THE

ONTARIO WATER RESOURCES

COMMISSION

INDUSTRIAL WASTE SURVEY

of the

CITY OF ST. CATHARINES

1965

A

REPORT ON

AN INDUSTRIAL WASTES SURVEY

of

THE CITY OF ST. CATHARINES

May - October, 1965

by

Division of Industrial Wastes

ONTARIO WATER RESOURCES COMMISSION

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

INDIVIDUAL INDUSTRIAL REPORTS - Page No.

TABLE OF CONTENTS (continued)

SECTION I

AN INDUSTRIAL WASTES SURVEY OF THE CITY OF ST. CATHARINES

May - October, 1965

An industrial wastes survey was conducted in the City of St. Catharines by the Division of Industrial Wastes, Ontario Water Resources Commission, during the period extending from May to October, 1965.

The purposes of the survey were to obtain information on the quantities and characteristics of industrial wastes discharged to the municipal sewers and to open watercourses within the city, and to indicate where and how pretreatment or control measures might be applied to facilitate operation of the present and proposed sewage treatment facilities.

Thirty-nine industries that were known to consume large quantities of water were visited to obtain operating, processing and waste handling data. Of these, twenty-eight were considered to contribute significantly to the total waste loading in the City of St. Catharines. These industries are discussed individually in the second section of this report. The remaining industries which discharge relatively uncontaminated or small volumes of waste are tabulated and a brief description of each is given. A list of the major dry industries located in the city may be found in the appendices.

SUMMARY

From the results of this industrial wastes survey of St. Catharines it was found that a number of sources of wastes existed that could adversely affect the operation of a sewage treatment plant, or could cause the deterioration of the sewerage system in the proximity of the discharges. These sources may be summarized as follows:

1. The food and beverage processing industries sewer wastes high in organic material during the tomato and grape harvesting seasons. This large organic loading is discharged during a short period of each year and should be minimized by strict in-plant control and good housekeeping practices at the industries in order to ensure efficient operation of the sewage treatment plant. If organic overloading at the sewage plant should occur, operating problems as well as a poor quality treatment plant effluent will result.
2. Metal working and plating plants using acid or alkali cleaners discharge wastes characterized by a variable pH as well as high concentrations of toxic ions (toxic to sewage treatment processes). Plating wastes, in general, do not lend themselves to treatment by conventional sewage treatment processes, and therefore should be controlled at their source to avoid interference with municipal treatment processes.

The three paper mills within the city are expected to continue to discharge their wastes to the Old Welland Canal. Because of the unusual and province-wide problem, staged programmes have been instituted by the industry to provide primary or equivalent treatment of the wastes. Secondary treatment is to be provided later.

CONDUCT OF SURVEY

The major portion of this industrial wastes survey of the City of St. Catharines was carried out during the summer and fall of 1965. Data on the three paper mills in the City was obtained from the results of surveys conducted during the summer of 1963. Since the waste effluent from the paper mills will probably not be handled by the municipal sewerage system and since no major changes were expected to have occurred since 1963, the pulp and paper mills were not re-investigated as part of this municipal survey. The Industrial Wastes Division is dealing, individually, with each mill in Ontario, to develop a suitable waste control programme.

Initial undertakings in the survey were facilitated by the use of a list of process industries made available by the Greater Niagara Chamber of Commerce, and by the provision of industrial water consumption data by the Waterworks Commission of the City of St. Catharines.

The information compiled in this report was obtained principally by consultation with industrial management and analysis of waste samples obtained from those industries discharging wastes which were deemed to be significant. Examinations of the industrial processes and waste disposal practices and the analytical results obtained on the waste samples form the basis for any recommendations made.

All waste samples collected during the course of the survey were submitted to the Ontario Water Resources Commission Laboratory in Toronto for analysis in accordance with procedures described in "Standard Methods for the Examination of Water and Wastewater", Eleventh Edition. Messrs. R. C. Stewart, D. S. Tolson and J. D. Luyt of the Division of Industrial Wastes, Ontario Water Resources Commission, participated in the survey.

INDUSTRIAL WATER SUPPLY

The industrial water consumption in the City of St. Catharines supplied by the St. Catharines Waterworks Commission during 1964 was in the order of 7.5 million gallons per day. An additional 24 million gallons per day was taken from the Welland Ship Canal for use by the three paper mills; Domtar Pulp and Paper Co. Ltd., Garden City Paper Mills Co. Ltd., and Interlake Tissue Mills Co. Ltd., and by Plant #2 of McKinnon Industries Limited. Two industries, Barnes Wines Limited and Hayes Steel Products Limited, obtained a small amount of cooling water from privately owned wells.

The water consumption figures for industries obtaining water from the municipality were provided by the Waterworks Commission of the City of St. Catharines and are the average 1964 figures. Industries obtaining water from other sources estimated the individual volumes consumed.

INDUSTRIAL WASTE DISPOSAL

The total industrial waste flow in the city was approximately the same as the industrial water consumption, that is, approximately 31.5 million gallons per day. Of this amount, 5.5 million gallons per day were discharged to municipal storm, sanitary or combined sewers. 6.5 million gallons per day were discharged by McKinnon Industries Limited, Plant #2 to the Welland Ship Canal. The remaining 19.5 million gallons per day were delivered to Twelve Mile Creek or its tributaries by the three paper mills, and in lesser quantities by McKinnon Industries, Plant #1, Barnes Wines Ltd., Grantham Packers Limited, and Hayes Steel Products Limited.

An estimated break-down of the 5.5 million gallons industrial waste effluent handled daily by the municipal sewage system indicated 5% of the water had been supplied for sanitary use, 82% for cooling purposes, and 13% for process purposes.

SEWAGE TREATMENT

The City of St. Catharines is presently served by a primary sewage treatment plant located in the Port Weller area. The plant effluent is discharged to Lake Ontario via the Welland Ship Canal. The design capacity of the plant is 1.6 mgd but an average flow of 5 to 6 mgd is delivered daily with peak flows of 10 mgd not uncommon. A portion of the flow in excess of 1.6 mgd by-passes the plant and is discharged untreated to the Welland Canal. In the Port Dalhousie area, sewage is discharged into the Martindale Basin without treatment. In addition, raw sewage is discharged directly into Twelve Mile Creek or its tributaries at various points in the city.

A 9 mgd primary treatment plant in the Port Dalhousie area with final discharge into Martindale Basin has been approved. An extension to the Port Weller area primary plant is expected to be completed during 1968. Secondary treatment will be provided after completion of the current five-year municipal sewage treatment programme. It is also expected that almost all areas of the city will eventually have access to sewage treatment facilities. This includes the areas west of Twelve Mile Creek but does not include the area east of the Welland Ship Canal.

In addition to the municipal sewage system, McKinnon Industries Limited operates a privately owned treatment plant at its Glendale Avenue Plant #2, east of the Welland Canal. This effluent is discharged to a creek east of the plant which eventually flows into the Ship Canal.

The chief feature of a primary sewage treatment plant is sedimentation in one or more settling tanks. Additional features such as screening, digestion of solids, and chlorination are usually integrated into the system. Performance figures for a primary treatment plant are normally in the order of 25 - 40% 5-day Bio-chemical Oxygen Demand reduction and 40 - 70%

suspended solids removal, depending on such factors as residence time, flow, geometry of the system and influent waste loadings. These figures may be compared to removal efficiencies of 85 - 95% by the activated sludge secondary treatment process. In addition, most metallic ions and other dissolved pollutants will not be completely removed by primary treatment alone.

INTERPRETATION OF ANALYTICAL RESULTS

The analyses performed on samples collected during the survey are listed below with a brief explanation of each as an aid in interpreting the significance of the analytical results.

Acidity - The acidity of water is usually caused by small amounts of carbonic acid in equilibrium with dissolved carbon dioxide, mineral acids, and salts of strong acids and weak bases. The presence of acidity in fresh domestic sewage indicates an acidic industrial waste discharge. Acidic wastes may corrode the sewers in the proximity of the discharge before appreciable degrees of dilution can be obtained.

Alkalinity - Natural waters are usually alkaline because of the presence of bicarbonate, carbonate and hydroxide components. Industrial discharges high in alkalinity can affect the hardness of the receiving stream and deposit calcium carbonate scale in sewers if hydroxide or "caustic" alkalinity is present. Both acidity and alkalinity are reported as parts per million (ppm) calcium carbonate.

Biochemical Oxygen Demand (BOD) - This test indicates the amount of oxygen required to stabilize the decomposable organic matter of a waste in 5 days under standard laboratory conditions. The BOD result is the most commonly used indicator for denoting the relative strength or quality of raw or treated sanitary sewage. The BOD approach to the evaluation of industrial wastes is of limited value, and could lead to substantial errors in the sizing

of biological treatment processes because of the unsuspected slow or rapid oxygen demand of certain industrial wastes.

Chemical Oxygen Demand (COD). - The COD test is a second indicator of the oxidizability of waste components. Test results refer to substances oxidizable by dichromate in 50% sulphuric acid refluxed for two hours at 145°C. The COD value is an important, rapid parameter for stream and industrial waste studies and control of waste treatment plants. The method fails to include some organic compounds which are biologically available to stream and sewage treatment plant organisms, and on the other hand, includes some compounds which are not a part of the immediate biochemical load on the receiving water.

Cyanide - Cyanides are not natural components of surface water, and if they are present, industrial pollution is indicated. Cyanides are very toxic components of industrial wastes. It has been reported that fish can not live indefinitely in water containing as little as 0.1 ppm cyanide ion (CN^-). Concentrations of cyanide, as low as a few parts per million, can liberate hydrogen cyanide which would be especially dangerous to sewerage system workers. Because of this health hazard, cyanides should be eliminated from industrial discharges, or at least reduced to neglible concentrations.

Grease and oil - Oil and grease present an offensive condition in surface water, and adversely affect the operation of a sewage treatment plant. They can coagulate, settle and block sewers. Grease and oil are determined as ether solubles.

Hydrogen Ion Concentration (pH) - The pH is the negative logarithm of the hydrogen ion concentration, and is reported in numbers ranging from zero, very acidic, to 14, very basic. The neutral point is pH 7. Acidity and alkalinity include the buffering action of a sample while the pH gives

the instantaneous activity of the hydrogen ion.

Metals - Metallic ions such as copper, nickel, chromium, cadmium and zinc, should be limited to low concentrations for discharge to municipal sewers be cause they are toxic to the biological processes in a secondary sewage treatment plant. Waste effluents to a watercourse should contain only small amounts of these metals since they are also toxic to aquatic life.

Phenols - The results are reported as phenolic equivalents and show the minimum phenolic content including cresols and higher hydroxy derivatives of benzene which react with either Gibbs reagent or 4 amino antipyrene, and are recorded in parts per billion (ppb). Phenolic wastes, in concentrations of only a few ppb, may cause objectionable tastes or odours in drinking or industrial water supplies and may taint the flesh of fish.

Suspended Solids - Suspended solids in waste effluents are removed by screening and settling. However, before these reach the sewage plant, large amounts of solids may result in clogging and blocking of pipes and sewers. Large amounts of suspended solids in the treatment plant influent may result in overloading of the plant's primary sedimentation facilities, resulting in a poor quality effluent.

GUIDELINES FOR INDUSTRIAL WASTE CONTROL

The table on page 9 summarizes the maximum concentrations of various substances found in industrial waste water which are normally permitted to enter the public sanitary sewers or storm sewers and natural watercourses.

Waste Constituent	Sanitary Sewer	Storm Sewer or Natural Watercourse
Temperature	Not to exceed 150° F.	Not to exceed 150° F.
Ether Solubles		
a) Animal or Vegetable origin	100 parts per million	15 parts per million
b) Mineral origin	15 parts per million	15 parts per million
pH	5.5 - 9.5	5.5 - 10.6
Suspended Solids	350 parts per million	20 parts per million
Biochemical Oxygen Demand	300 parts per million	20 parts per million
Chromium as Cr (hexavalent)	3 parts per million	1 part per million
Cyanide as HCN	2 parts per million	0.1 parts per million
Copper as Cu	1 part per million	1 part per million
Phenolic equivalents		
(Primary treatment)	50 parts per billion	
(Secondary treatment)	100 parts per billion	
Cadmium as Cd	no limit *	1.0 part per million
Zinc as Zn	no limit	15 parts per million
Iron as Fe	no limit	17 parts per million
Chlorides as Cl	no limit	1,500 parts per million
Sulphates as SO_4	no limit	1,500 parts per million

* Although no number is listed the remaining common heavy metals are usually limited to 5 ppm.

In addition to the preceeding limitations, it is also necessary to prohibit the discharge of material that would adversely affect the sewerage system, the sewage treatment processes, and the associated workers. Materials in this group would include inflammable or explosive matter, solids that could obstruct the flow, chemicals with offensive odours, and many others.

The means of effecting these controls would involve the enactment and enforcement of a sewer-use by-law by the municipality. This by-law should state what and how much of a waste constituent may be discharged to the municipal sewers, and these values should be predicated by local circumstances as well as the degree of protection required for the sewerage system.

One important aspect of such a by-law is the presence of a special clause that allows the municipality to accept a waste that does not meet the requirements of the by-law, but is amenable to treatment in the municipal facilities. In this case the industry in question may or may not be charged for the additional service it is receiving from the municipality.

From industry's point of view, there are two general courses of action that can be followed - discharge wastes to a storm sewer or natural watercourse or discharge wastes to the municipal sanitary sewers.

If wastes are to be discharged to a natural watercourse, the industry is required to meet the objectives of the Ontario Water Resources Commission, and these are indicated in the right hand column of the table on page 9. This can be accomplished by process changes, in-plant control, segregation of wastes for disposal elsewhere, and treatment of the wastes.

Where wastes are discharged to the municipal sanitary sewers, municipal sewer-use requirements will apply. The establishment of an industrial waste sewer-use by-law would offer guidelines as to what wastes would be acceptable in the system.

If an industry has wastes that do not meet these requirements, pretreatment of the wastes to make them acceptable should be required, or if the wastes are easily treatable, a special agreement between the industry and the municipality might be possible. In this case the industry may be required to pay the cost of the additional treatment.

Section II of this report deals with the individual industries, and in many cases recommendations are made to deal with what were considered to be waste disposal problems. Where the recommendations involve the sanitary sewers, either wastes presently being discharged or recommended to be discharged to the sanitary sewers, these recommendations should be carried out at the discretion of the City of St. Catharines.

GENERAL DISCUSSION OF FINDINGS

The total daily industrial waste loading in the City of St. Catharines during the tomato and grape harvesting season in terms of BOD was 62,000 pounds. Of this amount roughly 7,000 pounds were discharged to the municipal sewers, 55,000 pounds were discharged to the Old Welland Canal by the three paper mills and 600 pounds were discharged to open watercourses by four other industries. In terms of suspended solids, the daily waste loading was 50,000 pounds of which 5,000 pounds were discharged to the municipal sewers, 44,000 pounds were discharged to the Old Welland Canal by the paper mills and 1,000 pounds were discharged to natural watercourses by the four other industries.

Over eighty per cent of the BOD loading of 7,000 pounds per day exerted on the municipal sewers was discharged by the food and beverage processing industries of which Powell Foods Limited and Queensway Canning Company were the major contributors. All of these industries, except Lever Potato Chips, Limited, discharged strong wastes only during the canning and grape harvesting season in the fall. During the remainder of the year, the strength as well as the volume of the wastes would be much less.

Of the daily suspended solids loading of 5,000 pounds, it is estimated that forty-five per cent was sewered by McKinnon Industries Ltd., Plant #1 and twenty-five per cent was discharged by the food and beverage processing industries, again only during the canning and grape harvesting seasons.

Metals such as zinc, copper, nickel, chromium and cadmium which are toxic to the biological processes of a secondary treatment plant were sewered from the industries engaged in metal finishing. Dilution by the combined industrial and domestic wastes in the city sewers may reduce these metal concentrations to the extent necessary to eliminate the toxic effects of these metals on biological sewage treatment processes.

Another waste constituent of importance discharged by some of the metal-working industries was cyanide. Because of the extreme health hazard of cyanide, cyanide concentrations in municipal sewerage systems should be kept to trace quantities or eliminated. Although the toxicity of the cyanide would be reduced or eliminated by dilution in the city sewers before reaching the sewage treatment plant, sewers in the proximity of a cyanide discharge may carry a waste containing excessive amounts of cyanide. Should the pH of this waste flow fall below 7, hydrogen cyanide gas can be liberated. Court Industries Ltd. did discharge a waste containing high

concentrations of cyanide at a low pH.

Acid wastes discharged by Powell Foods Limited, Court Industries Limited and the wineries and canneries may cause problems of deterioration in the sewers near the points of discharge. However, neutralization by normally alkaline domestic sewage should take place in the municipal sewers before the wastes reach the sewage plant.

An important consideration in the operation of a municipal sewage system is the handling of intermittent or "batch" discharges of industrial wastes. Because of their intermittent nature, precautions taken to minimize the effects of these "batches" at the sewage treatment plant are not as effective as eliminating the discharges at the plant sites. In most cases neutralization, precipitation, settling, land-disposal or slow discharge of the "slug" over a long period of time are methods of reducing the effects of these discharges.

The most prevalent and important types of batch discharges in the city were spent acidic pickling liquors containing high metal concentrations, and alkaline solutions containing solids. The larger and more concentrated of these discharges should be neutralized and possible undergo further treatment before being sewered while the smaller less concentrated solutions could possibly be sewered slowly over a period of several hours.

In the city of St. Catharines, there were a number of seasonal industries. These included the wineries; Barnes Wines Limited, and Jordan Wines Limited, the canneries; Lincoln Canning Company and Queensway Canning Company, and the fruit processing industries; Powell Foods Limited and Wethey's Products Limited. With the exception of Barnes Wines Limited all of these industries discharged their respective waste effluents to the municipal sanitary sewers. These seasonal industries, when operating,

contributed 75 per cent of the total industrial 5-day BOD waste load exerted on the sewage system. During the major portion of each year, these industries were either completely shut down discharging no wastes, or performed operations such as bottling which resulted in much smaller quantities of waste as well as a much less concentrated waste. This factor may cause operating problems at the treatment plant during the harvesting season each year unless proper precautions at both the processing plants and the treatment plant are applied.

Suggested procedures at the industries would include good housekeeping, land-disposal of solid wastes and avoidance of batch discharges.

The two tables on the following pages summarize the industrial waste load in the city of St. Catharines. The industries are tabulated in groups according to the type of plant operations.

TABLE I

Summary of Continuous Industrial Waste Discharges

(a) Food and Beverage Processing Industry

Company	Waste Volume (gpd)	Liquid Waste Disposal	Contaminant Concentrations (ppm)				Waste Loadings (lbs/day)		
			5-day BOD	Susp. solids	pH	Ether solubles	5-day BOD	Susp. Solids	Ether solubles
Barnes Wines Limited	22,000 during grape harvesting season	Martindale Pond	580 - 8,000	49 - 2,754	3.0		230	50	
Jordan Wines Limited	140,000 during harvesting season	Sanitary Sewer	587	166	4.1-5.3		822	233	
Lever Potato Chips Ltd.	29,000	Sanitary Sewer	1567	1047	4.3		454	303	
Lincoln Canning Company	32,000	Sanitary Sewer	(total effluent could not be sampled)				400 (estimated)	140	
Powell Foods Limited	167,000 during harvesting season	Sanitary Sewer	1567	176	4.5-4.8		2622	302	
Queensway Canning Co.	16,000	Sanitary Sewer	8,700	2618	3.7-4.0		1392	418	
Wethey's Products Limited	-	Sanitary Sewer	(plant was idle during the survey and therefore estimates of the waste loading could not be made)						

TABLE I (continued)

(b) Meat-Packing Industry

Company	Waste Volume (gpd)	Liquid Waste Disposal	Contaminant Concentrations (ppm)				Waste Loadings (lbs/day)		
			5-day BOD	Susp. solids	pH	Ether Solubles	5-day BOD	Susp. solids	Ether solubles
Essex Packers Limited	11,400	Sanitary Sewer	46	28	6.6-6.9	2.1	5	3	0.2
Grantham Packers Limited	5,400	Twelve Mile Creek	3,250	932	6.2-6.5	127	176	50	6.9

TABLE I (continued)

(c) Metal-Working Industry

Company	Waste Volume (gpd)	Liquid Waste Disposal	Contaminant Concentrations (ppm)								Waste Loadings (lbs./day)						
			Susp. Solids	pH	Ether Solubles	HCN	Ni	Cu	Cd	Zn	Susp. Solids	Ether Solubles	HCN	Ni	Cu	Cd	Zn
Court Industries Limited	96,000	Sanitary Sewer	55	3.0-4.1		29	2.8	3.3	3.3	30	53		28	27	3.2	3.2	29
Ferranti-Packard Electric Limited	87,000	Sanitary Sewer	27	5.1	8	0.9	0.3	5			23.5	7.0	0.8	0.3	4.3		
Harjohn Industries Limited	7,850	Sanitary	7	3.3							0.6						
Hayes Steel Products Limited	89,000	Twelve Mile Creek	46-68	7	28.6						47.8	8.9					
Lightning Fastener Co. Ltd. (Niagara St. Plant)	44,000	Storm Sewer	82	7.5		17	6.4	11.8		21	11.5		2.5	0.9	1.6		2.9
McKinnon Industries Limited Plant #1	3,120,000	Twelve Mile Creek and Sanitary Sewer	Refer to the individual industrial report								2,300	1,700	Fe:	180			
Plant #2	6,400,000	Welland Ship Canal	Refer to the individual industrial report								900		Fe:	120			
Thompson Products Limited	1,300,000	Storm and sanitary sewers	6-82	7.5	6.6-30.2						390	200					
Tri-Sure Products Ltd.	7,700	Sanitary Sewer	2	7.7	2						0.2						
Yale and Towne Mfg. Co.	30,000	Sanitary Sewer	30	7.9	5	2.9					9	1.5	0.9				

TABLE I (continued)

(d) Textile Industry

Company	Waste Volume (gpd)	Liquid Waste Disposal	Contaminant Concentrations (ppm)				Waste Loadings (lbs/day)	
			5-day BOD	Susp. Solids	pH	phenols (ppb)	5-day BOD	Susp. Solids
Bay Mills Limited	6,250	Sanitary Sewer	1.9	8	7.4		0.1	0.5
Lightning Fastener Co. Limited (Church Street Plant)	30,000	Sanitary Sewer	81-401	31-86	2.2-9.9	20-80	72.1	17.5
Monarch Knitting Co. Ltd.	30,000	Sanitary Sewer	195	18	6.1		58.5	5.4

TABLE I (continued)

(e) Other Industry

Company	Waste Volume (gpd)	Liquid Waste Disposal	Contaminant Concentrations (ppm)					Waste Loadings (lbs/day)			
			5-day BOD	Susp. Solids	pH	Ether Solubles	Sulphides	5-day BOD	Susp. Solids	Ether Solubles	Sulphides
F.C. McCordick Leathers Ltd.	10,000	Sanitary Sewer	2,640	5,470	9.5-12.3	245	100	264	547	24.5	10
Scholler Bros. Limited	3,000	Sanitary Sewer	536	357	2.5-8.0			16.1	10.7		

TABLE I (continued)

(f) Paper Mills

Company	Waste Volume (gpd)	Liquid Waste Disposal	Waste Loadings (lbs/day)	
			5-day BOD	Susp. Solids
Domtar Pulp and Paper Company Limited	13,000,000	Twelve Mile Creek	51,600	32,000
Garden City Paper Mills Co. Limited	2,300,000	Twelve Mile Creek	940	2,166
Kimberly-Clark of Canada Limited	3,100,000	Twelve Mile Creek	1,900	10,000

TABLE II

Summary of Intermittent Industrial Discharges

Company	Disposal	Volume and Frequency of Discharge	Characteristics
Conroy Mfg. Company, Ltd.			
pickling liquor	Sanitary Sewer	300 gallons when required	low pH, high Zn and Fe content
cooling compounds		a total of 625 gallons every 2 weeks	high ether solubles content
Court Industries Ltd.			
pickling liquor	Sanitary Sewer	a total 750 gallons every 6 weeks	low pH, high Zn and HCN contents
caustic cleaning solutions		a total of 400 gallons per week	high pH, high Cu and HCN contents
Harjohn Industries Ltd.			
Hot water sealing solution	Sanitary Sewer	1,500 gallons 1/week	
Caustic etch solution		1,500 gallons 1/month	high pH, high Al content
Sulphuric Acid Anodizing Solution		1,500 gallons 1/year	low pH, high Al content
McKinnon Industries Ltd.,			
Plant #1.	Sanitary Sewer		
machining coolants			
caustic cleaning solutions			
paint spray booth wash water			
Thompson Products Ltd.			
caustic spray parts washer solution	Sanitary Sewers	800 gallons 1/week	

TABLE II (continued)

Summary of Intermittent Industrial Discharges

Company	Disposal	Volume and Frequency of Discharge	Characteristics
Tri-Sure Products Ltd.			
Bonderlubing Solution	Sanitary Sewer	200 gallons 1/day	
Bonderizing Solution		200 gallons 1/week	
Caustic Cleaning Solution		200 gallons 1/week	
Yale and Towne Mfg. Co.			
Various solutions in the electro-plating area	Sanitary Sewer	a total of 660 gallons per month	extremes in pH
Canada Hair Cloth Co. Ltd.			
textile treating solutions	Sanitary Sewer	2,800 gallons per day	high BOD and solids contents
Monarch Knitting Co. Ltd.			
textile treating solutions	Sanitary Sewer	2,000 gallons per day	some solutions have a high BOD content

GENERAL RECOMMENDATIONS

The following general recommendations are offered as a guide for the control of industrial wastes in the City of St. Catharines. More specific recommendations, applying to individual industries, may be found in the second section of this report which discusses each industry separately.

1. Industry should be made familiar with the type of municipal sewers now available or planned in their area, for sanitary, storm, or combined flows and whether more than one type of sewer has been or will be installed.
2. Industries with large volumes of uncontaminated process or cooling water should be requested to segregate these flows from contaminated streams and direct the uncontaminated water to a storm sewer or a natural watercourse where these facilities are available or planned, or recycle the clean water within the plant.
3. The municipality, in co-operation with industry should work toward the enactment of a mutually acceptable by-law for the control of process waste waters discharged to the municipal sewers. Industry would then become familiar with problems relating to industrial wastes, in the efficient operation and maintenance of a municipal sewage system, and could then plan their waste disposal programmes accordingly.
4. The municipality, as a general objective, should provide separate sanitary and storm sewers wherever possible.
5. Where not presently doing so, the industries should provide for the adequate disposal of their industrial wastes.

SECTION II

BARNES WINES LIMITED

Martindale Road

Barnes Wines Limited, located on the west bank of Twelve Mile Creek, was engaged in the processing of grapes into a variety of red and white wines.

SUMMARY

The plant effluent during most of the year was comprised mainly of cooling water and was therefore relatively uncontaminated upon discharge. However, during the grape harvesting and processing season, the waste strength increased greatly.

All industrial wastes were discharged through four separate sewers to Martindale Pond. The contaminated process wastes should be discharged to a sanitary sewer, when this becomes feasible, while the spent cooling water should continue to be discharged to Martindale Pond.

DETAILS OF SURVEY

Barnes Wines Limited was visited on June 8, 1965 and the waste streams sampled on September 28, during the grape harvesting season.

Personnel Interviewed

Mr. W. P. MacLean - Plant Superintendent

Description of Plant Processes

1,500 to 3,000 tons of grapes were processed annually into a variety of red and white wines. The processing included preliminary crushing, fermentation, pressing, further fermentation, filtration, storage and ageing for 1 - 2 years, a second diatomaceous earth filtration, cooling, a final filtration, blending, fortifying, and finally, bottling.

Production and Operating Data

Number of employees - 35

Production and Operating Data (continued)

Operating Schedule
- 1 shift per day
- 5 days per week
- for approximately 8 weeks, beginning during the early part of September, the plant operated 24 hours per day.

Raw Materials - 1,500 - 3,000 tons of grapes per year

Production Volume - 100 gallons white wine or 250 gallons red wine per ton of grapes

Water Consumption and Distribution

Source - Municipal supply. During the summer months a private well supplied some cooling water.

Volume - 32,000 - 47,000 gpd

Estimated Distribution - 1,000 gpd for sanitary use

24,000 gpd for cooling purposes

7,000 - 22,000 gpd for other process purposes

Sources and Disposal of Liquid Wastes

Sanitary wastes, cooling water and liquid process wastes, all segregated, were discharged without treatment to Martindale Pond.

Sources of contaminated process wastes included process spillage from the crushing and pressing operations and floor and equipment washings. Relatively uncontaminated cooling water was discharged from the fermenter cooling coils and compressors. Solid wastes such as grape stems and pumice were land-dumped.

Sampling and Analysis

Samples were taken on September 28, at half-hourly intervals and combined to give composites representing the morning and afternoon waste flows. Results of the analyses are presented on the following page.

(All results except pH reported in parts per million)

	5-day BOD	Susp. Solids	Diss. Solids	pH
Cooling Water Discharge				
9:00 a.m. - 12:00 noon	1.6	9	171	7.6
1:00 p.m. - 3:00 p.m.	1.5	32	208	7.3
Main Discharge				
9:00 a.m. - 12:00 noon	580	49	719	3.0
1:00 p.m. - 3:00 p.m.	8,000	2,754	1,716	-

WASTE LOADINGS

A rough estimate of the daily waste loading during the processing season was calculated to be as follows:

5-day BOD - 230 pounds per day

Suspended Solids - 50 pounds per day

pH - 3.0 - 7.6

CONCLUSIONS AND RECOMMENDATIONS

The process effluent from the winery was not satisfactory for discharge to a natural watercourse. The waste should be discharged to a municipal sanitary sewer when this method of disposal becomes available. In-plant efforts designed to minimize the amount of process spillage and to prevent any equipment leakage may succeed in decreasing the waste load discharged to Martindale Pond. No solid material which could be land-dumped should be flushed to the sewer.

The cooling water appears satisfactory for discharge to Martindale Pond. This discharge should be continued when a sanitary sewer connection is eventually realized in order to minimize the hydraulic load on the municipal sewage system.

JORDAN WINES LIMITED

120 Ridley Road

Jordan Wines Limited produced a variety of table wines and champagnes.

SUMMARY

This winery produced its strongest and greatest volume of wastes during a five to six week period beginning the middle of September and continuing until the end of October. Both sanitary and process wastes were sent to the municipal sanitary sewer.

Process wastes during the season contained a high BOD and acid content. During the remainder of the year they would be much weaker and in all likelihood be satisfactory for discharge to the sanitary sewage system.

DETAILS OF SURVEY

Jordan Wines Limited was visited on June 8, 1965 and the waste effluent sampled on September 29.

Personnel Interviewed

Mr. J. D. MacKenzie - Vice-President

Mr. Anderson - Winery Manager

Description of Plant Processes

Approximately 8,500 tons of grapes were processed annually into a variety of wines.

Processes involved in the production of wine include stem removal, preliminary crushing of the grapes, hydraulic pressing, fermentation, diatomaceous earth filtration, storage and ageing. After the interval required for proper ageing, the wine was filtered, blended, fortified and bottled for sale. A small amount of grape juice was concentrated in an evaporator to be processed during the following year.

Production and Operating Data

Number of employees - 60 during the season

21 during the remainder of the year

Operating Schedule - 1 twelve-hour shift per day during the season

- 1 eight-hour shift per day during the remainder of the year

- 5 days per week at all times

Raw Materials - 8,500 tons of grapes per year

Water Consumption and Distribution

Source - Municipal supply

Volume - 60,000 - 140,000 gpd

Estimated Distribution - 1,500 gpd for sanitary use

- 80,000 gpd for cooling purposes during the season

- 60,000 gpd for other industrial purposes during the season

- 60,000 gpd for cooling and other purposes during the remainder of the year.

Sources and Disposal of Liquid Wastes

All sanitary and liquid process wastes were discharged to the municipal sanitary sewer on Louth Street by means of two connecting sewers. Nineteen 150,000 gallon storage tanks were serviced by one connecting sewer while the remainder of the plant was serviced by a second connecting sewer.

A large amount of cooling water was used in the fermenter cooling coils and was discharged relatively uncontaminated. Sources of contaminated wastes included process spillage, washing of floors and equipment and washing of blankets used in the hydraulic grape press.

Wine lees were sold to distillers and all pumice was used as a fertilizer on the vineyards. The tartrate formed on the storage tank walls, removed by means of hot water, was land-dumped. These materials, therefore, did not constitute a source of sewered waste.

Sampling and Analysis

Samples of the total plant waste effluent, including the spent cooling water, were taken at twenty-minute intervals on September 29, and combined to give composite samples. In addition, two grab samples were taken when visual observations indicated an increased waste loading. A grab sample of the cooling water sewered by the winery was also taken.

The analytical results obtained on these samples are reported below. (All results except pH reported in parts per million)

	5-day BOD	Susp. Solids	Diss. Solids	pH
Total Plant Effluent				
10:00 a.m. - 12:00 noon	410	120	390	5.3
1:00 p.m. - 3:00 p.m.	1,100	312	484	4.2
3:00 p.m. - 4:30 p.m.	250	67	315	5.2
11:50 a.m. (grab sample)	800	444	402	4.2
1:00 p.m. (grab sample)	1,300	396	518	4.1
Cooling Water				
3:30 p.m. (grab sample)	20	12	314	6.3

WASTE LOADINGS

An estimate of the waste loading from Jordan Wines Ltd., during the grape harvesting and processing season was calculated to be:

5-day BOD - 822 pounds per day

Suspended Solids - 233 pounds per day

pH - 4.1 - 6.3

CONCLUSIONS AND RECOMMENDATIONS

The wastes from this industry were strong compared to normal sanitary sewage, but were typical of an operating winery. It would appear that a large part of the organic waste load originated from the blanket washing operation.

Segregation of the relatively uncontaminated spent cooling water with discharge to a storm sewer would reduce the hydraulic load on the municipal sanitary sewers and sewage treatment plant.

LEVER POTATO CHIPS LIMITED

Grote Street

Lever Potato Chips Limited produced packaged potato chips.

SUMMARY

All wastes were discharged to the municipal sanitary sewer. A grease trap and a vibrating screen were both being by-passed at the time of the survey because of operating problems, resulting in a sewered waste high in organic material. It is recommended that some form of grease and solids collection be re-instituted to provide a better quality effluent.

DETAILS OF SURVEY

Lever Potato Chips Limited was visited and surveyed on May 13 and June 8, 1965.

Personnel Interviewed

Mr. J. R. Wells - Secretary - Treasurer

Description of Plant Processes

Raw potatoes were mechanically peeled and cleaned, cut into thin slices and tumbled in water to remove the starch. The chips were then cooked in liquid shortening which replaced the water in the chips, and finally, were packaged for sale.

Production and Operating Data

Number of Employees - 37

Operating Schedule - 1 shift per day

5 days per week

Production Volume - 10 tons of potatoes were processed daily

Water Consumption and Distribution

Source - municipal supply

Volume - 27,000 gpd

Distribution - 1,000 gpd for sanitary purposes

3,000 gpd for cooling purposes

23,000 gpd for process purposes

Sources and Disposal of Liquid Wastes

All waste waters were discharged to the municipal sanitary sewer. This water contained large quantities of dirt and starch from the various potato washing operations. A vibrating screen for the removal of suspended solids and starch had been purchased but, at the time of the survey, was being by-passed because of operational problems. Some cooling water, used on the shortening tank, was also discharged to the sanitary sewer. This shortening tank was equipped with a float control and alarm to prevent the discharge of fatty material to the sewer. A grease trap which had been installed was not being used.

Potato peelings were trucked from the plant.

Sampling and Analysis

Presented below are the analytical results of the samples taken from the sewered plant effluent on May 13 and June 8, 1965.

(All results except pH reported in parts per million)

	5-day BOD	Susp. Solids	Diss. Solids	pH at Lab.
May 13				
Grab sample	2,100	4,064	992	6.3
June 8				
Composite 10:00 a.m. - 12:00 noon	1,800	638	818	4.4
Composite 1:00 p.m. - 3:00 p.m.	1,300	833	631	4.3
Composite 3:00 p.m. - 4:00 p.m.	1,600	1,670	910	4.2

WASTE LOADINGS

Based on the analytical results and the water consumption data, the daily waste loading was found to be:

5-day BOD	-	454 pounds per day
Suspended Solids	-	303 pounds per day
pH	-	4.2 - 6.3

CONCLUSIONS AND RECOMMENDATIONS

The organic loading in the plant waste effluent was high. Efforts should be made by Lever Potato Chips Limited to rectify this situation by using equipment such as the grease trap and vibrating screen. If this is not possible alternate methods of controlling the waste load discharged to the sewers may be required by the municipality.

LINCOLN CANNING COMPANY

203 Carlton

Lincoln Canning Company was engaged in the packing of tomatoes, peaches, pears and cherries.

SUMMARY

Plant operations at this cannery were seasonal with the strongest wastes produced in September and October during the tomato pack. The chief source of sewered waste at this time was the pressing of waste tomatoes.

DETAILS OF SURVEY

Lincoln Canning Company was visited and the plant effluent partially sampled on September 29, 1965.

Personnel Interviewed

Mr. O'Mara - Owner

Description of Plant Processes

In the tomato pack, tomatoes were water or steam washed, hand-peeled and packed into cans. The cans were filled with tomato juice, obtained by pressing waste tomatoes, sealed, and immersed in boiling water for several hours to cook the contents. They were then cooled in a long trough containing cooling water.

The peach, pear and cherry pack operations were similar to the tomato pack except that a sugar solution rather than fruit juice was added to the can contents. The waste would be much weaker during these packs.

Production and Operating Data

Operating Schedule - the plant was idle most of the year
- during the season (July to October) the plant operated 1 shift per day, 5 1/2 days per week

Production Volume - 30,000 cases tomatoes per year
- 45,000 - 60,000 cases of pears, peaches and cherries per year

Water Consumption and Distribution

Source - municipal supply

Volume - 37,500 gpd

Distribution - 1,250 gpd for sanitary purposes
4,250 gpd for cooling purposes
32,000 gpd for other industrial purposes

Sources and Disposal of Liquid Wastes

All liquid wastes, including the can cooling water, were discharged to the city sanitary sewers.

The source of the strongest waste was the tomato press. Some of the juice produced in this operation was used to fill the tomato cans but the largest portion was sewered. Other sources of waste-water were the water and steam tomato washers used to clean and soften the tomatoes before peeling.

Pressed tomato pulp was trucked from the plant and did not constitute a source of sewered waste.

Sampling and Analysis

The waste water from the outside and the inside tomato washers was sampled at half-hourly intervals on September 29. The samples were combined to give composites representing the time periods from 9:30 a.m. to 12:00 noon and 1:30 p.m. to 4:00 p.m. A grab sample of the can cooling water was also taken.

Samples of the waste from the tomato press could not be obtained.

The analytical results obtained on the samples collected are presented below.

(All results except pH reported in parts per million)

	5-day BOD	Susp. Solids	Diss. Solids	pH
Outside Tomato Washer				
9:30 a.m. - 12:00 noon	140	280	812	5.9
1:30 p.m. 4:00 p.m.	320	374	2,322	5.3
Inside Tomato Washer				
9:30 a.m. - 12:00 noon	5.2	63	339	6.5
1:30 p.m. - 4:00 p.m.	4.0	77	271	6.6
Spent Can Cooling Water	1.1	2	308	7.1

WASTE LOADINGS

Because the waste tomato juice delivered to the sewer could not be sampled, the waste loading from this cannery can only be estimated.

5-day BOD - 400 pounds per day

Suspended Solids - 140 pounds per day

CONCLUSIONS AND RECOMMENDATIONS

Although the total plant effluent could not be sampled, it would be expected to contain a very much higher organic waste loading than indicated by the analytical results of the in-plant samples that were taken. The waste from a tomato pressing operation may contain approximately 30,000 parts per million BOD and 14,000 parts per million suspended solids as well as a high degree of acidity. Therefore, the combined plant effluent discharged to the sewer from Lincoln Canning Company would be characterized by high BOD, solids and acid contents.

The strength of the plant wastes could be appreciably reduced by pressing only those tomatoes required to produce sufficient juice to fill the cans and by disposing of the remaining waste tomatoes by some alternate method, possibly trucking from the plant.

The cooling water was suitable for discharge to a storm sewer or a natural watercourse. If feasible, this water should be sent to one of these receiving streams, thereby reducing the hydraulic load on the sanitary sewage system.

POWELL FOODS LIMITED

Yale Crescent

Powell Foods Limited, formerly known as Powell and Growers Limited, was engaged in the production of Welch's grape products and cranberry jam and jelly.

SUMMARY

Powell Foods Limited discharged all liquid wastes to the municipal sanitary sewer by means of two connecting sewers, one servicing boiler blowdown and cooling water while the second serviced the remainder of the plant. During the grape harvesting season, the waste load increased greatly in both organic loading and volume. Recommendations include continued segregation of the spent cooling water from the remaining plant wastes and strict in-plant control to minimize the organic loading to the process sewer during the grape season.

DETAILS OF SURVEY

Powell Foods Limited was visited on June 10,1965 and the waste streams sampled on June 24, a normal bottling day, and on October 19, during the grape processing season.

Personnel Interviewed

Mr. J. Collard - Plant Manager

Mr. A. Weicker - Plant Engineer

Description of Plant Processes

During the season, grapes were trucked to the plant where they underwent washing, stem removal, heating and pressing. The resultant grape juice was pasteurized, cooled and stored in one of fifteen large wooden vats before further processing. During the succeeding year, the juice was to be taken out of storage, filtered through a diatomaceous earth filter and

Description of Plant Processes (continued)

bottled, canned or concentrated and frozen. The grape concentrate was produced by passing the juice through an evaporator equipped with a barometric condenser.

In addition, frozen cranberries were thawed and vacuum cooked to produce cranberry jam and jelly.

Production and Operating Data

Number of employees - 60 during the season

Operating schedule - 3 shifts per day, 7 days per week during the season

- 2 shifts per day, 5 days per week during the remainder of the year

Water Consumption and Distribution

Source - municipal supply

Volume - 156,000 gpd average during 1964

267,000 gpd during the season

Distribution - 1,500 gpd for sanitary use

100,000 gpd for cooling purposes

55,000 - 166,000 gpd for other industrial purposes

Sources and Disposal of Liquid Wastes

The contaminated liquid wastes from Powell Foods, Limited, consisted of the grape wash water, floor and equipment wash water, and process spillage. Relatively clean cooling water used in the ammonia refrigeration system, the barometric condensers and the boiler room was also sewered. Cream of tartar formed on the sides of the wooden storage vats was dissolved in a caustic solution and also sent to the sanitary sewer. Grape stems, pulp and seeds were trucked from the plant.

Sources and Disposal of Liquid Wastes (continued)

Contaminated processing wastes and the spent cooling waters were discharged from the plant via two separate sewers, one located on the west side and the other on the south side of the plant.

Sampling and Analysis

The waste effluent from Powell Foods, Limited was sampled twice, once during the grape harvesting season and once during a normal bottling day when grapes were not being processed. Samples from the main plant sewer were taken at fifteen-minute intervals and combined while samples of the condenser and boiler-room sewer were taken at thirty-minute intervals and combined to form composite samples representing the waste flow through each sewer. The analytical results are included on Page 42.

WASTE LOADINGS

Estimates of the waste loadings discharged by Powell Foods Limited may be made using the analytical results of the samples collected and the water consumption and distribution data. These estimates are presented below.

During the Grape Season

- 5-day BOD - 2,622 pounds per day

  Suspended Solids - 302 pounds per day

  pH - 4.5 - 8.2

During the Remainder of the Year

- 5-day BOD - 54 pounds per day

  Suspended Solids - 24 pounds per day

  pH - 6.9 - 7.8

CONCLUSIONS AND RECOMMENDATIONS

The spent cooling water from Powell Foods Limited was suitable for discharge to a storm sewer at all times during the year. The process effluent, during most of the year, was satisfactory for discharge to a sanitary sewer, but, during the grape harvesting season, increased greatly in strength. The BOD content of the waste during the season, ranged from 1,400 to 1,900 parts per million with a pH of 4.5 - 4.8. This loss of acidic organic material could result in the deterioration of the sewers in the vicinity of the discharge. Approaches to improve the effluent quality would involve good in-plant housekeeping and control by preventing or minimizing equipment and piping leaks, overflows and process spillage. Waste solid material on the floors should be collected in drums and trucked from the plant rather than flushed to the sewer.

ANALYTICAL RESULTS - POWELL FOODS LIMITED

(All analyses except pH reported in parts per million)

	Location	Type of Sample	Time	5-day BOD	Solids			pH
					Total	Susp.	Diss.	
June 24, 1965 (Normal Bottling Day)	Main Plant Sewer (West Side)	Composite	8:30 am -12 noon	28	270	10	260	7.8
	Main Plant Sewer (West Side)	Composite	1:00 pm -4:00 pm	120	370	25	345	6.9
	Boiler and Condenser Sewer (South Side)	Composite	8:30 am -12 noon	20	186	9	177	7.2
	Boiler and Condenser Sewer (South Side)	Composite	1:00 pm -4:00 pm	5.6	260	19	241	7.8
October 19, 1965 (During Grape Season)	Main Plant Sewer (West Side)	Composite	9:00 am -12 noon	1,400	1,288	168	1,120	4.5
	Main Plant Sewer (West Side)	Composite	1:00 pm -2:30 pm	1,900	1,600	190	1,410	4.6
	Main Plant Sewer (West Side)	Composite	2:30 pm -4:00 pm	1,400	1,636	170	1,466	4.8
	Boiler and Condenser Sewer (South Side)	Composite	9:00 am -12 noon	0.8	246	14	232	8.2
	Boiler and Condenser Sewer (South Side)	Composite	1:00 pm -4:00 pm	6.4	226	2	224	7.7

QUEENSWAY CANNING COMPANY

329 Welland Avenue

Queensway Canning Company processed and packed tomatoes, peaches and pears.

SUMMARY

The cannery was idle most of the year, but, during the canning season, discharged a relatively strong organic waste. The chief contributor to the organic waste loading was the pressing of those waste tomatoes not required for juice.

DETAILS OF SURVEY

Queensway Canning Company was visited and the waste effluent sampled on September 30, 1965, during the tomato pack, when the wastes being sewered were considered to be strongest.

Personnel Interviewed

Mr. J. Taliano - President

Description of Plant Processes

Tomatoes, delivered by truck to the cannery, were water-washed, steamed, hand-peeled and cored, and packed into cans. Juice to fill the cans was provided by the pressing of waste tomatoes. After the cans had been sealed, they were loaded into large metal baskets and lowered into tanks of boiling water for 75 minutes to cook the contents. The baskets were then hauled through a running-water cooling tank before storage.

The peach and pear packs consisted of essentially the same operations except that sugar syrup rather than fruit juice was added to the cans. The wastes from these packs would be expected to be much weaker than from the tomato pack.

Production and Operating Data

Operating Schedule - during the canning season (September to October) the plant operated six days per week with one 10-11 hour shift per day.

- during the remainder of the year the plant was idle.

Production Volume - 1,000 tons tomatoes and 400 tons pears and peaches were processed annually.

Water Consumption and Distribution

Source - municipal supply

Volume - 20,000 gpd during the canning season

Distribution - 1,000 gpd for sanitary use

3,000 gpd for cooling purposes

16,000 gpd for process purposes

Sources and Disposal of Liquid Wastes

All sanitary and liquid industrial wastes, except can-cooling water, were discharged to the sanitary sewer on Welland Avenue. Part of the spent cooling water was used as boiler make-up water and the remainder was sent to an open ditch behind the plant.

Process wastes originated from the tomato water-washing and pressing operations and from process spillage. Every three or four hours, the equipment and floors were water-hosed and the wastes flushed to the sewer. The excess tomato juice from the pressing operation not used to fill the cans was also discharged to the sewer. This constituted the strongest waste from the cannery.

Solid wastes such as tomato peelings were trucked from the plant.

Sampling and Analysis

Samples of the plant effluent were collected at fifteen-minute intervals on September 30, 1965 and combined to obtain composite samples. Grab samples of the can-cooling water, the tomato wash water and the sewered waste tomato juice were also taken.

The analytical results are presented below.

(All results except pH reported in parts per million)

	5-day BOD	Solids		pH	Acidity as $CaCO_3$
		Susp.	Diss.		
Total Plant Effluent					
9:00 a.m.-10:30 a.m.	9,200	3,616	5,696	4.0	3,020
10:30 a.m.-12:00 noon	11,000	3,754	6,566	3.9	3,560
1:00 p.m.-2:30 p.m.	5,200	1,900	2,696	3.9	1,740
2:30 p.m.- 4:00 p.m.	9,400	1,200	4,438	3.7	2,580
Spent Cooling Water	2.4	2	324	6.8	-
Tomato Wash Water	340	880	628	5.6	-
Waste Tomato Juice	32,000	14,840	-	-	-

WASTE LOADINGS

The waste loadings sewered by Queensway Canning Company, based on the analytical results and water consumption figures, are presented below.

5-day BOD - 1,392 pounds per day

Suspended Solids - 418 pounds per day

pH - 3.7 - 4.0

CONCLUSIONS AND RECOMMENDATIONS

The undesirable characteristics present in the plant waste effluent directed to the municipal sanitary sewage system were the high BOD, solids, and acid contents. Most of this organic waste loading was present as tomato juice obtained from the pressing of waste tomatoes. A small portion of the juice was used to fill the cans before sealing, but the largest flow was sewered. If a more satisfactory effluent is required by the municipality, it will be necessary to dispose of the waste tomatoes and tomato cores, not required for juice, by some alternate method, possibly trucking from the plant.

The tomato wash water also exceeded the normal amounts of suspended solids sent to a sanitary sewer. Preliminary screening of this waste would perhaps lower the suspended solids content to a more acceptable level.

The spent can-cooling water not used as boiler feed-water and sent to a creek, was satisfactory for such discharge.

WETHY'S PRODUCTS LIMITED

Brigger Street

This industry would normally be engaged in the production of jams, jellies and marmalades.

DETAILS OF SURVEY

Wethy's Products, Limited was visited a number of times during the course of the survey. However, because of in-plant problems, the plant remained idle and was not discharging a waste effluent. Therefore, an estimate of the waste loading from the plant could not be made.

Personnel Interviewed

Mr. W. Preston - Vice-President and Secretary-Treasurer

Plant Processes

A variety of jams, jellies and marmalades would normally be produced during the summer and fall of each year by the cooking, jarring and cooling of fruit.

Water Consumption and Waste Disposal

Approximately 33,000 gpd are used when the plant is in operation. This water would be used for sanitary, cooling and floor and equipment washing purposes. All waste water would be discharged to the municipal sanitary sewers.

DISCUSSION

Although the waste effluent could not be sampled, industries of this type usually discharge wastes containing high amounts of organic pollutants. Good housekeeping procedures, if not already being practiced, should be instituted to minimize the organic loading to the sewer.

ESSEX PACKERS LIMITED

226 Merritt Street

Essex Packers, Limited, prepared rabbit meat for human consumption.

SUMMARY

All liquid wastes were discharged to the municipal sanitary sewers and were satisfactory for such discharge.

DETAILS OF SURVEY

Essex Packers, Limited, was visited on June 7, 1965 and the waste effluent sampled on September 28, a typical killing day.

Personnel Interviewed

Mr. P. Wouk - Plant Manager

Description of Plant Processes

At the plant, rabbits, brought to the plant from the outlying area were killed, suspended by hooks from an overhead conveyor, decapitated, skinned, vented, inspected, cleaned, and washed. They were then removed from the conveyor, frozen and packed for shipment.

Preparation of a dry dog food, producing little or no liquid waste , was also performed at the plant.

Production and Operating Data

Number of employees - 13

Operating Schedule - 1 shift per day
5 days per week

- rabbits were slaughtered during an average of 12 hours per week.

Water Consumtion and Distribution

Source - municipal supply

Volume - 11,800 gpd

Distribution - 400 gpd for sanitary use

- an average of 11,400 gpd for process use.

Sources and Disposal of Liquid Wastes

All liquid wastes were discharged to the city sanitary sewer. The by-products; fur, blood, heads, paws, entrails and other organs were collected and trucked from the plant. A minimal amount of blood and fur escaped to the sewer. The strongest waste occurred during clean-up operations at the end of a killing period.

Sampling and Analysis

The waste effluent from Essex Packers, Limited, was sampled on September 28, 1965, a typical killing day.

Samples were collected half-hourly and combined to give composites of the effluent corresponding to the morning and afternoon periods of the working day. A grab sample of the effluent was taken when clean-up operations were underway.

Results of the analyses are reported below.

(All results except pH reported in parts per million)

	5-day BOD	Susp. Solids	Diss. Solids	pH	Ether Solubles	Kjeldahl Nitrogen as N
Plant Effluent						
10:00 a.m. - 12 noon	60	35	243	6.6	4.2	6.6
1:00 p.m. - 4:00 p.m.	32	20	236	6.9	0	5.0
During Clean-up period (Grab)	160	62	340	6.8	1.4	29.5

WASTE LOADINGS

The calculated waste loadings from the packing-house are as follows:

5-day BOD	- an average of 5 pounds per day
Suspended Solids	- an average of 3 pounds per day
Ether Solubles	- an average of 0.2 pounds per day

CONCLUSIONS AND RECOMMENDATIONS

A minimal amount of blood and fur was lost to the sewer from the plant. Based on the analytical results, the waste effluent was satisfactory for discharge to the municipal sanitary sewers.

GRANTHAM PACKERS LIMITED

147 Hartzell Road

Grantham Packers, Limited was engaged in the slaughtering of animals and processing of meat for sale.

SUMMARY

All liquid industrial wastes were discharged to a creek behind the plant. The wastes, consisting mainly of floor and equipment washwater, were high in organic contaminants. Good housekeeping practices should be adhered to inside the plant, and a satisfactory method of disposal of the industrial wastes must be developed.

DETAILS OF SURVEY

This meat-packing and slaughterhouse was visited on June 7, 1965, and the waste effluent sampled on June 7 and 10.

Personnel Interviewed

Mr. A. Willis - Manager

Production and Operating Data

Number of employees - 15

Operating Schedule - 1 shift per day
5 days per week

- slaughtering of a weekly average of 30 cattle, 80 hogs, and 30 calves was performed three days of the week.

Water Consumption and Distribution

Source - municipal supply

Volume - 5,800 gpd

Distribution - 400 gpd for sanitary purposes

5,400 gpd for industrial purposes

Sources and Disposal of Liquid Wastes

Most of the blood from the slaughtering operation was collected and removed along with the other inedible material by a rendering company. Waste wash water, containing some blood, was discharged through a catch basin to the rear of the property where it trickled down the embankment to a creek. This creek eventually joined Twelve Mile Creek.

Sanitary wastes were discharged to a septic tank.

Sampling and Analysis

Samples of the waste effluent were taken at fifteen-minute intervals on June 10 and combined to give composite samples. An additional grab sample of the effluent was taken on June 7.

The analytical results are reported below.

(All results except pH reported in parts per million)

Plant Effluent	5-day BOD	Susp. Solids	Diss. Solids	pH	Ether Solubles
June 7 (Grab)	6,200	1,696	3,934	6.1	156
June 10 - 8:00 am - 10:00 am	1,400	810	1,654	6.3	83
10:00 am - 12:00 noon	4,000	884	3,890	6.5	119
1:00 pm - 3:00 pm	4,200	1,196	4,284	6.2	119
3:00 pm - 5:00 pm	3,400	838	4,106	6.4	188

WASTE LOADINGS

The plant effluent waste loadings were calculated to be

5-day BOD - 176 pounds per day

Suspended Solids - 50 pounds per day

Ether Solubles - 6.9 pounds per day

CONCLUSIONS AND RECOMMENDATIONS

The plant waste effluent, because of the high organic waste load, was not suitable for discharge to an open watercourse. Consideration should be given to the possibility of inclusion of the wastes in the municipal sanitary sewage system. Efficient screening, grease removal and perhaps sedimentation would probably be required before the wastes would be acceptable in the municipal system.

The major source of pollutant material was the floor and equipment washings. Good housekeeping procedures, designed to minimize the loss of organic material to the sewer, should be practiced. Any solid material which could be collected and trucked from the plant should not be flushed to the sewer.

COLUMBUS McKINNON LIMITED

Ontario Street

Columbus McKinnon Limited manufactured chain, hand and electric hoists, chain attachments and accessories and small forgings and stampings.

SUMMARY

The major contaminated material sewered by this metal-working firm was in the form of "batch" discharges of spent pickling liquor. However, at the time of the survey, the firm was in the process of moving to Welland Avenue and after completion of the move, the spent liquor was to be trucked from the plant.

DETAILS OF SURVEY

Columbus McKinnon Limited, was visited on June 10 and October 1, 1965.

Personnel Interviewed

Mr. H. Leadley - Master Mechanic

Plant Personnel

Mr. E. Kennard - General Manager

Description of Plant Processes

Plant operations at Columbus McKinnon Limited consisted of most conventional metal-working operations including welding, forging and stamping. Wet operations included pickling, cold and hot water rinsing, caustic cleaning, and immersion in a lime solution as a drawing aid.

Production and Operating Data

Number of employees - 250

Operating Schedule - 2 shifts per day
5 days per week

Water Consumption and Distribution

Source - municipal supply

Volume - 102,000 gpd

Water Consumption and Distribution (continued)

Distribution - 6,000 gpd for sanitary use

- 96,000 gpd for industrial purposes (most of the process water was used for cooling purposes)

Sources and Disposal of Liquid Wastes

Both the sanitary and industrial waste effluents were discharged to the municipal sanitary sewers.

The major source of contaminated waste water was a weekly "batch" discharge of spent pickling liquor containing large amounts of solids and acidity. According to Columbus McKinnon personnel, this discharge to the sanitary sewer was to terminate when the plant operations had been moved to Welland Avenue.

The remaining wastes, consisting mainly of spent cooling and a small amount of spent rinsing waters, were relatively uncontaminated. Cooling water, used in the welding machines, was recirculated through a cooling tower during most of the year except the winter months.

Sampling and Analysis

A grab sample of the acid pickling tank contents was taken on October 1, 1965. Results of the analyses performed on the sample are presented below:

(All results except pH reported in parts per million)

	5-day BOD	Susp. Solids	Diss. Solids	pH	Iron as Fe
Pickling liquor (grab)	149,526	14,084	135,442	0.2	63

WASTE LOADINGS

Based on the analytical results and a pickling tank volume of 900 gallons, the waste load from this source is estimated to be:

5-day BOD	- 1,345 pounds per discharge
Suspended Solids	- 98.5 pounds per discharge
Iron as Fe	- 0.4 pounds per discharge
pH	- 0.2

CONCLUSIONS AND RECOMMENDATIONS

Since Columbus McKinnon Limited intended to truck the spent pickling liquor from the plant after completion of the move to the new location, and since most of the water was used for cooling purposes, the waste effluent is not expected to affect the operation of the sewage treatment plant, except hydraulically. For that reason, any uncontaminated cooling water should be discharged to a storm sewer or open watercourse or recirculated inside the plant in order to minimize the hydraulic load on the municipal sewage system.

CONROY MANUFACTURING COMPANY LIMITED

55 Catherine Street

Conroy Manufacturing Company, Limited manufactured oil and gas burners and furnaces and automotive parts.

SUMMARY

Most of the process waste from this plant was relatively uncontaminated cooling water. Contaminated sewered wastes consisted of "batch" discharges of spent pickling liquor, cooling compounds, and spent wash water from the spray paint booth.

DETAILS OF SURVEY

Conroy Manufacturing Company, Limited was visited on May 14, 1965.

Personnel Interviewed

Mr. F. S. Wood - Assistant General Manager

Mr. Featherstone - Plant Engineer

Description of Plant Processes

General Motors brake drums and domestic oil and gas burners and furnaces were manufactured at the plant. Most conventional metal-working operations, including the production of castings, various machining operations, pickling, galvanizing and spray painting, were performed at the plant.

Operating Data

Number of Employees - 160

Operating Schedule - 2 shifts per day
5 days per week

Water Consumption and Distribution

Source - municipal supply

Volume - 74,000 gpd

Estimated Distribution - 4,000 gpd for sanitary use
65,000 gpd for cooling purposes
5,000 gpd for other purposes

Sources and Disposal of Liquid Wastes

All sanitary and industrial wastes were discharged to the municipal sanitary sewers. By far the largest portion of the industrial waste effluent was cooling water. Periodic discharges of contaminated wastes consisted of spent hydrochloric acid pickling liquor which, at times, was trucked from the plant, machining cooling compounds which were recirculated through five machines, each having a capacity of 125 gallons and sewered every ten to fourteen days, and spent wash water used in a recirculating type water-walled spray paint booth.

Sampling and Analysis

Three grab samples were submitted to the OWRC laboratories in Toronto for analysis on June 2, 1965. These samples were taken from two "batch" discharges of machine coolants and a discharge of spent pickle liquor. The analytical results obtained on the samples are as follows:

(All results except pH reported in parts per million)

	5-Day BOD	Susp. Solids	Diss. Solids	pH	Zinc as Zn	Iron as Fe	Ether Solubles
Discharge of Coolant Codol 101-C	6,800	-	-	8.2	5.2	32.4	3,150
Discharge of Coolant HID-900	8,200	452	4,128	10.1	20	240	4,350
Discharge of Spent Pickling Liquor (HCL)	-	657	244,213	<1	66,000	25,800	-

WASTE LOADINGS

The following waste loadings have been calculated:

	300 gallon discharge of pickling liquor	625 gallon discharge of cooling compounds per 10 - 14 days
5-day BOD	-	47
Suspended Solids	2.0	2.8
Zinc as Zn	198	0.1
Iron as Fe	77	0.8
Ether Solubles	-	23.4
pH	< 1	8.2 - 10.1

CONCLUSIONS AND RECOMMENDATIONS

The spent pickling liquor could act as a corroding agent in the sewers near the discharge because of its extremely low pH. Disposal by trucking if possible, or pretreatment before discharge to the sewer may be required by the municipality. The waste machine coolants, containing appreciable amounts of mineral oils, should be passed through suitable grease traps or gravity separators to remove oil. Provision for breaking emulsions may have to be made to effect efficient separation of the oil.

It would be desirable to direct the spent cooling water to a storm sewer, if available, in order to minimize the hydraulic load on the municipal sanitary sewage system.

COURT INDUSTRIES LIMITED

6 Frank Street

Court Industries Limited, located on the corner of Frank Street and Gale Crescent, was engaged in various types of electroplating and some steel fabrication.

SUMMARY

Both the sanitary and industrial wastes were discharged to the municipal sanitary sewers.

Objectionable characteristics in the process wastes included high concentrations of certain heavy metals, cyanides, and acidity.

DETAILS OF SURVEY

Court Industries, Limited, was visited on May 12, 1965 and the waste effluent sampled on October 1.

Personnel Interviewed

Mr. D. Ballinger - Plant Supervisor

Mr. E. W. Gracey - Production Foreman

Description of Plant Processes

Tank and barrel plating of zinc, cadmium, copper, nickel, chromium and tin were performed at this plant. There were approximately forty plating tanks (ranging in size from 100 to 3,000 gallons) plus associated cleaning, pickling, and rinsing tanks. Some steel fabricating was also done at the plant.

Production and Operating Data

Number of Employees - 55

Operating Schedule - 2 full shifts plus 1 light shift per day. 5 days per week

Water Consumption and Distribution

Source - municipal supply

Volume - 167,000 gpd

Estimated Distribution - 1,400 gpd for domestic purposes

a small amount of water was used for cooling purposes

160,000 gpd for other industrial purposes.

Sources and Disposal of Liquid Wastes

Continuous process wastes originated mainly from a large number of running water rinses. Spent cooling water used in water-cooled compressors was directed to the plating rinses before being sewered. "Batch" discharges originated from a 750-gallon acid pickling tank emptied once every six weeks and numerous smaller alkali cleaning solutions dumped once per week.

Approximately sixty percent of the liquid effluent was found to be sewered to the Gale Crescent municipal sewer. The point of discharge of the remaining forty percent could not be found but is expected to be to the municipal sewage system also. Some, but certainly not all, of this amount would be lost by evaporation to the atmosphere.

Sampling and Analysis

Samples of the plant effluent were collected at fifteen-minute intervals and combined to give composite samples. In addition, three grab samples of the process effluent were taken at times when a noticeable change in the effluent colour occurred. The contents of the pickling tank and an alkali cleaning solution were also sampled. The analytical results are presented on page 65.

WASTE LOADINGS

Since the method of disposal of approximately only sixty percent of

WASTE LOADINGS (continued)

the plant water consumed could be ascertained, the following table presents the waste loadings calculated on the basis of an effluent flow of sixty percent of the total water consumption. The true waste loading figures would be higher than those presented.

Suspended Solids	- 55	pounds per day
Nickel as Ni	- 2.8	" " "
Copper as Cu	- 3.3	" " "
Cadmium as Cd	- 3.3	" " "
Zinc as Zn	- 30	" " "
Tin as Sn	- 3.2	" " "
Hexavalent Chromium as Cr	- 13	" " "
Cyanide as HCN	- 29	" " "
pH	- 3.0	- 4.1

CONCLUSIONS AND RECOMMENDATIONS

The wastes from Court Industries, Limited were high in cyanides, chromium, copper and acidity. The high concentrations combined with the relatively large volume of waste sewered would result in a significant loading being exerted on the municipal sewers.

Some metallic ions may adversely affect the oxidation process at a secondary treatment plant while others may impede the digestion of sludge. Excessive cyanide concentrations in the sewers, under conditions of low pH, may liberate hydrogen cyanide gas which would be a hazard to workers in the sewers and at the sewage plant. To avoid these situations, industrial wastes discharged to the sanitary sewers are usually limited to the following concentrations:

Copper	- 1 part per million
Chromium (Hexavalent)	- 3 parts per million
Nickel	- 5 parts per million
Cyanide	- 2 parts per million

It is recommended that the various plating and rinsing systems be examined in order to reduce the metal and cyanide losses to the sewer by utilizing the existing rinse and drag-out tanks to maximum efficiency. Additional rinsing and drag-out facilities may have to be provided. Furthermore, the discharge of spent plating solutions to the sewers should not be allowed at any time. If the results of these measures are not successful in providing a satisfactory effluent, pretreatment of the waste from Court Industries, Limited may be required by the municipality.

Court Industries Limited - Analytical Results

(All results except pH in parts per million)

	Solids			Nickel	Copper	Tin	Cadmium	Zinc	Chromium		Cyanide
	Susp.	Diss.	pH	as Ni	as Cu	as Sn	as Cd	as Zn	Total	Hex.	as HCN
Plant Effluent											
9:00 am - 10:30 am (Composite)	80	886	4.1	0.0	0.6	3.9	5.0	55	-	-	24
10:30 am - 12:00 noon (Composite)	88	880	3.4	2.7	6.8	3.3	3.0	31	-	-	26
1:00 pm - 2:30 pm (Composite)	32	804	3.0	1.6	3.3	3.3	2.7	14	-	-	21
2:30 pm - 4:00 pm (Composite)	20	700	3.0	6.8	2.5	2.5	2.7	19	20	13	45
9:00 am (Grab)	288	1,268	6.3	0.8	10.0	5.0	4.0	74	-	-	66
11:15 am (Grab)	44	928	2.6	2.0	12.3	4.0	5.5	28	-	-	24
2:30 pm (Grab)	44	682	3.2	3.5	2.8	2.5	3.2	19	10	2.4	20.5
Acid Pickling Solution											
1:30 pm (Grab)	220	26,284	< 1	8.0	9.2	60	720	2,700	0	0	6.1
Alkali Cleaning Solution											
1:30 pm (Grab)	416	39,202	12.3	0.0	93	6.6	2.4	52	0	0	69.6

FERRANTI-PACKARD ELECTRIC LIMITED

189 - 241 Dieppe Road

Ferranti-Packard Electric Limited, located on the north-west corner of Dieppe Road at Bunting, was engaged in the manufacture of electrical equipment.

SUMMARY

Large quantities of cooling water, and a smaller amount of plating wastes constituted most of the liquid waste sewered from the industry. The only objectionable characteristic of the waste effluent was a copper concentration of 5 parts per million.

DETAILS OF SURVEY

Ferranti-Packard Electric Limited was visited on May 13, 1965, and the waste effluent sampled on August 12.

Personnel Interviewed

Mr. G. L. Murray - General Manager

Mr. R. Pay - Maintenance Superintendent

Mr. G. Johnson - Meter Division Foreman

Description of Plant Processes

This firm manufactured electrical transformers, relays, capacitors and watt-hour meters. Plant processes consisted of injection moulding, die casting, degreasing, welding, spray painting, and electroplating.

Production and Operating Data

Number of Employees - 400

Operating Schedule - 1 full shift plus a second light shift per day
- 5 days per week

Water Consumption and Distribution

Source - municipal supply

Volume - 87,000 gpd

Estimated Distribution
- 10,000 gpd for sanitary use
- 50,000 gpd for cooling purposes
- 20,000 gpd consumed in the plating room
- 7,000 gpd for other industrial purposes

Sources and Disposal of Liquid Wastes

All sanitary and industrial wastes were discharged to the municipal sanitary sewage system. Contaminated wastes containing aluminum, nickel, silver, and cyanide, originated from the plating area. Five hundred gallons of spent wash water were sewered periodically from a water-walled spray paint booth. Other wastes consisted mainly of spent cooling water.

Sampling and Analysis

A composite sample representing the total plant effluent discharged between 1:00 pm to 4:00 pm, August 12, 1965, was obtained by collecting and combining samples taken at thirty-minute intervals. The analytical results are presented below:

NOTE: All results except pH reported in ppm unless otherwise indicated

	5-day BOD	Susp. Solids	Diss. Solids	pH	Nickel as Ni	Silver as Ag	Copper as Cu	Cyanide as HCN	Ether Solubles
Total Plant Effluent	24	27	445	5.1	0.3	<0.3	5	0.9	8

WASTE LOADINGS

The waste loadings calculated on the basis of the analytical results and the water consumption data are as follows:

Nickel - 0.26 pounds per day

Silver - 0.26 pounds per day

Copper - 4.35 pounds per day

Cyanide as HCN - 0.78 pounds per day

pH - 5.1

CONCLUSIONS AND RECOMMENDATIONS

The pH of the waste was somewhat acidic. Neutralization at the source should be undertaken to ensure control at the point of entry to the municipal sewer in the range pH 5.5 to 9.5. The five parts per million copper content of the effluent was higher than the recommended maximum limit of one part per million for discharge to a municipal storm or sanitary sewer.

HARJOHN INDUSTRIES LIMITED

Grantham Avenue

Harjohn Industries Limited was engaged in the anodizing of aluminum sheet metal.

SUMMARY

Both the sanitary and industrial wastes were discharged to the municipal sanitary sewage system. The continuous industrial waste had a low pH but was satisfactory in other respects for discharge to the sewers. Spent caustic etching and spent sulphuric acid anodizing solutions, both containing large quantities of the dissolved aluminum ion, were periodically sewered.

DETAILS OF SURVEY

Harjohn Industries Limited was visited on June 10 and the liquid wastes sampled on June 23, 1965.

Personnel Interviewed

Mr. J. Chorlton - President

Mr. J. S. Wolkowski - Plant Superintendent

Description of Plant Processes

The industry was engaged in custom anodizing and in producing "Alzak" aluminum reflector sheet. The aluminum sheets were immersed, in turn, into an alkaline cleaner, a caustic etch solution, a cold water running rinse, the sulphuric acid anodizing solution, and finally, a hot water sealing bath.

Production and Operating Data

Number of Employees - 7

Operating Schedule - 1 shift per day
- 5 days per week

Water Consumption and Distribution

Source - municipal supply

Volume - 12,500 gpd

Distribution - 150 gpd for domestic use
- 4,500 gpd for cooling purposes
- 7,850 gpd for other industrial purposes (mainly rinsing)

Sources and Disposal of Liquid Wastes

All sanitary and industrial wastes were discharged to the municipal sanitary sewers. Contaminated industrial wastes consisted of a continuous overflow from the cold water rinse tanks and from periodic discharges of the caustic etch solution (1,500 gallons per month), the sulphuric acid anodizing solution (1,500 gallons once or twice per year), and the hot water sealing bath (1,500 gallons once per week). Relatively clean cooling water used during the hot weather months was also discharged to the municipal system through the same connecting sewer.

Sampling and Analysis

The contaminated plant waste effluent and the contents of each tank periodically emptied were sampled on June 23, 1965.

Results of the analyses are as follows:

NOTE: All results except pH reported in parts per million (ppm) unless otherwise indicated.

Sample No.	Susp. Solids	Diss. Solids	Aluminum as Al	Sulphates as SO_4	pH	Acidity as $CaCO_3$	Alkalinity as $CaCO_3$
1	7	455	14	263	3.3	420	-
2	326	101,336	28,000	-	11.4	-	97,000
3	61	156,437	7,500	-	0.5	165,000	-
4	123	687	26	-	5.4	-	4

Sample No. 1 - continuous plant effluent excluding cooling water

Sample No. 2 - caustic etch solution - one week old, dumped once per month

Sample No. 3 - sulphuric acid solution - two months old, dumped once per year

Sample No. 4 - hot water seal - 4 days old, dumped once per week

WASTE LOADINGS

The waste load exerted on the municipal sewage system is presented below:

Suspended Solids - 0.6 pounds per day

Aluminum - 1.1 pounds per day

pH - 3.3

Based on the analytical results reported above, the waste loadings exerted by the "batch" discharges per discharge were:

	Caustic Etch Solution	Sulphuric Acid Anodizing Solution	Hot Water Seal
Susp. Solids	4.9 pounds	0.9 pounds	1.8 pounds
Diss. Solids	1,515 pounds	2,340 pounds	10.3 pounds
Aluminum as Al	420 pounds	112.6 pounds	0.4 pounds
pH	11.4	0.5	5.4

Since these solutions were sampled before completely spent, it is probable that the aluminum and solids loadings would have been appreciably higher when actually sewered.

CONCLUSIONS AND RECOMMENDATIONS

The low pH of the continuous rinse tank overflow may, in time, corrode the connecting sewer from the plant to the city sewers. Ensurance of protection from corrosion should be provided by neutralization of the waste before discharge.

The contents of the hot water seal tank may be discharged to the sewers without adverse effects. However, the caustic and acid solutions, containing large quantities of dissolved aluminum, should be neutralized and then clarified (with sludge removal) before discharge to the municipal sewer.

HAYES STEEL PRODUCTS LIMITED

Oakdale Avenue

The main operation at the Oakdale Avenue plant of Hayes Steel Products Limited was hammer forging to produce 1,500 tons of steel automotive and diesel tractor parts per month.

SUMMARY

All liquid plant wastes were ultimately discharged to the Old Welland Canal. The wastes, mainly cooling water, contained some phenolic compounds and oils but, in general, were satisfactory for discharge to the watercourse.

DETAILS OF THE SURVEY

The plant was visited and the waste effluents sampled on six different days during the course of the survey.

Personnel Interviewed

Mr. G. Greenhill - Plant Superintendent

Mr. J. Youritchuk - General Foreman

Description of Plant Processes

The company's main operation was hammer forging with a monthly output of roughly 1,400 - 1,500 tons of steel automotive and diesel tractor parts. Plant operations included quench hardening of metal, using water media. No chemical hardening or acid pickling was done at the plant.

Operating Data

Number of Employees - 170

Operating Schedule - 2 shifts per day (16 hours)
- 5 days per week

Water Consumption and Distribution

Source - Municipal supply and a private well

Volume - 59,000 gpd from municipal supply
- a lesser amount from the private well

...73 (a)

Distribution - 4,000 gpd for sanitary purposes
- 80,000 gpd for cooling purposes
- a small amount for other industrial purposes

Sources and Disposal of Liquid Wastes

The bulk of the water consumed by the plant was used for cooling purposes on the forge furnaces and the large air compressors. A large part of the cooling water was recirculated through a cooling pond approximately 150 by 50 feet at the rear of the premises along the Old Welland Canal bank. The overflow from the pond was baffled to prevent oil losses to the canal. A twelve-inch culvert pipe discharged furnace cooling water at an estimated 60 gallons per minute at the north end of the property. This discharge followed a meandering creek bed for 75 yards before emptying into the canal.

Sampling and Analysis

A number of grab samples of the plant effluent to the creek, the effluent to the recirculation pond, and the overflow from the pond to the canal were taken. Details of the sampling programme and the analytical results obtained on the samples collected are reported below:

NOTE: All results except pH and phenols reported in parts per million (ppm). Phenols reported in parts per billion (ppb).

Date	Time	5-day BOD	Susp. Solids	Diss. Solids	pH	Ether Solubles	Phenols (ppb)	Iron as Fe
Plant Effluent to Creek								
June 23	11:00 am	90	143	491	7.0	-	30	1.2
24	10:00 am	32	56	360	7.6	-	8	2.2
August 10	2:30 pm	10	6	402	-	9	20	-
Sept. 27	1:30 pm	19	22	352	7.2	16.8	-	-
Oct. 1	11:00 am	8	5	463	7.6	0.0	15	-
Average		32	46	413	-	-	18	-
Plant Effluent to Recirculation Pond								
June 23	11:00 am	6.6	2	354	7.9	12.0	2	0.50
24	10:00 am	6.0	0	412	8.1	11.3	2	0.44
August 10	2:30 pm	17	70	340	7.6	1.0	8	-
Sept. 27	1:30 pm	2.4	13	343	7.8	12.4	12	-
Oct. 1	11:00 am	8.0	5	463	7.6	0.0	15	-
Average		7.8	18	382	-	7.3	7.8	-

....74

Analytical Results (continued)

Date	Time	5-day BOD	Susp. Solids	Diss. Solids	pH	Ether Solubles	Phenols (ppb)	Iron as Fe
Recirculation Pond Overflow to Canal								
June 23	11:00 am	9.4	222	388	8.0	10.0	2	0.64
24	10:00 am	3.0	6	352	8.0	4.0	2	0.42
August 10	2:30 pm	8.0	39	411	7.5	21	4	2.1
12	11:00 am	11	15	449	8.2	9	-	-
Sept. 27	1:30 pm	50	100	354	7.3	121	8	-
Oct. 1	11:00 am	6.0	29	453	6.6	6.6	10	-
Average		14.6	68	401	-	28.6	5.2	-

WASTE LOADINGS

The following total plant waste loadings have been calculated:

5-day BOD - 23 pounds per day

Suspended Solids - 48 pounds per day

Ether Solubles - 14 pounds per day

pH - 6.6 - 8.2

CONCLUSIONS AND RECOMMENDATIONS

Efficient baffling of the recirculation pond overflow and skimming of the collected surface oils combined with segregation of the sanitary wastes should result in a process waste satisfactory for discharge to the Old Welland Canal. The sanitary wastes should be directed to a municipal sanitary sewer.

LIGHTNING FASTENER COMPANY LIMITED

Niagara Street Plant
50 Niagara Street

The Niagara Street plant of Lightning Fastener Company Limited manufactured slide fastener parts.

SUMMARY

As reported by company personnel, all wastes, including the plating shop effluent, were discharged to the municipal storm sewer without treatment. The plating wastes contained high concentrations of copper, nickel and cyanides, and as such were not suitable for discharge to a storm sewer. Spent cooling water constituted most of the remaining waste flow.

DETAILS OF SURVEY

This plant of Lightning Fastener Co. Ltd., was visited on May 12, 1965, and the plating shop effluent sampled on that date and on June 9, 1965.

Personnel Interviewed

Mr. Bowie - Plant Superintendent

Mr. G. Falk - Plant Engineer

Description of Plant Processes

Zipper parts were produced and assembled at the plant. Operations using water were die casting and barrel plating.

Production and Operating Data

Number of Employees - 400

Operating Schedule - 1 shift per day
- 5 days per week

Water Consumption and Distribution

Source - municipal supply

Volume - 54,000 gpd

Estimated Distribution - 10,000 gpd for domestic use
- 14,000 gpd for use in the plating shop
- 30,000 gpd for cooling and other industrial purposes

Sources and Disposal of Liquid Wastes

According to company personnel, process wastes originating from the plating room and spent cooling water from the die casting machines and other sources were discharged to the municipal storm sewer.

Sampling and Analysis

Sampling of the plating shop effluent prior to discharge to the storm sewer was undertaken on May 12 and June 9, 1965.

Results of the analyses performed on the samples are reported below:

NOTE: All results except pH reported in parts per million (ppm) unless otherwise indicated.

Plating Wastes		Susp. Solids	Diss. Solids	pH	Copper as Cu	Nickel as Ni	Zinc as Zn	Cyanide as HCN
Grab Sample	May 12	37	329	9.1	2.2	9.5	19	30
Composite	9:30 am - 10:00 am June 9	56	398	7.6	8.6	9.8	15	31
Composite	10:30 am - 12 noon June 9	107	499	7.5	15	3.0	27	2.9

WASTE LOADINGS

The following waste loadings exerted on the storm sewer have been calculated based on a flow of 14,000 gpd from the plating shop.

Suspended Solids - 11.5 pounds per day

Copper as Cu - 1.6 pounds per day

Nickel as Ni - 0.9 pounds per day

Cyanides as HCN - 2.5 pounds per day

CONCLUSIONS AND RECOMMENDATIONS

The plating wastes were not suitable for discharge to a storm sewer. Complete treatment consisting of cyanide destruction, and removal of metal ions by pH adjustment and settling, would allow these wastes to be discharged to the storm sewer.

Partial treatment by in-plant control to reduce the metal and cyanide concentrations may be acceptable to the municipality for the diversion of these wastes to the sanitary sewer.

McKINNON INDUSTRIES LIMITED

(Plant #1)
Ontario Street

McKinnon Industries Limited, Plant #1, located on the east bank of Twelve Mile Creek, manufactured a wide variety of automobile components for General Motors of Canada.

SUMMARY

Most of the liquid wastes from the plant were discharged to the municipal sewers which, in turn, discharged without treatment to Twelve Mile Creek. The remaining process wastes discharged directly to the Creek. The waste effluents consisted mainly of cooling water which contained some suspended matter and oil.

DETAILS OF SURVEY

The plant was visited on June 9, 1965, and the waste effluents sampled on October 20.

Personnel Interviewed

Mr. J. A. Watson	-	Plant Engineer
Mr. G. J. Gaukroger	-	Chief Metallurgist
Mr. G. Wilks	-	Assistant Plant Engineer, Plant #1
Mr. J. S. Marchington	-	Assistant Plant Engineer, Plant #2

Description of Plant Processes

Almost all metal-working and associated operations were performed at the plant. Following is a brief summary of plant areas and operations:

West of Ontario Street

Die Building 15	-	die casting
Forge Building 5	-	forging
Building 4	-	manufacturing of front end and brake components
Building 1	-	manufacturing of bearings

Building 2	-	manufacturing of spark plugs and fuel pumps, toolroom
Building 3	-	manufacturing of axle shafts
Annex Building 9	-	heat treatment of axle shafts

East of Ontario Street

Building 7	-	powerhouse
Building 11	-	personnel offices
Delco Building 6	-	manufacturing of electrical components and steering mechanisms
Buildings 8, 12, 13, 16	-	manufacturing and assembling of rear-end components

Production and Operating Data

Number of Employees	-	4,500
Operating Schedule	-	1-3 shifts per day, 7 days per week

Water Consumption and Distribution

Source	-	municipal supply
Volume	-	3,120,000 gpd
Estimated Distribution	-	120,000 gpd for sanitary use
	-	3,000,000 gpd for industrial purposes, and used mainly as cooling water

Sources and Disposal of Liquid Wastes

Combined sanitary and process wastes were discharged to Twelve Mile Creek either directly or via the city sewers.

The operations in Die Building 15 sewered an estimated 7,000 gpd directly to the Creek. Forge Building 5 was serviced by the Carlton Street municipal sewer. A waste volume of approximately 43,000 gpd, consisting chiefly of de-scaling water from which the scale was first recovered, originated here. Buildings 3, 9 and a part of Building 1 were serviced by a private sewer also discharging directly into the Creek. The estimated waste flow here was 500,000 gpd and consisted mainly of cooling water from the induction hardening

process and other operations. The wastes from Buildings 1, 2, 4, 7 and 11 were discharged through a number of connecting sewers to the Ontario Street municipal sewer, while wastes from Buildings 6, 8, 12, 13 and 16 were sent to the Thomas Street sewer running under the plant. The waste flow into each sewer was estimated as being in the order of 1,250,000 gpd. Both sewers discharged into the Carlton Street municipal trunk sewer, which, in turn, discharged directly into Twelve Mile Creek.

By far the largest part of the water consumed by the industry was discharged as relatively uncontaminated cooling water. Contaminated wastes originated from a variety of sources, including a small copper plating unit in Building 6, three water-walled spray paint booths sewering a total of 18,000 gallons spent wash water per year, blackening of spark plug shells involving alkali cleaning, water rinses and an acid bath, and various other alkali-cleaning baths and water rinses scattered throughout the plant.

Three central cooling systems using a mixture of soluble oils in water were used in the plant. The sludge collected here was trucked away. Small individual cooling systems throughout the plant were sewered periodically as the oil became spent.

Sampling and Analysis

The waste effluents from McKinnon Industries Limited, Plant #1, were sampled on October 20, 1965. The wastes discharged to the Ontario St. and Thomas St. sewers could not be sampled at the numerous points of entry. Therefore, in order to obtain information on the effect of the industry's wastes on the municipal sewage, samples of the waste flows in the Ontario St. and Thomas St. sewers were taken below and above the entrance of the plant wastes into the sewers. Details and results of the sampling programme and analyses are presented in tabulated form on page 83.

WASTE LOADINGS

Waste loadings from the plant have been estimated, based on the water consumption data and the analytical results. Because the flows in the municipal sewers and the volume of waste sewered from the various sections of the plant could not be accurately determined, it should be noted that the figures presented below are only rough approximations.

5-day BOD	- 500 pounds per day
Suspended Solids	-2,300 pounds per day
Ether Solubles	-1,700 pounds per day
Iron as Fe	- 180 pounds per day

CONCLUSIONS AND RECOMMENDATIONS

Wastes discharged directly to Twelve Mile Creek from Buildings 3 and 9 appear suitable for discharge to the open watercourse. The waste from Die Building 15 contained some oil but was satisfactory in other respects for discharge to the Creek.

It is difficult to assess the effects of the plant's industrial wastes on the Ontario St. and Thomas St. municipal sewers. These sewers discharged to the Carlton Street sewer, which, at the time of the survey, emptied directly into Twelve Mile Creek.

The process wastes entering the Ontario Street sewer had a diluting effect on the municipal sewage with respect to the BOD and solids contents. However, the iron and oil concentrations in the sewage were increased.

Based on these observations, it would appear that the plant wastes directed to the Ontario Street sewer were relatively low in organic and suspended solid wastes but high in iron and oil contents.

The effects of the wastes entering the Thomas Street sewer were different in nature. The BOD content of the municipal sewage was somewhat diluted although not to the same extent as was the case in the Ontario Street sewer. Furthermore, the suspended solids concentration in the sewage increased

slightly while the iron and oil concentrations increased appreciably. These observations would be partially explained if the volume of municipal sewage was greater here than in the Ontario Street sewer, resulting in less dilution of the municipal sewage by the industrial wastes. In fact, visual observations indicated the flow in the Ontario St. sewer below McKinnon Industries Ltd., to be relatively small. The flow in the Thomas Street sewer could not be determined.

It appears that the most unfavourable characteristic of the industry's waste was the ether solubles or oil content. In-plant efforts to minimize the oil losses to the sewers would result in a better quality effluent and would prevent possible operating difficulties at the municipal sewage treatment plant. The discharge of any relatively uncontaminated cooling water to Twelve Mile Creek would minimize the hydraulic loading on the sewage system.

McKINNON INDUSTRIES LIMITED, PLANT #1

NOTE: All analysis except pH reported in ppm unless otherwise indicated

Sample Point	Type of Sample	Time Taken	5-day BOD	Total Solids	Susp. Solids	Diss. Solids	pH	Ether Solubles	Iron as Fe	Copper as Cu
Die Building 15	Composite	1:00 p.m.-3:00 p.m.	21	266	23	243	7.4	42	0.75	-
Forge Bldg. 5 (De-scaling Water)	Grab	2:30 p.m.	0.2	Sample exhausted			8.0	-	1.61	-
Bldgs. 3 and 9	Composite	10:00 a.m.-2:30 p.m.	6.8	218	13	205	8.8	2.6	0.91	-
Bldgs. 3 and 9	Composite	1:00 p.m.-4:00 p.m.	4.8	220	10	210	8.6	6.8	1.00	-
Ontario Street Sewer										
below plant	Composite	10:00 a.m.-12:00 noon	300	978	272	706	7.0	34.2	3.25	-
below plant	Composite	1:00 p.m.-3:00 p.m.	230	886	308	578	7.2	35.8	4.6	-
above plant	Composite	1:00 p.m.-3:00 p.m.	32	284	54	230	7.3	56.4	5.25	-
Thomas Street Sewer										
below plant	Composite	11:00 a.m.-12:00 noon	200	798	152	646	6.4	22.0	2.15	1.0
above plant	Composite	11:00 a.m.-12:00 noon	130	486	136	350	6.7	116	4.1	0.6
below plant	Composite	1:00 p.m.-4:00 p.m.	360	810	134	676	6.6	33	2.15	0.6
above plant	Composite	1:00 p.m.-4:00 p.m.	145	654	206	448	7.1	103	7.4	0.4
Bldg. 12	Composite	1:00 p.m.-4:00 p.m.	78	260	60	200	7.2	105	1.95	-

McKINNON INDUSTRIES LIMITED

(Plant #2)
Glendale Avenue

Plant #2 of McKinnon Industries Limited, located immediately east of the Welland Ship Canal, manufactured and assembled automobile engines.

SUMMARY

The liquid industrial wastes from the plant were discharged either directly to the Welland Ship Canal or indirectly via a small creek to the Canal. These wastes were, in general, satisfactory for such discharge.

Sanitary wastes were handled in a privately owned and operated sewage treatment plant.

DETAILS OF SURVEY

Plant #2 of McKinnon Industries Limited, was visited on June 22 and the waste effluents sampled on June 23, 1965.

Personnel Interviewed

Mr. J. A. Watson	-	Plant Engineer
Mr. G. J. Gaukroger	-	Chief Metallurgist
Mr. G. Wilks	-	Assistant Plant Engineer, Plant #1
Mr. J. S. Marchington	-	Assistant Plant Engineer, Plant #2

Production and Operating Data

Number of Employees - 3,500

Operating Schedule - 3 shifts per day
- 6-7 days per week

Water Consumption and Distribution

Source	-	municipal supply for sanitary use
	-	Welland Ship Canal for industrial purposes
Volume	-	400,000 gpd from the municipal supply
	-	6,000,000 gpd from the Welland Ship Canal

Sources and Disposal of Liquid Wastes

The plant may be divided into three parts: the foundry, the engine plant, and the powerhouse. In the foundry, where engine blocks were cast, large amounts of water were used in seven water-walled melting furnaces, gas scrubbers and dust collectors. About 50,000 tons of sand per year were used and settled in a U-shaped 600 by 350 ft. foundry sludge pond. Relatively clean foundry cooling water was discharged to the Welland Ship Canal by means of a private sewer.

The automobile engines were assembled and tested in the engine plant. Piston tinning, using a potassium stannate electroplating solution plus associated water rinses, was performed here. Lubricating and soluble machine oils were collected in a pit. All liquid wastes from the engine plant were discharged to a small creek east of the plant, which followed a three-quarter mile course and discharged into the Welland Canal system.

The powerhouse effluent included compressor cooling water and boiler blow-down water. These wastes were discharged to the Ship Canal by means of a private sewer.

The effluent from the sewage plant, treating all sanitary wastes from McKinnon Industries, Plant #2, was discharged to the creek east of the plant.

Sampling and Analysis

The sampling programme undertaken at the industry was designed to include all process effluents leaving the plant. Composite samples were obtained by collecting and combining samples taken at thirty-minute intervals from the various waste streams. Details of the sampling programme and the analytical results obtained are presented in tabulated form on the following page:

NOTE: All results except pH and phenols reported in parts per million (ppm). Phenols reported in parts per billion (ppb).

Sample No.	5-day BOD	Susp. Solids	Diss. Solids	pH	Ether Solubles	Iron as Fe	Phenols (ppb)
1	3.2	41	347	8.7	-	-	-
2	-	27	215	-	0.0	-	-
3	8.2	80	230	8.1	-	2.2	2
4	6.0	618	1700	8.1	-	72.0	6
5	3.4	21	295	8.2	-	6.7	6
6	2.6	41	191	8.1	0.0	1.3	2
7	3.0	59	217	7.7	-	2.2	4
8	4.6	50	202	7.9	-	2.2	2

Sample No.

1 McKinnon Service Water from Welland Canal
Grab sample: 2:00 p.m., June 24

2 Foundry Plant Effluent to Welland Canal
Composite sample: 9:00 a.m. - 12:00 noon, June 23

3 Combined Foundry Plant and Powerhouse Effluent to Welland Canal
Composite Sample: 9:00 a.m. - 12:00 noon, June 23

4 Foundry Plant Effluent to Sludge Pond
Grab Sample: 9:00 a.m., June 23

5 Sludge Pond Effluent to Creek
Grab Sample: 9:00 a.m., June 23

6 Engine Plant Effluent to Creek
Grab Sample: 9:30 a.m., June 23

7 Creek downstream of McKinnon WPCP
Composite Sample: 9:00 a.m. - 12:00 noon, June 23

8 Creek downstream of McKinnon WPCP
Composite Sample: 1:00 p.m. - 4:00 p.m., June 23

WASTE LOADINGS

The waste loadings, calculated on the basis of the analytical results and the water consumption data, are presented below. The 5-day BOD and suspended

solids loadings were calculated using the BOD and solids concentrations of the waste less the respective concentrations of the raw service water. Because of a lack of accurate waste flow data, these figures are estimates only.

5-day BOD	-	120 pounds per day
Suspended Solids	-	900 pounds per day
Ether Solubles	-	small amounts
Iron as Fe	-	120 pounds per day

CONCLUSIONS AND RECOMMENDATIONS

The analytical results of the samples collected indicate that the wastes from the plant were suitable for discharge to an open watercourse.

The foundry sludge settling pond appears to have been satisfactorily removing the suspended solids and iron from the waste before discharge to the creek.

THOMPSON PRODUCTS LIMITED

230 Louth St.

Thompson Products Limited manufactured automotive and aircraft parts, mining drill bits and electronic and nuclear power components. The two plants of this company were located one on each side of Louth Street.

SUMMARY

Waste effluents from Thompson Products Ltd., were directed to the municipal sanitary sewer or to the municipal storm sewer, both located along Louth Street.

All wastes were expected to be segregated by the latter part of 1966. At the time of the survey only those wastes from Plant #2 were segregated. A cooling tower, under construction at the time of the survey, was hoped to reduce the water consumption of the plant by approximately fifty percent.

DETAILS OF SURVEY

The plant was visited on June 8, 1965, and the plant waste streams sampled on October 19.

Personnel Interviewed

Mr. R. Massiah - Plant Engineer

Production and Operating Data

Number of Employees - 1,400

Operating Schedule - 3 shifts per day
- 5 days per week

Water Consumption and Distribution

Source - municipal supply

Volume - 1,270,000 gpd

Distribution - 35,000 gpd for sanitary purposes
- 1,235,000 gpd for industrial purposes used mainly as cooling water

Sources and Disposal of Liquid Wastes

By far the largest amount of water consumed by Thompson Products Limited was used for cooling purposes on induction generators, heat treating furnaces, compressors, and in the aluminum foundry, and was relatively uncontaminated upon discharge. Contaminated liquid wastes originated from caustic spray parts washers. About 800 gallons of the spent solution was sewered weekly. The industry estimated a maximum of 50 gallons of soluble oils per week were lost through leakage from the hydraulic pressure system.

Construction of a cooling tower was hoped to reduce the total water consumption of the plant by fifty percent by the reclamation and recirculation of the relatively clean cooling water. In addition, a programme of segregation of all plant wastes was expected to be completed by the end of 1966. At the time of the survey, the wastes from Plant #2 were segregated while those from Plant #1 were not.

Plant #1 discharged waste to both the sanitary and storm sewers on Louth Street, while only one connecting sewer from Plant #2, discharging into the municipal storm sewer, could be found.

Sampling and Analysis

The waste streams from Thompson Products Limited, were sampled at twenty-minute intervals on October 19, 1965. Composite samples of the waste were obtained by combining these samples. Details of the sampling and the analytical results obtained on the samples are presented on page 91.

WASTE LOADINGS

Based on the analytical results and the water consumption data, the waste load discharged by the industry is presented below:

5-day BOD	-	260 pounds per day
Suspended Solids	-	390 pounds per day
Ether Solubles	-	200 pounds per day
pH	-	7.1 - 8.0

CONCLUSIONS AND RECOMMENDATIONS

From the preceding analytical results, the plant effluent discharged to the storm sewer was somewhat higher than desirable with respect to the 5-day BOD and suspended solids contents. Wastes discharged to the sanitary sewer were satisfactory for such discharge. Since the wastes from both plants were to be segregated by the latter part of 1966, it is recommended that any contaminated industrial wastes, that is, all wastes except the cooling water, be included in the waste sent to the municipal sanitary sewage system. The cooling water should be directed to the storm sewer.

THOMPSON PRODUCTS LIMITED - ANALYTICAL RESULTS

NOTE: All results except pH reported in ppm unless otherwise indicated

Origin of Waste	Point of Discharge	Type of Sample	Time	5-day BOD	Total Solids	Susp. Solids	Diss. Solids	pH	Ether Solubles
Plant #1	Storm sewer	Composite	9:00 am - 12 noon	17	416	22	394	7.1	7.4
Plant #1	Storm sewer	Composite	1:00 pm - 4 pm	38	624	54	570	7.9	19.6
Plant #1	Storm sewer	Grab	4:00 pm	-	-	-	-	-	6.6
Plant #1	Sanitary sewer	Composite	9:00 am - 12 noon	17	294	22	272	7.1	32.2
Plant #1	Sanitary sewer	Composite	1:00 pm - 4:00 pm	13	256	10	246	7.4	10.6
Plant #2	Storm sewer	Composite	9:00 am - 12 noon	17	246	6	240	8.0	12.6
Plant #2	Storm sewer	Composite	1:00 pm - 4:00 pm	44	290	82	208	7.7	-
Plant #2	Storm sewer	Grab	4:00 pm	-	-	-	-	-	39.2

TRI-SURE PRODUCTS LIMITED

264 Welland Avenue

This firm was engaged in die casting, wire forming and in the manufacture of container closures and automotive stampings.

SUMMARY

All wastes from Tri-Sure Products Limited, including spent cooling water, were discharged to the municipal sanitary sewers. Contaminated wastes originated from a small zinc plating shop.

DETAILS OF SURVEY

The plant was visited May 12 and August 11, 1965.

Personnel Interviewed

Mr. C. T. Phelan - Office Manager

Mr. R. Ross - Foreman

Description of Plant Processes

Plant processes included stamping of metal container caps, bonderizing, zinc barrel plating, bonderlubing, die casting, and wire forming.

Production and Operating Data

Number of employees - 50

Operating Schedule - 1-2 shifts per day
- 5 days per week

Water Consumption and Distribution

Source - municipal supply

Volume - 25,000 gpd

Estimated Distribution - 1,250 gpd for sanitary use
- 17,000 gpd for cooling purposes
- 6,750 gpd for other industrial purposes

Sources and Disposal of Liquid Wastes

Most of the water consumed at the industry was used for cooling purposes in the die casting operation and in the compressor and vapour

degreaser. The sludge collected in the vapour degreaser was land dumped. Cutting oil was retained in drums and trucked from the plant.

The bonderizing, bonderlubing and zinc plating operations were performed in one room which contained the vapour degreaser, two running water rinses connected in series, a caustic cleaner, bonderizing and bonderlubing solutions, four zinc plating barrels and a drier. The zinc cyanide solution was rarely, if ever, dumped. The caustic cleaner and bonderite solutions were sewered once each week and the bonderlube solution, once per day. This schedule could vary depending on use of the solutions.

Both the domestic and the process wastes were discharged to the city municipal sanitary sewer.

Sampling and Analysis

Grab samples of the overflow from the water rinses and of the caustic cleaning solution were taken at 9:30 a.m., August 11, 1965. The analytical results obtained are reported below:

NOTE: All results reported in parts per million.

	5-day BOD	Susp. Solids	Diss. Solids	pH	Zinc as Zn	Ether Solubles
Running Water Rinse	1.2	2	272	7.7	0.0	2
Caustic Cleaner	94	376	16,264	11.8	22	118

WASTE LOADINGS

The waste load exerted by the continuous process effluent, consisting mainly of cooling water, would be small. The waste load of the batch discharges, namely, the bonderizing, bonderlubing and caustic cleaning solutions, is estimated as having been in the order of 0.2 pounds 5-day BOD and 1 pound suspended solids per discharge, also very low.

CONCLUSIONS AND RECOMMENDATIONS

The continuous process effluent from Tri-Sure Products Limited was satisfactory for discharge to a sanitary sewer.

The small batch discharges of caustic, bonderizing, and bonderlubing solutions could be sewered slowly over a period of time to minimize their effect on the sewage system by obtaining maximum use of the dilution available in the municipal sewers. Because of the toxic nature of the cyanide ion, the discharge of spent zinc cyanide plating solution should not be allowed at any time.

YALE AND TOWNE MANUFACTURING COMPANY

CANADIAN DIVISION
Yale Crescent

This firm manufactured builders' hardware, locks, hoists, trolleys, tractor shovels and fork-lift trucks.

SUMMARY

All wastes were discharged to the municipal sewers. Contaminated process wastes originated from a chromium, brass, bronze, zinc and cadmium plating area. Waste here consisted of periodic discharges of spent acidic and alkaline solutions as well as the running water rinses. Spent cooling water constituted the remainder of the plant process wastes.

DETAILS OF SURVEY

Yale and Towne Manufacturing Company was visited on May 12, 1965 and the process effluent sampled on August 11.

Personnel Interviewed

Mr. R. R. Wood - Works Manager

Mr. F. Saxton - Plating Room Foreman

Production and Operating Data

Number of Employees - 235

Operating Schedule - 1 shift per day
5 days per week

Water Consumption and Distribution

Source - municipal supply

Volume - 43,000 gpd

Estimated Distribution - 6,000 gpd for domestic use
- 27,000 gpd for cooling purposes
- 10,000 gpd for other process purposes

Sources and Disposal of Liquid Wastes

A large part of the water consumed by the plant was used for cooling purposes in an air conditioning unit, a vapour degreaser, and water-

cooled compressors. Contaminated wastes originated from the plating area where chromium, brass, bronze, zinc and cadmium electroplating was performed. There were a total of ten running water rinses here. Only the chromium plating system had a drag-out tank. Anodizing and parkerizing were also performed here but very little waste originated from these operations. Tanks periodically emptied (once per month) were a 220-gallon alkali cleaning tank, a 60-gallon muriatic acid dip, two 150-gallon alkaline electro-cleaner tanks, and an 80-gallon caustic cleaner tank used in the anodizing process.

All wastes were delivered to the municipal sewers by means of four connecting sewers. The main or process sewer serviced the plating area and all sources of spent cooling water except that from the air conditioner. The remaining three sewers carried roof drainage, wastes from the air conditioner, and sanitary wastes.

Sampling and Analysis

The main process sewer was sampled at twenty-minute intervals between 1:00 p.m. and 4:00 p.m. on August 11, 1965. The samples were combined to obtain a composite sample representing the plant's operations during this period. In addition, grab samples of the solutions periodically dumped were taken the same day. The analytical results are presented on the following page.

NOTE: All results except pH reported in parts per million (ppm) unless otherwise indicated.

	5-day BOD	Susp. Solids	Diss. Solids	Ether Solubles	Cadmium as Cd	Zinc as Zn	Chromium as Cr		Cyanide as HCN	pH
							Tot.	Hex.		
Plant Process Effluent	6.8	30	466	5	0.0	0.0	0.4	0.08	2.9	7.9
Alkali Cleaner	4500	76	119,102	-	0.2	0.0	0.0	0.0	3.1	13.2
Muriatic Acid Dip	140	6	1,632	-	0.3	27	0.1	0.0	0	1.4
Alkaline Electro-Cleaner	30	135	27,153	-	0.0	1.8	0.1	0.0	0.7	12.9
Caustic Cleaner used in anodizing process	25	100	82,484	-	0.0	12.5	2	0.0	0	12.0

WASTE LOADINGS

The following waste loadings have been calculated using as a basis the analytical results reported above and a waste flow of 30,000 gpd through the main process sewer.

5-day BOD - 2.0 pounds per day

Suspended Solids - 9.0 pounds per day

Ether Solubles - 1.5 pounds per day

pH - 7.9

Cyanide as HCN - 0.9 pounds per day

The waste loads exerted on the city sewers as a result of the "batch" discharges, assuming each solution was sewered once per month, are

as follows:

5-day BOD	-	10.1 pounds per month
Suspended Solids	-	0.4 pounds per month
pH	-	1.4 - 13.2
Zinc as Zn	-	0.03 pounds per month
Cyanide as HCN	-	0.009 pounds per month

CONCLUSIONS AND RECOMMENDATIONS

The analytical results indicate that the continuous process effluent contained a cyanide concentration somewhat in excess of the recommended maximum limit of two parts per million for discharge to a sanitary sewer. Attempts to decrease this amount would include the use of additional drag-out and rinsing steps in the plating operations. The effluent was satisfactory in other respects.

The effect of the periodic discharges of spent cleaning solutions on the municipal sewage system would be decreased by a slow discharge to the sewer, thereby utilizing the dilution powers available in the municipal sewers to maximum advantage.

BAY MILLS LIMITED

40 Riordan St.

Bay Mills Limited was a small textile manufacturing firm.

SUMMARY

Industrial wastes from the plant, consisting mainly of spent rinse waters, were discharged to the municipal sanitary sewers and were satisfactory for such discharge.

DETAILS OF SURVEY

The plant was visited on May 13, 1965.

Personnel Interviewed

Mr. F. Kurschner - Plant Superintendent

Description of Plant Processes

Bay Mills Limited manufactured fiberglas textile cloth for the automotive and aircraft industries. No dyeing was performed.

Production and Operating Data

Number of Employees - 30

Operating Schedule - 7 hours per day
- 3 days per week

Water Consumption and Distribution

Source - municipal supply

Volume - 7,000 gpd

Distribution - 750 gpd for domestic use
- 6,250 gpd for industrial purposes
- 95 percent of the process water was deionized and used as textile cloth rinse water

Sources and Disposal of Liquid Wastes

The main source of liquid wastes at the plant was the continuous overflow of the fiberglas cloth rinsing water. Both this and the sanitary wastes were delivered to the municipal sanitary sewage system.

Sampling and Analysis

A grab sample of the rinse water was taken on May 13, 1965. The results of the analyses are as follows:

NOTE: All results except pH reported in parts per million (ppm) unless otherwise indicated

	5-day BOD	Susp. Solids	Diss. Solids	pH
Rinse Water	1.9	8	238	7.4

CONCLUSIONS AND RECOMMENDATIONS

The effluent from Bay Mills Limited was suitable for discharge to the municipal sanitary sewage system.

CANADA HAIR CLOTH COMPANY LIMITED

198 St. Paul St.

Canada Hair Cloth Company Limited was engaged in the manufacture of garment inner-linings and other textile products.

SUMMARY

All wastes from the plant were directed to the municipal sanitary sewage system. Contaminated wastes consisted of frequent discharges of detergent and sizing solutions and spent rinse water. Other wastes consisted of cooling water.

DETAILS OF SURVEY

The plant was visited on May 12, 1965, and the solutions periodically discharged were sampled on August 13.

Personnel Interviewed

Mr. A. DeVos - Maintenance Superintendent

Description of Plant Processes

Fibers, bought by the firm, were woven into garment inner-linings and other textile products. The textile was subjected to various washing, sizing, and rinsing baths to give it the required properties.

Production and Operating Data

Number of Employees - 87

Operating Schedule - 2 shifts per day
- 5 days per week

Water Consumption and Distribution

Source - municipal supply

Volume - 22,700 gpd

Estimated Distribution - 2,200 gpd for sanitary purposes
- 18,000 gpd for cooling purposes
- 2,500 gpd for other process purposes

Sources and Disposal of Liquid Wastes

The detergent wash tank had a volume of about 400 gallons containing 0.25% detergent. The rinse tank contained about 800 gallons of water. These solutions were dumped totally or partially two or three times daily, depending on use. About fifteen gallons containing some urea formaldehyde resin residue was also dumped daily.

Liquid wastes were directed through a sump to the sanitary sewer. There was a one-half inch screen inside the sump and a one-eighth inch screen outside the sump to prevent any fiber from escaping to the sewer.

Sampling and Analysis

Grab samples of the three textile treating solutions were collected on August 13. The analytical results obtained are tabulated below:

NOTE: All results except pH reported in parts per million (ppm) unless otherwise indicated

Sample No.	5-day BOD	Susp. Solids	Diss. Solids	pH	COD	Estimated Volume Discharged
1	100	91	8,011	10.6	12,358	1,200 gallons per day
2	31	23	471	7.3	87,990	1,600 gallons per day
3	9,600	6,576	58,748	7.4	191,158	100 gallons per week

Sample No.

1 - Detergent wash solution

2 - Rinse water

3 - Sizing solution

WASTE LOADINGS

The waste load exerted on the municipal sewers by the periodic discharges have been calculated and are presented below:

5-day BOD - 3.1 pounds per day

Suspended Solids - 2.5 pounds per day

pH - 7.3 - 10.6

CONCLUSIONS AND RECOMMENDATIONS

The detergent solution and rinse water were satisfactory for discharge to the sanitary sewer. Although the sizing solution had a high organic loading, it should not cause problems in the sewerage system because of the small volume discharged.

LIGHTNING FASTENER COMPANY LIMITED

Church Street Plant
Church Street

The Church Street plant of Lightning Fastener Co. Ltd. was engaged in the dyeing and bleaching of cotton and cotton-nylon cloth.

SUMMARY

Sanitary and process wastes originating at the plant were delivered to the municipal sanitary sewers. The processes of dyeing, bleaching and rinsing the cloth produced a contaminated waste effluent.

DETAILS OF SURVEY

The plant was visited and the waste effluent sampled on September 29 and November 19, 1965.

Personnel Interviewed

Mr. T. Atkinson - Plant Manager

Mr. R. Pettifer - Dye House Foreman

Production and Operating Data

Number of Employees - 75

Operating Schedule - 1 shift per day
- 5 days per week

Water Consumption and Distribution

Source - Municipal supply

Volume - 76,000 gpd

Estimated Distribution - 2,000 gpd for sanitary purposes
- 74,000 gpd for industrial use

Sources and Disposal of Liquid Wastes

All wastes were discharged to the municipal sanitary sewers. Sources of contaminated industrial wastes were the dyeing, bleaching and water rinsing operations.

Hot spent rinse water was passed through a heat exchanger for heat recovery before discharge.

Sampling and Analysis

Grab samples of both the cold and the hot wastes were taken on September 29 and November 19, 1965. Results of the analyses are presented below:

NOTE: All results except pH, phenols, and colour dilution reported in parts per million (ppm). Phenols reported in parts per billion (ppb).

	5-day BOD	Susp. Solids	Diss. Solids	pH	COD	Phenols (ppb)	Colour Dilution Unfiltered	Colour Dilution Filtered
Hot Wastes								
Sept. 29	120	51	4,831	2.6	517	20	1:250	1:250
Nov. 19	43	12	2,320	2.2	295	20	1:200	-
Cold Wastes								
Sept. 29	32	62	6,924	9.9	66	80	1:125	1:100
Nov. 19	770	110	2,142	9.7	1,648	80	1:25	-

WASTE LOADINGS

Assuming a contaminated waste flow of 30,000 gpd, the estimated waste loadings are as reported below. Because of the limited nature of the sampling programme at the plant, these figures should be used as approximations only.

5-day BOD	- 72 pounds per day
Suspended Solids	- 18 pounds per day
pH	- 2.2 - 9.9

CONCLUSIONS AND RECOMMENDATIONS

If the low pH of the hot waste effluent occurs frequently or continually, it may deteriorate the sewers in the vicinity of the discharge. The neutralizing action of normally alkaline domestic sewage combined with dilution in the municipal sewers should render the waste harmless before it reaches the sewage treatment plant.

The industrial wastes from this plant of Lightning Fastener Company Limited appear to have been satisfactory in other respects for discharge to the sanitary sewer.

MONARCH KNITTING COMPANY LIMITED

34 Page Street

Monarch Knitting Company Limited produced men's and boys' hosiery.

SUMMARY

Both the sanitary and industrial wastes were sent to the municipal sanitary sewage system. Numerous daily "batch" discharges of the cloth treatment solutions and rinses were the major waste sources at the plant.

DETAILS OF SURVEY

The plant was visited during May, 1965, and the waste effluents sampled on June 24.

Personnel Interviewed

Mr. W. Thornes - Manager

Mr. E. Morrison - Plant Engineer

Description of Plant Processes

Various types of fibres were brought into the plant and knitted to produce men's and boys' hosiery. The products then underwent various textile treating operations such as pre-shrinking, bleaching, rinsing, and dyeing. Only piece dyeing, in which the cloth passes through the dye bath, was performed here. Dyeing facilities included ten open-tub paddle-type dye machines.

Production and Operating Data

Number of Employees - 140

Operating Schedule - 1 shift per day
- 5 days per week

Water Consumption and Distribution

Source - municipal supply

Volume - 63,500 gpd

Estimated Distribution - 3,500 gpd for sanitary purposes
- 30,000 gpd for cooling purposes
- 30,000 gpd for other process purposes

Sources and Disposal of Liquid Wastes

Spent cooling water from the air conditioning unit constituted a weak waste. Stronger process wastes originated from the "batch" discharges of pre-shrinking, bleaching, softening and dyeing solutions and rinses. Each discharge had a volume of approximately 275 gallons.

All industrial and sanitary wastes were sent to the municipal sanitary sewage system.

Sampling and Analysis

A composite sample of the process wastes was taken during the period from 8:30 a.m. to 12:00 noon. Wet process operations ceased at 12:00 noon. In addition, grab samples of each "batch" discharge were taken as they occurred. In this way, a picture representative of the day's operations was obtained. Results of the analyses performed on the samples are reported below:

NOTE: All results except pH reported in parts per million (ppm) unless otherwise indicated

Sample No.	5-day BOD	Susp. Solids	Diss. Solids	pH	Alkalinity as $CaCo_3$	Phosphates
1	195	18	1,022	6.1	-	95
2	660	3	423	5.5	55	-
3	940	65	10,905	4.9	196	300
4	126	25	1,259	5.2	171	77
5	-	70	3,002	9.4	724	-
6	115	5	3,045	5.9	40	-
7	20	2	558	7.1	277	-
8	12	11	235	7.6	197	-

Sample No.

1 - Composite sample of process wastes, 8:30 a.m. - 12:00 noon

2 - Formaldehyde and acetic acid solution, grab sample

3 - Pre-shrinking solution, grab sample

4 - Rinse after pre-shrinking treatment, grab sample

5 - Peroxide bleaching solution, grab sample

6 - Bleaching solution, grab sample

7 - Rinse after bleaching, grab sample

8 - Softening solution, grab sample

WASTE LOADINGS

Based on the composite sample analysis and the estimated water distribution figures, an approximation of the waste loading to the sewers may be made as follows:

5-day BOD	-	58.5 pounds per day
Suspended Solids	-	5.4 pounds per day
Phosphates as PO_4	-	28.5 pounds per day

CONCLUSIONS AND RECOMMENDATIONS

The average characteristics of the waste indicate it to have been satisfactory for discharge to the sanitary sewer. However, certain batch discharges, specifically the formaldehyde-acetic acid and the pre-shrinking solutions, exceeded the BOD concentration of 200-300 ppm usually present in municipal sewage. Although the dye liquors and dye rinses were not sampled, they are also usually high in 5-day BOD, suspended solids and colour dilution. The colour dilution is not highly objectionable as long as sufficient dilution is obtained in the sewers and if proper treatment is available at the sewage treatment plant to remove this colour before the waste reaches a stream, lake or other open watercourse.

F. C. McCORDICK LEATHERS LIMITED

86 Grantham Avenue

F. C. McCordick Leathers Limited was engaged in the vegetable tanning of cattle hides to produce lace leather.

SUMMARY

All liquid wastes from the tannery were discharged directly to the municipal sanitary sewer on Grantham Avenue. Process wastes consisted of the spent hide-treating solutions containing hair, dirt, salt, lime and sulphides which were sewered after use.

DETAILS OF SURVEY

The tannery was visited May 13, 1965, and the waste effluent sampled on August 10.

Personnel Interviewed

Mr. E. F. McCordick - President

Description of Plant Processes

The tannery produced tanned lace leather from cattle hides by the vegetable tanning process. Very little chrome tanning was performed.

Briefly, the vegetable tanning process consists of washing and soaking the hides to remove blood, dirt, and free salt, followed by fleshing to remove the fatty tissues, unhairing by means of a sodium sulphide and lime solution, de-liming by means of an ammonium salt, bating to remove unwanted proteins by enzymatic action, and tanning with solutions of vegetable tannin extracts for an extended period of time. Finishing operations such as oiling, polishing and cutting of the tanned hides are then performed.

F. C. McCordick Leathers performed the steps preliminary to the actual tanning in large 1,800 gallon paddle-equipped wooden vats. The tanning operations were performed in large watertight wooden tumbling drums.

Production and Operating Data

Number of Employees - 40

Operating Schedule
- 1 shift per day
- 6-7 days per week

Production Volume
- 6 packs per week; each pack weighs approximately 250-300 pounds.
- At the time of the survey, production was expected to increase.

Water Consumption and Distribution

Source - municipal supply

Volume - 11,000 gpd

Distribution
- 1,000 gpd for domestic use
- 10,000 gpd for process purposes

Sources and Disposal of Liquid Wastes

The liquid discharge from the tannery was intermittent throughout the day, consisting of "batch" discharges of the washing, dehairing, liming, desalting and bating solutions.

All wastes were delivered to the municipal sanitary sewer on Grantham Avenue. The process wastes ran through a trough inside the building and into a connecting sewer to the municipal sewer.

Sampling and Analysis

Two composite samples of the plant effluent, representing the morning and afternoon operations were taken on August 10, 1965. Grab samples of the unhairing, desalting and bating solutions were also taken. The analytical results are presented on page 113.

WASTE LOADINGS

Based on the analysis of the two composite samples and the water consumption data, the following waste loadings have been calculated:

5-day BOD	-	264 pounds per day
Suspended Solids	-	547 pounds per day
Ether Solubles	-	24.5 pounds per day
Sulphides as S	-	10 pounds per day

Since operations at the tannery would differ from day to day, the characteristics of the waste and the loadings may also differ from day to day.

CONCLUSIONS AND RECOMMENDATIONS

The waste sewered by the industry was highly concentrated but of small volume. Vegetable tanning wastes are generally amenable to treatment in a municipal sewage plant, but primary pre-treatment is usually applied before discharge to the sewer system. This is necessary due to the large quantities of suspended solids and lime present in the waste which may affect the sewers in the vicinity of the discharge by clogging.

The presence of sulphides in the waste can be the cause of obnoxious odours rising from the sewer system.

F. C. McCORDICK LEATHERS LIMITED - ANALYTICAL RESULTS

All results except pH reported in ppm unless otherwise indicated

	5-day BOD	Susp. Solids	Diss. Solids	pH	Calcium as Ca	Sulphide as S	Chloride as Cl	Ether Solubles
Total Plant Effluent								
Composite 8 am - 12 noon	4,700	4,932	11,290	12.3	1,176	200	95	398
Composite 1 pm - 4 pm	580	538	3,882	9.5	396	0	475	92
Unhairing Solution								
Grab 8:15 am	8,600	24,732	24,054	12.5	1,816	500	70	-
Desalting Solution								
Grab 10:30 am	2,400	1,774	15,034	7.1	48	13	635	-
Bating Solution								
Grab 2:00 pm	900	1,114	5,362	9.5	484	6	570	-

SCHOLLER BROTHERS LIMITED

321 Welland Avenue

Scholler Brothers Limited, an organic chemical industry, produced textile finishes and specialty organic products.

SUMMARY

Process wastes were discharged to the municipal sanitary sewer on Welland Avenue after passing through a sump. The wastes consisted of drum and equipment washings and periodic discharges of spent lye and acids.

DETAILS OF SURVEY

The plant was visited during May, 1965, and the process wastes sampled at various times during the course of the municipal survey.

Personnel Interviewed

Mr. H. G. Barnes - Managing Director

Description of Plant Processes

This organic chemical firm manufactured soaps, softeners, resins, sulphonated oils and textile finishes. The required chemical reactions took place in five water-cooled reactors.

Production and Operating Data

Number of Employees - 12

Operating Schedule
- 1 shift per day
- 5 days per week
- soaps were produced during two weeks in the spring and another two weeks in the autumn
- sulphonation was performed at the rate of one batch per week

Water Consumption and Distribution

Source - municipal supply

Volume - 6,900 gpd

Distribution
- 300 gpd for sanitary purposes
- 3,600 gpd for cooling purposes
- 3,000 gpd for other industrial purposes

Sources and Disposal of Liquid Wastes

Roof drainage and cooling water used in each of five reactors was discharged to the Vine Street sewer. Other wastes, including sanitary as well as the remaining process wastes, were discharged to a sump inside the plant fence and thence to the Welland Avenue sanitary sewer.

The process wastes included drum and equipment wash water, periodic discharges of spent lye solution from the soap-making process, and spent acid from the sulphonation process in which 600-1,600 pounds acid per batch were used.

Sampling and Analysis

The contents of the sump discharging to the Welland Avenue sewer was sampled at various times during the fall of 1965. Details of the sampling programme and results of the analyses are presented below:

NOTE: All results except pH reported in ppm unless otherwise indicated

Date	Time	5-day BOD	Susp. Solids	Diss. Solids	pH	Anionic Surfactants as ABS
August 9	1:30 pm	60	102	496	7.1	0.1
Sept. 27	2:10 pm	300	780	664	8.0	6.4
Sept. 28	9:30 am	270	148	634	6.0	0.5
Sept. 30	11:00 am	6.2	8	482	6.7	-
Sept. 30	4:00 pm	2,400	1,012	1,698	6.9	-
Oct. 1	10:10 am	185	92	876	2.5	12.5
Average		536	357	808	-	4.9
Maximum		2,400	1,012	1,698	2.5 (min.) 8.0 (max.)	12.5

WASTE LOADINGS

The following waste loadings have been calculated using as a basis, the average of the analytical results and the estimated water distribution figures.

5-day BOD	-	16 pounds per day
Suspended Solids	-	11 pounds per day
pH	-	2.5 - 8.0

CONCLUSIONS AND RECOMMENDATIONS

The waste effluent characteristics fluctuated quite significantly from day to day and even throughout the day. However, because of the small contaminated waste volume passing through the sump, this should not present a serious problem at the sewage treatment plant. If a low effluent pH occurs frequently, corrosion of the connecting sewer to the municipal sewer may occur.

DOMTAR PULP AND PAPER COMPANY LIMITED

The Howard Smith Division
343 Glendale Ave.

The Howard Smith Division of Domtar Pulp and Paper Company Limited, located in St. Catharines, was composed of three mills; the Lybster Mill, the Lincoln Mill and the Sulphite Mill.

(A) LYBSTER MILL

SUMMARY

Mill wastes, containing large quantities of 5-day BOD and suspended solids, were disposed of by discharge to the Old Welland Canal.

DETAILS OF SURVEY

An industrial wastes survey at this mill was conducted during May of 1963. All information included herein was obtained from the report prepared at that time.

Plant Personnel

Mr. H. A. Syme - Resident Manager

Mr. E. A. Shields - Plant Manager

Mr. E. Wilkinson - Control Engineer

Description of Plant Processes

Sulphite, soda and kraft pulp was brought in from other mills, re-pulped and fed to three Fourdrinier machines for sheet production. Products included drinking cup stock, glassine, onion skin, cellucine, poster and grease-proof papers.

Production and Operating Data

Number of Employees - 183

Operating Schedule - 3 shifts per day
- 6 days per week

Production Volume - 20,000 tons of paper products per year

Water Consumption

- 328,000 gpd from the municipal supply
- 1,700,000 gpd from the Welland Ship Canal for industrial purposes

Sources and Disposal of Liquid Wastes

The major waste sources were the white water systems of each paper machine. Periodic wastes originated from floor and equipment wash-ups. Both process and sanitary wastes were directed to the Old Welland Canal.

WASTE LOADINGS

5-day BOD	- 1,600 pounds per day
Suspended Solids	- 6,000 pounds per day
pH	- 7.1

(B) LINCOLN - SULPHITE MILL

SUMMARY

Mill wastes were discharged to the Old Welland Canal. Approximately 18,000 gallons per day of spent sulphite liquor were trucked to the Ontario Paper Co. Ltd. for use in alcohol and vanillin production.

DETAILS OF SURVEY

All material included in this report was obtained from the results of an industrial wastes survey conducted at the mill during May of 1963.

Plant Personnel

Mr. H. A. Syme	- Resident Manager
Mr. T. W. Westlake	- Technical Director
Mr. P. N. Halliwell	- Production Manager

Description of Plant Processes

Operations at the mill included:

1) Production of boxboard, card-middles, insulation papers and beaming board from sulphite pulp on a thin board machine of 50 tons per day capacity.

2) Digestion of debarked cut logs to produce 37,000 tons sulphite pulp annually.

3) Chlorine and hypochlorite bleaching of some pulp products.

4) Extraction and dewatering of pulp.

Production and Operating Data

Operating Schedule - 3 shifts per day
- 6 days per week

Production Volume - 50 tons paperboard and specialty papers per day
- 150 tons sulphite pulp per day

Water Consumption

- 135,000 gpd from the municipal supply
- 11,000,000 gpd from the Welland Ship Canal for industrial purposes

Sources and Disposal of Liquid Wastes

Liquid wastes originated from a number of sources and are itemized below:

1) Board Machine - felt washer spray water and white water overflow from the recycling reservoir chest.

2) Sulphite Mill - diluted sulphite liquor from blow pit operations following pulp digestion. Concentrated spent sulphite liquor was sent to the Ontario Paper Co. Ltd. for use in the production of alcohol and vanillin.

3) Bleaching - overflow from the Sherbrooke Washer seal box, the unbleached white water chest and the primary unbleached centricleaner.

The sanitary wastes were combined with the mill process wastes and the total flow discharged to the Old Welland Canal.

WASTE LOADINGS

5-day BOD - 50,000 pounds per day

Suspended Solids - 26,000 pounds per day

GARDEN CITY PAPER MILLS COMPANY LIMITED

Turner Crescent

Garden City Paper Mills Company Limited produced tissue and wrapping papers and vegetable parchment.

SUMMARY

Process wastes were discharged to a surface drain which flowed approximately one mile before entering the Old Welland Canal. Paper machine wastes had a moderate BOD and suspended solids loading. Parchment wastes were highly acidic.

DETAILS OF SURVEY

An industrial wastes survey was conducted at the mill by members of the Industrial Wastes Division, Ontario Water Resources Commission, during May, 1963. The information presented here was obtained from the report prepared following that survey.

Plant Personnel

Mr. H. Crabtree - General Manager

Mr. T. A. Deans - Plant Manager

Mr. A. R. Murphy - Technical Superintendent

Description of Plant Processes

Groundwood, sulphite and kraft pulps were received in bales and sent to two Fourdrinier paper machines to produce tissue and wrapping papers. The vegetable parchment was made by dipping paper from the Fourdriniers into a fifty percent sulphuric acid solution, washing, and passing the paper through a strong ammonia solution to neutralize the acid remaining on the sheets.

Production and Operating Data

Number of Employees - 130

Operating Data - 3 shifts per day on the paper machines
- 2 shifts per day on the parchment machine
- 5 days per week

Production Volume - 12 tons tissue and wrapping papers per day
- 6 tons parchment per day

Water Consumption

- 70,000 gpd from the municipal supply
- 2,250,000 gpd from the Welland Ship Canal for process use

Sources and Disposal of Liquid Wastes

Waste sources were the white water systems on the two paper machines, the wash water used in the parchment process, and floor washings.

All process wastes were ultimately discharged to the Old Welland Canal. Sanitary sewage was discharged to the municipal sewers.

WASTE LOADINGS

5-day BOD	- 940 pounds per day
Suspended Solids	- 2,166 pounds per day
pH of parchment machine wastes	- 1.9
Sulphates as SO_4	- 25,140 pounds per day

INTERLAKE TISSUE MILLS COMPANY LIMITED

Merritt Street

Interlake Tissue Mills Company Limited, a subsidiary of Kimberly-Clark Canada Limited, produced a variety of specialty papers.

SUMMARY

Liquid wastes, originating from the three paper machines and the groundwood mill, were discharged to the Old Welland Canal.

DETAILS OF SURVEY

A report presenting the results of an industrial wastes survey conducted at the mill in May and June of 1963, forms the basis for the material presented here.

Plant Personnel

Mr. J. E. Carruthers - Plant Manager

Mr. E. R. Wand - Chief Chemist

Description of Plant Processes

Tissue papers, napkin and towel papers, second sheets, and wax papers were produced on three fourdrinier paper machines from groundwood, sulphite, kraft and soda pulps. These pulps were obtained from a small groundwood pulping operation and from outside sources.

Production and Operating Data

Number of Employees - 300

Operating Data - 3 shifts per day
- 6 days per week

Production Volume - 92 tons daily

Water Consumption

- 90,000 gpd from the municipal supply
- 3,000,000 gpd from the Welland Ship Canal for industrial purposes

Sources and Disposal of Liquid Wastes

The sources of wastewater at the mill were the felt-washers and each of the white water systems on the paper machines. The wood grinding operations evolved a small amount of floor and equipment rinsing waste. Mill wastes were sent to the Old Welland Canal.

Sanitary wastes were only partially segregated from the process wastes.

WASTE LOADINGS

5-day BOD	-	1,900 pounds per day
Suspended Solids	-	10,000 pounds per day

APPENDIX A

MANUFACTURING INDUSTRIES USING LITTLE OR NO PROCESS WATER

ALEXANDER AWNINGS

AMPERE ELECTRIC LTD.

H. BARBER MONUMENTS

BAR-NEL VENETIAN BLINDS

BEAVER LUMBER CO. LTD.

BELMAR WELDING LTD.

BETTER SHADE CO. LTD.

BRUGG CABINET WORKS

BUILDERS' SPECIALTY SALES

FRED G. BURCHER

THE CANADA BLOCK CO. LTD.

CLARK CRAFT INDUSTRIES

CLARK MACHINE CO. LTD.

CLA-VAL CANADA LTD.

CLELAND METAL PRODUCTS LTD.

CORNELIUS MONUMENTS LTD.

CRYSLER MACHINE CO. LTD.

DAVIS LUMBER CO. LTD.

DENSMORE TOOL AND DIE WORKS LTD.

T. W. DODD MACHINE WORKS

DUO TEMP (NIAGARA) LTD.

EMPIE MANUFACTURING OF CANADA

ENSIGN INDUSTRIALS LTD.

F. B. TOOL AND DIE LIMITED

S. FELDMAN AND SON

FLANGEKLAMP OF CANADA LTD.

FRANKLIN METAL PRODUCTS

GARDEN CITY WIRE WORKS CO.

GENAIRE (1961) LTD.

GIROTTI MACHINE WORKS LTD.

HAMPDEN-PENZER LTD.

HARRIS SIGN CO.

HAR-WIN LTD.

HILDEBRANDT IRON WORKS

HY-GRADE CONCRETE CO. LTD.

GIROTTI SCULPTURED ART

IVES MACHINE SHOP

JOHNSON, MATHEY AND MALLORY LTD., FOUNDRY DIV.

JULIUS SHEET METAL CO. LTD.

KOSKI'S WOODWORKING

L AND M BRONZE CO.

LINCOLN CHEMICALS LTD.

LINCOLN FABRICS LTD.

LINCOLN FOUNDRY LTD.

LINCOLN MACHINE SHOP LTD.

LORD AND BURNHAM CO. LTD.

M AND B PRECISION PRODUCTS LTD.

McGEE MARKING DEVICES

MERCURY VARNISH CO. LTD.

G. A. MOGGRIDGE CO. LTD.

MOHAWK PLACK CRAFT

MORAN BEVERAGES LTD.

NATIONAL OXYGEN LTD.

NIAGARA HEATING PRODUCTS LTD.

NUBONE CORSET CO. OF CANADA LTD.

PAGE MACHINE, TOOL AND DIE WORKS LTD.

PAGE MANUFACTURING CO. LTD.

PENBERTHY INJECTOR LTD.

PENINSULA FITTINGS (ST. CATHARINES) LTD.

PENZER PRODUCTS LTD.

PIRIE BROTHERS

PORT WELLER DRY DOCKS LTD.

RIGBY'S LTD.

ST. CATHARINES AUTO-BODIES LTD.

ST. CATHARINES BRICK AND TILE CO. LTD.

ST. CARHARINES CRUSHED STONE LTD.

SAMCO BRASS LTD.

SARNIA SCAFFOLDS LTD.

SARGENT AND GREENLEAF OF CANADA LTD.

SENECA MFG. (ST. CATHARINES) LTD.

SKYWAY LUMBER CO. LTD.

STAR STONE PRODUCTS LTD.

STERLING VARNISH CO. OF CANADA LTD.

SUMMIT SPRING SERVICE LTD.

TAUSEN FREUND AND COMPANY

THERMO-RITE MANUFACTURING CO.

THOROLD WELDING WORKS LTD.

TRANSIT MIXED CONCRETE AND BUILDERS SUPPLY LTD.

TRAPP MANUFACTURING LTD.

TRIANGLE DIE AND TOOL CO. LTD.

TWIN-LOCK IRON WORKS LTD.

UNITED COOLER (NIAGARA) LTD.

UPSONBILT LTD.

WARREN BROTHERS LTD.

WELLINGTON WOOD PRODUCTS LTD.

WIGNALL AND SONS LTD.

WRIGHT MACHINE AND TOOLS LTD.

APPENDIX B

SUMMARY OF INDUSTRIES DISCHARGING RELATIVELY UNCONTAMINATED WASTES

Company	Water Consumption	Waste Discharge	Remarks
The Anthes-Imperial Co. Ltd.	82,000	sanitary sewers	spray paint booth wash water discharged periodically
Blenkhorn and Sawle Ltd.	3,300	sanitary sewers, cooling water to ditch	spray paint booth wash water discharged periodically
Canadian Warren Pink Ltd.	10,800	sanitary sewers	
Cunningham Foundry and Machine Co. Ltd.	7,200	sanitary sewers	
E.T.F.Tools Ltd.	28,800	sanitary sewers	Slurries of sand in water in 3 wet tumblers are discharged to the sewer once or twice each week (each discharge amounts to 30 gallons)
Empire Rug Mills Ltd.	6,000	sanitary sewers	a small amount of lint is present in the wash water discharge
Foster Wheeler Ltd.	125,000	sanitary sewer, cooling water to ditch	pressure testing water directed to sanitary sewer
Irish Dry Beverages Ltd.	22,400	sanitary sewers	bottle washing wastes not highly contaminated

APPENDIX B (continued)

Company	Water Consumption	Wastes Discharge	Remarks
Newman Structural Steel Ltd.	6,900	sanitary sewers	
Niagara Structural Steel Co. Ltd.	23,000	sanitary sewers	
The W. S. Tyler Co. of Canada, Ltd.	14,200	Twelve Mile Creek	paint spray booth wash water discharged periodically. two 300-gallon rinse tanks following a pickling treatment are discharged once every ten days.