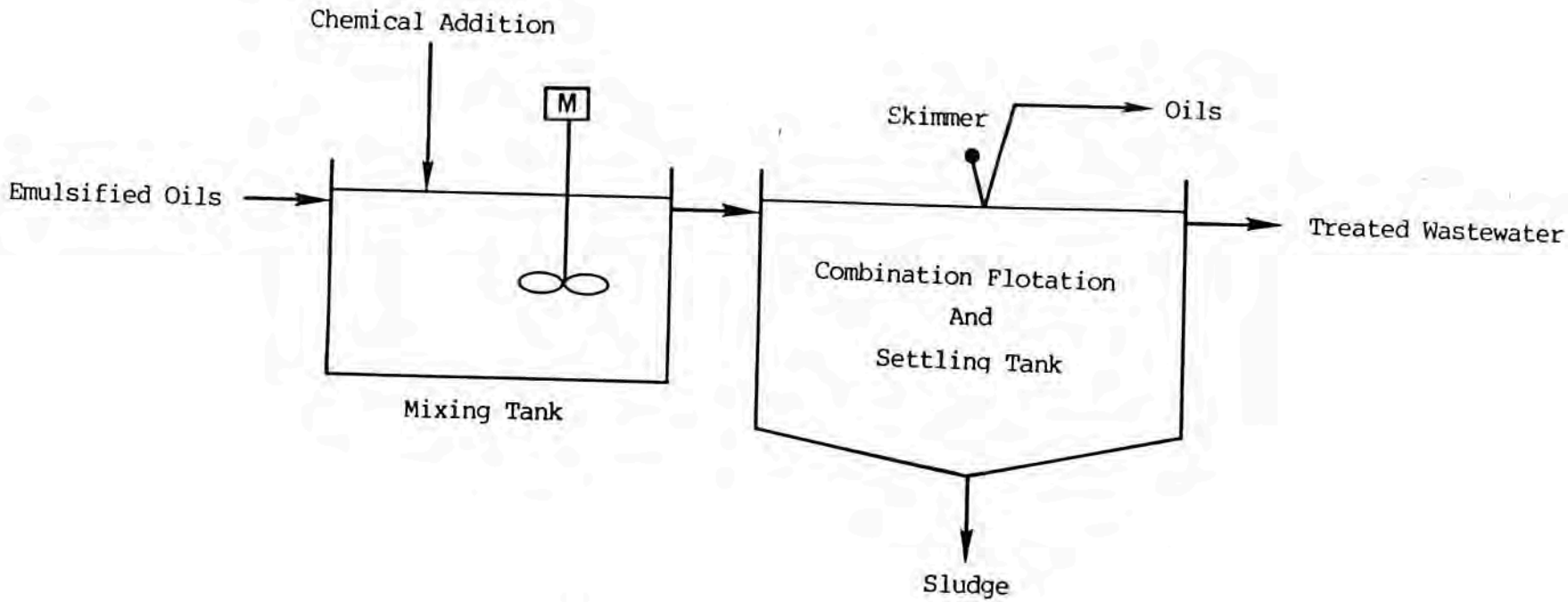

FIGURE 7-30

TYPICAL EMULSION BREAKING/SKIMMING SYSTEM

of mechanical surface skimmers that are presently in use. Decanting methods include removal of the oily surface residue via a technique such as controlled tank overflow or by removal of the demulsified wastewater from the bottom of the tank. Decanting can be accomplished with a series of tap-off lines at various levels which allow the separated oils to be drawn off the top or the wastewater to be drawn off the bottom until oil appears in the wastewater line. With any of these arrangements, the oil is usually diverted to storage tanks for further processing or hauling by a licensed contractor.

Chemical emulsion breaking can be accomplished by a large variety of chemicals which include acids, salts, or polymers. These chemicals are sometimes used separately, but often are required in combination to break the various emulsions that are common in the wastewater. Acids are used to lower the pH to 3 or 4 and can cleave the ion bond between the oil and water, but can be very expensive unless acid rich wastewaters, such as pickling wastes, can be used. Acids are more commonly employed in oil recovery systems than in oily waste removal systems. Iron or aluminum salts such as ferrous sulfate, ferric chloride, or aluminum sulfate are more commonly used because they are less expensive. These salts combine with the wastewater to form acids which in turn lower the pH and break the oil/water bond (and have the additional benefit that these salts aid in agglomeration of the oil droplets), but the use of these salts produces more sludge because of the addition of iron or aluminum. Polymers, such as polyamines or polyacrylates and their copolymers, have been demonstrated to be effective emulsion breakers and generate less sludge than do metal salts. The Option 1 treatment system costing, presented in Section VIII, is based upon the use of aluminum sulfate plus a quantity of polymer as the emulsion breaking chemicals.

After chemical addition, the mixture is agitated to ensure complete contact of the emulsified oils with the demulsifying agent. With the addition of the proper amount of chemical and thorough agitation, emulsions of 5% to 10% oil can be reduced to approximately 0.01% remaining emulsified oil. The third step in the emulsion breaking process is to allow sufficient time for the oil/water mixture to separate. Differences in specific gravity will permit the oil to rise to the surface in approximately two hours. Heat can be added to decrease the separation time. After separation, the normal procedure involves skimming or decanting the oil from the tank.

Application

Emulsion breaking technology can be applied to the treatment of emulsified oil/water mixtures in the Metal Finishing Category wherever it is necessary to separate oils, fats, soaps, etc. from wastewaters. Certain machining coolant emulsion cannot be chemically or thermally broken and must be treated by ultrafiltration.

The main advantage of the chemical emulsion breaking process is the high percentage of oil removal possible with this system. For proper and economical application of this process, the oily wastes (oil/water mixture) should be segregated from other wastewaters either by storage in a holding tank prior to treatment or be fed directly into the oily waste removal system from major collection points. Further, if a significant quantity of free oils are present, it is economically advantageous to precede the emulsion breaking with a gravity separator. Chemical and energy costs can be high, especially if heat is used to accelerate the process.

Chemical emulsion breaking can be highly reliable if adequate analysis is performed prior to the selection of chemicals and proper operator training is provided to ensure that the established procedures are followed.

For chemical emulsion breaking, routine maintenance is required on pumps, motors, and valves as well as periodic cleaning of the treatment tank to remove any sediment which may accumulate in the tank. The use of acid or acidic conditions will require a lined tank, and the lining should be checked periodically. Emulsion breaking generates sludge which requires proper disposal.

Performance

The performance attainable by a chemical emulsion breaking process is dependent on addition of the proper amount of de-emulsifying agent, good mixing agitation and sufficient retention time for complete emulsion breaking. Since there are several types of emulsified oils, a detailed study should be conducted to determine the most effective treatment techniques and chemicals for particular application.

Demonstration Status

Emulsion breaking is a common technique used in industry, is a proven method of effectively treating emulsified wastes, and is in use at 29 plants in the present data base. These plants are identified in Table 7-65.

TABLE 7-65
METAL FINISHING PLANTS EMPLOYING EMULSION BREAKING

01058	11477	12095	20173	30153	36074
01063	12075	13041	20247	33050	38040
03041	12076	20103	20249	33120	40836
06679	12080	20158	20254	33127	46713
11129	12091	20159	30135	33179	

influent flow < 3944 l/hour; 0.0048 hp/gph

influent flow > 3944 l/hour; 0.0096 hp/gph

The power required for the sludge pumps in the batch system is the same as that required for the sludge pumps in the continuous system. Energy costs for these requirements are estimated based on a unit cost of $0.045/kilowatt hour of required electricity.

TABLE 8-5

LIME ADDITIONS FOR LIME PRECIPITATION

Stream Parameter	Lime Addition kg/kg (lbs/lb)
Aluminum	0.81
Antimony	4.53
Arsenic	1.75
Cadmium	2.84
Chromium	2.73
Cobalt	2.35
Copper	1.38
Iron (Dissolved)	1.28
Lead	2.19
Magnesium	0.205
Manganese	3.50
Mercury	1.48
Nickel	0.42
Selenium	1.45
Silver	3.23
Zinc	1.25

Chemical Emulsion Breaking

Chemical emulsion breaking removes emulsified oil droplets from suspension through chemical destabilization. Destabilization allows the oil droplets to agglomerate, rise to the surface of the separation tank, and be removed from the wastewater by surface skimming mechanisms. This technology assumes that the waste oil emulsion is capable of being broken through chemical addition only, and that addition of heat will not be required.

In this waste treatment system, emulsified oil wastes are mixed with alum and chemical polymers, then allowed to separate via gravity separation in a settling tank. Once separation has occurred, the waste oils can be skimmed from the tank surface and disposed. The remaining wastewater is either passed on to further treatment or discharged depending on the waste treatment system.

Chemical emulsion breaking can be performed in either a continuous or a batch mode. Each operating mode, the equipment associated with each mode, and the design and operating assumptions incorporated are discussed in the following paragraphs.

Investment Costs - The investment costs associated with the continuous and batch operating modes for chemical emulsion breaking are shown in Figure 8-11 as a function of waste stream flow rate. For the continuous operating mode, the cost curve is based upon the purchase and installation of the following equipment:

2	946 liter (250 gallon) alum dilution tanks
2	Alum dilution tank mixers
2	Variable speed alum feed pumps (with pump stands and associated automatic control equipment)
2	946 liter (250 gallon) polymer dilution tanks
2	Polymer dilution tank mixers
2	Variable speed polymer feed pumps (with pump stands and associated automatic control equipment)
1	Steel mixing tank with liner for chemical addition (sized for 15 minute retention time)
1	Mixing tank mixer (motor horsepower variable with mixing tank volume)
1	Steel gravity separation tank with liner, weirs, and baffles (sized for 1 hour retention time)
1	Separation tank surface oil skimming mechanism
1	Skimmed oil transfer pump
1	Waste oil storage tank (steel tank with liner, sized for 20 day retention)
1	Separation tank effluent transfer pump

For the chemical emulsion breaking unit operated in the batch mode, the cost curve is based upon the purchase and installation of the following equipment:

1	946 liter (250 gallon) alum dilution tank
1	Alum dilution tank mixer
1	Alum feed pump with pump stand
1	946 liter (250 gallon) polymer dilution tank
1	Polymer dilution tank mixer
1	Polymer feed pump with pump stand
2	Steel gravity separation tanks with liners (sized for variable retention depending on least cost mode)
2	Tank mixers (motor hp variable with separation tank volume)
1	Separation tank effluent transfer pump

The chemical emulsion breaking system (both batch and continuous operating modes) have been sized for a 20% excess capacity factor. Selection of the operating mode is based on a least cost basis as discussed previously in the Section VIII text.

Operation and Maintenance Costs - The operation and maintenance costs associated with the chemical emulsion breaking unit consist of labor and material expenses.

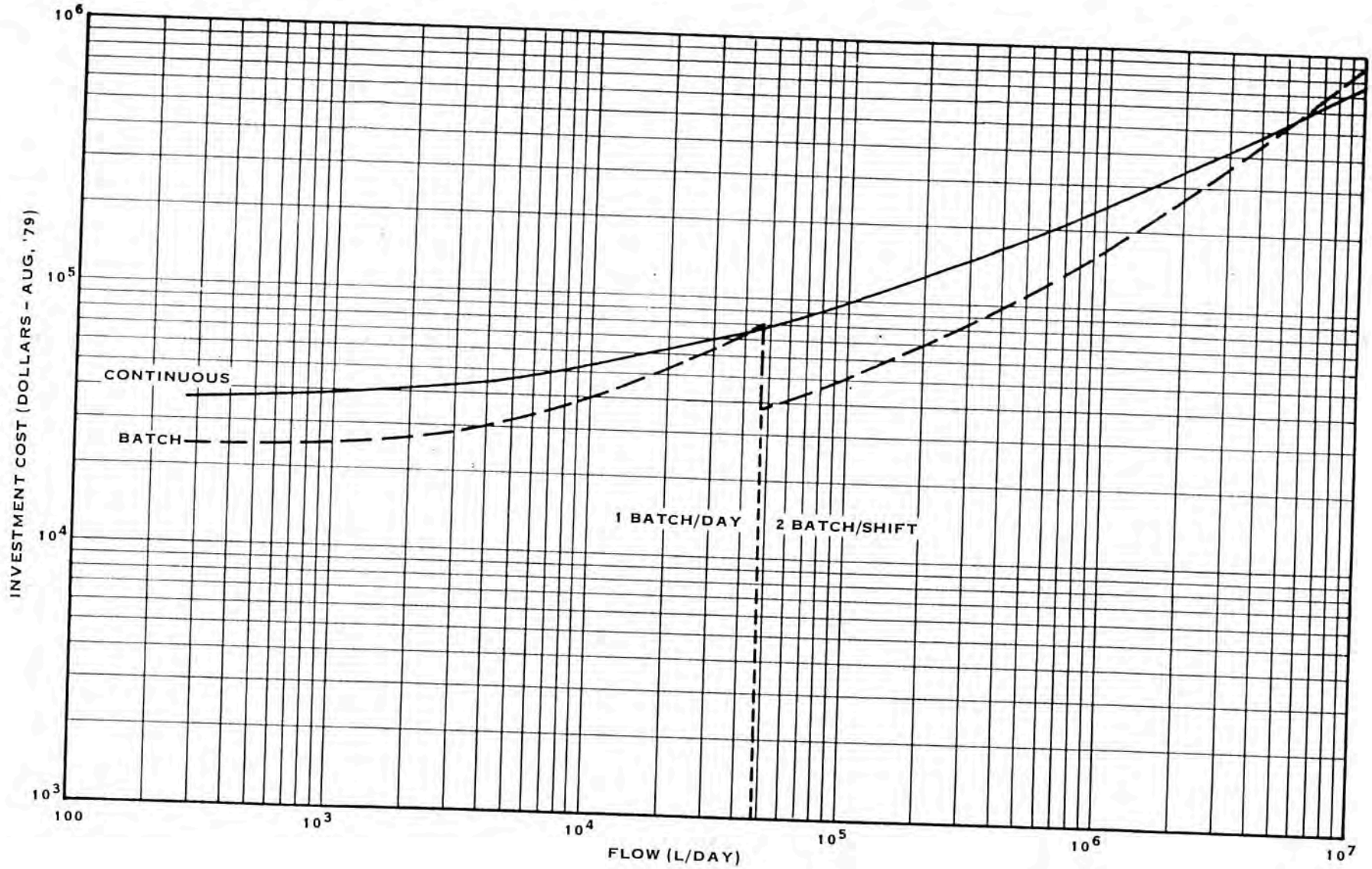

FIGURE 8-11
EMULSION BREAKING INVESTMENT COSTS

Annual labor expenses for both the continuous and batch operating modes for the chemical emulsion breaking unit are shown in Figure 8-12 as a function of waste stream flow rate. For the continuous operating mode, labor requirements are based on estimated manhours required for diluting and mixing the polymer and alum solutions and operating the unit. General operation labor has been estimated at 0.75 manhours per 8 hour shift. General maintenance of the entire system has been estimated at 2 manhours per week.

For the batch operating mode, labor requirements are based on estimated manhours required for diluting and mixing the polymer and alum solutions and operating the unit. General operation labor has been estimated at 0.75 manhours required per batch. General maintenance of the entire system has been estimated at 1 manhour per week.

Labor expenses have been calculated using a labor rate of $6.71 per manhour plus an additional 15% to cover indirect labor costs.

Material costs are associated with the alum and polymer chemical addition requirements. Polymer is added to the wastewater until a concentration of 150 mg/l is attained. Alum is added to the wastewater until a concentration of 25 mg/l is attained. Chemical costs have been based upon the following unit prices:

$0.38 per kg of alum
$1.55 per kg of polymer

The assumption has been made that the unit operates 24 hours per day, 5 days per week, 52 weeks per year.

Energy Costs - Annual energy expenses for the chemical emulsion breaking system (both batch and continuous operating modes) are shown in Figure 8-13 as a function of waste stream flow rate. These costs are based on operation of the dilution tank mixers, chemical feed pumps, mixing and separation tank mixers (as applicable), oil skimmer (as applicable), and solution transfer pumps (oil and separation tank transfer pumps, as applicable). Energy expenses have been estimated based upon a rate of $0.045/kilowatt-hour of required electricity. It has been assumed that the unit operates 24 hours per day, 5 days per week, 52 weeks per year.

Holding Tanks

Tanks serving a variety of purposes in wastewater treatment and control systems are fundamentally similar in design and construction and in cost. They may include equalization tanks, solution holding tanks, slurry or sludge holding tanks, mixing tanks, and settling tanks from which sludge is intermittently removed manually or by sludge pumps. Tanks for all of these purposes are addressed in a single cost estimation subroutine with additional costs for auxilliary equipment such as sludge pumps added as appropriate.

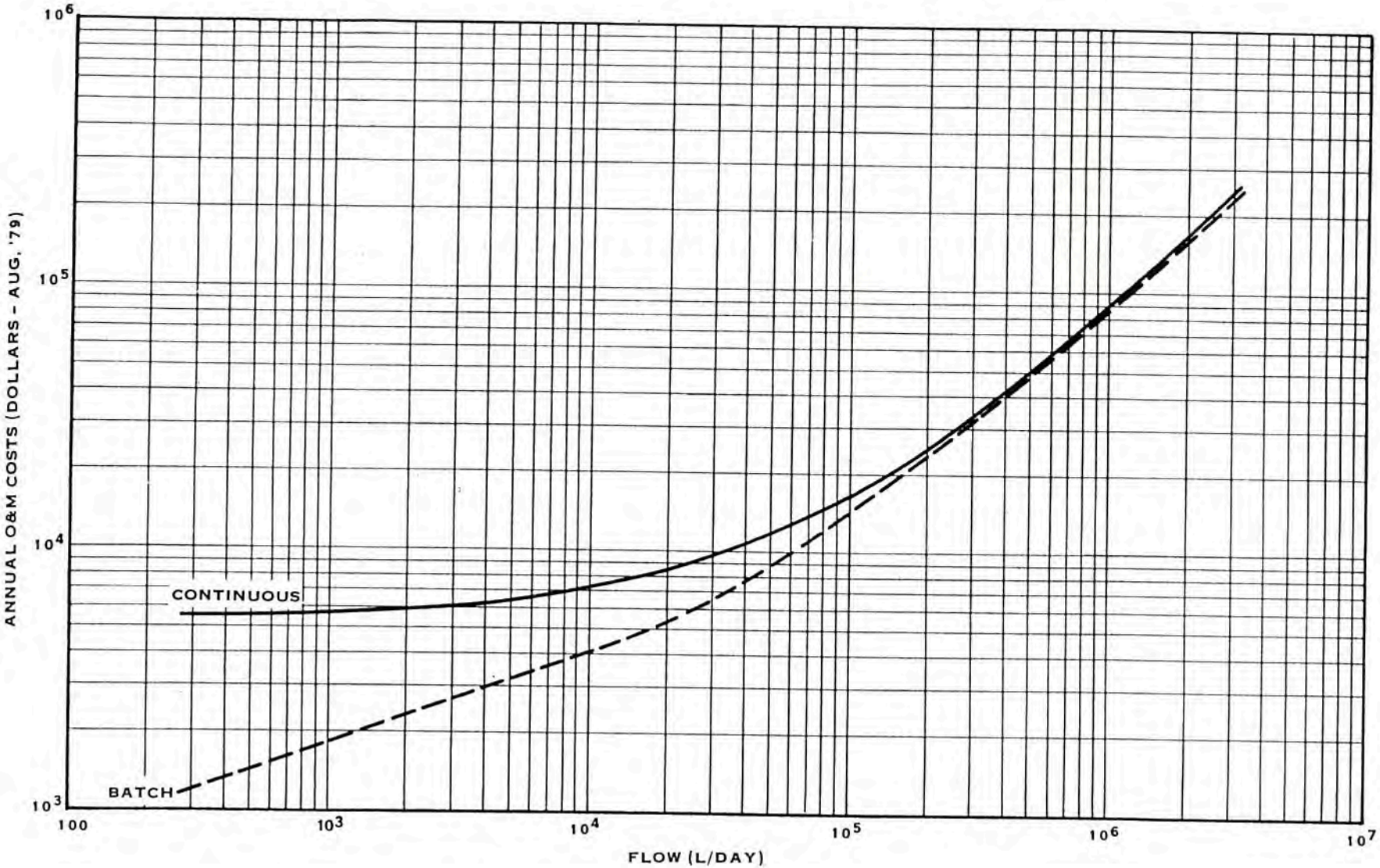

FIGURE 8-12
ANNUAL O&M COSTS VS. FLOW RATE FOR CHEMICAL EMULSION BREAKING

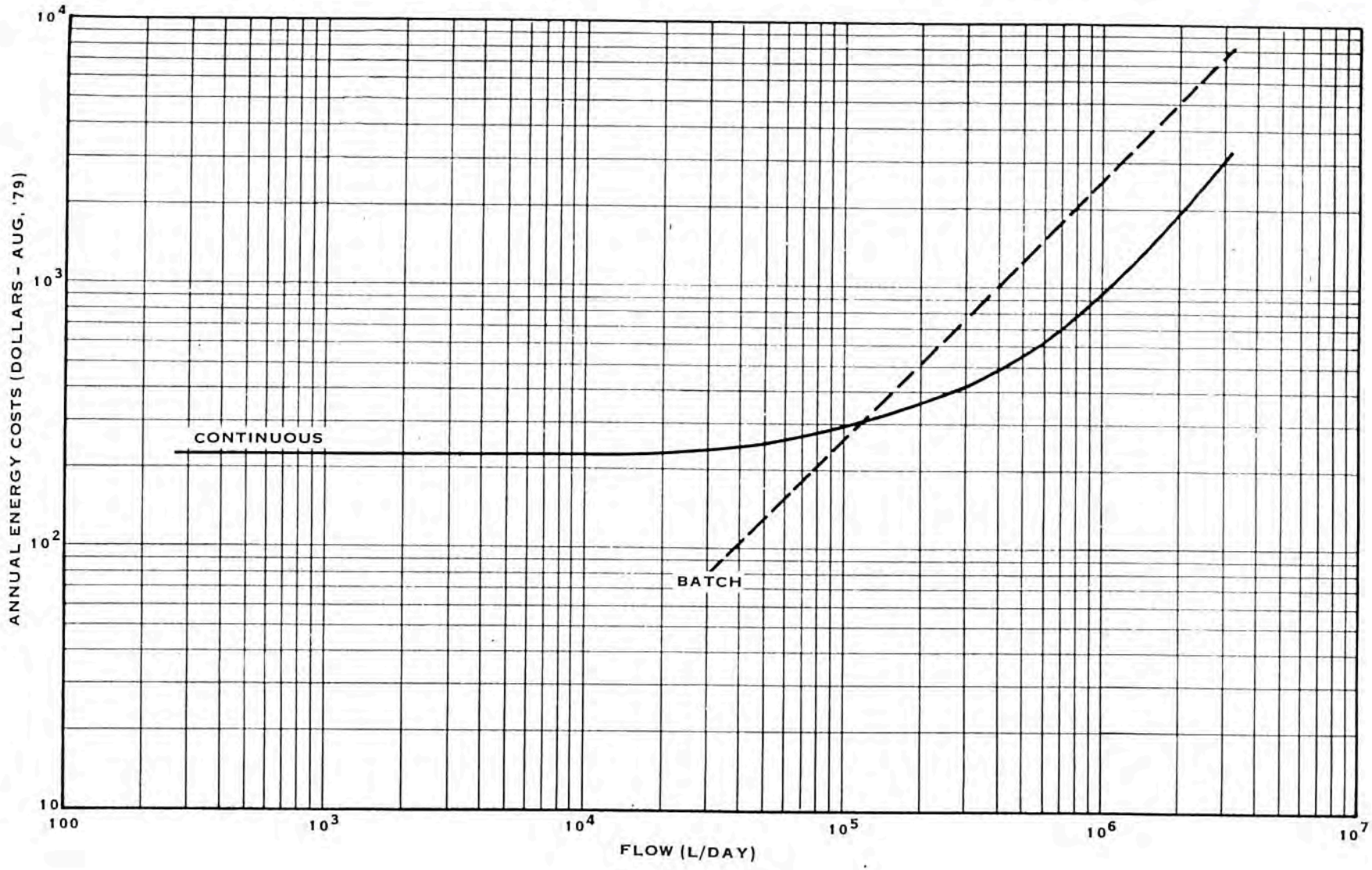

FIGURE 8-13
ANNUAL ENERGY COSTS VS. FLOW RATE FOR CHEMICAL EMULSION BREAKING

Investment Costs - Costs are estimated for steel tanks. Tank construction may be specified as input data, or determined on a least cost basis. Retention time is specified as input data and, together with stream flow rate, determines tank size. Investment costs for steel tanks sized for 0.5 days retention and 20% excess capacity are shown as functions of stream flow rate in Figure 8-14. These costs include mixers, pumps and installation.

Operation and Maintenance Costs - For all holding tanks except sludge holding tanks, operation and maintenance costs are minimal in comparison to other system O&M costs. Therefore only energy costs for pump and mixer operation are determined. These energy costs are presented in Figure 8-15.

For sludge holding tanks, additional operation and maintenance labor requirements are reflected in increased O&M costs. The required manhours used in cost estimation are prsented in Figure 8-16. Labor costs are determined using a labor rate of $6.71 per manhour plus 15% indirect labor charge.

Where tanks are used for settling as in lime precipitation and clarification batch treatment, additional operation and maintenance costs are calculated as discussed specifically for each technology.

Multimedia Filtration

This technology provides removal of suspended solids by filtration through a bed of particles of several distinct size ranges. As a polishing treatment after chemical precipitation and clarification processes, multimedia filtration provides improved removal of precipitates and thereby improved removal of the original dissolved pollutants.

Investment Costs - The size of the granular bed multimedia filtration unit is based on 20% excess flow capacity and a hydraulic loading of 81.5 lpm/m^2. Investment cost is presented in Figure 8-17 as a function of flow installation.

Operation and Maintenance - The costs shown in Figure 8-18 for operation and maintenance include contributions of materials, electricity and labor. These curves result from correlations made with data obtained by a major manufacturer. Energy costs are estimated to be 3% of total O&M.

Ultrafiltration

Ultrafiltratic . is a separation process involving the use of a semipermeable polymeric membrane. The porous membrane acts as a barrier, separating molecular sized particulates from the waste stream. Membrane permeation by particulates is dependent upon particulate size, shape and chemical structure. Solvents and lower molecular weight solutes are typically passed through the

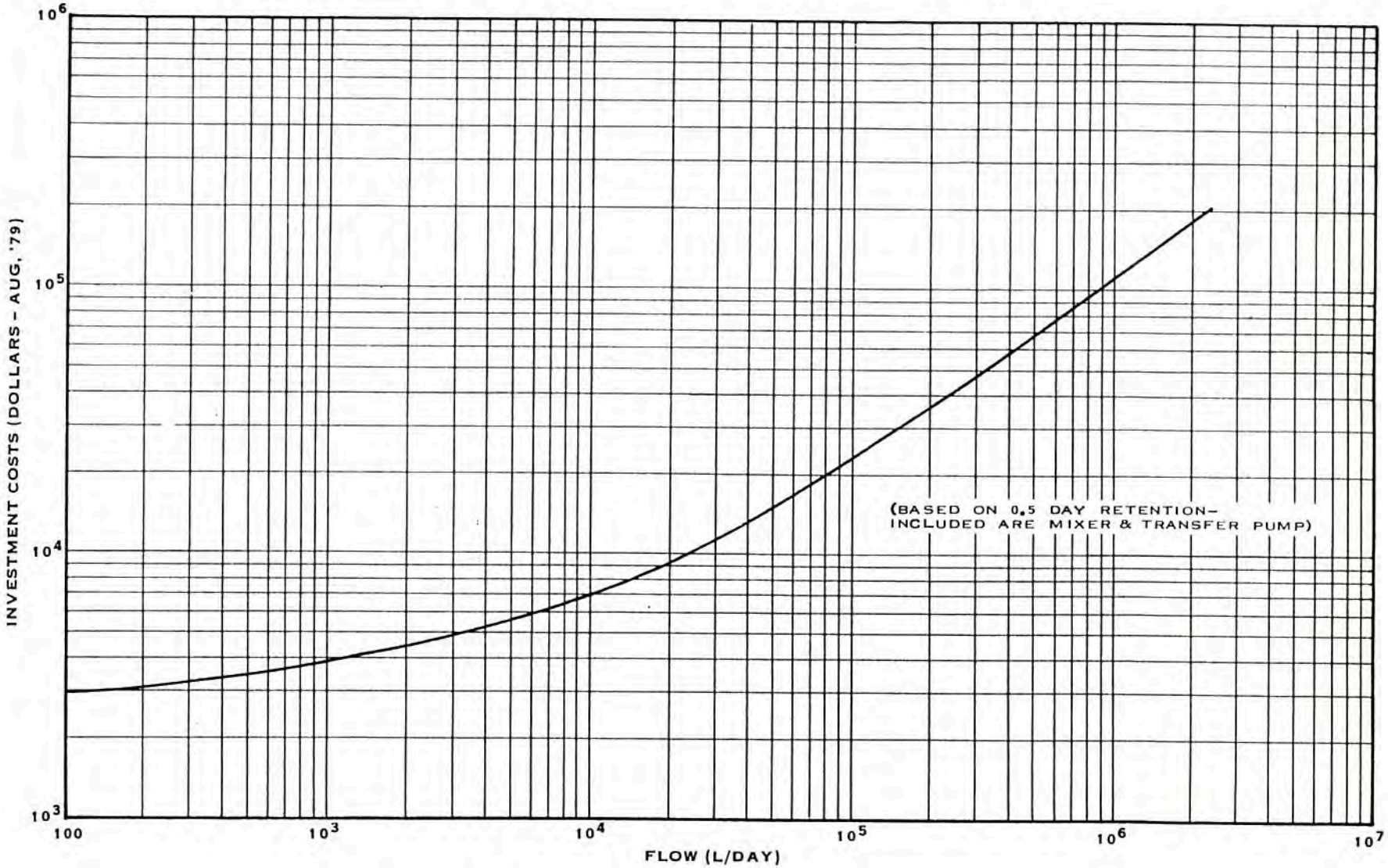

FIGURE 8-14
HOLDING TANK INVESTMENT COSTS

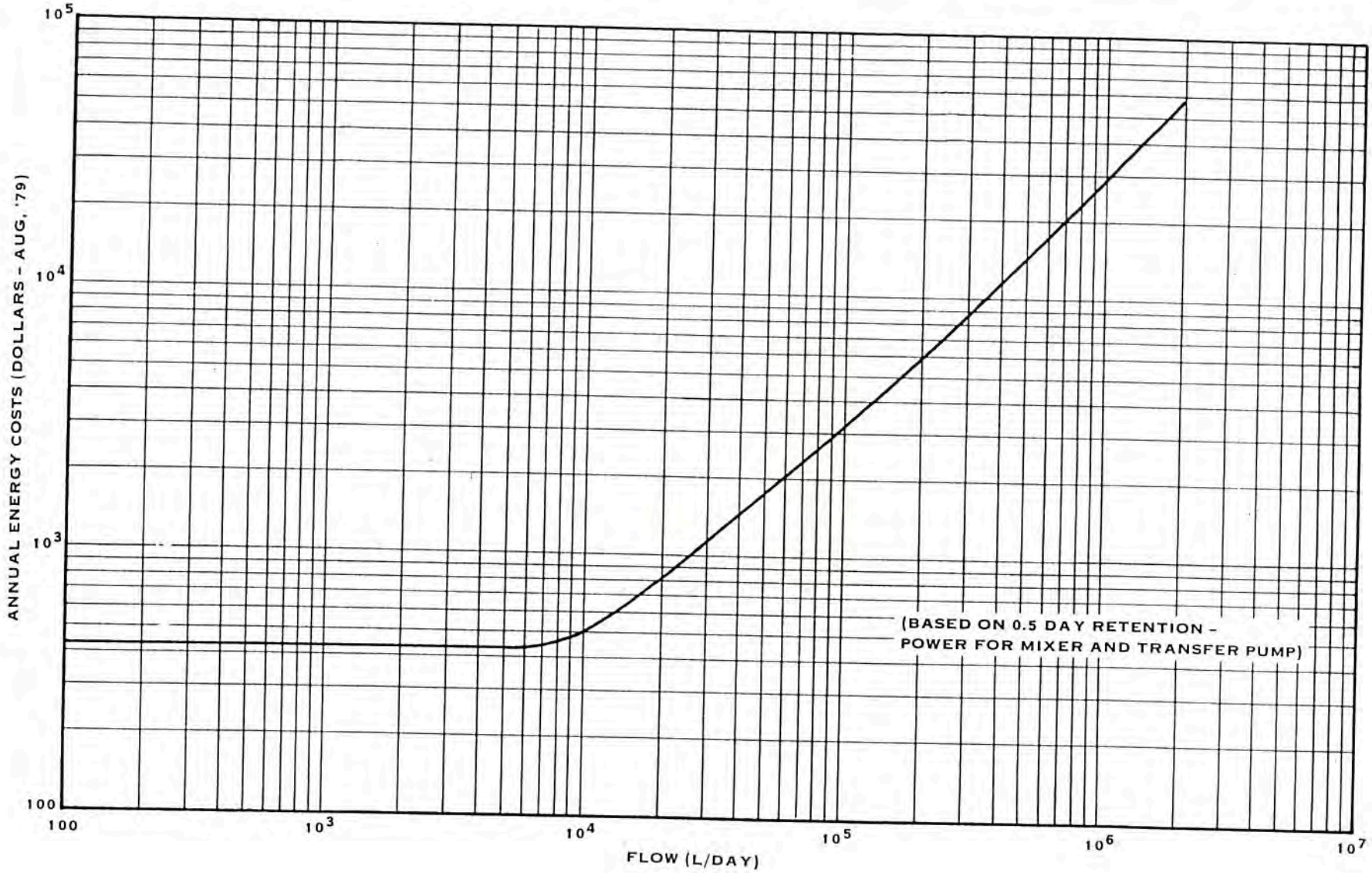

FIGURE 8-15
ANNUAL ENERGY COSTS VS. FLOW FOR HOLDING TANKS

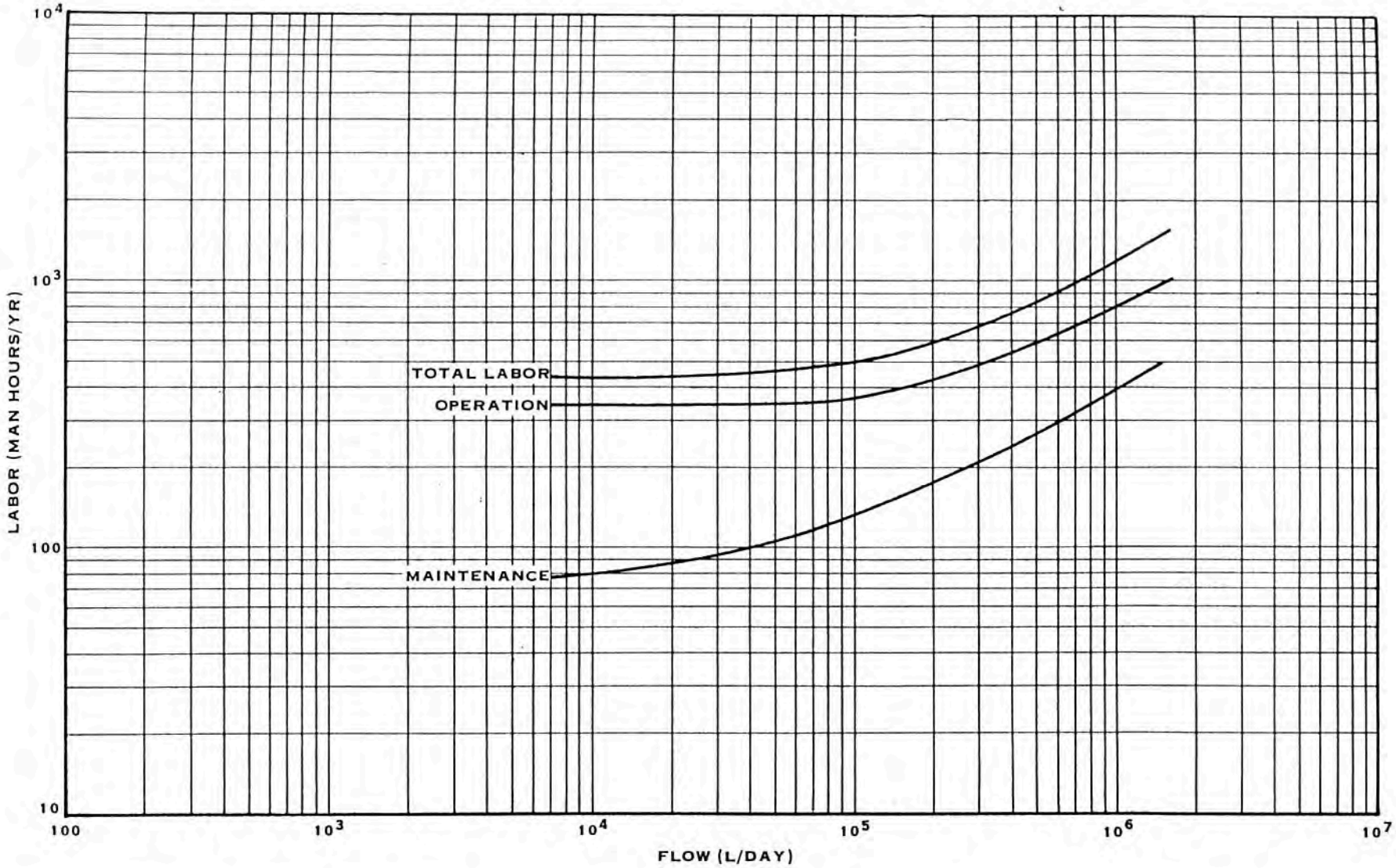

FIGURE 8-16
LABOR REQUIREMENTS VS. FLOW FOR SLUDGE HOLDING TANKS

engineering, line segregation, administration, and interest expenses during construction. In developing cost estimates for these option systems, it is assumed that none of the specified treatment and control measures is in place so that the presented costs represent total costs for the systems.

Several of these system cost curves show discontinuities. Some of these result from transitions occurring in specific component cost subroutines, and others result from changes in system cost factors. Sludge dewatering costs are of particular significance. For flows below 10^6 l/day sludge dewatering is accomplished using sludge drying beds, and cost estimates reflect this technology. Above this flow sludge dewatering is accomplished using a vacuum filter. Since the degree of dewatering achieved (typically 40% solids from a sludge drying bed and 20% solids from a vacuum filter) is influenced by this change, system costs are influenced not only by the dewatering costs themselves, but also through an effect on the volume of sludge requiring contract removal. At very high flow rates, the cost of removing sludge at 20% solids may become substantial, and the most economical system design would incorporate further dewatering of the vacuum filter product. This refinement, however, has not been included in these cost estimates.

System Cost Estimates (Option 1)

This section presents the system cost estimates for the Option 1 end-of-pipe treatment systems. The representative flow rates used in these system cost estimates were determined based upon actually sampled flows and flow information received in the data collection portfolios. The complete system block diagram applicable to cases 1-5 is shown in Figure 8-33. Option 1 treatment for the isolated oily waste stream addressed in case 6 is shown in Figure 8-34.

The costing assumptions for each component of the Option 1 system were discussed above under Technology Costs and Assumptions. In addition to these components, contract sludge removal was included in all cost estimates.

Table 8-9 presents costs for each of the six cases discussed above for various treatment system influent flow rates. The basic cost elements used in preparing these tables are the same as those presented for the individual technologies: investment, annual capital costs, annual depreciation, annual operations and maintenance cost (less energy cost), energy cost, and total annual cost. These elements were discussed in detail earlier in this section.

For the cost computations, a least cost treatment system selection was performed. This procedure calculated the costs for a batch treatment system and a continuous treatment system over a 5 year comparison period. Figures 8-35 through 8-46 show the investment and total annual costs for each case shown in Table 8-9.

TABLE 8-9

Option 1 Costs

Case Number		Flow gpd	Flow l/day	Investment (Dollars)	Capital Costs (Dollars)	Depreciation (Dollars)	Operation & Maintenance (Dollars)	Energy (Dollars)	Total Annual (Dollars)
1	Batch	264.	1,000.	129466.937	10916.160	25893.387	12446.344	35.090	49290.977
1	Batch	2638.	10,000.	156768.312	13217.984	31353.660	22896.891	53.571	67522.062
1	Batch	26380.	100,000.	271783.812	22915.613	54356.762	32761.973	396.887	110431.187
1	Continuous	263800.	1,000,000.	658308.687	55505.562	131661.687	182141.437	5877.852	375186.500
1	Continuous	2637999.	10,000,000.	1389210.00	117132.437	277842.000	1433646.00	36224.941	1864844.00
2	Batch	264.	1,000.	141021.000	11890.398	28204.199	19893.262	63.154	60051.012
2	Batch	2662.	10,000.	169637.562	14303.066	33927.512	24395.422	81.395	72707.375
2	Batch	26350.	100,000.	295868.875	24946.352	59173.773	39586.777	271.490	123978.312
2	Continuous	263600.	1,000,000.	754696.125	63632.437	150939.187	178190.812	5740.566	398503.000
2	Continuous	2637998.	10,000,000.	1547783.00	130502.937	309556.562	1368158.00	34512.113	1842729.00
3	Batch	264.	1,000.	177289.500	14948.301	35457.898	14035.863	36.611	64478.672
3	Batch	2660.	10,000.	207743.000	17516.000	41548.598	21761.270	61.020	80886.812
3	Batch	26410.	100,000.	386569.187	32593.875	77313.812	40553.965	463.474	150925.062
3	Continuous	266330.	1,000,000.	947278.312	79870.062	189455.625	268203.125	6650.617	544179.375
3	Continuous	2638998.	10,000,000.	2148885.00	181185.187	429777.000	2172029.00	41918.371	2824909.00
4	Batch	264.	1,000.	76337.000	6436.414	15267.398	10597.324	31.078	32332.215
4	Batch	2642.	10,000.	98451.000	8300.969	19690.199	17826.531	51.313	45869.012
4	Batch	26420.	100,000.	239445.562	20188.953	47889.109	31906.484	405.359	100389.812
4	Continuous	264300.	1,000,000.	674088.500	56836.125	134817.687	242074.375	4442.797	438170.937
4	Continuous	2642999.	10,000,000.	1638202.00	138126.312	327640.375	2034457.00	28883.500	2529106.00
5	Batch	264.	1,000.	144796.750	12208.711	28959.348	19384.918	59.962	60612.937
5	Batch	2638.	10,000.	223017.687	18803.766	44603.535	28946.770	88.451	92442.500
5	Batch	26460.	100,000.	408999.937	34485.125	81799.937	47390.582	479.039	164154.625
5	Continuous	264600.	1,000,000.	1035760.50	87330.375	207152.062	261455.187	6539.930	562477.500
5	Continuous	2645998.	10,000,000.	2291527.00	193212.625	458305.375	2095432.00	40662.414	2787612.00
6	Batch	264.	1,000.	48120.527	4057.312	9624.105	3676.566	7.431	17365.414
6	Batch	2640.	10,000.	79619.937	6713.219	15923.984	5396.180	26.372	28659.754
6	Batch	26400.	100,000.	95708.812	8069.754	19141.762	21783.789	263.722	49259.023
6	Batch	264000.	1,000,000.	306961.562	25881.625	61392.312	108626.562	2637.227	198537.687
6	Continuous	2640000.	10,000,000.	1412968.00	119135.750	282593.562	818738.375	10547.426	1231010.00

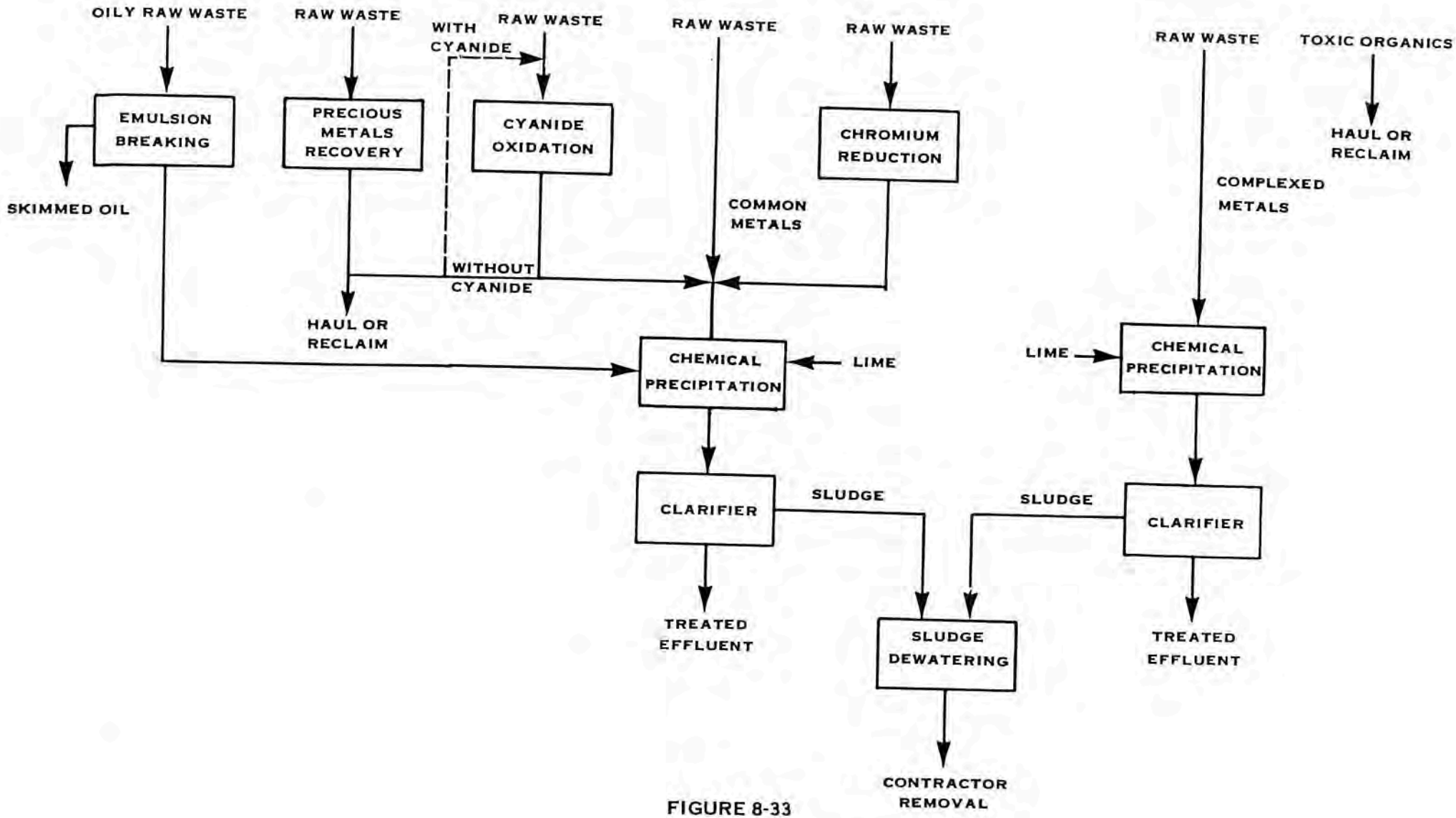

FIGURE 8-33
OPTION I SYSTEM

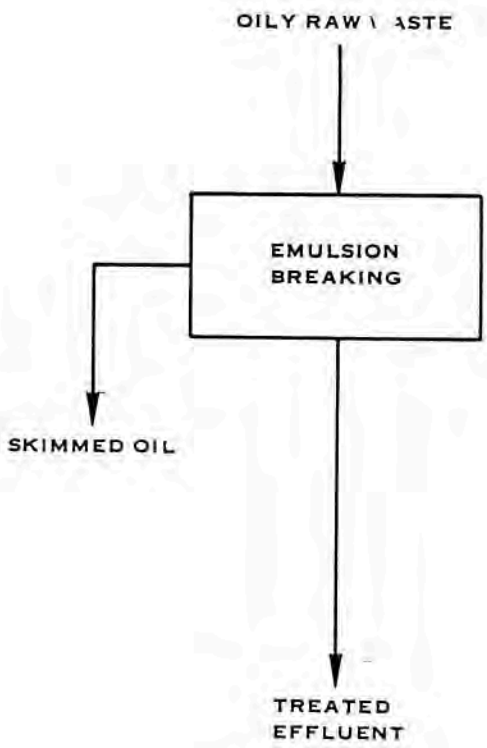

FIGURE 8-34
OPTION 1 TREATMENT SYSTEM
FOR SEGREGATED OILY WASTE STREAMS

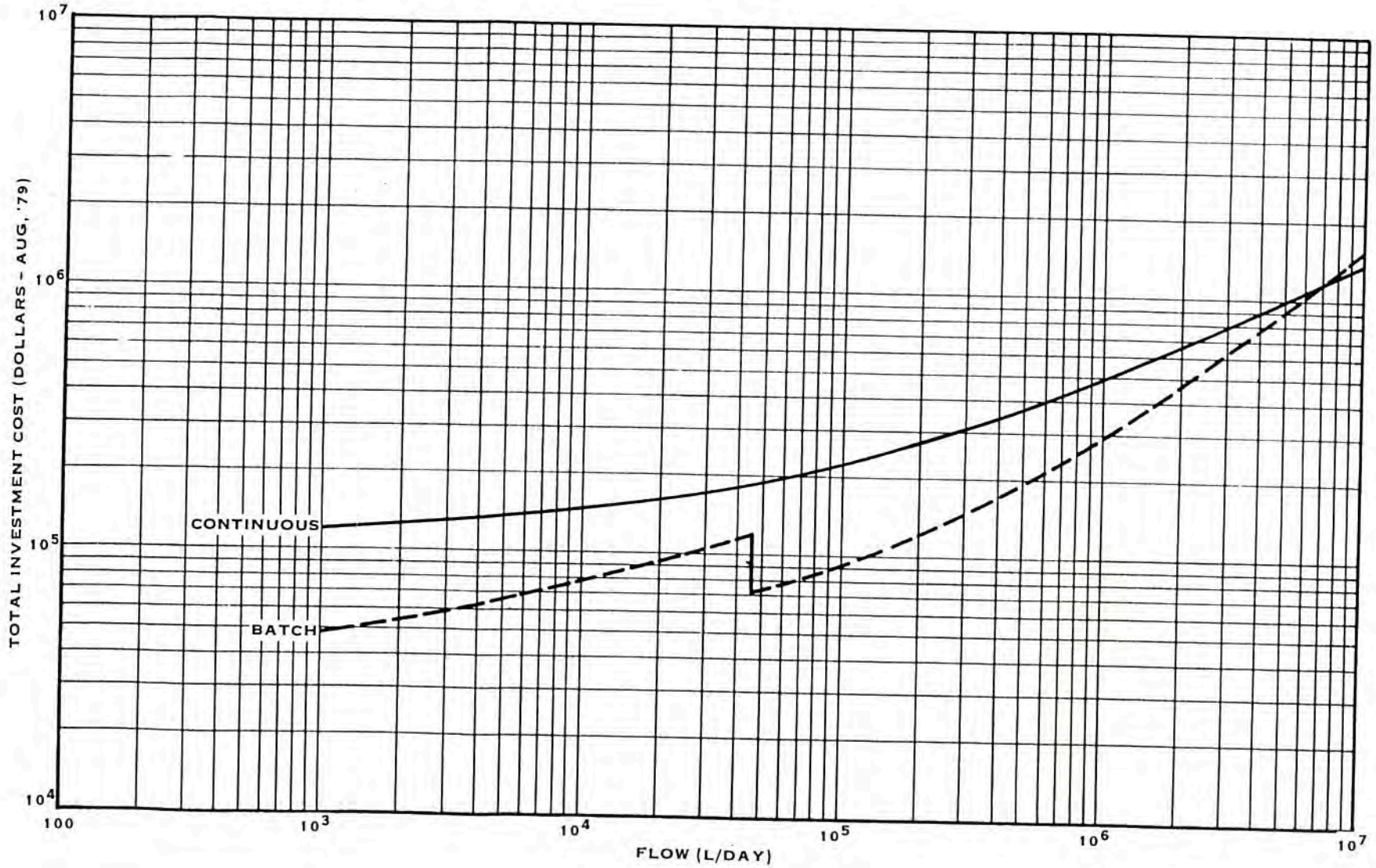

FIGURE 8-45
TOTAL INVESTMENT COSTS VS. FLOW RATE FOR OPTION 1 TREATMENT SYSTEM, CASE 6

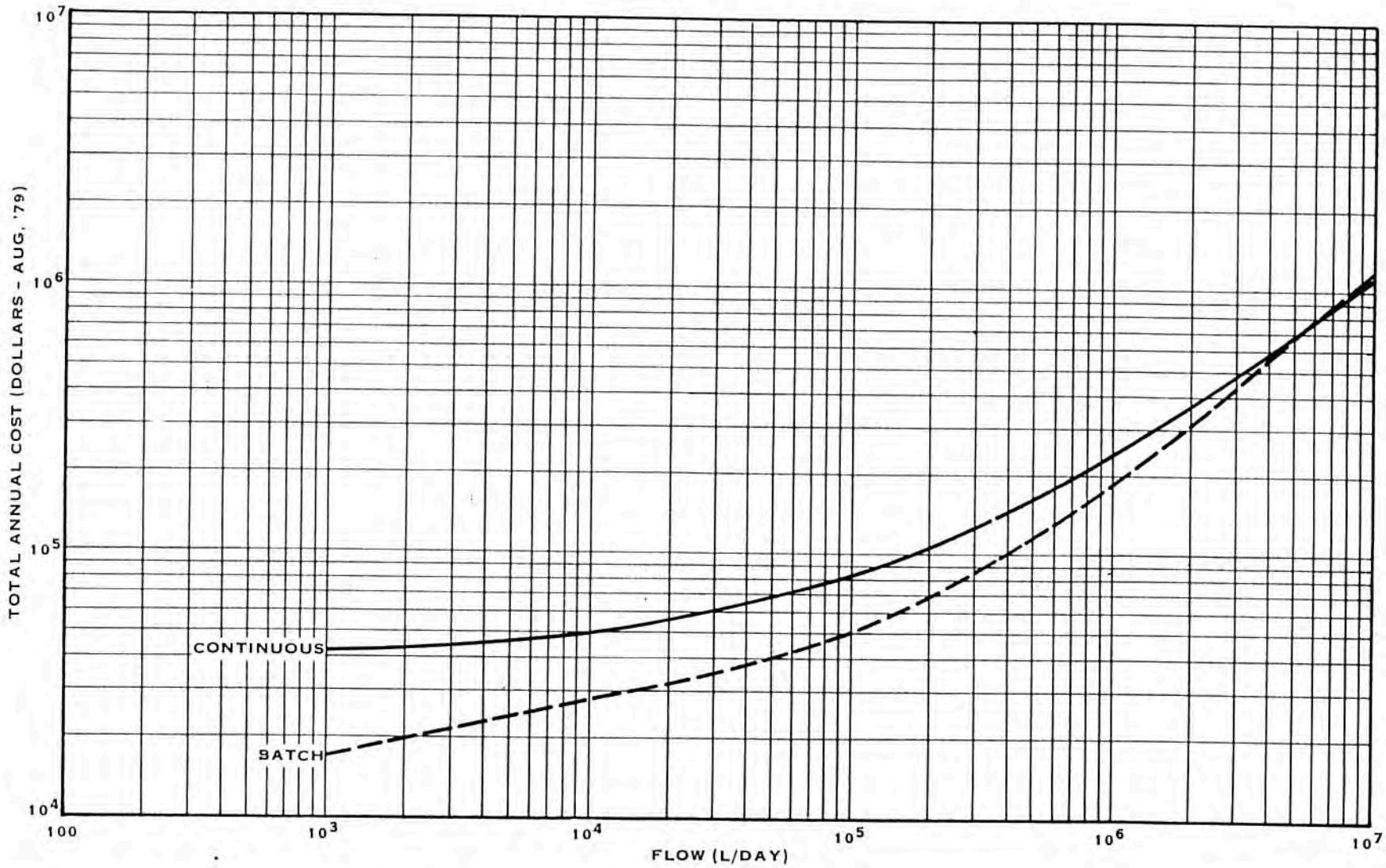

FIGURE 8-46

TOTAL ANNUAL COST VS. FLOW RATE FOR OPTION 1 TREATMENT SYSTEM , CASE 6

APPENDIX E. ENVIRONMENTAL IMPACTS OF DIRECT DISCHARGES

METALS
SAMPLE POINT: RAW WASTEWATER

CRITERIA COMPARISON FOR THE DRUM RECONDITIONING INDUSTRY - DIRECT DISCHARGERS

NUMBER OF PLANTS: 50
AVG PLANT FLOW: 0.003 MGD

CAS NUMBER	POLLUTANT	PRIOR. POLL.	EFFECTS &	AVERAGE PLANT EFFLUENT (ug/l)	WATER QUALITY CRITERIA: AQUATIC LIFE ACUTE $ (ug/l)	AQUATIC LIFE CHRONIC $ (ug/l)	HUMAN $ HEALTH WQ (ug/l)	DRINKING $ WATER STANDARD (ug/l)	ANALYSIS: CONCENTRATION/CRITERIA ACUTE	CHRONIC	HUMAN	DRINK	RESULTS: ACUTE PROB.	CRITICAL STREAM DILUTION	TOTAL ^ POLLUTANT LOADING (lbs/day)
7440382	ARSENIC	yes	C	54	360.0 C	190.00 C	0.002 C	50 M	0.2	0.3	24,545.5	1.1		24,545	0.07
7439921	LEAD	yes	T/C	14,485	83.0 C	3.20 C	50.000 T	50 M	174.5	4,526.6	289.7	289.7	yes	4,527	18.13
7440417	BERYLLIUM	yes	C	20	130.0 L9	5.30 LC	0.007 C	-0-	0.2	3.7	2,897.1		yes	2,897	0.02
7439976	MERCURY	yes	T	8	2.4 C	0.01 C	0.144 T	2 M	3.2	641.7	53.5	3.9	yes	642	0.01
7440439	CADMIUM	yes	C/M/T	405	3.9 C	1.10 C	10.000 T	10 M	103.9	368.5	40.5	40.5	yes	368	0.51
7440666	ZINC	yes		24,975	120.0 C	110.00 C	-0-	-0-	208.1	227.0			yes	227	31.26
7429905	ALUMINUM			20,028	1,500.0 L9	100.00 LC	-0-	-0-	13.4	200.3			yes	200	25.07
7440508	COPPER	yes		1,582	18.0 C	12.00 C	-0-	1,300 PRM	87.9	131.8		1.2	yes	132	1.98
7439896	IRON			106,450	-0-	1,000.00 C	-0-	-0-		106.5				106	133.25
7440224	SILVER	yes		10	4.1 C	0.12 LC	50.000 T	50 M	2.4	82.5	0.2	0.2	yes	83	0.01
7440315	TIN			1,459	-0-	18.60 LD	-0-	-0-		78.5				78	1.83
7440473	CHROMIUM	yes		3,164	1,700.0 C	210.00 C	170,000.000 T	50 M	1.9	15.1	0.0	63.3	yes	63	3.96
7440360	ANTIMONY	yes		3,482	9,000.0 L4	1,600.00 LC	146.000 T	-0-	0.4	2.2	23.8			24	4.36
7439987	MOLYBDENUM			558	-0-	27.80 LD	-0-	-0-		20.1				20	0.70
7440020	NICKEL	yes	C/M	202	1,400.0 C	160.00 C	13.400 T	-0-	0.1	1.3	15.1			15	0.25
7440484	COBALT			404	1,620.0 L4	28.20 LD	-0-	-0-	0.2	14.3				14	0.51
7440280	THALLIUM	yes		100	1,400.0 L4	40.00 LC	13.000 T	-0-	0.1	2.5	7.7			8	0.13
7440622	VANADIUM			53	11,200.0 L9	9.00 LD	-0-	-0-	0.0	5.9				6	0.07
7439965	MANGANESE		M	1,703	-0-	388.00 LD	-0-	-0-		4.4				4	2.13
7782492	SELENIUM	yes		29	260.0 C	35.00 C	10.000 T	10 M	0.1	0.8	2.9	2.9		3	0.04
7440393	BARIUM			1,970	410,000.0 L4	2,813.00 LD	-0-	1,000 M	0.0	0.7		2.0		2	2.47
7439954	MAGNESIUM			12,023	-0-	367,600.00 LD	-0-	-0-		0.0				0	15.05
7440428	BORON			2,085	-0-	-0-	-0-	-0-							2.61
7440702	CALCIUM			39,155	-0-	-0-	-0-	-0-							49.01
7440235	SODIUM			5,183,000	-0-	-0-	-0-	-0-							6,487.82
7440326	TITANIUM			476	-0-	-0-	-0-	-0-							0.60

TOTAL: 6,782

NOTE: & C = known or suspected carcinogen, M = known or suspected mutagen, T = known or suspected teratogen
$ See attached sheet for definitions to codes pertaining to each criteria
^ Total subcategory pollutant loading (see attached methodology)

SOURCE: ITD information (October 1987), using method I mean

10/29/87

ORGANICS
SAMPLE POINT: RAW WASTEWATER

CRITERIA C... ...SON FO... ...RUM RE... ...TONING... TRY - ...T DIS... S

NUM PLANT 50
AVG PLANT FLOW: 0.003 MGD

CAS NUMBER	POLLUTANT	PRIOR. POLL.	EFFECTS &	AVERAGE PLANT EFFLUENT (ug/l)	WATER QUALITY CRITERIA: AQUATIC LIFE ACUTE # (ug/l)	AQUATIC LIFE CHRONIC # (ug/l)	HUMAN # HEALTH WQO (ug/l)	DRINKING # WATER STANDARD (ug/l)	ANALYSIS: CONCENTRATION/CRITERIA ACUTE	CHRONIC	HUMAN	DRINK	RESULTS: ACUTE PROB.	CRITICAL STREAM DILUTION	TOTAL ^ POLLUTANT LOADING (lbs/day)
75354	1,1-DICHLORODETHENE	yes	C	25,286	30,300 L4	2,400.0 LD	0.03 C	7 PM	0.8	10.5	766,242.4	3,612.3		766,242	31.65
127184	TETRACHLORODETHENE	yes	C	86,267	5,280 L9	840.0 C	0.80 C	0 PRM	16.3	102.7	107,833.7	*	yes	107,834	107.98
75092	METHYLENE CHLORIDE	yes	C	9,820	193,000 L9	9,650.0 @	0.19 C	-0-	0.1	1.0	51,684.2			51,684	12.29
117817	BIS (2-ETHYLHEXYL) PHTHALATE	yes	C	21,449	11,100 L4	3.0 LC	1.75 C	-0-	1.9	7,149.7	12,256.6		yes	12,257	26.85
67641	ACETONE			857,784	10,000 L4	500.0 @	99,870.17 T*	-0-	85.8	1,715.6	8.6		yes	1,716	1,073.73
84742	DI-N-BUTYL PHTHALATE	yes		6,887	940 L9	9.4 @	34,000.00 T	-0-	7.3	732.7	0.2		yes	733	8.62
78933	2-BUTANONE (MEK)		T	716,029	520,000 L4	70,000.0 LD	1,495.14 T*	-0-	1.4	10.2	478.9		yes	479	896.29
79016	TRICHLORODETHENE	yes	C	1,135	18,000 L4	2,200.0 LD	2.70 C	5 PM	0.1	0.5	420.4	227.0		420	1.42
107062	1,2-DICHLORODETHANE	yes	C	315	118,000 L9	20,000.0 C	0.94 C	5 PM	0.0	0.0	335.1	63.0		335	0.39
85018	PHENANTHRENE	yes	C/M	11,577	3,980 E	39.8 @	42.00 T	-0-	2.9	290.9	275.6		yes	291	14.49
156605	TRANS-1,2-DICHLORODETHENE	yes		20,295	135,000 L9	110,000.0 LD	-0-	70 PRM	0.2	0.2		289.9		290	25.40
121142	2,4-DINITROTOLUENE	yes	C	11	31,000 L9	310.0 @	0.11 C	-0-	0.0	0.0	100.0			100	0.01
71556	1,1,1-TRICHLORODETHANE	yes		18,384	40,000 L9	2,000.0 @	18,400.00 T	200 PM	0.5	9.2	<1.0	91.9		92	23.01
100425	STYRENE		C/M	11,158	23,000 L4	6,800.0 LD	-0-	140 PRM	0.5	1.6		79.7		80	13.97
100414	ETHYLBENZENE	yes		21,598	32,000 L9	6,800.0 LD	1,400.00 T	680 PRM	0.7	3.2	15.4	31.8		32	27.04
108883	TOLUENE	yes		20,295	13,000 L9	650.0 @	14,300.00 T	2,000 PRM	1.6	31.2	1.4	10.1	yes	31	25.40
85687	BUTYL BENZYL PHTHALATE	yes		3,281	1,700 L9	220.0 LC	-0-	-0-	1.9	14.9			yes	15	4.11
100516	BENZYL ALCOHOL			4,747	10,000 L9	500.0 @	-0-	-0-	0.5	9.5				9	5.94
98555	ALPHA-TERPINEOL			4,745	10,000 L9	500.0 @	-0-	-0-	0.5	9.5				9	5.94
124185	N-DECANE (N-C10)			11,750	18,000 L4	1,300.0 LD	-0-	-0-	0.7	9.0				9	14.71
101848	DIPHENYL ETHER			2,457	670 L4	410.0 LD	-0-	-0-	3.7	6.0			yes	6	3.08
65850	BENZOIC ACID			47,615	180,000 L9	9,000.0 @	-0-	-0-	0.3	5.3				5	59.60
91203	NAPHTHALENE	yes		3,108	2,300 L9	620.0 LC	6,759.29 T*	-0-	1.4	5.0	0.5		yes	5	3.89
78591	ISOPHORONE	yes		14,048	117,000 L4	5,850.0 @	5,200.00 T	-0-	0.1	2.4	2.7			3	17.58
95487	O-CRESOL			90	5,000 I4	50.0 @	-0-	-0-	0.0	1.8				2	0.11
88755	2-NITROPHENOL	yes		2,954	37,665 A4	1,883.3 @	-0-	-0-	0.1	1.6				2	3.70
142621	HEXANOIC ACID			774	11,700 D	585.0 @	-0-	-0-	0.1	1.3				1	0.97
108952	PHENOL	yes		932	8,900 L9	750.0 L	3,500.00 T	-0-	0.1	1.2	0.3			1	1.17
86737	FLUORENE	yes	C	12	1,700 E	17.0 @	-0-	-0-	0.0	0.7				0	0.02
92524	BIPHENYL			472	4,700 L4	2,200.0 LD	-0-	-0-	0.1	0.2				0	0.59
99876	P-CYMENE			713	6,500 L4	4,600.0 LD	-0-	-0-	0.1	0.2				0	0.89
78831	ISOBUTYL ALCOHOL		C	3,517	524,600 D	26,230.0 @	-0-	-0-	0.0	0.1				0	4.40
629970	N-DOCOSANE (N-C22)			7,867	530,000 L4	68,000.0 LD	-0-	-0-	0.0	0.1				0	9.85
98953	NITROBENZENE	yes		14	27,000 L4	460.0 LD	19,800.00 T	-0-	0.0	0.0	0.0			0	0.02
91587	2-CHLORONAPHTHALENE	yes		2,323	-0-	-0-	-0-	-0-							2.91
91576	2-METHYLNAPHTHALENE			24	-0-	-0-	-0-	-0-							0.03
112403	N-DODECANE (N-C12)			6,950	-0-	-0-	-0-	-0-							8.70
544763	N-HEXADECANE (N-C16)			1,122	-0-	-0-	-0-	-0-							1.40
630024	N-OCTACOSANE (N-C28)			28,081	-0-	-0-	-0-	-0-							35.15
593453	N-OCTADECANE (N-C18)			8,669	-0-	-0-	-0-	-0-							10.85
629594	N-TETRADECANE (N-C14)			24,941	-0-	-0-	-0-	-0-							31.22
492228	THIOXANTHONE			311	-0-	-0-	-0-	-0-							0.39

TOTAL: 2,516

NOTE: & C = known or suspected carcinogen, M = known or suspected mutagen, T = known or suspected teratogen
\# See attached sheet for definitions to codes pertaining to each criteria
^ Total subcategory pollutant loading (see attached methodology)
@ Denotes a criteria exceedance
source: EPA ... (0.1 for 1987), using method I mean

10/29/87

PESTICIDES
SAMPLE POINT: RAW WASTEWATER

CRITERIA COMPARISON FOR THE DRUM RECONDITIONING INDUSTRY - DIRECT DISCHARGERS

NUMBER OF PLANTS: 50
AVG PLANT FLOW: 0.003 MGD

CAS NUMBER	POLLUTANT	PRIOR. POLL.	EFFECTS &	PLANT EFFLUENT (ug/l)	WATER QUALITY CRITERIA: AQUATIC LIFE ACUTE $ (ug/l)	AQUATIC LIFE CHRONIC $ (ug/l)	HUMAN $ HEALTH WLO (ug/l)	DRINKING $ WATER STANDARD (ug/l)	ANALYSIS: CONCENTRATION/CRITERIA ACUTE	CHRONIC	HUMAN	DRINK	RESULTS: ACUTE PROB.	CRITICAL STREAM DILUTION	TOTAL ^ POLLUTANT LOADING (lbs/day)
86500	AZINPHOS METHYL		C	5,448	0.15 L9	0.001 C	-0-	-0-	36,320.0	5,447,999.7			yes	5,448,000	6.82
76448	HEPTACHLOR	yes	C	284	0.52 C	0.004 C	0.0003 C	-0-	546.2	74,736.8	1,021,582.8		yes	1,021,583	0.36
333415	DIAZINON		M	1,035	0.20 L9	0.009 C	-0-	-0-	5,175.0	115,000.0			yes	115,000	1.30
2642719	AZINPHOS ETHYL			4,260	1.10 L9	0.055 @	-0-	-0-	3,872.7	77,454.5			yes	77,455	5.33
115902	FENSULFOTHION			6,827	10.00 L9	0.500 @	-0-	-0-	682.7	13,654.0			yes	13,654	8.55
1031078	ENDOSULFAN SULFATE	yes		528	0.22 C	0.056 C	74.0000 T	-0-	2,400.0	9,428.6	7.1		yes	9,429	0.66
959988	ENDOSULFAN I	yes		296	0.22 C	0.056 C	74.0000 T	-0-	1,345.5	5,285.7	4.0		yes	5,286	0.37
60515	DIMETHOATE			1,500	200.00 L9	10.000 @	593.8494 T*	-0-	7.5	150.0	2.5		yes	150	1.88
	ETRIDAZONE			252											0.32
21609904	LEPTOPHOS			3,959											4.96
														TOTAL:	31

NOTE: & C = known or suspected carcinogen, M = known or suspected mutagen, T = known or suspected teratogen
$ See attached sheet for definitions to codes pertaining to each criteria
^ Total subcategory pollutant loading (see attached methodology)

SOURCE: ITD information (October 1987), using method I mean

10/29/87

WATER QUALITY CRITERIA CODES

ALL CRITERIA CODES

-0- NO AVAILABLE CRITERIA IN LIST OF LIST

FRESHWATER AQUATIC LIFE CODES

TYPE OF TEST CODES

ICUTE VALUES

C	EPA CRITERIA
PC	PROPOSED EPA CRITERIA
L9	LOWEST REPORTED 96 HR LC50
L4	LOWEST REPORTED 48 HR EC50
A2	ADJUSTED 24 HR LC50 (X 0.66)
A4	ADJUSTED 48 HR LC50 (X 0.81)
A7	ADJUSTED 72 HR LC50 (X 0.92)
D	ADJUSTED 24 HR EC50 (X 0.53)
E	ESTIMATED (NEELY, 1983)
LR7	LOWEST REPORTED 7 DAY LC50
LR1	LOWEST REPORTED 14 DAY LC50
LT	LOWEST TOXIC CONCENTRATION (NO TIME GIVEN)

CHRONIC VALUES

C	EPA CRITERIA
LC	LOWEST REPORTED CHRONIC VALUE
LM	LOWEST REPORTED MATC VALUE
LN	LOWEST REPORTED NOEL VALUE
LD	LOWEST REPORTED NDE VALUE
LO	LOWEST REPORTED OTHER VALUE
AA	ACUTE X APPLICATION FACTOR
E	ESTIMATED (NEELY, 1983)
@	ESTIMATED USING APPLICATION FACTOR (see methodology sheet)

DRINKING WATER CODES

M	MAXIMUM CONTAMINANT LEVEL (ENFORCEABLE)
PM	PROPOSED MAXIMUM CONTAMINANT LEVEL
PRM	PROPOSED RECOMMENDED MAXIMUM CONTAMINANT LEVEL

HUMAN HEALTH-WATER AND ORGANISMS CODES

TYPE OF CRITERIA CODES

C	FOR CARCINOGENICITY PROTECTION (R = 10E-6)
T	FOR TOXICITY PROTECTION
O	FOR PROTECTION AGAINST ORGANOLIPTIC EFFECTS
C*	NONREGULATORY ESTIMATED SAFE LEVEL FOR CARCINOGENICITY PROTECTION
T*	NONREGULATORY ESTIMATED SAFE LEVEL FOR TOXICITY PROTECTION

APPENDIX F. ENVIRONMENTAL IMPACTS OF INDIRECT DISCHARGES

METALS
SAMPLE POINT: RAW WASTEWATER

CRITERIA COMPARISON FOR THE DRUM RECONDITIONING INDUSTRY - INDIRECT DISCHARGERS - AT LOW STREAM FLOW

NUMBER OF PLANTS: 200
AVERAGE PLANT FLOW: 0.003 MGD
AVERAGE POTW FLOW: 1 MGD
STREAM DILUTION FACTOR: 12

POLLUTANT	PRIOR. POLL.	EFFECTS &	AVERAGE PLANT EFFLUENT (ug/l)	WATER QUALITY AND POTW CRITERIA (Safe Levels) AQUATIC LIFE ACUTE $ (ug/l)	AQUATIC LIFE CHRONIC $ (ug/l)	HUMAN $ HEALTH WQO (ug/l)	DRINKING $ WATER STANDARD (ug/l)	POTW INHIB. (ug/l)	SLUDGE CONTAM. (mg/kg)	POTW CONCENTRATIONS POTW INFLUENT (ug/l)	POTW EFFLUENT (ug/l)	DIL. POTW EFFLUENT (ug/l)	SLUDGE (mg/kg)	ANALYSIS AND RESULTS CONCENTRATIONS/CRITERIA ACUTE	CHRON	HUMAN	DRINK	INH	SLUDGE	TOTAL ^ INDIRECT LOADING (lbs/day)
SODIUM			5,183,000	-0-	-0-	-0-	-0-			15,549.00	15,549.00	1,295.75	0.00							25,951.28
IRON			106,450	-0-	1,000.00 C	-0-	-0-			319.35	319.35	26.61	0.00		0.03					533.00
CALCIUM			39 155	-0-	-0-	-0-	-0-			117.47	117.47	9.79	0.00							196.05
ZINC	yes		24, 75	120 C	110.00 C	-0-	-0-	5,000	2,000	74.93	16.48	1.37	348.31	0.14	0.01			0.01	0.17	125.05
ALUMINUM			20,028	1,500 L9	100.00 LC	-0-	-0-			60.08	60.08	5.01	0.00	0.04	0.05					100.28
LEAD	yes	T/C	14,485	83 C	3.20 C	50.000 T	50 M	100	1,000	43.46	13.04	1.09	181.29	0.16	0.34	0.02	0.02	0.43	0.18	72.53
MAGNESIUM			12,023	-0-	367,600.00 LO	-0-	-0-			36.07	36.07	3.01	0.00		0.00					60.20
ANTIMONY	yes		3,482	9,000 L4	1,600.00 LC	146.000 T	-0-			10.44	3.55	0.30	41.09	0.00	0.00	0.00				17.43
CHROMIUM	yes		3,164	1,700 C	210.00 C	170,000.000 T	50 M	50,000	1,000	9.49	2.28	0.19	42.99	0.00	0.00	0.00	0.00	0.00	0.04	15.84
BORON			2,085	-0-	-0-	-0-	-0-			6.25	6.25	0.52	0.00							10.44
BARIUM			1,970	410,000 L4	2,813.00 LO	-0-	1,000 M			5.91	5.91	0.49	0.00	0.00	0.00		0.00			9.86
MANGANESE		M	1,703	-0-	388.00 LO	-0-	-0-			5.11	5.11	0.43	0.00		0.00					8.53
COPPER	yes		1,582	18 C	12.00 C	-0-	1,300 PRM	1,000	1,000	4.75	0.85	0.07	23.19	0.05	0.01		0.00	0.00	0.02	7.92
TIN			1,459	-0-	18.60 LO	-0-	-0-			4.38	4.38	0.36	0.00		0.02					7.31
MOLYBDENUM			558	-0-	27.80 LO	-0-	-0-			1.68	1.68	0.14	0.00		0.01					2.80
TITANIUM			476	-0-	-0-	-0-	-0-			1.43	1.43	0.12	0.00							2.38
CADMIUM	yes	C/M/T	405	4 C	1.10 C	10.000 T	10 M	1,000	20	1.22	0.47	0.04	4.42	0.12	0.04	0.00	0.00	0.00	0.22	2.03
COBALT			404	1,620 L4	28.20 LO	-0-	-0-			1.21	1.21	0.10	0.00	0.00	0.00					2.02
NICKEL	yes	C/M	202	1,400 C	160.00 C	13.400 T	-0-	1,000	200	0.61	0.41	0.03	1.19	0.00	0.00	0.00		0.00	0.01	1.01
THALLIUM	yes		100	1,400 L4	40.00 LC	13.000 T	-0-			0.30	0.30	0.02	0.00	0.00	0.00	0.00				0.50
ARSENIC	yes	C	54	360 C	190.00 C	0.002 C	50 M	100		0.16	0.10	0.01	0.30	0.00	0.00	3.74 *	0.00	0.00		0.27
VANADIUM			53	11,200 L9	9.00 LO	-0-	-0-			0.16	0.16	0.01	0.00	0.00	0.00					0.27
SELENIUM	yes		29	260 C	35.00 C	10.000 T	10 M			0.09	0.09	0.01	0.00	0.00	0.00	0.00	0.00			0.14
BERYLLIUM	yes	C	20	130 L9	5.30 LC	0.007 C	-0-			0.06	0.06	0.00	0.00	0.00	0.00	0.72				0.10
SILVER	yes		10	4 C	0.12 LC	50.000 T	50 M	5,000		0.03	0.01	0.00	0.14	0.00	0.00	0.00	0.00	0.00		0.05
MERCURY	yes	T	8	2 C	0.01 C	0.144 T	2 M	100	10	0.02	0.01	0.00	0.07	0.00	0.06	0.01	0.00	0.00	0.01	0.04
																		TOTAL:		27,127

NOTE: & C = known or suspected carcinogen, M = known or suspected mutagen, T = known or suspected teratogen
$ See attached sheet for definitions to codes pertaining to each criteria
^ Total subcategory pollutant loading (see attached methodology)
* Denotes a criteria exceedance

10/29/87

SOURCE: ITD information (October 1987), using method I mean

ORGI.....
SAMPLE POINT: RAW WASTEWATER

RITERI PRISON DRY CISTRY DIRECT INDIRECT

NUMBER OF PLANTS: 200
AVERAGE PLANT FLOW: 0.0[illegible]
AVERAGE POTW FLOW: 1 MGD
STREAM DILUTION FACTOR: 12

POLLUTANT	PRIOR. POLL.	EFFECTS $	AVERAGE PLANT EFFLUENT (ug/l)	WATER QUALITY AND POTW CRITERIA (Safe Levels) AQUATIC LIFE ACUTE $ (ug/l)	AQUATIC LIFE CHRONIC $ (ug/l)	HUMAN $ HEALTH WQO (ug/l)	DRINKING $ WATER STANDARD (ug/l)	POTW INHIB. (ug/l)	POTW CONCENTRATIONS POTW INFLUENT (ug/l)	POTW EFFLUENT (ug/l)	DIL. POTW EFFLUENT (ug/l)	SLUDGE (mg/kg)	ANALYSIS AND RESULTS CONCENTRATIONS/CRITERIA ACUTE	CHRON	HUMAN	DRINK	INH	SLUDGE	TOTAL ^ INDIRECT LOADING (lbs/day)
ACETONE			857,784	10,000 L4	500 @	99,870.172 T*	-0-		2,573.35	2,573.35	214.45	0.00	0.26	0.43	0.00				4,294.92
2-BUTANONE (MEK)		T	716,029	520,000 L4	70,000 LD	1,495.140 T*	-0-		2,148.09	2,148.09	179.01	0.00	0.00	0.00	0.12				3,585.16
TETRACHLOROETHENE	yes	C	86,267	5,280 L9	840 C	0.800 C	0 PRM	20,000	258.80	25.88	2.16	263.76	0.00	0.00	2.70 *		* 0.01		431.94
BENZOIC ACID			47,615	180,000 L9	9,000 @	-0-	-0-		142.85	142.85	11.90	0.00	0.00	0.00					238.41
N-OCTACOSANE (N-C28)			28,081	-0-	-0-	-0-	-0-		84.24	84.24	7.02	0.00							140.60
1,1-DICHLOROETHENE	yes	C	25,286	30,300 L4	2,400 LD	0.033 C	7 PM		75.86	12.14	1.01	7.60	0.00	0.00	30.65 *	0.14			126.61
N-TETRADECANE (N-C14)			24,941	-0-	-0-	-0-	-0-		74.82	74.82	6.24	0.00							124.88
ETHYLBENZENE	yes		21,598	32,000 L9	6,800 LD	1,400.000 T	680 PRM		64.79	3.24	0.27	73.37	0.00	0.00	0.00	0.00			108.14
BIS (2-ETHYLHEXYL) PHTHALATE	yes	C	21,449	11,100 L4	3 LC	1.750 C	-0-		64.35	15.44	1.29	145.73	0.00	0.43	0.74				107.40
TOLUENE	yes		20,295	13,000 L9	650 @	14,300.000 T	2,000 PRM		60.89	1.83	0.15	105.60	0.00	0.00	0.00	0.00			101.62
TRANS-1,2-DICHLOROETHENE	yes		20,295	135,000 L9	110,000 LD	-0-	70 PRM		60.89	3.04	0.25	13.79	0.00	0.00		0.00			101.62
1,1,1-TRICHLOROETHANE	yes		18,384	40,000 L9	2,000 @	18,400.000 T	200 PM	1,000	55.15	4.96	0.41	29.91	0.00	0.00	0.00	0.00	0.06		92.05
ISOPHORONE	yes		14,048	117,000 L4	5,850 @	5,200.000 T	-0-		42.14	42.14	3.51	0.00	0.00	0.00	0.00				70.34
N-DECANE (N-C10)			11,750	18,000 L4	1,300 LD	-0-	-0-		35.25	35.25	2.94	0.00	0.00	0.00					58.83
PHENANTHRENE	yes	C/M	11,577	3,980 E	40 @	42.000 T	-0-		34.73	1.04	0.09	138.54	0.00	0.00	0.00				57.97
STYRENE		C	11,158	23,000 L4	6,800 LD	-0-	140 PRM		33.47	33.47	2.79	0.00	0.00	0.00		0.02			55.87
METHYLENE CHLORIDE	yes	C	9,820	193,000 L9	9,650 @	0.190 C	-0-	100,000	29.46	1.47	0.12	16.68	0.00	0.00	0.65		0.00		49.17
N-OCTADECANE (N-C18)			8,669	-0-	-0-	-0-	-0-		26.01	26.01	2.17	0.00							43.41
N-DOCOSANE (N-C22)			7,867	530,000 L4	68,000 LD	-0-	-0-		23.60	23.60	1.97	0.00	0.00	0.00					39.39
N-DODECANE (N-C12)			6,950	-0-	-0-	-0-	-0-		20.85	20.85	1.74	0.00							34.80
DI-N-BUTYL PHTHALATE	yes		6,887	940 L9	9 @	34,000.000 T	-0-		20.66	2.07	0.17	55.41	0.00	0.02	0.00				34.48
BENZYL ALCOHOL			4,747	10,000 L9	500 @	-0-	-0-		14.24	14.24	1.19	0.00	0.00	0.00					23.77
ALPHA-TERPINEOL			4,745	10,000 L9	500 @	-0-	-0-		14.24	14.24	1.19	0.00	0.00	0.00					23.76
ISOBUTYL ALCOHOL		C	3,517	524,600 D	26,230 @	-0-	-0-		10.55	10.55	0.88	0.00	0.00	0.00					17.61
BUTYL BENZYL PHTHALATE	yes		3,281	1,700 L9	220 LC	-0-	-0-		9.84	0.98	0.08	26.40	0.00	0.00					16.43
NAPHTHALENE	yes		3,108	2,300 L9	620 LC	6,759.294 T*	-0-		9.32	0.93	0.08	8.00	0.00	0.00	0.00				15.56
2-NITROPHENOL	yes		2,954	37,665 A4	1,883 @	-0-	-0-		8.86	0.89	0.07	0.00	0.00	0.00					14.79
DIPHENYL ETHER			2,457	670 L4	410 LD	-0-	-0-		7.37	7.37	0.61	0.00	0.01	0.00					12.30
2-CHLORONAPHTHALENE	yes		2,323	-0-	-0-	-0-	-0-		6.97	6.97	0.58	0.00							11.63
TRICHLOROETHENE	yes	C	1,135	18,000 L4	2,200 LD	2.700 C	5 PM	20,000	3.41	0.17	0.01	0.39	0.00	0.00	0.01	0.00	0.00		5.68
N-HEXADECANE (N-C16)			1,122	-0-	-0-	-0-	-0-		3.37	3.37	0.28	0.00							5.62
PHENOL	yes		932	8,900 L9	750 L	3,500.000 T	-0-	200,000	2.80	0.06	0.00	1.63	0.00	0.00	0.00		0.00		4.67
HEXANOIC ACID			774	11,700 D	585 @	-0-	-0-		2.32	2.32	0.19	0.00	0.00	0.00					3.88
P-CYMENE			713	6,500 L4	4,600 LD	-0-	-0-		2.14	2.14	0.18	0.00	0.00	0.00					3.57
BIPHENYL			472	4,700 L4	2,200 LD	-0-	-0-		1.42	1.42	0.12	0.00	0.00	0.00					2.36
1,2-DICHLOROETHANE	yes	C	315	118,000 L9	20,000 C	0.940 C	5 PM		0.95	0.11	0.01	0.00	0.00	0.00	0.01	0.00			1.58
THIOXANTHONE			311	-0-	-0-	-0-	-0-		0.93	0.93	0.08	0.00							1.56
O-CRESOL			90	5,000 I4	50 @	-0-	-0-		0.27	0.27	0.02	0.00	0.00	0.00					0.45
2-METHYLNAPHTHALENE			24	-0-	-0-	-0-	-0-		0.07	0.07	0.01	0.00							0.12
NITROBENZENE	yes		14	27,000 L4	460 LD	19,800.000 T	-0-		0.04	0.00	0.00		0.00	0.00	0.00				0.07
FLUORENE	yes	C	12	1,700 E	17 @	-0-	-0-		0.04	0.00	0.00	0.00	0.00	0.00					0.06
2,4-DINITROTOLUENE	yes	C	11	31,000 L9	310 @	0.110 C	-0-		0.03	0.01	0.00		0.00	0.00	0.01				0.06

TOTAL: 10,063

ORGA
SAMPLE POINT: RAW WASTEWATER

ITERIA RISON DRUM ITTC II STRY DIRECT ... LOW STREAM FLOW

NUMBER OF PLANTS: 200
... PLANT ... 0.00...
AVERAGE POTW FLOW: 1 MGD
STREAM DILUTION FACTOR: 12

POLLUTANT	PRIOR. POLL.	EFFECTS &	AVERAGE PLANT EFFLUENT (ug/l)	WATER QUALITY AND POTW CRITERIA (Safe Levels): AQUATIC LIFE ACUTE $ (ug/l)	AQUATIC LIFE CHRONIC $ (ug/l)	HUMAN $ HEALTH W&O (ug/l)	DRINKING $ WATER STANDARD (ug/l)	POTW INHIB. (ug/l)	POTW CONCENTRATIONS: POTW INFLUENT (ug/l)	POTW EFFLUENT (ug/l)	DIL. POTW EFFLUENT (ug/l)	SLUDGE (mg/kg)	ANALYSIS AND RESULTS: CONCENTRATIONS/CRITERIA ACUTE	CHRON	HUMAN	DRINK	INH	SLUDGE	TOTAL ^ INDIRECT LOADING (lbs/day)

NOTE: & C = known or suspected carcinogen, M = known or suspected mutagen, T = known or suspected teratogen
$ See attached sheet for definitions to codes pertaining to each criteria
^ Total subcategory pollutant loading (see attached methodology)
# Denotes a criteria exceedance

10/29/87

SOURCE: ITD information (October 1987), using method I mean

PESTICIDES

SAMPLE POINT: RAW WASTEWATER

CRITERIA COMPARISON FOR THE DRUM REFURBISHING INDUSTRY - INDIRECT DISCHARGERS - AT LOW STREAM FLOW

NUMBER OF PLANTS: 200
AVERAGE PLANT FLOW: 0.003 MGD
AVERAGE POTW FLOW: 1 MGD
STREAM DILUTION FACTOR: 12

POLLUTANT	PRIOR. POLL.	EFFECTS &	AVERAGE PLANT EFFLUENT (ug/l)	WATER QUALITY AND POTW CRITERIA (Safe Levels) AQUATIC LIFE ACUTE $ (ug/l)	AQUATIC LIFE CHRONIC $ (ug/l)	HUMAN $ HEALTH W&O (ug/l)	DRINKING $ WATER STANDARD (ug/l)	POTW INHIB. (ug/l)	POTW CONCENTRATIONS POTW INFLUENT (ug/l)	POTW EFFLUENT (ug/l)	DIL. POTW EFFLUENT (ug/l)	SLUDGE (mg/kg)	ANALYSIS AND RESULTS CONCENTRATIONS/CRITERIA ACUTE	CHRON	HUMAN	DRINK	INH	SLUDGE	TOTAL ^ INDIRECT LOADING (lbs/day)
FENSULFOTHION			6827	10.00 L9	0.500 @	-0-	-0-		20.48	20.48	1.7068		2.05 ▮	3.41 ▮					34.18
AZINPHOS METHYL		C	5448	0.15 L9	0.001 C	-0-	-0-		16.34	16.34	1.3620		108.96 ▮	1,362.00 ▮					27.28
AZINPHOS ETHYL			4260	1.10 L9	0.055 @	-0-	-0-		12.78	12.78	1.0650		11.62 ▮	19.36 ▮					21.33
LEPTOPHOS			3959						11.88	11.88	0.9898								19.82
DIMETHOATE			1500	200.00 L9	10.000 @	594 T#	-0-		4.50	4.50	0.3750		0.02	0.04	0.00				7.51
DIAZINON		M	1035	0.20 L9	0.009 C	-0-	-0-		3.11	3.11	0.2588		15.52 ▮	28.75 ▮					5.18
ENDOSULFAN SULFATE	yes		528	0.220 C	0.056 C	74.0000 T	-0-		1.58	1.58	0.1320		7.20 ▮	2.36 ▮	0.00				2.64
ENDOSULFAN I	yes		296	0.220 C	0.056 C	74.0000 T	-0-		0.89	0.89	0.0740		4.04 ▮	1.32 ▮	0.00				1.48
HEPTACHLOR	yes	C	284	0.520 C	0.004 C	0.0003 C	-0-		0.85	0.85	0.0710		1.64 ▮	18.68 ▮	255.40 ▮				1.42
ETRIDAZONE			252						0.76	0.76	0.0630								1.26
																		TOTAL:	122

NOTE: & C = known or suspected carcinogen, M = known or suspected mutagen, T = known or suspected teratogen
$ See attached sheet for definitions to codes pertaining to each criteria
^ Total subcategory pollutant loading (see attached methodology)
▮ Denotes a criteria exceedance

10/29/87

SOURCE: ITD information (October 1987), using method I mean

WATER QUALITY CRITERIA CODES

ALL CRITERIA CODES

-0- NO AVAILABLE CRITERIA IN LIST OF LIST

FRESHWATER AQUATIC LIFE CODES

TYPE OF TEST CODES

ACUTE VALUES

C	EPA CRITERIA
PC	PROPOSED EPA CRITERIA
L9	LOWEST REPORTED 96 HR LC50
L4	LOWEST REPORTED 48 HR EC50
A2	ADJUSTED 24 HR LC50 (X 0.66)
A4	ADJUSTED 48 HR LC50 (X 0.81)
A7	ADJUSTED 72 HR LC50 (X 0.92)
D	ADJUSTED 24 HR EC50 (X 0.53)
E	ESTIMATED (NEELY, 1983)
LR7	LOWEST REPORTED 7 DAY LC50
LR1	LOWEST REPORTED 14 DAY LC50
LT	LOWEST TOXIC CONCENTRATION (NO TIME GIVEN)

CHRONIC VALUES

C	EPA CRITERIA
LC	LOWEST REPORTED CHRONIC VALUE
LM	LOWEST REPORTED MATC VALUE
LN	LOWEST REPORTED NOEL VALUE
LD	LOWEST REPORTED NDE VALUE
LO	LOWEST REPORTED OTHER VALUE
AA	ACUTE X APPLICATION FACTOR
E	ESTIMATED (NEELY, 1983)
@	ESTIMATED USING APPLICATION FACTOR (see methodology sheet)

DRINKING WATER CODES

M	MAXIMUM CONTAMINANT LEVEL (ENFORCEABLE)
PM	PROPOSED MAXIMUM CONTAMINANT LEVEL
PRM	PROPOSED RECOMMENDED MAXIMUM CONTAMINANT LEVEL

HUMAN HEALTH-WATER AND ORGANISMS CODES

TYPE OF CRITERIA CODES

C	FOR CARCINOGENICITY PROTECTION (R = 10E-6)
T	FOR TOXICITY PROTECTION
O	FOR PROTECTION AGAINST ORGANOLIPTIC EFFECTS
C*	NONREGULATORY ESTIMATED SAFE LEVEL FOR CARCINOGENICITY PROTECTION
T*	NONREGULATORY ESTIMATED SAFE LEVEL FOR TOXICITY PROTECTION