge (conventional) is carried out in a single or two stage process. The sludge is heated within a digestor and the functions of digestion are carried out under anaerobic environments. In the two stage process, the first tank performs digestion while the second acts as a storage and concentration area. There are aerobic digestion processes which are applied frequently to sludges from activated sludge, trickling filter and other bio-process units.

Thickeners are employed to concentrate sludges from various process sources. In operation, the units perform as special clarifiers which are designed on the basis of hydraulic surface loading and solids loading. Aerobic conditions should be maintained with the thickener.

Oxidation of raw sludge involves the incorporation of elevated temperatures and pressures within a reactor. A mixture of gases, liquid, and ash are discharged from the unit with the liquid and ash returned to heat the incoming sludge. Incineration by multi-hearth devices is discussed under sludge disposal.

Equipment Categories	Applications
1. Thickeners a. Mechanical b. Flotation	Concentration and volume reduction of water and wastewater process sludges.
2. Digestors a. Anaerobic b. Aerobic	Treatment, reduction and disposal of wastewater process sludges.
3. Imhoff Tanks	Primary treatment and digestion of sludge.
4. Oxidation (Zimmerman)	Reduction of organic content and volume of sludge.
5. Incineration	Volume reduction and disposal of sludge.

Sludge Dewatering Equipment (EW24, ES24)

Waste solids resulting from treatment processes are discharged as wet sludge or slurry containing less than 5% solids (depending upon conditioning) by weight. Dewatering operations are employed to facilitate subsequent disposal work. The choice technique of sludge dewatering depends on the characteristics of the sludge, the method of disposal and the costs involved.

In principle the methods of solid concentration used by dewatering equipment are specialized forms of liquid-solid separation. The various techniques (equipment types) are typically oriented towards particular categories and concentrations of sludge.

Equipment Categories	Applications
1. Sludge Drying Beds	Dewatering of digested sludge.
2. Centrifuges a. Disc b. Solid Bowl c. Basket	Dewatering of slurries and process treatment sludges, industrial wastes.
3. Gravity	Dewatering of treatment process sludges.
4. Belt Filter Press	Dewatering of treatment process sludges, industrial wastes.
5. Plate Frame Filter Press	Dewatering of treatment process sludges, industrial wastes.
6. Vacuum Filter a. Belt b. Coil	Dewatering of treatment process sludges.
7. Evaporator	Low volume liquid sludge concentration of "hard to treat" sludges.
8. Screening	Dewatering of treatment process sludges, industrial wastes.

Sludge Disposal Equipment (EW25, ES25)

Methods of sludge disposal vary depending upon the local conditions and the type of sludge in question. Presently the most predominate method of disposal is discharge to surface waters or sanitary landfill. Sludges resulting from water treatment processes are often disposed of in recovery ponds; these provide a mechanism for sludge disposal, and a means for recovering blow-off water. Sludges resulting from chemical treatments are especially unyieldly and difficult to reduce.

Alternative methods of sludge disposal concern total digestion, pelletization, incineration and land discharge. More conventional techniques include, in addition to discharge and landfill, drying, lagooning and filtration. Some of these are simply sludge reduction or storage alternatives.

Equipment Categories	Applications
1. Land Disposal a. Spreaders (Trucks) b. Sprayer Systems	Surface and subsurface application of digested and undigested sludge and waste effluents.
2. Incineration	Sludge processing by incineration.
3. Digestors	Reduction by biological or chemical activity.
4. Precipitators	Reduction of sludge wastes by pelletization.

Softeners (EW28)

Hard waters require the removal or altering of certain "hard" constituents to insure fitness. This is accomplished by the precipitation of calcium and magnesium salts or the conversion of these agents into other corresponding salts. Treatment by chemicals (lime) or ion exchange are typical methods of softening and demineralization.

Hardness may be removed from process water upon the addition of lime (CaO) and soda ash. This is commonly referred to as the lime-soda process. Adequate time for mixing and sedimentation of the precipitate should be allowed. Often the decanted liquid is filtered to remove the last traces of chalk present.

Ion exchange is commonly accomplished by the zeolite process or by the use of other exchange resins. In the zeolite process the calcium and magnesium salts are replaced by their equivalent of sodium salts. The zeolite can be recharged using brine solution.

Equipment Categories	Application
1. Lime Softeners	Removal of hardness, turbidity.
2. Ion Exchange	Water softening and demineralization for process waters, pH control.
3. Recarbonators	Addition of CO_2 after lime treatment.

Valves (EW3, ES3)

Valves are used to perform at least one of three discrete functions: (1) shut off, (2) throttling or (3) backflow prevention. Valves will also differ by their mode of operation within the system. Basically there are manually operated valves and remotely operated (automatic) valves which can be actuated electrically, hydraulically, or pneumatically.

Valve selection for a particular application depends upon the characteristics of the flowing medium (corrosiveness, abrasiveness, and viscosity), the operating temperature and pressure, the physical space requirements, and the components compatibility within the system.

These major categories may be further expanded in consideration of specific functions, i.e., pressure relief, fluid level control, drainage, and so forth.

Equipment Categories	Applications
1. Ball Valves	Shut-off service, speed control, check service, pressure regulating.
2. Gate (Knife) Valves	Shut-off service.
3. Diaphragm Valves	Throttling service.
4. Butterfly Valves	Flow regulation, shut-off service.
5. Globe Valves	On-off (positive), throttling control
6. Check Valves	Backflow prevention.
7. Flap Valves	Discharge, pressure relief.
8. Actuated Valves	Automated valves providing various services
9. Backflow Preventers (Specialized)	Check and backflow prevention.
10. Mud Valves	Blow-off and drain connections.

Specialized and Miscellaneous Equipment

The following entries are related to either specific treatment processes and operations, or, concern facility maintenance, construction and operation factors. These hardware units are available from manufacturers as individual components or as integrated parts of various equipment systems.

Equipment categories with Descriptions:

1. Skimmers - Skimmers are utilized for surface removal of oil and other light solids in clarifiers, precipitators, flotation units and other separators.

2. Deaerators - Deaerators function to remove dissolved oxygen from process waters. They are typically available as package units.

3. Degasifiers - Degasifiers are used to blow out H_2S and CO_2.

4. Ejectors - Ejectors function as pumping or feeding mechanisms.

5. Motors and Engines - Motors are available as driving units for equipment requiring mechanization. Engines (fuel) may be utilized to provide conventional or standby service.

6. Generators - Electrical generators are available in a variety of sizes for conventional or standby power.

7. Drives - Drives act as transfer devices for the mechanization of processes and equipment systems.

8. Heat Exchangers - Transfer of heat from source to process environment. Most common applications are with sludge digestors and evaporators.

9. Tanks and Standpipes - Storage and equalization of distribution flow.

10. Inspection and Cleaning equipment - Various types of inspection equipment such as leak detectors are available from manufacturers. Many manufacturers also market cleaning materials and devices such as chemicals, scrubbers and pigs.

11. Scales - Gravimetric determination of chemical feed and other use.

12. Chemical Generators - Chemical generators, in the form of package units, are available for the generation of chemical agents used in disinfection (hypochlorite). These units require saltwater or brine solution.

13. Laboratory Equipment - Instrumentation and supplies necessary for quality control monitoring of chemical and biological parameters. Available from chemical and biological scientific companies.

SECTION V

MANUFACTURING SOURCES

This directory contains an extensive listing of European, Asian and American corporations engaged in the manufacture, supply or distribution of water and wastewater treatment equipment, products and services. All manufacturers listed were questioned and asked to contribute information and literature concerning their product line for inclusion within this catalog. Literature from appropriate companies which responded to this request has been included with section IV of the catalog.

WESTERN EUROPE

AUSTRIA

Manufacturer	Product
BRAN & LUBBE GES m.b.H. Munchener Bundesstr. 192, 5020 Salzburg	Pumps.
FURIT-WERKE KERN & CO. Burggasse 4, A-9020 Klagenfurt 5028 Salzburg-Kasern	Sewer Pipes, Sewer Shaft Cylinders.
FRANZ OBERASCHER & CO. Giessereien und Maschinenfabrik 5028 Salzburg-Kasern	Pumps.
G. RUMPEL G.m.b.H. 1015 Wien 1, Seilerstatte 16	Water Treatment Plants, Sewage Plants, Filtering Plants.
HERMANN HANSMANN Helenengasse 1, 1021 Wien	Filters.
MASCHINENFABRIK ANDRITZ AG P.O.B. 24, A-8045 Graz	Sludge Dewatering Machines, Industrial Clarification Plants.
ORION WERKE G.m.b.H. Fachbereich Wasseraufbereitung vorm. Buhring & Bruckner Pasettistrasse 77, 1204 Wien	Filtering Plants, Water Separators.
OVERHOFF F.m.b.H. & CO KG Widerhofweg 8, 1090 Wien	Water Treatment and Sewage Clarifying Plants.

Manufacturer	Product
VEREINIGTE OSTERREICHISCHE EISEN UND STAHLWERKE AG Muldenstrasse 5, 4020 Linz	Water Treatment Plants.
VÖEST-ALPINE AG P.O.B. 2, A-4010 Linz	Clarifying Plants, Sewage Purification Plants.
WABAG WASSERREINIGUNGSBAU G.m.b.H. Paracelsusstrasse 4, 5020 Salzburg	Water Treatment and Sewage, Clarifying Plants.

BELGIUM

ACH (ATELIERS DE CONSTRUCTION DE HERSTAL, SA) 148 rue Hayeneux, B-4400 Herstal	Pumps.
ATELIERS DE BRAINE 75 bld. Lanbermont, B-1030 Bruxelles	Mixers.
BALTIMORE AIRCOIL CHEMVIRON SA 1135 chaussee de Waterloo, 1180 Bruxelles	Chemicals for Water Treatment.
CIE GENERALE D'ENTERPRISES ELECTRIQUES ET INDUSTRIELLES "ELECTROBEL" SA 1 place de Trone, 1000 Bruxelles	Water Treatment Plants.
GFE BENELUX SA Gesellschaft fur die Entwicklung von, Lnadwirtschaft u. Industrie 18 avenue de l'Oree, 1050 Bruxelles	Sewage Pumps.
GRANGES GRAVER NV, SA Div. Smith & Loveless 451 chaussee de Louvain, B1030 Bruxelles	Sewage Treatment Plants, Ejectors, Pump-Stations, Clarifiers.
O.C.P. EPURATION ET CONDITIONNEMENT DES EAUX 5 avenue de l'Heliport - Bruxelles 1000	Water and Waste Water Treatment Equipment.
SEE SA (SOCIETE D'EPURATION ET D'ENTREPRISES) rue Elise, 93-103, B - 1050 Bruxelles	Water Treatment Plants, Sewage Treatment Plants.

DENMARK

Manufacturer	Product
AKVADAN-HARVEY A/S Krogshojvej 29, DK-2880 Bagsvaerd	Sewage Treatment Plants, Ozone Systems.
GRENAA VAERK A/S Aarhusvej, DK-8500 Grenna	Water Works, Sewage Treatment Plants, Centrifuges for Sludge Drying.
HARVEY & CO. A/S Rustenborgvej 7 KD-2800 Copenhagen/Lyngby	Sewer Systems, Sewage Purification, Water-Works.
HETO Klinthøj Voenge 3,	Analysis and Measurement Equipment, Sewage and Water Pollution Treatment Equipment.
JOSEPH LEVIN & CO. A/S Technical Department Vadgaardsvej 42, DK-2600 Copenhagen/Soborg	Deodorizing Plants, Sewage Sludge Plants.
F. L. SMIDTH & CO A/S (INDUSTRIAL EQUIPMENT DIVISION) Vigerslev Alle 77, DK-2500 Copenhagen, Valby	Solid Waste Treatment Plants.

FINLAND

A. AHLSTRÖM OY 48600 Karhula	Pumps.
ENSO-GUTZEIT OSAKEYHTIÖ Engineering Division Box 34, SF-57101 Savonlinna 10	Waste Water Treatment, Sludge Treatment.
FINN-MAYREI OY 17800 Kuhmoinen	Water Filters.
G.A. SERLACHIUS OY 35800 Mantta	Pumps.
KONEKEMIA OY P.O. Box 184, 00101 Helsinki 10	Aerators, Screw Pumps, Filters.
OY FILTER AB Tinasepantie 23, 00620 Helsinki 62	Water and Sewage Treatment.
MATERIEL PERRIER SARL avenue Beaunier, B.P. 43, 42160-Andrezieux-Boutheon	Screening and Micro-Screening Equipment.

Manufacturer	Product
MATERIEL TELEPHONIQUE DIVISION ELECTRO-HYDRAULIQUE 46 quai Alphonse Le Gallo, 92103 Boulogne-Billancourt	Centrifugal Pumps.
MERLIN 6 r. Grolee, Lyon 2 69	Water Effluent Treatment Equipment.
METKLEN-FRANCE 8 rue de la Renardiere 94120 Fontenay-Sous-Bois	Filtration, Filters.
MOLRY CHIMIE 56 r. de Maubeuge, Paris 9 75	Filters, Water Purifying Products.
M.P.I. (MATERIAL PROCESSING INTERNATIONAL) 18-20 rue de l'Esterel, Cedex L 175 Zone Industrielle Silic, Rungis 94533	Reverse Osmosis and Ultrafiltration, Effluent Treatment.
N.A.S.A. 26 r. Leopold Bellan, Paris 2 75	Water and Effluent Treatment.
NATIONAL-STANDARD SA avenue de la Houille Blanche B.P. 218, 73005 Chambery Cedex	Filters and Filtration Equipment.
VALMET OY Punanotkonkatu 2, 00130 Helsinki 13	Sewage Clarifying Plants.

FRANCE

A.F.M.A. (ATELIERS DE FABRICATION DE MATERIEL AGRICOLE, STE) Avenue de la Resistance, Fontenay-Tresigny, Seine-et-Marne	Sewage Clarifying Plants.
APPLICATIONS CHIM., DANS L'IND. 21 bd. Grenelle, Paris 15 75	Decantation Tanks, Sand Filters, Water Clarification Equipment.
ATELIERS DE BARONCOURT Dommary-Baroncourt 55	Water Purification using Activated Sludge.
B.E.R.I.M. (BUREAU D'ETUDES ET DE RECHERCHES POUR L'INDUSTRIES MODERNE) 20 rue Berbier de Mets, 75013 Paris	Sewerage and Waste Water Treatment.
COCEI 44 av. de Chatou, Rueil-Malmaison 92	Water Effluent Treatment Equipment.

Manufacturer	Product
COFIES 33 rue de Clos Verger, Venissieux	Filtration, Iron Extraction, Demineralization.
DEGREMONT 183 rte. de St Cloud Rueil-Malmaison 92	Water and Effluent Treatment and Purification.
ERPAC 85 r. Carpeaux, Wasquehal 59	Activated Sludge, Sand Filters Filtration Tanks.
FILTRES VERNAY av. de Lattre de Tassigny B.P. 68, z.i., 69330 Meyzieu	Rotary Drum Filters, Continous Thickeners, Sludge Membrane Pumps.
OMNIUM ASSAINISSEMENT 11 r. Roger Bacon, Paris 17 75	Tanks, Grinding Devices, Sand Washers, Filters.
PARSONS ET WHITTEMORE 12 r. de Ponthieu, Paris 8 75	Water and Effluent Treatment.
PEC ENGINEERING 10 av. George V, Paris 8 75	Water and Effluent Treatment.
P.E.M.E. Gonnehem 62	Pumps.
PENNWALT-FRANCE SA 94 rue d'Estienne d'Ovres, Rueil	Separators, Decanters, Effluent Treatment.
PERMO 9 r. d'Estienne d'ovres, Rueil 92	Sand Filters, Water Clarification.
PETROLE-CHIMIE 5 r. Taylor, Paris 10 75	Water and Effluent Treatment.
PETROTECHNIE 5 r. Bachaumont, Paris 2 75	Water and Effluent Treatment and Purification, Filtration.
P. FERBECK & VINCENT 10 rue Paul-Dautier 78140 Velizy-Villacoublay	Incinerators, Filter-Media.
PHILIPPE (FILTERS) 109 b.d H. Barbusse, Houilles 78	Chlorometer.
PHILIPS INDUSTRIE 105 rue de Paris, 93002 Bobigny	Monitors.
PHYSIMECA (STE) 14 r. de la Martiniere, Saclay 91	Water Treatment.

Manufacturer	Product
PICA, STE 159 r. de Rome, Paris 17	Effluent Treatment.
PLANCHET (LTS HENRI) Veauche 42	Pumps, Decantation and Filtration Tanks, Aerators.
POMPES ALTA SA SOCIETE ANCIENNE DE CONSTRUCTIONS 45 av. du Pont de Tasset 74000 Meythet	Sewage Pumps.
POMPES ESSA-MICO SA 14-18 rte. de Chatour, B.P. 4 78 Carrieres-sur-Seine, Yvelines	Sewage Pumps.
POMPES RUTSCHI SA 1 av. de Fribourg 68110 Mulhouse/Illzach	Sewage Pumps.
PONT-A-MOUSSON SA 4X 54017 Nancy Cedex	Water and Waste Water Treatment Equipment.
PROCEDES SEM SA 70 av. de Motel, Cachan	Separators, Decanters, Aerators.
PRODUITS CHIMIQUES ALUMINEUX Septimes-les Vallons 13	Water Clarification.
PROGRESSA la Bergue, Cranvas Sales 74	Chlorometers, Filters.
RECUPERATION TERMIQUE EPUR 9 r. Castex, Paris 4 75	Water and Effluent Treatment.
REGULATION AUTOMATIQUE, LA 20 quai de Stalingrad, 92 Boulogne	Filters, Water Level Indicators, Flow Meters.
SANILO 6 r. Jean Goujon, Paris 8 75	Effluent Water Treatment, Water Purifying Products.
SCET INTERNATIONAL 5 r. Bellini, 92806 Puteaux	Water and Effluent Treatment (Domestic and Industrial).
SECOMA 274 cours Emile-Zola, 69 Villeurbanne	Water Pollution Control Products.
SECOMETAL 45 r. Chaussee d'Antin, Paris 9 75	Purification of Effluent Filters, Incinerators.
SECOTRAP 20 bis, r. Mably, Bordeaux 33	Water and Effluent Treatment.

Manufacturer	Product
SEPEREF-TMP B.P. n° 1 - Quincieux 69650 St Germain au Mont d'Or (F)	Plastic Pipes and Fittings for Water Supply.
S.E.R.I.B. BODELOT 69 r. d'Aire, Labuissiere 62	Purification of Effluent Water.
S.E.R.I.M. 18 bd. de la Bastille, Paris 12 75	Treatment of Domestic and Industrial Waste.
SERI (RENAULT ENGINEERING) Centre Parly 2, Le Chesnay 78	Water and Effluent Treatment.
S.E.T.I.F. 17 r. de Clichy, Paris 9 75	Water and Effluent Treatment.
SETUDE 27 bd. des Italiens, Paris 2 75	Water and Effluent Treatment.
S.E.U.R.E.C.A. 91 av Kleber, Paris 16 75	Water and Effluent Treatment.
S.O.C.E.A. EAU ET ASSAINISSEMENT 280 avenue Napoleon-Bonaparte, 92505 Rueil-Malmaison	Water Treatment Plants, Sludge Incineration.
SPEICHIM 106 r. d'Amsterdam, Paris 9 75	Treatment of Domestic and Industrial Waste.
STUDELEC av. du Vercors, Meylan 38	Water and Effluent Treatment and Purification.
TECHNA 9 r. A de la Forge, Paris 17 75	Water and Effluent Treatment Equipment.
TETTBRO, SA 216 rue de Rivoli, 75 Paris 1e	Water Treatment Plants.
TROUFFIER (ETS) 128 bd. de la Republique Angouleme 16	Water and Effluent Treatment.
VANLAER (STE) 133 r. Gen. Mesny, Haubourdin 49	Decantation and Filtration Tanks.
WALDBERG 52 av. du Pre. Wilson, Puteaux 92	Purification of Effluent and Waste Water.
WANSON (ETS) 59 av. Jean Jaures, Arcueil 94	Decantation and Filtration Tanks, Filters, Incinerators.
WAUQUIER (POMPES) 69 r. de Wazemmes, Lille 59	Effluent Treatment.

Manufacturer	Product
WIERITAM 92 r. Baudin, Levallois 92	Water and Effluent Treatment.

GERMANY (FEDERAL REPUBLIC)

A. BOLZ GMBH & CO KG 7988 Wangen, Allgu	Water Treatment Plants.
AEF-TELEFUNKEN 6 Frankfurt 70	Sewage Water Purifying Plant.
A. GENTIL, MASCHINEFABRIK GMBH Lange Strasse 24, 8750 Aschaffenburg	Sewage Pumps.
ALB. KLEIN FG Haupstr. 108, 5241 Niederfischbach	Sewage Clarifying Plants.
ALFA-LAVAL Postfach, S-147 00 Tumba 205 Hamburg-Bergedorf	Centrifuges for Sludge De-Watering, Waste Water Treatment Plants.
ALFRED KARCHER SPEZIALMASCHINEN UND ANLAGENBAU 7057 Winnenden, Postfach 403	Sewage Water Treatment Equipment.
ALGORITE-GESELLSCHAFT FORTSCH & CO Schauenburger Strasse 44 2000 Hamburg 1	Water Treatment Agents.
ALLGEM ROHRLEITUNG AG Kappeler Strasse 126 4000 Dusseldorf-Reisholz	Water Separators.
ALLWEILER AG Allweilerstrasse 1-0 7760 Radolfszell, Bodensee	Sewage Pumps.
ANGELMI-WERKE GMBH Fischenzstr. 39, 7750 Konstanz	Drinking Water Preparing Plant.
A. OTT GMBH 8960 Kempten, Jagerstr. 4-12 P. O. Box 2120	Effluent Testing Installation.
AQUA FILT UNNDEBRINK KG Postfach 21, Essen 43 Bergeborbeck	Water Conditioning Plant.
A. REIBER, GMBH 7410 Rutingen	Sewage Water Purifying Plant.

Manufacturer	Product
ARMATUREN u. APPARATEBAU PAUL GRAEFE Saarbrucker Str. 11-13 6000 Frankfurt/M.-Schwanheim	Water Separators.
AUG. SCHNAKENBERG & CO, CHEMIE-APPARATEBAU 56 Wuppertal 2 Beyenburger Strasse 146/168	Waste Water Samplers, BOD-apparatus.
AUGUST BARTLING Bruckenstr. 33, 4972 Lohne 3 Gohfeld	Filtering Plants.
AUGUST KLUBER GMBH Postfach 8, 6905 Schriesheim	Water Analysis Equipment.
AWAC MANFRED MEGIES Schisslerstrasse 14, 8900 Augsburg	Drinking Water Preparation Plant.
AWA GMBH Garten Strasse 9, 7295 Dornstetten	Water Analysis Equipment Water Purifying Plant.
B & A BEHALTER UND APPARA- TEBAU GMBH 5930 Huttental-Weidenau Postfach 30	Treatment of Industrial Effluent, Water Conditioning.
BAYROL GMBH Lockhamer Strasse 29 8033 Martinsried	Water Purification Agents.
BECKER GBR. 4720 Beckum	Water Distilling Apparatus and Plant.
BECK & HENKEL, MASCHINENBAU AG Wolfhagerstrasse 32-40, 3500 Kassel	Water Treatment Plants.
BENCKISER KNAPSACK GMBH Am Hafen 2, 6802 Ladenburg	Water Treatment Agents.
BENZ WERKZEUG-UND MASCHINENBA 7612 Haslach	Water Separators.
BERKEFELD FILTER D-31 Celle, P.O. Box 12	Water Sterilization, Decontamination, Mechanical Purification, Demineralization.
BISCHOFF GOTTFRIED KG Gartnerstrasse 44, 43 Essen 1	Water Clarification Plant, Sludge Dewatering Equipment.

Manufacturer	Product
BLANKE ARMATUREN KG Johannes Blanke, Konigswinterer Str. 80, 5300 Bonn 5, Bad Godesberg	Water Level Indicators, Flow Meters.
BORSIG GMBH Berliner Str. 19-37 Postfach, 1000 Berlin 27	Water Purifying Plant, Industrial Water Purifying Plant.
BRAN & LUEBBE 2000 Norderstedt 1, Werkstrasse 4 P.B. 1360	Automatic Analyzers, Monitors and Sensors for Monitoring Water.
BROWN BOVERI & CIE Kallstadter Strasse 1, Postfach 351 68 Mannheim	Water Purification Plant, Measuring Instruments.
BRUHL, HAGEN MESS-UND REGELTECHNIK, INH. KLAUS-DIETER BRUHL Egenstr. 53-55, 5805 Breckerfeld 1	Sewage Clarifying Plants.
BUCKAU WOLF GRUPPE 4150 Frefeld, Postfach 2380	Chemical Treatment of Drinking Water, Equipment for Effluent Treatment.
BURDOSA ING. HERWIG BURGERT Industriestrasse 3 6300 Gieben-Rodgen	Water Pollution Control Products.
CAMA F. MEYER KG 6206 Hahn/Ts	Water Purifying Plant.
CHEMIE BRITA Adolfstrasse 4-6, 6200 Wiesbaden	Drinking Water Preparing Plant, Water Filters.
CHEMISCHE FABRIK BUDENHEIM RUDOLF A. OETKER Postfach 45-47, 6501 Budenheim u Mainz	Water Treatment Agents.
CILLCHEMIE ERNST VOGELMANN Bottwarbahnstr. 70, 7100 Heilbronn	Water Treatment Plants.
CLEVER & CO Schederhofstrasse 105-127 4300 Essen	Sewage Clarifying Plants.
CONDUX-WERK Abt 24 S. Anziege vorn im Buch 6451 Wolfgang	Mechanical Clarification of Sewage Water.

Manufacturer	Product
CONRAD J. STENGELIN Obere Vorstadt 21, Donau 7200 Tuttlingen	Sewage Water Purifying Plant.
DANCO & DIENENTHAL KG Hagener Strasse 103, 5900 Siegen	Treatment of Industrial Effluend and Sewage.
DEINZER & WEYLAND GMBH Siemensstrasse 35-37 6710 Frankenthal	Sewage Plants.
DELUWA PUMPEN FABRIKEN SCHLESIGER & CO KG Berrenrather Strasse 391 5000 Koln-Sulz	Sewage Plants.
DEUTSCHE GERATEBAU GMBH 4796 Salzkotten, Postfach 119	Plants for the Purification of Sewage Water.
DEUTSCHE NALCO-CHEMIE GMBH REUTERWEG 50-53, 6 Frankfurt Main	Water Purification Plant, Sludge Dewatering Equipment.
DIPL ING H. SCHANTZ 7064 Remshalden-Hebsack	Water Treatment Plants.
DITTMANN & CO GMBH KG Lorenzstr. 2, 7500 Karslruhe	Water Treatment Plants.
DORR-OLIVER GMBH Friedrich-Bergius-Str. 5 D-6200 Wiesbaden 12	Equipment for the Mechanical Clarification of Sewage Water, Sludge Draining Installations.
DR EUGEN MOHR KG Bergstrasse 5, 7713 Hugingen	Sewage Water Purification Equipment.
DREW CHEMICAL (DEUTSCHLAND) GMBH Katharinenstrasse 31 2000 Hamburg 11	Water Pollution Control Products.
DSD DILLENGER STAHBAU GMBH Henry-Ford-Strasse 6630 Saarlouis-Roden	Industrial Water Purifying Plant.
E EBINGER Gierather Strasse 80a. 5070 Bergisch Gladbach	Drinking Water Preparing Plant.
EISENMANN KG 7030 Boblingen bei Stuttgart Postfach 177	Apparatus and Equipment for the Chemical and Biological Purification of Sewage Water.

Manufacturer	Product
ERNST HAAGE, APARATEBAU UND LABORINRICHTUNGEN Hauskampstrasse 58, 4330 Mulheim Ruhr	Sewage Clarifying Plants.
EVT ENERGIE-UND VARFAHRENS-TECHNIK GMBH Johannesstrasse 39-45, 7 Stuttgart 1	Incinerators, Slag Removal Equipment, Sludge Drying and Destruction Equipment.
FARBWERKE HOECHST AG VORM MEISTER LUCIUS & BRUNING Postfach 800320, 6230 Frankfurt Main 80	Water Treatment Agents.
FELUWA PUMPENFABRIKEN SCHLESIGER & CO 5531 Murlenbach	Sewage Plants and Sewage Pumps.
FILTERWERK MANN & HUMMEL GMBH D-7140 Ludwigsburg, Hindenburgstr. 37-45, P.O. Box 409	Filtration Plants.
FISCHER AND PORTER BMGH 3400 Gottingen, Postfach 701	Accessories for Sewage Water Purifying Plants.
F. MAYER CAMA KG 6202 Hahn/Ts	Drinking Water Preparing Plant.
FIREDRICH AMBS KG 7830 Emmendingen, Postfach 1560	Equipment for the Treatment of Sewage Water.
FRIEDRICH GROHE ARMATUREN-FABRIK 5870 Hemer, Postfach 260	Apparatus and Equipment for the Chemical and Mechanical Purification of Drinking Water.
FRIEDRICHFELDER ANLAGEN-UND VERFAHRENSTECHNIK GMBH Postfach 734, 6800 Mannheim 1 C 8, 9	Plant for Treatment of Chemically Polluted Waste Water.
FT ELECTRIC 7000 Stuttgart 80	Sedimentation Tank Installations.
GEBR. BELLMER KG 7532 Niefern-Oschelbronn 1	Chemical and Biological and Mechanical Purification of Sewage Water.
GES. CALORIC FUR APPARATEBAU GMBH Akilindastr. 56, 8032 Gragelfling	Neutralising Sewage Water.

Manufacturer	Product
GEWERKSCHAFT KERAMCHEMIE SIERSHAHN 5433 Siershahn	Sewage Clarifying Plants.
GOTTRIED BISCHOFF KG 43 Essen, Postfach 188 Gartnerstarasse 44	Apparatus for the Purification of Sewage.
GUTLING GMBH Industrie-Abwasseranlagen Hofner Str. 47, Postfach 66 D-7012 Fellbach-Oeffingen	Ion Exchange Recovery Plants, Ultrafiltration Filter Presses.
HAMANN WALTER HANDELSGES Dortstrasse 15, 2101 Meckelfeld	Sewage Water Disinfacting Installations.
HANS REISERT GESELLSCHAFT FUR WESSERVEREDLUNG 3100 Celle, Postfach 144	Drinking Water Purification Equipment.
HEINRICH FRINGS MASCHINEN- UND APPARATEBAU 5300 Bonn, Jagerstr. 9	Chemical and Biological Purification of Sewage Water, Sewage Water Aerators.
HUGO FISCHER VDI Wiedfeldstr. 79, 4300 Essen Bredeney	Water Purification Equipment.
INAX-ABWASSERTECHNIK DIPL- ING NEUMAYR & DR ROENNEKE KG Graf Diederich Strasse 22 5840 Schwerte	Sewage Treatment.
JAECKEL GEORG 8602 Brietenlohe	Water Purification Equipment.
JUNG PUMPEN, JUNG & CO Postfach 1190, 4803 Steinhagen	Sewage Pumps, Sewage Plants, and Filtering Plants.
KHD INDUSTRIEANLAGEN AG HUMBOLDT WEDAG Herner Strasse 299, Postfach 2730 D-4630 Bochum	Slurry Centrifuges, Filters, Pumps, Flotation Plants, Flocculants, Measuring and Controlling Instruments.
K. H. HILDEBRAND 5421 Fachbach/Bad Ems	Sewage Clarifying Plants.
KLAUS BILL Kemeler Weg 1, 6209 Lindschied	Agitators.
KLOCKNER-HUMBOLDT-DEUTZ AG-KHD Deutz Mulheimer Strasse 111 Postfach 800509, 5 Koln Deutz	Waste Water Treatment Plant, Sludge Drying Equipment.

Manufacturer	Product
KLOCKNER-WERKE AG 4100 Duisburg, Mulheimer Str. 50	Settling Tanks, Sludge-Digestion Tanks, Sludge Combustion Plants.
KOPPERS-WISTRA-OFENBAU GMBH Wiesenstrasse 134, 4 Dusseldorf 11	Incinerators, Sludge Dewatering Equipment.
KRAUSS-MAFFEI AKTIENGESELL-SCHAFT 8000 Munchen 50, Krauss-Maffei Str 2	Mechanical Clarification of Sewage Water, Filters, Incinerators.
LAYER AND KNODLER Daimlerstr. 12a 7050 Waiblingen	Neutralisation Plant for Sewage Water.
L. & C. STEINMULLER GMBH 527 Gummersbach 1 Postfach 1949/1960	Waste Disposal and Waste Water Technology.
LUWA-SMS GMBH 6308 Butzbach, Postfach 120	Mechanical Clarification of Sewage Water.
MENZEL & CO Hedelfingerstrasse 95 7000 Stuttgart 60	Individual Sewage Treatment Plants, Activated Sludge Plants.
MICHAEL VOIT, MASCHINENFABRIK 8671 Weissenstadt (Bayern)	Sewage Plants.
MULDER-VOGEM DEUTSCHLAND GMBH Kaiserstr. 11-13, 4000 Dusseldorf	Sewage Water Purifying Plant.
NETZSCH-MOHNOPUMPEN GMBH Liebigstrasse 28, 8264 Waldkraiburg	Pumps, Filter Presses, Sludge Dewatering Equipment.
NORDSEE-PUMPENFABRIK 2112 Jesteburg u Buchholz in der Nordheide	Sewage Pumps.
OLTSCH & CIE Homburger Strasse 101 6660 Zweibrucken	Sewer Plants.
OSNA J. HARTLAGE Pumpen und Maschinenfabrik 4500 Osnabruck, Postfach 2240	Water Purification Equipment.
OSPA-APPARATEBAU PAUSER GMBH & CO KG Wirhelmstrasse 9 7070 Schwabisch Gmund	Water Purification Equipment.

Manufacturer	Product
OXY-ESTERATOR GMBH Hasenheide 9, 1000 Berlin 61	Water Purification Equipment.
PASSAVENT-WERKE Michelbacher Hutte 6209 Aarbergen 7	Water Purification Equipment, Sewage Water Treatment, Sedimentation Tanks.
PERMUTIT AKTIENGESELLSCHAFT August Viktoria Strasse 62, 1000 Berlin 33	Water Purifying Plant.
PFAUDLER-WERKE AG Postfach 17 80, D-6830 Schweitzingen	Water Purification Equipment.
PHARMACHEMIE FABRIK Ordenmeisterstr. 52, 1000 Berlin	Water Treatment Plants.
PUMPENFABRIK U. MECH. WERKSTATTE WILHELM DUCHTING Kanpmannstrasse 22, 5810 Witten-Annen	Sewage Pumps.
RHEIN-RUHR INGENIEUR-GESELLSCHAFT MGH Burgwall 5, 4600 Dortmund	Sewage Plants.
RHEINSTAHL AG Stockumer Str. 28, 5810 Witten-Annen	Water Treatment Plants, Sewage Pumps, Filtering Plants.
RITZ-PUMPENFABRIK KG Becherlehenstrasse 26-30 7070 Schwabisch Gmund	Sewage Plants.
ROEDIGER ANLAGENBAU-GESELLSCHAFT D-6450 Hanau/Main Kinzigheimer Weg 104	Sewage Treatment Equipment, Sludge Digestion, Sludge Dewatering, Sludge Composting.
ROMPF - EQUIPMENT FOR SEWAGE TREATMENT PLANTS D-6349 Roth/Dillkreis	Aeration Equipment, Floating Covers.
SAESTER FAIRTEC GMBH Kilner Landstrasse 145a, 5160 Durem	Sewage Water Purifying Plants.
SCHANTZ WASSERAUFBEREITUNG Muhlenstrasse, 2352 Bordesholm	Water Treatment Plants, Filtering Plants.

Manufacturer	Product
SCHLAMMFREI-OLPFLEGE DR. ING EDGAR SCHINDLER 2000 Hamburg 74 Rotenbruckenweg 20	Filters for Sewage Clarifying Plants.
SCHUMACHER'SCHE FABRIK 712 Bietigheim/Wurtt Lochgauer Str. 39/41, Postfach 207	Biological Sewage Treatment.
SERVO-TECHNIK GMBH 6900 Heidelberg 1 (Pfaffenfrund) Friedrich-Schoot-Str. 6	Treatment of Industrial Effluent and Drinking Water.
SERVO WASSEREINGERBAU GMBH & CO KG Wurtt 3, 7417 Urach	Water Purifying Plant.
STA-RITE INDUSTRIES GMBH EUROPA Wiesenstrasse 6, 6103 Griesheim Dr. Darmstadt	Water Treatment Plants.
STEINMULLER 5270 Gummersbach 1 Postbox 1949	Incinerator Plants, Water Treatment Plants.
STENGELIN J. CONRAD Obere, Vorstadt 21, Donau 7200 Tuttlingen	Sewage Water Aerators, Industrial Water Purifying Plant.
STEULER-INDUSTRIEWERKE GMBH Postfach 49, 541 Hohr- Grenzhausen	Pumps, Filter Presses, Sludge Dewatering Equipment.
THEODOR CHRIST GMBH Eltinger Strasse 60 Postfach 347 7250 Leonberg	Sewage Water Preparing Plant, Ion Exchangers.
TURBO-MULLER KG 8012 Ottobrunn Dei Munchen Bergmaierstr. 25-27	Mechanical Clarification of Sewage Water.
UNIVERSAL GES ZUR ERRICH- RUNG VON UMWELTSCHUT- ZANLAGEN Humboldstr. 2g, 2410 Molln	Sewage Water Treatment Plants.
WABAG WASSERREINIGUNGSBAU A. KRETZSCHMAR KG Lichtenfalser Strasse 53 8650 Kulmbach	Water Purification Equipment.

Manufacturer	Product
WALETZKO ALFRED Brientenfilder Strasse 31 5820 Geveisberg	Water Purification Equipment.
WASSERTECHNISCHE GESSEL- SCHAFT H. LUDE & CO Kemptener Strasse 34 8951 Unterthingau	Filter Nozzles and Water Treatment Equipment.
WERNER & CO Isernhagener Strasse 87, 3000 Hannover	Sewer Plants.
WERNER FULL 6271 Niederseelbach 1	Water Treatment Equipment and Accessories.
WESTAB GMBH & CO KG Hafenstrasse 4, 41 Duiburg 13	Sludge Dewatering Equipment.
WIBAU MATTHIAS & CO KG Postfach 1520, 646 Gelnhausen	Filters, Water Purification Plant.
WILHELM KOPP, ABT;MIKRONA D=5100 Aachen, Postfach 848	Mechanical Purification of Drinking Water.
WILHELM SCHULER FILTERTECH- NIK GMBH 6719 Elsenberg (Pfalz) Postfach 225	Filters, Sewage Water Aerators.
WILHELM WALTER ORGANISA- TION GMBH 1000 Berlin 33, Wetzlarer Str. 6	Drinking Water Purification Equipment.
WIMMER GMBH 8399 Sulzbach	Sludge Draining Centrifuges.

GREECE

A.E.T.E.X. - EVIM LTD. 10 Kapnokoptiriou str. Athens	Sewage Pumps.
C. M. KOSTARAS 70 Piraeus str., Moschaton, Athens	Pumps.
FILTECH HELLAS LTD. 44 Leoforos Lavriou Paiania Attikis	Filters.
IBS UNITED TUBE MILLS CO. SA 16 Eleft. Venizelou str. Kallithea, Athens	Pumps.

IRELAND (REPUBLIC)

Manufacturer	Product
A. H. MASSER LTD. Kylemore Toad, Dublin ID	Effluent Holding Tanks, Valves, Pumps, Pipework and Fittings.
ANDERSON AND MARTIN LTD. 23 Anglesea Street, Dublin 2	Effluent Treatment Plants, Mixers, Aerators, Sludge Dewatering Plant, Filters.
BRENNAN SALES & CO LTD. 26 Foster Avenue Mt. Merrion, Dublin	Effluent Treatment Plants.
HARPER AND FAY LTD. Hazelhatch, Newcastle, Co. Dublin	Pumps, Screens, Aerators, Sludge Scrapers, Rotary Distributors.
LEVIS ENGINEERING CO. LTD. 1 Popes Road, Cork	Water Treatment Plants, Filters.
MOP JOHNSON WELL SCREENS (IRELAND) LTD. Salmon Leap, Leixlip, Co. Dublin	Filters.
TONGE & TAGGART LTD. East Wall Road, Dublin 3	Cast Iron Pipe Fittings, Surface Boxes, Manhole Covers, Drain Fittings.
V. FLEMING LTD. 14 Clarence Street Dun Laoghaire, Co. Dublin	Chemicals, Metering Pumps, Monitoring Equipment, Ozone Generators, Pumps, Tanks.

ITALY

A.G.A. SPA DIVISIONS OFFICINE MECC. Avenza - C. le D. Zaccagna 13 Carrara, Cap 54031	Feedwater Purifiers, Water Level Indicators.
A.M.S. GAMBAROTTA 38070 Cadine (TN)	Filtering Plants.
AQUACARE ITALIA SPA Via Alessandro Bonci 21 Roma, Cap 00168	Waste Water Sanitising Plant.
BOSCO E C. SPA Via Buenos Aires 4, Torino Cap 10134	Flow Meters, Water Level Indicators.

Manufacturer	Product
CHEMICONSULT SPA Via Vincenzo Monti 55, Milano Cap 20123	Water Treatment Plant.
CHEMIVIRON ITALIA SPA Via Accademia 39, Milano Cap 20131	Water Purification Plant.
C.I.D.A. DI P.I. STAFANAZZI PINO Via Varese 26, Busto A., Cap 21052	Feedwater Purifiers.
CILLICHEMIE ITALIANA SRL Via Plinio 59, Milano, Cap 20129	Water Clarification Plant, Purification and Filtering Plant.
COMEPLA SPA Via Lombardia 1, Monastier di Treviso, Cap 31050	Feedwater Purifiers.
CULLIGAN ITALIANA SPA Cadrigno, Via Gandolfi 6 Granarolo Emilia, Cap 40057	Water Treatment Plant.
DEGREMONT ITALIA SPA Via Crocefisso 27, Milano Cap 20122	Waste Water Sanitising Plants, Ozonisation Plants, Purification and Filtering Plants.
DORR-OLIVER SPA Corso Matteotti 3, Milano Cap 20121	Water Clarification Plant, Waste Water Sanitising Plants, Purification and Filtering Plants.
DR. ING. ALFREDO PONZINI SRL Via IV Novembre 16 26015 Soresina (CR)	Water Treatment Plants, Filter Presses.
EAB Ponte Chiasso, Via Rossini 4 Como, Cap 22100	Water Clarification Plant, Waste Water Sanitising Plant.
EL-CAR PATERSON CANDY ITALIANA Via G. di Vittorio 307/6, 20099 Sesto San Giovanni (Milano)	Water Clarification Plants, Purification and Filtering Plants.
ELETTRACQUA SPA- Via G. da Verazzano 145, Genova Cap 16165	Water Clarification, Ozonisation, Purification and Filtering Plants.
I.M.E.L. SPA Via Divisione Julia, Codropio Cap 33033	Water Clarification Plant, Purification and Filtering Plant.

Manufacturer	Product
NECKAR SNC Via Colombo 11/30, Genova Cap 16121	Purification and Filtering Plants.
NETHERLANDS	
APPARATENFABRIEJ HOME BV Lekstraat 213-227, The Hague	Water Purification Plant, Softening Equipment.
CORODE NV Loonsebaan 73, Vught	Filtering Plants.
DAMBACH INDUSTRIE-ANLAGEN GMBH Gaggenau (W. Dld.) Adolf Dambach-strasse	Waste Water Treatment Plants, Compost Preparation Plants.
DELTA ENGINEERING BV Schiekade 34, Rotterdam	Waste Water Treatment, Ion Exchange, Deaerating Equipment, Flocculation/Filtration.
DORR-OLIVER BV Baden Powellweg 305, Amsterdam 9	Sewage Pumps, Filtering Apparatus, Water Treatment Plants.
DUPER WATERREINIGING NV Nieuwendammerkade 1-3 Amsterdam N	Water Treatment Plants.
FISCHER & PORTER BV Blankenweg 22, P.B. 282, Arnhem	Sewage Clarifying Plants, Flow Meters.
GRONFA PROCESTECKNIEK BV Laan Copes van Cattenburch 90 Den Haag	Pumps, Filtering Plant.
HOLLAND BV HANDELSVERENIG-ING Spuistraat 210, Postbus 3508 Amsterdam	Water Purification Plants, Reverse Osmosis Plants, Ion Exchangers.
HOLTHUIS BV/GEHO POMPEN Grubbenvorsterweg 2, Venlo	Pumps.
HORMAN VLAS NV Strijenseweg 124a, 's-Gravendeel	Filters.
IMBEMI-REGULO BV Haariem, Mauritsstraat 5-7 Postbus 160	Purification Plants for Sewage, Filter Plants, Incinerators.
INSTRUMENTENFABRIEK "MICRO" le Wijkstr. 6, Arnhem	Sewage Clarifying Plants.

Manufacturer	Product
KELMFA NV Merwedeweg 8, Bruekelen, Postbus 39	Aerators, Filters for Water, Sludge Dryers.
LANDUSTRIE SNEEK MACHINE-FAGRIEK ELECTROTECHNIEK BV Piete Zeemanstraat 6, Sneek	Sewage Clarifying Plants.
MACHINEFABRIEK V/H PANNEVIS & ZOEN NV Elektronweg 24, Utecht	Sewage Clarifying Plants.
NORIT N.V. Nijverheidsweg - Noord 72 Postbus 105 3800 AC Amersfoort	Activated Carbon.
PIELKENROOD - VINITEX BV Postal address: P.O. Box 24 Krommenie 1430	Water Treatment and Recycling Plants.
NORWAY	
ALFSEN & GUNDERSON A/S Stalverksveien 1, Oslo 6	Sludge Treatment, Chemical Treatment, Sewage Treatment Systems.
ALWATECH A/S Harbitzalléen 3, Oslo 2	Equipment for Waste Water Treatment, Sludge Treatment, Apparatus for Measuring, Regulating and Controlling.
AQUAKJEMI A/S P.O. Box 51, 1601 Fredrikstad	Equipment for Waste Water Treatment, Sludge Treatment, Instruments.
A/S FLEBU LUFTEKNIKK Ringeriksveien 175 1300 Sandvika	Equipment for Waste Water Treatment
SELCO A/S Lilleakervn. 6, Oslo 2	Sewage Treatment Systems, Chemical Treatment.
WISBECH REFSUM A/S Tomtegaten 28, 3000 Drammen	Waste Water Treatment Plant Equipment.
PORTUGAL	
MOALI, MAQUINAS INDUSTRIAIS SARL Avenida da Republica 32-5^{o} E, Lisboa	Water Treatment Plants.

Manufacturer	Product
PHILIPS PORTUGUESA SARL Apartado 1331, Lisboa 1	Water Monitoring Networks, Instrumentation.
SPAIN	
ASTILLEROS DEL CADAGUA, W. EMILIO GONZALEZ SA Apartado 740, de Bilbao Burcena-Baracaldo (Vizcaya)	Water Treatment Plants.
BOMBAS ITUR, MANUFACTURAS ARANZABAL SA Camino Urteta s/n, Apartado 41 Zarauz, Guipuzcoa	Sewage Pumps and Filters.
INFILCO ESPANOLA SA Hermanos Miralles 95, Madrid 6	Water Treatment Plants, Sewage Clarifying Plants and Filtering Plants.
LA PROMOTORA INDUSTRIAL SA Rambla de Cataluna 6, Atico Barcelona 7	Water Treatment and Sewage Plants, Pumps, Filters.
PHILIPS IBERICA SAE Apartado 2065, Madrid 27	Monitoring Networks, Instrumentation, Sewage Treatment Plants.
ROS-ROCA SA Carretera Madrid-Barcelona, km 511 Apartado 31, Tarrega, Lerida	Sewage Plants and Pumps.
S.A.E. DEGREMONT Carretera Erleches s/n Apartado 1.485 de Bilbao, Asua, Vizcaya	Water Treatment and Sewage Clarifying Plants.
SOCIEDAD ANONIMA OTTO Alcala 67, Madrid 14	Sewage Clarifying Plants.
SWEDEN	
AVB-VAGFORBATTRINGAR AB Box 12148, 102 24 Stockholm	Sewage Clarifying Plants.
ALFA-LAVAL AB Fack, S-147 00 Tumba	Pre-fabricated Waste Treatment, Decanter Centrifuges, Drying Plants.
APPARATKEMISKA AB AKA Box 15071, 104 65 Stockholm 15	Filtering Plants, Water Treatment Plants, Pumps.

Manufacturer	Product
CONARA AB Box 5028, S-102 41 Stockholm 5	Moveable Waste Water Treatment Plants.
CULLIGAN TEKO AB Heliovägen 10, S-10460 Stockholm	Purification Plants and Equipment.
DEFIBRATOR TEKO AB Heliosvagen 10, 104 60 Stockholm 20	Water Treatment Equipment.
DEGRÉMONT VATTENVÅRD AB Box 906, S-181 09 Lidingö	Chemical Treatment, Instruments and Apparatus for Measuring.
DOWO, AB Lundag 11, 171 63 Solna	Sewage Clarifying Plants.
FRACTIONATOR, AB Fack, 100 51 Stockholm 28	Water Treatment Products.
GRANIT OCH BETON AB Äggelundavägen 4, 170 23 Barkarby	Water Treatment Equipment.
HOLMENS BRUK AB 601 88 Norrköping	Water Treatment Products.
INGENIORSFIRMAN TEKO AB Box 20 100, 104 60 Stockholm 20	Water Treatment Plants.
LEJE & THURNE AB Nybrokajen 7, Box 160 63, 103 22 Stockholm 16	Sewage Clarifying and Water Treatment Plants.
NORCLEAN, AB Vare, 432 00 Varberg	Water Treatment Products.
PUMPANLÄGGNINGAR, AB Box 153, S-421 22 Vastra Frolunda	Equipment for Waste Water.
RECI INDUSTRI AB Box 132, 701 03 Orebro	Water Treatment Products.
SVENSKA CELLULOSA AKTIEBOLAGET Fack, 851 88 Sundsvall	Water Treatment Equipment.

SWITZERLAND

ALBERT LANG Albisriederstr. 5, 8040 Zurich	Water Treatment Plants.
A. SCHELLENBAUM & CO. AG Postfach 74, 8404 Winterthur (ZH)	Water Treatment Plants and Filters.

Manufacturer	Product
BBC BROWN, BOVERI & COMPANY LTD. CH-5401 Baden	Effluent and Sewage Treatment.
ISO WASSERAUFBEREITUNG AG Schlertlingasse 10, 4000 Basel (BS)	Water Treatment Plants, Filtering Plants, Sewage Treatment Plants.
KATADYN PRODUKTE AG Industriestr. 27, 8304 Wallisellen (ZH)	Water Treatment and Filtering Equipment.
OZON BLATTER & CO. Peter Merian-Str. 47, Postfach 1123 4002 Basel	Water and Sewage Treatment Plants.

UNITED KINGDOM

ADAMS-HUDRAULICS LTD. P.O. Box 15 Peaseholme Green York YO1 1XA	Pumping and Treatment Machinery for Sewage Disposal.
AKWAPLAN ENGINEERING CO LTD. 19 The Crescent, Leatherhead, Surrey	Water Treatment Plants, Municipal Waterworks.
ALBION CONCRETE PRODUCTS Sewage Treatment Div., Llangadog, Carms	Concrete Modular Sewage Treatment Plants.
ALLEN GWYNNES PUMPS LIMITED (a subsidiary of Amalgamated Power Engineering Ltd.) Queens Engineering Works, Bedford, MK40 4JB	Pumps.
APPELCO EUROPE LTD. 226 Whiteshorse Road, Corydon CRO 2LB	Water Recycling Equipment.
AQUASTAT LTD. Romney House, Tufton Street London SW1P 3DR	Process Water Treatment.
AQUA (MARINE) LTD. Povey Cross House, Horley, Surrey	Water Treatment Plants.
ASTELL HEARSON CO. 172 Brownhill Road, Catford, London SE6 2DL	Water Analysis and Quality Control Apparatus.

Manufacturer	Product
AZTEC ENGINEERING LIMITED Goods Station Road Turnbridge Wells, Kent	Aeration, Filters, Sampling Systems, Valves.
BIWATER TREATMENT CO. LTD. Biwater House, Mill Road, Holmwood, Dorking, Surrey	Pressure and Gravity Sand Filtration.
BRAN & LUEBBE (GB) LTD. 62 Coventry Road, Market Harborough, Leics	Metering Pumps.
BRITISH CECA COMPANY LTD. 17-27 Garratt Lane, Wandsworth, London SW18 4AE	Effluent and Water Treatment Plants.
CLARKE CHAPMAN LTD., WATER TREATMENT UNIT P.O. Box 13, Mount Street, Tipton, West Midlands DU4 7DN	Water and Effluent Treatment Plants, Filtration Plants, Media Filters, Process Ion Exchange.
DEGREMONT LAING LIMITED Awuazur House, Elstree Way, Borehamwood, Herts	Water and Effluent Treatment Plants.
DORR-OLIVER COMPANY LIMITED Norfolk House, Wellesley Road Croydon, Surrey CR9 2DS	Screens, Clariflocculators, Flash Mixers, Aerators, Bio-Filters, Centrifuges, Incinerators, Pumps.
D. WICKHAM & CO. LTD. Ware, Hertfordshire SG12 9QA	Sludge Dewatering Equipment, Sludge Handling Conveyors, Sand Skimming and Respreading Equipment.
ESMIL-ENVIROTECH LIMITED Station Road, St. Neots, Huntingdon PE19 1QG	Sedimentation Tank Scrapers, Aerators, Sludge Thickeners, Flotators, Sand Filters.
NECKAR WATER ENGINEERING LTD. 31-33 College Road, Harrow, Middx	Coagulation, Flotation, Filtration and Clarification Plants, Activated Sludge Sewage Treatment Plants.
PERMUTIT-BOBY LIMITED Permutit House, 632/652 London Road, Isleworth, Middlesex TW7 4EZ	Plants for Physical/Chemical, Biological and Ion Exchange Treatment of Effluents.
SATEC LIMITED P.O. Box 12, Weston Road, Crewe CW1 1DE, Cheshire	Effluent Treatment Plants, Activated Sludge Processes, Scrapers, Sludge Dewatering and Incineration, Pump Stations.

AMERICA

CANADA

Manufacturer	Product
CAE FIBERGLASS PRODUCTS LTD. Box 517 Industrial Airport Edmonton, AB, TKJ 2K5, Canada	Fiberglass and Plastic Pipe, Tanks and Valves.
DAF INDAL LTD. 3570 Hawkestone Road Mississauga, Ontario L5C 2V8	Domes, Bridges, Conveyors, Towers, Process Equipment.
H.F. INSTRUMENTS LTD. Division of Shaban Mfg. Limited 105 Healey Road, Bolton Ontario LOP 1AO, Canada	Turbidimeters.
JENKINS BROS. LTD. 170 St. Joseph Blvd., Lachine, PQ, Canada	Valves.
PEROLIN-BIRD ARCHER LTD. Cobourg, ON, Canada	Chemical Feed Apparatus and Pumps, Chemicals for Water Treatment.
SINGER VALVE Box 69, Surrey, BC, Canada	Valve, Controllers.
TERMINAL CITY IRON WORKS, LTD. 1909 Franklin St. Vancouver, BC, Canada	Pipe and Fittings, Valves, Gates, Meters.

UNITED STATES

A/C PIPE INC. Boro & Secane Roads Box 443 Primos, Pennsylvania 19018	Pipes and Accessories.
ACCUSONIC DIVISION OF ORE INC. Box 709 Falmouth, Massachusetts 02541	Gauges, Flow Meters.
AG-CHEM EQUIPMENT CO., INC. 4900 Viking Drive Minneapolis, Minnesota 55435	Sludge Disposal and Application.
AIR PRODUCTS & CHEMICALS INC. P.O. Box 538T Allentown, Pennsylvania 18105	Aeration Equipment and Systems Ozonators, Activated Sludge.

Manufacturer	Products
ALLIED CHEMICAL CORP. Industrial Chemical Division Box 1139 R Morristown, New Jersey 07960	Chemicals for Water and Waste Water Treatment.
ALLIED COLLOIDS INC. One Robinson Lane Ridgewood, New Jersey 07450	Chemicals for Water and Waste Water Treatment.
ALLIS-CHALMERS VALVE DIVISION Box 712 York, Pennsylvania 17405	Valves.
ALLIS-CHALMERS MOTOR AND GENERATOR DIVISION 4620 Forest Ave. Norwood, Ohio 45212	Motors and Generators.
ALLIS-CHALMERS INDUSTRIAL CONTROLS P.O. Box 89 Wichita Falls, Texas 76307	Motor Controls.
AMERICAN CAST IRON PIPE CO. Box 2727 Birmingham, Alabama 35202	Pipe, Valves, Well Casings.
AMERICAN CYANAMID CO. CHEMICAL & PLASTIC DIVISION Berdan Ave. Wayne, New Jersey 07470	Chemicals for Water and Waste Water Treatment.
AMERICAN NORIT CO. 6301 Glidden Way Jacksonville, Florida 32208	Activated Carbons.
AMERON 400 South Atlantic Blvd. Monterey Park, California 91754	Coatings and Linings, Dome Covers, Pipe and Jointing Materials.
AMETEK/PLYMOUTH PRODUCTS DIVISION 502 Indiana Ave. Sheboygan, Wisconsin 53081	Plastic Valves, Service and Meter Boxes.
AMF-CUNCO PRECISION CONTROL PRODUCTS 400 Research Parkway Meriden, Connecticut 06450	Metering Pumps.
ANDCO INC. ENVIRONMENTAL PROCESS DIVISION P.O. Box 988 Buffalo, New York 14240	Chemicals for Water Treatment, Heavy Metal Removal Systems.

Manufacturer	Product
AQUA-AEROBIC INTERNATIONAL P.O. Box 2026 Rockford, Illinois 61111	Aerators, Mixers, Filtration Systems, Clarifiers.
AQUAFINE CORPORATION 1869 Victory Place Burbank, California 91504	Water Sterilization.
AQUAMATIC INC. 2412 Grant Ave. Rockford, Illinois 61101	Water Meters, Valves, Controls, Demineralizers.
AQUA SURVEY & INSTRUMENT CO. 7041 North Vine St. Cincinnati, Ohio 45216	Magnetic Locators, Magnetop Markers, Pendant-Lamps.
ARCO ELECTRIC PRODUCTS CORP. P.O. Box 278 Shelbyville, Indiana 46176	Generators.
ARMCO STEEL CORP. Box 600 Middletown, Ohio 45043	Gates, Pipe.
ASAHI/AMERICA 425 Riverside Ave. Medford, Massachusetts 02155	Thermo Plastic Valves.
ASPHALT PRODUCTS OIL CORP. 2405 East South Street Long Beach, California 90805	Coatings and Linings.
ASTRO ECOLOGY CORP. P.O. Box 58159 Houston, Texas 77058	Analytical Testing Equipment.
ATKOMATIC VALVE CO., INC. 141 South Sherman Drive Indianapolis, Indiana 46201	Valves-Solenoid.
ATLAS MINERALS & CHEMICALS DIVISION EBS INC. 121 Norman Street Mertztown, Pennsylvania 19539	Corrosion Proof Cements, Coatings, Linings, Plastic Fabrications, Flexible Ducting, Pipe-Joining Compounds.
AURORA PUMP A UNIT OF GENERAL SIGNAL CORP. 800 Airport Road North Aurora, Illinois 60542	Pumps, Ejectors.
AUTOCON INDUSTRIES INC. SUBSIDIARY OF CONTROL DATA CORP. 2300 Berkshire Lane Plymouth, Minnesota 55441	Controllers, Indicating and Recording Instruments, Telemetering Equipment.

Manufacturer	Product
AUTOTROL CORP. BIO-SYSTEMS DIVISION 5855 North Glen Park Road Glendale, Wisconsin 53209	Advanced Waste Water Treatment Processes, Ion-Exchange Equipment, Sludge Concentrators.
AVCO CORPORATION 201 Lowell Street Wilmington, Massachusetts 01887	Demineralizers, Ion-Exchange Equipment, Advanced Waste Treatment Processes.
BADGER METER INC. 4545 West Brown Deer Road Milwaukee, Wisconsin 53223	Instrumentation Meters, Couplings, Registers, Valves.
R. H. BAKER & CO., INC. 2929 South Santa Fe Ave. Los Angeles, California 90058	Brass Goods, Gaskets and Packing, Pipe Fittings, Sleeves.
BALSBAUGH INC. Plymouth Industrial Park Plymouth, Massachusetts 02360	Monitoring and Control Systems.
BARBER-COLMAN 1300 Rock Street Rockford, Illinois 61101	Aerators.
C. E. BAUER DIVISION COMBUSTION ENGINEERING 1717 Sheridan Ave. Springfield, Ohio 45505	Sewage Screens, Sludge Dewatering Equipment, Digestion Tank Equipment, Filter Equipment, Odor Control Materials, Ozone Generators.
BAUSCH & LOMB ANALYTICAL SYSTEMS DIVISION 820 Linden Ave. Rochester, New York 14625	Spectrophotometers.
BECKMAN INSTRUMENTS, INC. 7360 Lincoln Ave. Chicago, Illinois 60646	Meters, Analytical Instrumentation.
BERKELEY CONTROLS INC. 2700 Du Pont Drive Irvine, California 92715	Analytical Instrumentation, Monitoring and Control Equipment.
THE BETHLEHEM CORPORATION 33 Rector Street New York, New York 10006	Furnaces for Carbon Regeneration and Sludge Incineration.
BETHLEHEM STEEL CORPORATION Bethlehem, Pennsylvania 18016	Pipe, Tanks, Coatings and Linings.

Manufacturer	Product
BIF UNIT OF GENERAL SIGNAL CORP. 1600 Division Road West Warwick, Rhode Island 02893	Feedwater Treatment, Waste Water Treatment Systems, Filter Plant Equipment, Meters, Pumps, Valves, Controllers, Instrumentation.
BIG WHEELS INC. P.O. Box 113 Paxton, Illinois 60957	Sludge Application and Disposal.
BINGHAM & TAYLOR CORP. Nalle Street Culpeper, Virginia 22701	Plastic Curb Boxes, Meter Boxes, Valve Boxes.
BINGHAM-WILLAMETTE CO. DIVISION OF GUY F. ATKINSON CO. 2800 N.W. Front Ave. Portland, Oregon 97210	Centrifugal Pumps, Hydraulic Turbines, Valves.
BIRD MACHINE CO. Neponset Street South Walpole, Massachusetts 02071	Aerators, Centrifuges.
BLUE WHITE INDUSTRIES 14931 Chestnut Street Westminster, California 92683	Chemical Metering Pumps, Flow Meters.
BOWERSTON SHALE CO. Box 199 Bowerston, Ohio 44695	Filter Underdrains.
BRAILSFORD & CO., INC. 670 Milten Road Rye, New York 10580	Flowers, Samplers, Vacuum Pumps.
F. S. BRAINARD & CO. 231 Penn Street Burlington, New Jersey 08016	Field Test Kits, Gauges, Meters, Instruments.
BRAN & LUBBE, INC. 2508 Gross Point Road Evanston, Illinois 60201	Water Treatment Plants, Metering Pumps, Analytical Monitoring, Mixers, Agitators, Ultrafiltration, Reverse Osmosis.
BRAUKMANN CONTROLS CORP. 56 Harvester Ave. Batavia, New York 14020	Regulators, Valves, Strainers, Gauges.
BRISTOL, DIVISION OF ACCO 40 Bristol Street Waterbury, Connecticut 06720	Flowmeters, Gauges, Telemetering Equipment, Controllers, Hydrogen-ion Exchange Equipment.

Manufacturer	Product
BROOKS INSTRUMENT DIVISION EMERSON ELECTRIC CO. 407 West Vine Street Hatfield, Pennsylvania 19440	Controllers, Gauges, Meters. Indicating and Recording Instruments.
BROOKS PRODUCTS INC. 10141 Olney Street El Monte, California 91731	Curb Boxes.
BROWNING CHEMICAL CORP. 295 Madison Ave. New York, New York 10017	Chemicals for Water and Waste Water Treatment.
BUCKET ELEVATOR CO. 24-T Commerce Street Chatham, New Jersey 07928	Belt Conveyors and Elevators for Sludge Grits and Screenings.
J. M. BUSH CO. 2 Lipan Street Denver, Colorado 80223	Filter Bottoms, Covers, Plastic Tanks.
BUTLER MANUFACTURING CO. 7400 East 13th Street Kansas City, Missouri 64126	Conveyors, Tanks.
BYRON JACKSON PUMP DIVISION BORG-WARNER CORP. 2300 East Vernon Ave. Los Angeles, California 90058	Pumps.
CAL CUT PIPE & SUPPLY INC. P.O. Box 2147 Bakersfield, California 93303	Steel Pipe and Tanks.
CALGON CORP. SUBSIDIARY OF MERCK & CO., INC. Box 1346 Pittsburgh, Pennsylvania 15230	Chemicals for Water and Waste Water Treatment.
CAN-TEX INDUSTRIES DIVISION HERSCO CORP. Process Equipment Division Box 340 Mineral Wells, Texas 76067	Pump Stations, Tertiary Filters, Clarifiers, Pipe, Packaged Sewage Treatment.
CAPITAL CONTROLS COMPANY P.O. Box 211 Colmar, Pennsylvania 18915	Chlorination Equipment.
CARLISLE TIRE & RUBBER CO. DIVISION OF CARLISLE CORP. P.O. Box 99 Carlisle, Pennsylvania 17013	Reservoir Linings.

Manufacturer	Product
CARLON METER COMPANY SUBSIDIARY OF JSJ CORP. 715 Robbins Road Grad Haven, Michigan 49417	Water Meters, Remote Reading Systems.
RALPH B. CARTER CO. 192 Atlantic Street Hackensack, New Jersey 07602	Equipment for Water and Waste Water Treatment Processes.
CARUS CHEMICAL CO., INC. 1500 Eighth Street La Salle, Illinois 61301	Chemicals for Water and Waste Water Treatment.
CEA - CATER - DAY CO. Minneapolis, Minnesota 55452	Waste Water Treatment Systems and Components.
CERTAIN TEED PIPE & PLASTICS GROUP P.O. Box 860 Valley Forge, Pennsylvania 19482	PVC Sewer Pipe.
CHEMFIX, INC. 505 McNeilly Road Pittsburgh, Pennsylvania 15226	Packaged Waste Treatment Units.
CHICAGO BRIDGE & IRON CO. 505 Columbia Building 2651 East 21st Tulsa, Oklahoma 74114	Steel Plate Construction Tanks.
CHLORINATORS, INC. 2430 N.E. Dixie Highway Jensen Beach, Florida 33457	Chlorination Equipment.
CIBA - GEIGY CORPORATION Pipe Systems Department 9800 Northwest Freeway Houston, Texas 77092	Pipe Systems.
CLA-VAL CO. Newport Beach, California 92663	Automatic Valves, Controllers.
CLOW CORP. 1211 West 22nd Street Executive Plaza East Oak Brook, Illinois 60521	Aerators, Pipe and Fittings, Gates, Pumps, Valves, Chemical Feed Apparatus, Clarifiers, Filter Equipment.
COLT INDUSTRIES FAIRBANKS-MORSE PUMP DIVISION 3601 Kansas Ave. Kansas City, Kansas 66110	Pumps, Reverse Osmosis Equipment.

Manufacturer	Product
CONSOLIDATED ELECTRIC CO. 141 South Lafayette Freeway St. Paul, Minnesota 55107	Pump and Valve Controls.
COOK WELL STRAINER CORP. P.O. Box 11002 Cincinnati, Ohio 45211	Screening Equipment.
CORAD WATER METERS 12900 South West 89th Court Miami, Florida 33176	Water Meters.
CPC ENGINEERING CORP. SUBSIDIARY OF NEPTUNE INTER- NATIONAL CORPORATION Box 36-T Sturbridge, Massachusetts 01566	Pumps, Screening Equipment, Sludge Removal Equipment, Tanks.
CRANE CO. Box 191 King of Prussia, Pennsylvania 19406	Water and Waste Treatment, Reverse Osmosis Ozonation, Clarification, Deaeration, Filtration, Straining.
CROMAGLASS CORP. Box 1146 Williamsport, Pennsylvania 17701	Waste Treatment Processes, Pumps, Tanks, Package Treat- ment Units.
CUES, INC. THE CARBORUNDUM CO. 3501 South Vinland Road Orlando, Florida 32805	Sewer Maintenance and Inspec- tion Equipment.
DAYTON FOUNDRY COMPANY 11803 Industrial Avenue South Gate, California 90280	Pipe Fittings.
DELAVAL TURBINE INC. CONDENSER AND FILTER DIVISION Front Street Florence, New Jersey 08518	Filter and Filter/Demineralizer System.
DELTA SCIENTIFIC CORP. 1172 Rte. 109 Lindenhurst, New York 11757	Analytical Instrumentation.
DELTA SCIENTIFIC DIVISION ENVIROTECH CORPORATION 250 Marcus Blvd. Hauppauge, New York 11787	Automated Analysis of Water, Waste Water and Process Fluids.
DEVON PRODUCTS, INC. 7321 N. Figueroa Street Los Angeles, California 90041	Control and Monitoring Apparatus, Chemical Feed Equipment, Chemical Feed Pumps.

Manufacturer	Product
DEXOL INC. 1010 19th Ave. East Box 3222 Tuscaloosa, Alabama 35401	Curb and Meter Boxes.
DEZURIK CORP. 51 Riverview Road Sartell, Minnesota 56377	Valves.
DIAMOND SHAMROCK CORP. 1100 Superior Ave. Cleveland, Ohio 44114	Chemicals for Water and Waste Water Treatment, Chlorination Equipment, Ion Exchange Materials.
THE DICKEY CO. Box 6 Pittsburg, Kansas 66762	Vitrified Clay Pipe, Mechanical Joints.
DIVERSIFIED ELECTRONICS, INC. 119 North Morton Ave. Evansville, Indiana 47711	Industrial Control Devices.
DORR-OLIVER, INC. 77 Havemeyer Lane Stamford, Connecticut 06904	Water and Waste Water Treatment Processes and Equipment.
DOW CHEMICAL CO. 2020 Dow Center Midland, Michigan 48640	Chemicals for Water and Waste Water Treatment.
DRESSER MANUFACTURING DIVISION DRESSER INDUSTRIES INC. 41 Fisher Ave. Bradford, Pennsylvania 16701	Clamps, Couplings, Joints, Pipe Fittings, Sleeves, Valves.
DUCTILE IRON COMPANY OF AMERICA Carolyn Avenue Savannah, Georgia 31401	Pipe Fittings.
E.I. DU PONT DE NEMOURS & CO., INC. ENVIRONMENTAL PRODUCTS Wilmington, Delaware 19898	Chemicals for Water and Waste Water Treatment, Covers and Linings, Analytical Testing Equipment, Laboratory Equipment.
E.I. DU PONT DE NEMOURS & CO., INC. PLASTIC PRODUCTS AND RESINS DEPT. Wilmington, Delaware 19898	Permeators.
DYNECO INC. 6921 Environ Blvd., 1-T Lauderhill, Florida 33319	Screening Equipment.

Manufacturer	Product
EAST JORDAN IRON WORKS East Jordan, Michigan 49727	Sleeves and Valves.
ECODYNE SMITH & LOVELESS DIVISION 14040 Sante Fe Trail Drive Lenexa, Kansas 66215	Aerators, Clarifier Equipment, Filter and Screening Equipment, Lift Stations, Sludge Handling and Control.
ECOLOGIC INSTRUMENT CORPORATION SUBSIDIARY OF UNITED STATES FILTER CORP. 132 Wilbur Place Bohemia, New York 11716	Water Instruments, Test Kits, Chemicals.
EIMCO DIVISION ENVIROTECH CORPORATION Box 300 Salt Lake City, Utah 84110	Chemical Feed Equipment, Clarifier Equipment, Mixing Devices, Pumps, Flocculation Equpment, Scrrening Equipment, Sludge Handling and Control.
ENDRESS & HAUSER, INC. 2350 Endress Place Greenwood, Indiana 46142	Control and Monitoring Devices, Ejectors, Flow and Level Measuring Equipment.
ENGELHARD INDUSTRIES 430 Mountain Ave. Murray Hill, New Jersey 07974	Chlorination Equipment, Odor Control Materials.
ENPO-CORNELL PUMP CO. 420 East Third Street Piqua, Ohio 45356	Pumps and Controls.
ENVIREX INC. WATER QUALITY CONTROL DIVISION 1702 South Prairie Ave. Waukesha, Wisconsin 53186	Aeration Systems, Trickling Filters, Clarification, Sludge Dewatering.
ENVIRONMENT/ONE CORP. P.O. Box 773 Schenectady, New York 12309	Waste Treatment Processes, Grinder Pumps.
ENVIRONMENTAL ELEMENTS CORP. Box 1318 Baltimore, Maryland 21203	Clarifier Equipment, Filtration and Sedimentation Equipment.
ENVIRONMENTAL PRODUCTS INC. Box 2385 Hickory, North Carolina 28601	Pumps and Lift Stations, Aerators.
ENVIROTECH CORP. 3000 Sand Hill Road Menlo Park, California 94025	Water Quality Control and Industrial Processing Equipment.

Manufacturer	Product
ETHYL CORP. 330 South 4th Richmond, Virginia 23219	Filter Equipment, Filter Materials.
ETHYL CORP. PIPE PRODUCTS DIVISION 451 Florida, Ethyl Tower Baton Rouge, Louisiana 70801	Plastic Pipe.
FABRI-VALVE A DILLINGHAM CORP. Box 4367-T Portland, Oregon 97208	Gates, Valves.
FACET ENTERPRISES, INC. 434 West Twelve Mile Road Department TR Madison Heights, Michigan 48071	Demineralization, Filter Material and Equipment, Aerators, Clarifier Equipment, Ion-Exchange Equipment, Water Separators, Sludge Handling and Control.
FARNAN BRASS WORKS CO. 1104 Center Street Cleveland, Ohio 44113	Brass Goods, Fittings, Couplings, Yokes, Cocks and Stops, Curb Boxes.
FERRO CORPORATION One Erieview Plaza Cleveland, Ohio 44114	Aerators, Diffusers, Filter Equipment, Filter Material.
FIBERCAST CO. A DIVISION OF YOUNGSTOWN SHEET AND TUBE COMPANY Box 968 Sand Springs, Oklahoma 74063	Plastic Pipe and Pipe Fittings.
FIBERGLASS SPECIALTY CO. 527 Shoreview Park Ave. St. Paul, Minnesota 55112	Clarifier Equipment, Digestion Tanks, Pipe, Filter Equipment.
FILTRATION EQUIPMENT CORP. 1425 Emerson Street Rochester, New York 14606	Filtration Systems and Equipment.
FISCHER & PORTER CO. ENVIRONMENTAL DIVISION County Line Road Warminster, Pennsylvania 18974	Instrumentation for Process/Power/Environmental, Chlorination Equipment, Chemical Feed Equipment, Flumes, Gates.
FISHER RESEARCH LABORATORY Box 490 Belmont, Calfiornia 94002	Leak Detectors.

Manufacturer	Product
FISHER SCIENTIFIC CO. 711 Forbes Ave. Pittsburgh, Pennyslvania 15219	Analytical Measuring Devices.
FISHER TANK CO. 3131 West 4th Street Chester, Pennsylvania 19013	Steel Tanks, Steel Plate Construction.
FLEXIBLE VALVE CORP. 9 Empire Blvd. South Hackensack, New Jersey 07606	Valve, Gates.
FLINTKOTE CO. PIPE PRODUCTS DIVISION 1 Cascade Plaza, Suite 1402 Akron, Ohio 44308	Pipe and Fittings.
FLUID DYNAMICS CO. Box 10 Cedar Knolls, New Jersey 07927	Aerators.
FLYGT CORPORATION 129 Glover Ave. Norwalk, Connecticut 06856	Pumps, Pump Controls, Valves.
FMC CORPORATION ENVIRONMENTAL EQUIPMENT DIVISION 1800 FMC Drive West Itasca, Illinois 60143	Aerators, Filters, Diffusers, Pumps, Sedimentation Equipment, Intake Screens, Controllers.
FORCE-FLOW EQUIPMENT 3567 Golden Gate Way Lafayette, California 94549	Chlorination Equipment, Chlorine Scales.
FORD METER BOX CO., INC. 775 Manchester Ave. Box 443 Wabash, Indiana 46992	Brass Goods, Meter Boxes and Covers, Fittings, Yokes, Clamps, Couplings, etc., Meter Testing Equipment.
FRAM CORPORATION 105 Pawtucket Ave. Providence, Rhode Island 02916	Filter Equipment.
FREE-FLOW INC. Box 4067 Benson Station Omaha, Nebraska 68104	Flumes.
FULLER CO. 2966 East Victoria Street Compton, California 90224	Chemical Feed Equipment, Filter Equipment, Gates, Pumps.

Manufacturer	Product
THE GALIGHER CO. P.O. Drawer 209 Salt Lake City, Utah 84110	Pumps.
GAMON-CALMET INDUSTRIES, INC. P.O. Box 15999 Covington, Kentucky 41015	Water Meters.
GARLOK INC. CONSTRUCTION PRODUCTS DIVISION Palmyra, New York 14522	Expansion Joints.
GATES RUBBER CO. 999 South Broadway Denver, Colorado 80217	Coatings and Linings.
GELMAN INSTRUMENT CO. 600 South Wagner Road Ann Arbor, Michigan 48106	Instrumentation and Apparatus for Bacteriological Evaluation of Water.
GENERAL ELECTRIC CO. SAC Building 81-111 1 River Road Schenectady, New York 12345	Generators, Motors, Drives, Controllers, Instrumentation.
GIFFORD-HILL-AMERICAN INC. Box 47127 Dallas, Texas 75247	Pipe.
GIRARD POLLY PIG, INC. Box 27208 Houston, Texas 77027	Cleaning Equipment and Corrosion Control.
GLIDDEN COATINGS & RESINS ARCHITECTURAL & MAINTENANCE SCM CORPORATION Cleveland, Ohio 44115	Coatings and Linings.
GLOBE LININGS INC. BOX 7396 Long Beach, California 90807	Cover and Lining Systems.
GOLDEN ANDERSON VALVE SPECIALTY CO. 1250 St. George St. East Liverpool, Ohio 43920	Valves.
GOODALL RUBBER CO. Box 631 Trenton, New Jersey 08604	Hose, Pipe and Pipe Fittings.
B.F. GOODRICH GENERAL PRODUCTS 500 South Main Street Akron, Ohio 44318	Coatings and Linings, Filter Media and Systems, Odor Control.

Manufacturer	Product
GORMAN RUPP CO. 305 Bowman Street Mansfield, Ohio 44901	Lift Stations, Oxygenators, Pumps.
GOULDS PUMPS INC. 240 Fall Street Seneca Falls, New York 13148	Pumps.
GRIFFIN PIPE PRODUCTS CO. 2000 Spring Road Oak Brook, Illinois 60521	Pipe and Accessories.
GULF SEAL CORP. 601 Jefferson Ave. 534 Dresser Tower Houston, Texas 77002	Coatings and Linings.
HABITATS, INC. AERO-MOD DIVISION P.O. Box 1086 Manhattan, Kansas 66502	Waste Water Treatment Plants.
HACH CHEMICAL CO. Box 907 Ames, Iowa 50010	Chemicals for Water and Waste Water Treatment.
HALLIBURTON SERVICES SPECIAL PRODUCTS DIVISION Box 1431 Duncan, Oklahoma 73533	Flow Meters, Conveyors, Electronic Read-Out Equipment, Mixers, Inspection, Sealing and Maintenance Equipment.
HAYWARD TYLER INC. 25 Harbor Ave. Norwalk, Connecticut	Pumps.
HELLIGE INC. 877 Stewart Ave. Garden City, New York 11530	Scientific Instruments.
HERSEY PRODUCTS INC. 250 Elm Street Dedham, Massachusetts	Meters, Valves, Gauges.
HINDE ENGINEERING CO. 654 Deerfield Road Highland Park, Illinois 60035	Sewage Treatment Equipment, Systems and Plants.
HOLTKAMP COMPANY Box 567 Centralia, Illinois 62801	Standby and Portable Pumps.
HOMELITE 14401 Carowinds Blvd. Charlotte, North Carolina 28217	Pumps.

Manufacturer	Product
HORIZON ECOLOGY CO. 7435 North Oak Park Ave. Niles, Illinois 60648	Control and Monitoring Equipment.
HUNGERFORD & TERRY INC. 226 Atlantic Ave. Clayton, New Jersey 08312	Water Conditioning and Treatment Plants.
HUSKY INDUSTRIES, INC. INDUSTRIAL DIVISION Route 1, Box 275 Dunnellon, Florida 32670	Activated Carbon.
HYCOR CORPORATION 800 Skokie Highway Lake Bluff, Illinois 60044	Liquid Solid Separation.
HYDRO-CONDUIT CORPORATION Box 2360 Newport Beach, California 92660	Pipe.
HYDRO-O-MATIC PUMP A DIVISION OF WYLAIN, INC. P.O. Box 327 Ashland, Ohio 44805	Ejectors, Pumps.
ICI UNITED STATES, INC. Wilmington, Delaware 19897	Activated Carbon.
IDREX INC. P.O. Box 367 Frankfort, Illinois 60423	Filtration.
IMC CHEMICAL CROUP INC. Sobin Park Boston, Massachusetts 02210	Chemicals for Water and Waste Water Treatment.
INDEPENDENT FITTING CO. Box 23294 Portland, Oregon 97223	Pipe Fittings and Jointing Materials.
INDICO INC. 186 Crescent Road Needham Heights, Massachusetts 02194	Aeration Equipment and Systems.
INDUSTRIAL FILTER DIVISION HARMSCO INC. P.O. Box 14054 North Palm Beach, Florida 33408	Filters.
INFILCO DEGREMONT INC. Box K-7 Richmond, Virginia 23288	Aerators, Filters, Clarifiers, Mixing Equipment, Valves.

Manufacturer	Product
INGERSOLL-RAND CO. Woodcliff Lake, New Jersey 07675	Filters.
INTERCONTINENTAL PLASTIC MFG. CO. 825 Trunk Ave. Dallas, Texas 75210	Meter Boxes.
INTERPACE CORPORATION 260 Cherry Road Parsippany, New Jersey 07054	Pipe.
IONICS, INC. 65 Grove Street Watertown, Massachusetts 02172	Waste Water Treatment Systems and Equipment.
ISCO Box 5347 Lincoln, Nebraska 68505	Sampling Devices.
ITT FLUIDS HANDLING DIVISION 320 Park Ave. New York, New York 10022	Pumps, Meters, Valves, Strainers.
JACKSON-RAND CORPORATION FLOMATCHER DIVISION Box 1048 Corvallis, Oregon 97330	Controllers.
JAECO PUMP COMPANY 539 Ford Street West Conshohocken, Pennsylvania 19428	Proportion Pumps, Metering Pumps, Chemical Feed Treatment Systems.
JAMES JONES COMPANY 4127 Temple City Blvd. El Monte, California 91734	Brass Goods, Goosenecks, Curb Stops, Cocks, Valves.
JEFFREY MENUFACTURING DIVISION DRESSER INDUSTRIES INC. Box 1879 Columbus, Ohio 43216	Agitators, Chemical Feed Apparatus, Coagulators, Intake Scrrens, Mixing Equipment.
JET AERATION COMPANY 750 Alpha Drive Cleveland, Ohio 44143	Waste Water Treatment Systems.
JOHNS-MANVILLE Box 5108 Denver, Colorado 80217	Pipe, Couplings, Valves, Filter Media.
JOHNSTON PUMP COMPANY 1775 East Allen Ave. Glendora, California 91740	Pumps.

Manufacturer	Product
JONES CHEMICAL, INC. 100 Harwood Ave. Caledonia, New York 14423	Chemicals for Water and Waste Water Treatment.
KASON CORPORATION Peddie Building 231 Johnson Ave. Neward, New Jersey 07108	Clarifiers, Sewage Screens.
KENNEDY VALVE MFG. CO. INC. Department AW Box 931 Elmira, New York 24902	Brass Goods, Cocks, Curb and Corporation Stops, Valves.
KENT METER SALES INC. 7 East Silver Springs Blvd. Suite 400 Ocala, Florida 32670	Water Meters.
KEYSTONE VALVE DIVISION KEYSTONE INTERNATIONAL INC. 9600 West Gulf Bank Drive Houston, Texas 77040	Valve.
KOMAX SYSTEMS, INC. 1947 East 223rd Street Long Beach, California 90810	Chlorinators, Mixers.
KOMLINE-SANDERSON ENGINEERING CORP. 12 Holland Ave. Peapack, New Jersey 07977	Analytical Measuring Devices, Lime Slakers and Feeders, Pumps, Sludge Handling Equipment.
KREBS ENGINEERS 1205 Chrysler Drive Menlo Park, California 94025	Desanders.
LAKESIDE EQUIPMENT CORP. 1022 East Devon Ave. Bartlett, Illinois 60103	Waste Water Treatment Systems and Plants.
LAMSON DIVISION DIEBOLD INC. 818 Mulberry Road S.E. Canton, Ohio 44707	Aeration Equipment and Systems.
LAVAL SEPARATOR CORP. P.O. Box 6119 Fresno, California 93727	Liquid Solid Separators.
LAYNE & BOWLER INC. Box 8097 Memphis, Tennessee 38108	Vertical Turbine Pumps.

Manufacturer	Product
LEOPOLD CLARI-VAC INC. 888 West Goodale Blvd. Columbus, Ohio 43212	Clarifiers, Sedimentation.
F. B. LEOPOLD COMPANY DIVISION OF SYBRON CORP. 227 South Division Street Zelienople, Pennsylvania 16063	Filter Underdrains, Aerators, Gratings, Flow Measurement and Instrumentation Equipment, Rotary Filter Agitators.
LIMITORQUE CORPORATION 181 South Gulph Road King of Prussia, Pennsylvania 19333	Agitators, Aerators, Couplings, Valve Operating Units.
LIQUIFLO EQUIPMENT CO. 140 Mt. Bethel Road Warren, New Jersey 07060	Pumps.
LONE STAR STEEL CO. Box 35888 Dallas, Texas 75235	Pipe.
LYNCHBURG FOUNDRY A MEAD COMPANY Drawer 411 Lynchburg, Virginia 24505	Pipe and Fittings.
MCDOWELL MANUFACTURING CO. Dubois, Pennsylvania 15801	Land Disposal Systems for Waste Effluents.
A. Y. MCDONALD MFG. CO. Box 508 Dubuque, Iowa 52001	Meter Couplings and Yokes, Service Saddles, Valves, Brass Goods, Curb Boxes.
MCKESSON CHEMICAL CO. Crocker Plaza One Post Street San Francisco, California 94104	Chemicals for Water and Waste Water Treatment.
MCNICHOLS COMPANY 4889 East 154th Street Cleveland, Ohio 44128	Bar Gratings.
MCWANE CAST IRON PIPE CO. Box 607 Birmingham, Alabama 35201	Cast Iron Pipe and Fittings.
MAGNA CORPORATION 11808 South Bloomfield Ave. Santa Fe Springs, California 90670	Feed Water Treatment Equipment.
MAPCO INC. PROCESS & CONTROLS DIVISION 1437 South Boulder Tulsa, Oklahoma 74119	Waste Water Treatment Systems.

Manufacturer	Product
MAROLF, INC. 15500 49th Street Clearwater, Florida 33520	Sewage Treatment Plants.
MD PNEUMATIC INC. P.O. Box 2877 Springfield, Missouri 65803	Aeration Equipment and Systems.
MEAD PIPE - ALABAMA Box 309 Anniston, Alabama 36201	Pipe and Accessories.
MEC-O-MATIC CO. 455 Woodlane Drive St. Paul, Minnesota 55165	Chemical Feeders, Chlorinators, Dechlorinating Equipment, Reverse Osmosis Equipment.
MECHANICAL DEVELOPMENT CORP. 746 East Milwaukee Street Whitewater, Wisconsin 53190	Feed Water Treatment Equipment.
MET-PRO SYSTEMS INC. A SUBSIDIARY OF MET-PRO CORP. Box 144 Harleysville, Pennsylvania 19438	Water Treatment Systems, Gravity and Pressure Filters, Clarifiers, Waste Water Treatment Plants, Sludge Thickening, Dewatering Equipment.
MICHIGAN HYDRANT & VALVE CO. 12606 Inkster Road Detroit, Michigan 48239	Distributors for Pumps, Tapping Machines, Sleeves, Valves.
MICHIGAN WHEEL 1501 Buchanan Ave. S.W. Grand Rapids, Michigan 49507	Aeration Equipment and Systems.
MIDLAND PUMP L.F.E. FLUIDS CONTROL DIVISION 110 Skiff Street Hamden, Connecticut 06514	Aeration Equipment and Systems, Pumps.
MILLIPORE CORPORATION Ashby Road Bedford, Massachusetts 01730	Filtration Systems and Equipment.
CE MINERALS 901 East 8th Ave. King of Prussia Industrial Park King of Prussia, Pennsylvania 19406	Sewage Treatment Plants.
MONARCH SEPARATORS, INC. 6827 Signat Houston, Texas 77041	Separators, Corrugated Plate Interceptors.

Manufacturer	Product
MUELLER CO. 500 West El Dorado Street Decatur, Illinois 62525	Tapping Machines, Coupling, Brass Goods, Valves, Cocks, and other Fluid Control Items.
MUESCO INC. MEASUREMENT & CONTROL DIVISION Box 36425 Houston, Texas 77036	Meters, Valves, Monitoring Instrumentation.
MULTIPLEX MANUFACTURING CO. CRISPIN VALVE DIVISION 600 Fowler Ave. Berwick, Pennsylvania 18603	Valves.
NALCO CHEMICAL CO. 2901 Butterfield Road Oak Brook, Illinois 60521	Chemicals for Water and Waste Water Treatment.
NATGUN INTERNATIONAL CORP. Teal Road Wakefield, Massachusetts 01880	Precast Concrete Tanks.
NEPTUNE MICROFLOC INC. SUBSIDIARY OF NEPTUNE INTERNATIONAL Box 612 Corvallis, Oregon 97330	Chemical Feed Apparatus, Clarifiers, Filtration Systems, Mixing Equipment, Sedimentation Equipment, Valves.
NEPTUNE WATER METER CO. SUBSIDIARY OF NEPTUNE INTERNATIONAL 30 Perimeter Park Atlanta, Georgia 30341	Water Meters, Instruments.
NEPTUNE NICHOLS ENGINEERING & RESEARCH CORPORATION SUBSIDIARY OF NEPTUNE INTERNATIONAL Homestead and Willow Roads Belle Mead, New Jersey 08502	Filter Presses, Sludge Furnaces.
NEWARK WIRE CLOTH CO. 365 Verona Ave. Neward, New Jersey 07104	Pressure Filters.
NORTHERN GRAVEL CO. Box 307 Muscatine, Iowa 52761	Filter Media.
NORTON CO. CHEMICAL PROCESS PRODUCTS DIVISION P.O. Box 350 Akron, Ohio 44309	Biological Reactors and Elements.
OCEAN RESEARCH EQUIPMENT, INC. P.O. Box 709 Falmouth, Massachusetts 92541	Flowmeters.

Manufacturer	Product
OLIN CORPORATION WATER SERVICES 3155 Fiberglass Road Kansas City, Kansas 66115	Chemical for Water and Waste Water Treatment.
OWENS-CORNING FIBERGLASS Fiberglass Tower Toledo, Ohio 43659	Pipe, Tanks, Valves.
PACIFIC STATES CAST IRON PIPE CO. Box 1219 Provo, Utah 84601	Pipe and Fittings.
PARKSON CORPORATION SUBSIDIARY OF A JOHNSON & CO. INC. 5601 N.E. 14th Avenue Ft. Lauderdale, Florida 33334	Gravity Settlers, Separators/ Thickeners.
PD FILTRATION, INC. 739 Riverside Ave. Westport, Connecticut 06880	Pressure Drum and Multi-Roller Filters.
PEABODY FLOMATCHER, INC. P.O. Box 1048 Corvallis, Oregon 97330	Variable Speed Pump Controllers and Systems.
PERMUTIT CO., INC. SUBSIDIARY SYBRON CORP. P.O. Box 365 Paramus, New Jersey 07652	Water and Waste Treatment for Industry and Municipality.
PETROLITE CORPORATION TRETOLITE DIVISION 369 Marshall Ave. St. Louis, Missouri 63119	Flocculants, Flocculating Equipment.
PHILADELPHIA QUARTZ CO. Box 840 Valley Forge, Pennsylvania 19482	Chemicals for Water and Waste Water Treatment.
PHOENIX IRON WORKS 800 Pine Street Oakland, California 94607	Castings, Pipe Fittings - Distribution.
PIELKENROAD SEPARATOR CO. P.O. Box 53563 Houston, Texas 77052	Water and Waste Water Treatment Systems.
PILOT MANUFACTURING CO. P.O. Box 3128 Torrance, California 90510	Tools and Equipment for the Pipe Industry.

Manufacturer	Product
PITTSBURGH - DES MOINES STEEL CO. P.O. Box 1596 Des Moines, Iowa 50306	Engineers/Fabricators/Constructors.
PLASTI-STEEL 1075 Vickers - Kansas State Bank & Trust Building 125 North Market St. Wichita, Kansas 67202	Tank and Pond Liners.
JOSEPH G. POLLARD CO. INC. New Hyde Park, New York 11040	Pipeline Equipment.
POLYMETRICS, INC. SUBSIDIARY OF TECHNICAL EQUITIES CORP., INC. 3011 Corvin Drive Santa Clara, California 95051	Reverse Osmosis Water Purification.
HENRY PRATT CO. 401 South Highland Ave. Aurora, Illinois 60507	Valves.
PRELOAD CO., INC. 839 Stewart Ave. Garden City, New York 11530	Constructors, Prestressed Concrete, Storage and Pressure Facilities.
PRICE BROTHERS CO. 367 West Second Street Box 825 Dayton, Ohio 45401	Pipe.
PROGRESSIVE FABRICATORS, INC. 6880 North Broadway St. Louis, Missouri 63147	Steel Pipe.
QUALITY CONTROL EQUIPMENT CO. P.O. Box 2706 Des Moines, Iowa 50315	Automatic Waste Water Samplers.
RANNEY COMPANY DIVISION OF LAYNE, NEW YORK CO., INC. P.O. Box 145 Westerville, Ohio 43081	Infiltration Galleries, Pump Stations, Concrete Caissons.
REED MANUFACTURING CO. 1425 West 8th Street Erie, Pennsylvania 16512	Pipe Cutting Machines and Tools.
REFCO PURIFICATION SYSTEMS Box 2356 San Leandro, California 94577	Ultraviolet Disinfectors.

Manufacturer	Product
REILLY TAR & CHEMICAL CORP. P.O. Box 97 Hazelwood, Missouri 63042	Jointing Materials, Pipe Coatings.
RESOURCES CONSERVATION CO. P.O. Box 936 Renton, Washington 98055	Evaporator Systems, Brine Concentrators, Sludge Dewatering and Drying Systems.
REYNOLDS METALS CO. Richmond, Virginia 23261	Land Disposal of Sewage Effluent.
ROBBINS & MYERS, INC. MOYNO PUMP DIVISION Springfield, Ohio 45501	Pumps.
ROBERTS FILTER MANUFACTURING CO. 6th & Columbia Ave. Darby, Pennsylvania 19023	Filter Plant Equipment, aerators, Agitators, Ion-Exchange Equipment and Materials, Feeders, Chemicals.
ROBINTECH, INC. Box 2342 Ft. Worth, Texas 76101	Plastic Pipe and Fittings.
ROCKWELL INTERNATIONAL 400 North Lexington Ave. Pittsburgh, Pennsylvania 15208	Meters.
RODNEY HUNT CO. WATER CONTROL EQUIPMENT DIVISION 46 Mill Street Orange, Massachusetts 01364	Gates, Valves.
ROSS VALVE MANUFACTURING CO. P.O. Box 595 Troy, New York 12181	Valves.
RUSSELL PIPE & FOUNDRY CO., INC. Box 730 Alexander City, Alabama 35010	Pipe and Fittings, Curb Boxes, Joints.
RUST-OLEUM CORPORATION 2301 Oakton Street Evanston, Illinois 60204	Industrial Coatings.
JOSEPH T. RYERSON & SONS, INC. Box 8000-A Chicago, Illinois 60680	Plastic Pipe.
SARGENT-WELCH SCIENTIFIC CO. 7300 North Linder Ave. Skokie, Illinois 60076	Chemical Reagents.

Manufacturer	Product
SCHRAMM INC. 901 East Virginia Ave. West Chester, Pennsylvania 19380	Aerators, Agitators, Mixing Devices.
SCIENTIFIC PRODUCTS 1546 East Grand Blvd. Detroit, Michigan 48211	Filter Equipment.
SHARPLES - STOKES DIVISION PENNWALT CORPORATION 955 Mearns Road Warminster, Pennsylvania 18974	Centrifuging Equipment, Flocculating Equipment, Sludge Concentrators.
SIGMAMOTOR, INC. 14 Elizabeth Street Middleport, New York 14105	Automatic Samplers and Flowmeters.
SINGER COMPANY WATER RESOURCES DIVISION 1993 Chelsea Ave. Memphis, Tennessee 38108	Aerators, Pumps, Screening Equipment.
SIRCO CONTROLS CO. 401 Second Ave. West Seattle, Washington 98119	Flow Measurement, Sampling Equipment.
R & G SLOANE MANUFACTURING CO., INC. P.O. Box 876 Sun Valley, California 91352	Pipe, Valves.
A. O. SMITH HARVESTORE PRODUCTS INC. 550 W. Algonquin Road Arlington Heights, Illinois 60006	Tanks, Steel.
A. O. SMITH - INLAND INC. REINFORCED PLASTICS DIVISION 2700 West 56th Street Little Rock, Arkansas 72209	Plastic Pipe.
SOUTHERN PERFORATING CO. Route 2, Old Tasso Lane Cleveland, Tennessee	Perforating.
SPRAYING SYSTEMS CO. 6635 Delmar Blvd. St. Louis, Missouri 63130	Spray Nozzles and Accessories.
STEVENS INTERNATIONAL, INC. P.O. Box 619 Kennett Square, Pennsylvania 19348	Flowmeters.
STILES-KEM CORPORATION A SUBSIDIARY OF MET-PRO CORP. 3301 Sheridan Road Zion, Illinois 60099	Water Conditioning Chemicals and Dispensers.

Manufacturer	Product
SUPERIOR UTILITY PRODUCTS INC. 140 East Dana Street Mountain View, California 94041	Pipe Fittings, Joints, Couplings, Pressure Filters.
SWECO, INCORPORATED 6033 East Bandini Blvd. Dept. 101009 P.O. Box 4151 Los Angeles, California 90051	Filter Equipment, Screening Equipment, Sludge Control.
TAIT-ANDRITZ 4601 Locust Lubbock, Texas 79404	Sludge Dewatering Equipment.
TAYLOR CHEMICALS INC. 7300 York Road Baltimore, Maryland 21204	Analytical Measuring Devices, Field Test Kits, Chlorine Measuring Devices.
TECHOLOGY, INC. 1719 Kenny Road Columbus, Ohio 43214	Sludge Concentration.
TECTANK INCORPORATED 2101 South 21st Parsons, Kansas 67357	Steel Tanks.
TENCO HYDRO/AEROSCIENCES, INC. 5220 East Ave. La Grange, Illinois 60525	Clarifier Equipment, Package Treatment Equipment.
TETCO INCORPORATED 520 Saw Mill River Road Elmsford, New York 10523	Screening Media.
TETRADYNE CORPORATION 1681 South Broadway Carrollton, Texas 75006	Flow Monitoring Instruments.
THOMPSON-HAYWARD CHEMICAL CO. 5200 Speaker Road Kansas City, Kansas 66106	Chemicals for Water and Waste Water Treatment.
TIFCO P.O. Box 23294 Portland, Oregon 97223	Fittings for Asbestos - Cement Pipe.
TNEMEC CO., INC. Box 1749 Kansas City, Kansas 64141	Coatings.
TOPCO COMPANY DIVISION STERLING-SALEM CORP. 1801 Newgarden Road Box 507 Salem, Ohio 44460	Ejectors, Filter Equipment, Package Treatment Units.

Manufacturer	Product
TRAVERSE CITY IRON WORKS Box 848 Traverse City, Michigan 49684	Fire Hydrants, Gate Valves, Check Valves, Indicator Posts.
TURBITROL COMPANY A DIVISION TAULMAN CO. Box 12047 Atlanta, Georgia 30355	Meters, Pumps, Filtration Equipment and Media, Chemical Feed Apparatus, Valves.
C. E. TYLER INDUSTRIAL PRODUCTS 8200 Tyler Blvd. Mentor, Ohio 44060	Wire Cloth and Wire Screens.
TYLER PIPE INDUSTRIES INC. Box 2027 Tyler, Texas 75701	Plastic Pipe and Fittings, Curb Boxes, Joints, Sleeves.
UNI-BELL PLASTIC PIPE ASSN. 2655 Villa Creek Drive Suite 164 Dallas, Texas 75234	Plastic Pipe.
UNITED STATES OZONAIR CORP. 1025 Grandview Drive South San Francisco, California 94080	Ozone Generators.
UNION CARBIDE ENVIROMENTAL SYSTEMS 2710 Stemons Freeway Suite 700 Dallas, Texas	Waste Water Treatment Plants and Systems.
UNIVERSAL ENGINEERED SYSTEMS, INC. 7071 Commerce Circle Pleasanton, California 94566	Flow Measurement Equipment, Sampling Equipment, Valves.
U.S. PIPE & FOUNDRY CO. Box 10406 North Birmingham, Alabama 35202	Pipe, Joints, Fittings, Valves, Gates.
UOP, INCORPORATED FLUID SYSTEM DIVISION 2980 North Harbor Drive San Diego, California 92101	Reverse Osmosis, Elements and Systems.
UOP, INCORPORATED JOHNSON DIVISION Box 3118 St. Paul, Minnesota 55165	Intake Screens and Strainers.
VALVE & PRIMER CORPORATION 1420 South Wright Blvd. Schaumburg, Illinois 60172	Valves.

Manufacturer	Product
VICTAULIC COMPANY OF AMERICA 3100 Hamilton Blvd. South Plainfield, New Jersey 07080	Grooved Pipe Couplings, Fittings and Valves.
VIRGINIA CHEMICALS INC. 3340 West Norfolk Road Portsmouth, Virginia 23703	Water Corrosion Inhibitors.
E. H. WACHS COMPANY 100 Shepard Street Wheeling, Illinois 60090	Pipe Cutting Machines, Pumps, Valve Operating Units.
WALKER PROCESS DIVISION CHICAGO BRIDGE & IRON CO. Aurora, Illinois 60506	Aerators, Clarifier Equipment, Digestion Tank Equipment, Filter Equipment, Mixing Devices, Screening Equipment, Sludge Handling and Control.
WALLACE & TIERNAN DIVISION PENNWALT CORPORATION 25 Main Street Belleville, New Jersey 07109	Chlorination Equipment, Pumps, Chemical Feed Apparatus, Evaporation Equipment, Ion Exchange Equipment.
WARMINSTER FIBERGLASS CO. Box 188 Southampton, Pennsylvania 18966	Gates.
WASHINGTON ALUMINUM CO., INC. Penn R.R. and Knecht Ave. Baltimore, Maryland 21229	Aerators, Gates, Gratings, Screening Equipment, Valves.
WATERMAN INDUSTRIES, INC. P.O. Box 458 Exeter, California 93221	Gates and Valves.
WATEROUS COMPANY 300 John E. Carroll Ave. East South St. Paul, Minnesota 55075	Pumps.
WATER REFINING CO., INC. 500 North Verity Parkway Middleton, Ohio 45042	Deionization.
WATERSAVER CO., INC. 3560 Wynkoop Street Denver, Colorado 80216	Flexible Linings.
WATER WORKS SUPPLY & MFG. CO. 3379 Railroad Ave. Union City, California 94587	Valve Operating Units.
WATT REGULATOR CO. Box 628 Lawrence, Massachusetts 01842	Valves.

Manufacturer	Product
WELL STRAINER CORPORATION 6330 Glenway Ave. Cincinnati, Ohio 45211	Strainers.
WEMCO DIVISION ENVIROTECH CORPORATION P.O. Box 15619 Sacramento, California 95813	Aerators, Ejectors, Mixing Devices, Pumps, Screening Equipment, Sludge Control.
WESTERN FILTER CO. 4545 East 60th Ave. Box 76323 Denver, Colorado 80216	Filtration Systems and Elements, Clarifiers, Chemical Feed Apparatus.
WESTERN LAND ROLLER CO. 1341 West 22nd Street Box 668 Hastings, Nebraska 68901	Pumps.
WESTERN STATES MACHINE CO. 1770 Fairgrove Ave. Hamilton, Ohio 45012	Centrifugal Equipment.
WESTVACO CORPORATION Covington, Virginia 24426	Activated Carbon.
WHEELER MANUFACTURING CORP. Box 688 Ashtabula, Ohio 44004	Pipe Tools.
WHITEWATER MANUFACTURING CO. 1108 East Milwaukee Street Whitewater, Wisconsin 53190	Automatic Air Volume Controls.
WORTHINGTON CORPORATION 270 Sheffield Street Mountainside, New Jersey 07092	Meters, Pumps.
ZETA-METER INC. Department T 1720 First Ave. New York, New York 10028	Flocculating Equipment.
ZURN INDUSTRIES, INC. Erie, Pennsylvania 16512	Water and Waste Water Treatment Plants and Equipment.
JAPAN	
ANRITSŪ ELECTRIC CO., LTD. 12-20, Minami Azabu, 4-chome Minato-ku, Tokyo 106	Measuring Equipment and Indicators.

Manufacturer	Product
CHIYODA MANUFACTURING CO., LTD. 75-5 Imojiya Koshoku City Nagano-pref., Japan	Water Distillation Equipment.
EBARA-INFILCO CO., LTD. Palaceside Bldg. 1-1, Hitotsubashi, Chiyoda-ku Tokyo, Japan	Water Treatment Equipment, Fume Incinerator, Sludge Dehydrator.
ISHIGAKI MECHANICAL INDUSTRY CO., LTD. 4-27, chuo-cho Sakaide City Kagawa-pref., Japan	Daphragm Press.
JAPAN ORGANO CO., LTD. 5-5-16 Hongo Bunkyo-ku Tokyo, Japan	Water Deionizer.
KATO RIKI MGF. CO., LTD. 669-4 Kamekubo Ohi-machi, Iruma-gun Saitama-pref., Japan	Cooling Water Circulation.
KOTOBUKI INDUSTRIAL CO., LTD. 1-20, Toyooka-dori Mizuho-ku Nagoya, Japan	Demineralizer.
KOTOBUKI SHOJI LTD. 1-20, Toyooka-dori Mizuho-ku Nagoya, Japan	Demineralizer.
KURIMOTO IRON WORKS CO., LTD. 56, Kitahorie, Miikedori Nishi-ku, Osaka	Industrial Waste Treatment.
MARUSHIMA HYDRAULIC GATE WORKS, LTD. 1-6-15, Tsuruhashi Ikuno-ku, Osaka	Treatment Equipment and Plants, Measuring Equipment and Indicators.
NEW COSMOS ELECTRIC CO., LTD. 5-4, Mitsuyanaka, 2-chome Yodogawa-ku, Osaka	Measuring Equipment and Indicators.
NIHON DEGREMENT K.K. 5-5-16 Hongo Bunkyo-ku Tokyo, Japan	Pulsator.
NIPPON ZOKI 2-10, Hirano-cho Higashi-ku, Osaka	Treatment Equipment and Plants.
NOHZAI CHEMICAL CO., LTD. Naniwa Bldg. 6-22, 5-chome, Fukushima Fukushima-ku, Osaka	Treatment Equipment and Plants.

Manufacturer	Product
ORGANO SOFTENER CO., LTD. 6 Rokuban-cho Chiyoda-ku Tokyo, Japan	Water Softner.
SANCHIN MGF. CO., LTD. 3-50 Kamejima-cho Nakamura-ku Nagoya, Japan	Sludge Dehydrator.
SEKISUI CO., LTD. 2, Kimugasa-cho, Kita-ku, Osaka	Treatment Equipment and Plants.
SHINKO PFAUDLER CO., LTD. 1-31, Wakinohama-cho, Fukiai-ku Kobe, Japan	Clarification and Demineralization System, Water Softner.
TAKUMA CO., LTD. 16-1, Dojimanaka, 1-chome Kita-ku, Osaka	Industrial Waste Treatment.
TOHZAI CHEMICAL CO., LTD. Naniwa Bldg. 6-22, 5-chome, Fukushima Fukushima-ku, Osaka	Industrial Waste Treatment.
TOKYO KOSAN CO., LTD. 1-21-6, Dogenzaka Shibuya-ku Tokyo, Japan	Chlorinator.
TOKYO ORGANIC CHEMICAL INDUSTRIES, LTD. 5-2-43, Toshima Kita-ku Tokyo, Japan	Iron Exchange Resin.
TOKYO PLASTIC INDUSTRY CO., LTD. 2-9-5 Sake-machi Higashi Murayama City Tokyo, Japan	Water Deionizer.
TOYO KAGAKU SANGYO CO., LTD. 2-36, Funakoshi-cho, Higashi-ku, Osaka 540	Industrial Waste Treatment, Measuring Equipment and Indicators.
VALCANO & CO. 3-38, Kita Nonka, 1-chome Yodogawa-ku, Osaka	Industrial Waste Treatment.
YUASA BATTERY CO., LTD. 6-6, Josai-cho Takatsuki-shi, Osaka-fu	Industrial Waste Treatment.