THE

ONTARIO WATER RESOURCES

COMMISSION

INDUSTRIAL WASTES SURVEY

of the

CITY OF BARRIE

1969

A

Report On

An Industrial Wastes Survey

of

The City of Barrie

1969

Division of Industrial Wastes
ONTARIO WATER RESOURCES COMMISSION

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INTRODUCTION

This survey was carried out to determine the quantity and characteristics of wastes being discharged by industries to the municipal sanitary sewer system, to storm sewers and to natural watercourses. The responsibility for regulation of discharges to storm sewers and natural watercourses rests with the OWRC, while the quality of effluents discharging to the sanitary sewers is regulated by the City of Barrie under the terms of By-law #66-69.

All industries with discharges to storm sewers or natural watercourses were included, but those discharging wastes to the sanitary sewers were included only where the discharge was greater than 1000 gallons per day.

All storm sewers and watercourses flow into Kempenfelt Bay (Lake Simcoe) as does the effluent from the City's secondary sewage treatment plant (STP). The STP has a rated capacity of 3 MGD and of this at present 2.5 MGD is allocated.

Table I, below, shows the limits set on the concentration of contaminants in wastewater discharging to the sanitary sewers (By-law #66-69) and the OWRC objectives for the concentration of contaminants in wastewater discharging to storm sewers or natural watercourses.

TABLE I

CITY OF BARRIE BY-LAW #66-69 LIMITS
AND OWRC OBJECTIVES

CONTAMINANT	BY-LAW #66-69 LIMITS	OWRC OBJECTIVES
Biochemical Oxygen Demand - five day test (BOD_5)	300	15
Suspended solids	350	15
Total Chromium	3	1
Ether soluble materials	100/15 *	15
Cyanides	2	0.1
Zinc	5	5
Copper	1	1
Nickel	5	1
pH	5.5 - 9.5	5.5 - 9.5
Chlorides	-	1500

All above in parts per million (ppm) except pH

* 100 ppm of animal or vegetable origin
15 ppm of mineral origin

CONDUCT OF THE SURVEY

A list (Table II) of industries using more than 1000 gpd was obtained from the PUC and each of these industries was visited to inspect the processes being carried out and to determine the sources and types of wastes being discharged. Survey personnel then conducted a sampling programme at each plant, with the object of determining the acceptability of waste discharges and the loadings being exerted upon the municipal STP.

TABLE II

LIST OF INDUSTRIES WITH CONSUMPTION GREATER THAN 1000 GPD

INDUSTRY	CONSUMPTION (GPD)	INDUSTRIAL WASTES SEWERED TO	
		SANITARY (GPD)	STORM/WATER-COURSE (GPD)
Barrie Creamery	3,350	3,350	-
Barrie Examiner	4,500	Domestic only	3,300
Barrie Plating	2,500	2,500	-
Barrie Tanning	180,000	180,000	-
Canadian General Electric	424,000	212,000	212,000
Canadian Tyler Refrigeration Ltd., Universal Cooler Division	27,300	27,300	-
Canadylet Closures	72,400	72,400	-
Chrysler Outboard #1	1,200	1,200	-
Chrysler Outboard #2	1,800	1,800	-
Culligan Water Conditioning	24,400	Domestic only	23,200
Devilbiss	20,000	" "	15,000
Dufferin Materials and Construction	36,000	" "	?[a,c]
Hill Refrigeration	20,000	" "	18,000
Imperial Eastman	15,850	5,850	10,000
Kolmar	20,000	10,000	10,000
Lakeview Dairy	?[b]	30,000	?[b]
Lufkin Rule	60,000	55,000	-
Mansfield Denman General	505,000	135,000	340,000
Moldex Limited	39,000	Domestic only	38,000
Plastomer	47,000	" "	44,000
Robson Lang Leathers Limited	143,000	141,000	2,000
Sarjeant Company Limited	5,700	Domestic only	?[c,d]
Seven-up Limited	6,800	4,250[c]	-
Smiths Farm Dairy	10,000	10,000	-
West Bend	62,500	15,000	47,500
	1,732,300 + Lakeview	906,650	763,000 + Lakeview

a - yard run-off volume impossible to estimate.
b - own well + PUC - volume cannot be estimated.
c - water consumed in product.
d - negligible volume of rinse water discharged on land.

RESULTS OF THE SURVEY

Twenty-five industries using more than 1000 gallons of water per day were surveyed and the disposition of waste discharges was found to be:

	WITH TREATMENT	WITHOUT TREATMENT
Storm sewer/watercourse	1	12
Sanitary Sewer	3	14

NOTE: Some industries discharge both to sanitary sewer and storm sewer.

These figures do not include domestic and sanitary waste discharges.

The acceptability of the discharges was:

	STORM SEWER/WATERCOURSE	SANITARY SEWER
Acceptable	9	9
Unacceptable	4	8

Of the four industries having treatment facilities, two were found to be producing an unacceptable effluent

The loadings exerted upon the municipal sewage treatment plant by those of the twenty five industries surveyed which have discharges to the sanitary sewers were as follows:

Number of plants:- 17

INDUSTRY	BOD	SUSPENDED SOLIDS	CHROMIUM	ETHER SOLUBLES	CYANIDE	ZINC	COPPER	NICKEL
BARRIE CREAMERY	16.5*	-	-	-	-	-	-	-
BARRIE PLATING	-	-	0.5	-	-	-	-	-
BARRIE TANNING	2700	2900	49	87	-	-	-	-
CANADIAN GENERAL ELECTRIC	-	32	9.8	-	0.3	0.4	-	3.5*
CANADIAN TYLER REFRIGERATION LTD., UNIVERSAL COOLER DIVISION	17	60	-	-	-	-	-	-
CANADYLET CLOSURES	-	51	-	-	5.1	1.9	3.3	-
CHRYSLER OUTBOARD #1	-	-	-	-	-	-	-	-
CHRYSLER OUTBOARD #2	-	-	-	-	-	-	-	-
IMPERIAL EASTMAN	-	-	-	-	-	-	-	-
KOLMAR	30*	4*	-	10*	-	-	-	-
LAKEVIEW DAIRY	202.5*	-	-	-	-	-	-	-
LUFKIN RULE	-	-	-	-	-	-	-	-
MANSFIELD DENMAN GENERAL	-	-	-	-	-	-	-	-
ROBSON LANG LEATHERS LTD.	488	388	34	109	-	-	-	-
SEVEN-UP LIMITED	-	-	-	-	-	-	-	-
SMITHS FARM DAIRY	18*	-	-	-	-	-	-	-
WEST BEND	17	-	-	4	-	-	-	-
	3489	3435	93.3	210	5.4	2.3	3.3	3.5

Loadings in pounds per day

* Estimated

The hydraulic loading exerted by these plants was 906,650 gpd.

If from the total loadings, the contributions of the two tanneries, the two dairies, the creamery and the cosmetics plant are substracted, the remaining eleven plants contribute the following loadings:

BOD	SUSPENDED SOLIDS	CHROMIUM	ETHER SOLUBLES	CYANIDE	ZINC	COPPER	NICKEL
34	143	10.3	4	5.4	2.3	3.3	3.5

These eleven plants exert a hydraulic loading of 532,300 gpd.

The loadings from these eleven plants are disproportionate to the hydraulic flow. That is, together they exert 59% of the hydraulic loading but only 1% of the BOD loading, 4% of the suspended solids loading, 11% of the chromium loading and 1.9% of the ether solubles loading. They do, however, exert 100% of the cyanide, zinc, copper and nickel loadings.

Two industries, Canadian General Electric and Canadylet Closures, are responsible in total for the cyanide, zinc, copper and nickel loadings.

RECOMMENDATIONS

The following is a summary of the recommendations made in the individual reports on the industries surveyed.

COMPANY	RECOMMENDATIONS
BARRIE CREAMERY COMPANY	NONE
THE BARRIE EXAMINER	NONE
BARRIE PLATING AND ANODIZING	Waste control facilities proposed for new plant should be approved by the City.
BARRIE TANNING LIMITED	1. Waste treatment plant be redesigned, modified, extended or otherwise altered to allow treatment sufficient to produce an acceptable effluent. 2. Settling characteristics of the influent to the waste treatment plant be re-evaluated. 3. Operating procedures be strictly followed at all times.
CANADIAN GENERAL ELECTRIC COMPANY LIMITED	1. Fog spray rinses to be installed between stations 10 and 11 and 19 and 20 (Figure I). 2. Before addition of perchloron at station 32 (Figure I), the solution should be well stirred and pH of approximately 11 should be maintained. 3. Boiler blowdown be directed to sanitary sewer. 4. Oil traps be installed in the cooling water effluent lines.
CANADIAN TYLER REFRIGERATION LTD., UNIVERSAL COOLER DIV.	Dumps of high strength solutions be bled slowly to the sanitary sewer system.
CANADYLET-CLOSURES LIMITED	1. All cyanide-bearing streams be routed through the cyanide treatment unit. 2. The pH in the cyanide treatment unit sump be maintained at 11 to ensure complete oxidation of cyanide. At this pH the copper should also be precipitated. 3. Thorough mixing be achieved in the neutralization tank. 4. A settling tank be provided to allow precipitated metals to be removed from the waste stream before discharge to the sewer.

COMPANY	RECOMMENDATIONS
CHRYSLER CANADA OUTBOARD (Plant #1)	NONE
CHRYSLER CANADA OUTBOARD (Plant #2)	Uncontaminated cooling water be discharged to the storm sewer system.
CULLIGAN WATER CONDITIONING (BARRIE) LIMITED	NONE
DeVILBISS (CANADA) LIMITED	1. Facilities to remove cyanide from the waste stream be provided. 2. The company should provide facilities to ensure that no contaminating material will reach the creek in the event of an accident or spill.
DUFFERIN MATERIALS AND CONSTRUCTION LIMITED	1. A rainwater collection channel be constructed around the yard and connected to a settling tank for removal of suspended solids. 2. If necessary, chemical treatment of the settling tank effluent be provided. 3. All manholes, catch basins and pipes leading to the creek be blocked or diverted to flow through the rainwater collection system.
HILL REFRIGERATION OF CANADA	1. Paint spray booth wastes be discharged to the sanitary sewer system. 2. A further survey be carried out by the company to determine if the wastes from the bonderizing operation are in compliance with OWRC objectives on a continuing basis.
IMPERIAL-EASTMAN CORPORATION (CANADA) LIMITED	1. Adequate dragout and rinsing facilities be provided. 2. Periodic cleaning of the plating shop sump be instituted.
KOLMAR OF CANADA LIMITED	Dry cleaning of equipment prior to wet cleaning be instituted to minimize loadings to the sanitary sewer system.
LAKEVIEW PURE MILK DAIRY LIMITED	A meter be installed to measure the volume of water taken from the well.

COMPANY	RECOMMENDATIONS
LUFKIN RULE COMPANY OF CANADA LIMITED	1. A further survey be conducted by the City of Barrie of the operations within this plant to evaluate the acceptability of the waste discharged to the Anne Street sanitary sewer during the operation of the nickel plating line and etching line. 2. The company investigate the apparent malfunction of the pH controller-recorder. 3. The company instruct their personnel that there is to be no batch discharge of strong wastes to the sanitary sewer, regardless of the circumstances. 4. Cooling water be discharged to the ditch instead of the sanitary sewer.
MANSFIELD DENMAN GENERAL COMPANY LIMITED	Uncontaminated cooling water be discharged to the storm sewer system.
MOLDEX LIMITED	NONE
PLASTOMER LIMITED	Spent hydraulic oil be treated with an absorbent material before disposal at the city dump.
ROBSON LANG LEATHERS LIMITED	1. Equalization facilities be installed. 2. Treatment facilities to remove chromium from the equalised waste be provided. 3. Further survey be carried out during beamhouse operation.
SARJEANT COMPANY LIMITED	Control be exercised to ensure no run-off from land disposal site.
SEVEN-UP (ONTARIO) LIMITED	Neutralization facilities be provided.
SMITHS FARM DAIRY (BARRIE) LIMITED	NONE
WEST BEND OF CANADA LIMITED	Dumps of high strength solutions be bled slowly to the sanitary sewer system.

BARRIE CREAMERY COMPANY

This industry, located at 81/83 Bayfield Street, was surveyed on June 5, 1969.

DETAILS OF SURVEY

Personnel Interviewed

Mr. W. F. Norris . - Owner

Personnel Participating

N. A. Gillies - OWRC

Description of Plant and Process

This is a conventional creamery, operating two pasteurising vats and one churn. Cream is received in cans and there is one can washing machine.

Production and Operating Data

*Cream Processed	-	4,000 lbs/day
*Butter Produced	-	1,000 lbs/day
Operating Schedule	-	Days/week (summer) 5
	-	" " (winter) 3
Number of Employees	-	5

* Based on an average 20 days/month

Water Consumption

Water consumption, based on figures supplied by the Public Utilities Commission, is at present approximately 3,350 gallons/day.

Sources of Liquid Wastes, Treatment and Disposal

Wastes arise from can, floor and equipment washing, spillage and buttermilk. All buttermilk is hauled away for use as animal feed, while the other wastes are discharged without treatment to the municipal sanitary sewer system.

Sampling and Analysis

Due to the difficulty of obtaining representative samples of this type of plant, no samples were taken.

WASTE LOADINGS

Since no samples were taken, a theoretical calculation of the waste loadings will be used to determine the contribution of this industry to the load on the municipal sewage treatment plant.

The following values are modifications of figures taken from the publication of the United States Public Health Service, "An Industrial Wastes Guide to the Milk Processing Industry":-

Operation	lbs BOD/10,000 lbs milk or milk equivalent
Receiving cream	2.0
Cream Pasteurisation and cooling	1.0
Butter Churning and washing	2.0
Total	5.0

Cream Processed - 4,000 lbs/day

∴ Milk equivalent - 33,000 lbs/day

From these figures, the daily BOD_5 loading to the sanitary sewer may be

calculated to be $\frac{33,000}{10,000} \times 5.0$ or 16.5 lbs.

DISCUSSION OF FINDINGS

No processing was being carried out at the time of the survey and therefore no estimate could be made of the standard of housekeeping. However, from available literature describing similar operations it would appear that the calculated loading is reasonable.

It must be emphasised that the production volume and waste loading are based upon averages and will be more or less according to seasonal variation. However, deviation from the average should be fairly small since seasonal variation in the quantity of cream received is largely absorbed by changing the number of operating days per week, rather than by changing the daily production volume.

CONCLUSIONS

Based on a theoretical calculation, this industry discharges to the municipal sanitary sewer 16.5 lbs/day of BOD_5, and 3,350 gallons/day of waste.

RECOMMENDATIONS

No recommendations will be made at this time.

THE BARRIE EXAMINER

This industry, located on Bayfield Street, was surveyed on June 5, 1969.

DETAILS OF SURVEY

Personnel Interviewed

Mr. W. Telfer - General Manager

Personnel Participating

P. Chisholm - OWRC

Description of Process

"The Barrie Examiner" is a newspaper, published daily, with a circulation of approximately 10,500 copies per day. The plant consists of a type setting room, a printing room and a maintenance area.

There is also a small amount of commercial printing, but this is a minor aspect of the business.

Operating Data

The plant employs sixty men in a one shift, five days per week operation.

Water Consumption and Distribution and Wastes Disposal

All water used is purchased from the city. Consumption is consistent at 93,000 gallons per month. The only manufacturing use of water is cooling water in the press casting machine. This cooling water is directed to a storm sewer.

The printing machines are cleaned with varsol-soaked rags which are burnt after use.

CONCLUSION

There is no process waste loading from this plant to the city sanitary system. Since the water is used only on a "once through" basis for cooling, it was deemed unnecessary to take samples of the effluent.

RECOMMENDATIONS

No recommendations will be made at this time.

BARRIE PLATING AND ANODIZING

This plant, situated on Victoria Road, was visited on June 3 and 4, 1969, in order to ascertain the waste loading to the municipal sanitary sewer system.

DETAILS OF SURVEY

Personnel Interviewed

Mr. E. Beacock - Owner

Personnel Participating

P. Chisholm - OWRC

Operating Data

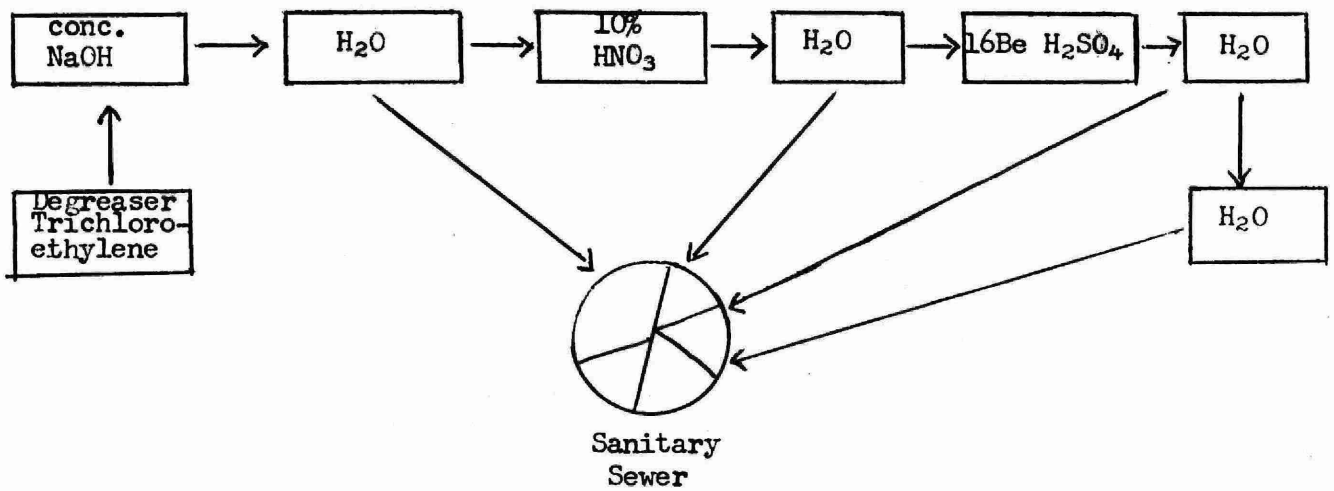
Number of employees - 4

Days/week - 5-1/2

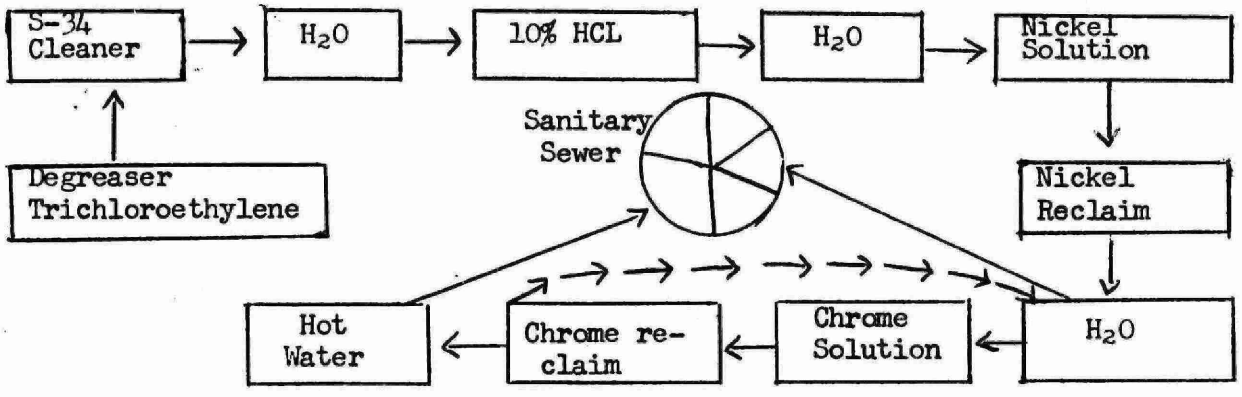
Hours/day - 8

Description of Process

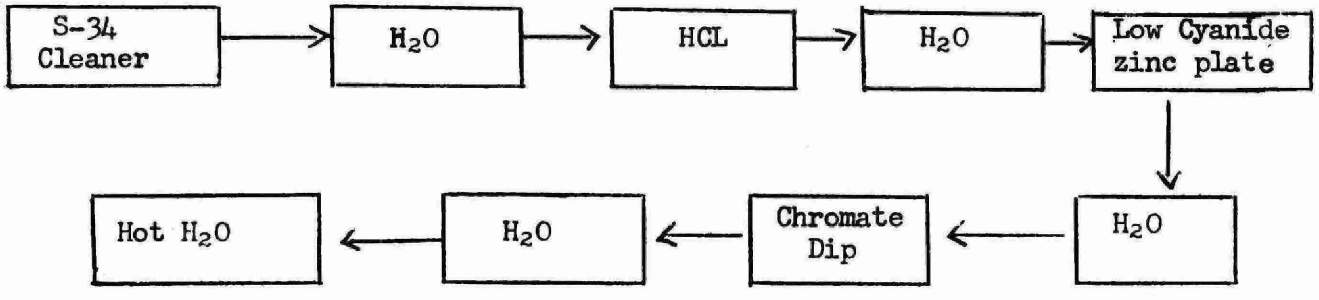
Anodizing Cycle



Nickel - Chroming Cycle



Zinc Plating Cycle



The above are the operations carried out at this plant. At present the work is approximately 50% anodizing and 50% chroming with a small quantity of zinc plating. A new plant (at a new location) is proposed and when this plant is opened, 80% of all work will be nickel chroming.

Water Consumption and Distribution

All water used is drawn from the municipal supply. In the four months prior to the survey 217,000 Imperial gallons were used. Other than sanitary, the only use of this water is in rinse tanks.

Sampling and Analysis

Samples were taken during both anodizing and chroming operations. Grab samples and composites were taken and all samples were submitted to the OWRC laboratories for analysis.

DISCUSSION OF FINDINGS

While anodizing was in progress, two grab samples and a four hour composite were taken. Only pH was determined. The results are within OWRC objectives.

SAMPLE	pH
Composite (4 hr.) 11:00 a.m. - 3:00 p.m.	7.6
Grab 2:25 p.m.	7.7
Grab 3:15 p.m.	7.4

Both grab samples were taken at the time of most flow of sulphuric acid rinse water to sewer.

Four grab samples were taken during the chroming operation.

	SAMPLE	pH	TOTAL CHROMIUM	CHROMIUM (Hex.)
Grab	10:00 a.m.	4.9	21.5 ppm	14.5 ppm
"	1:45 p.m.	2.6	10.0 ppm	2.3 ppm
"	2:45 p.m.	3.6	16.0 ppm	7.0 ppm
"	4:00 p.m.	6.5	24.7 ppm	0.6 ppm

These results are obviously unsatisfactory, the chromium content of the effluent being too high. The pH values are also unsatisfactory.

RECOMMENDATIONS

Since this company is moving to new premises early in 1970, there are no recommendations specific to the present operation except that every effort should be made to reduce losses to the sewer by whatever means are available.

Before operations are commenced in the new plant, a full schedule of waste control and treatment facilities should be approved by the City.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

1 p.p.m. = 1 mgm. / litre
= 1 lb./100,000 Imp. Gals.

Municipality: Barrie Report to: N. Gillies c.c.

Source: Barrie Plating & Anodising

Date Sampled: 3/6/69 by: P. Chisholm br

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.								
		Total	Susp.	Diss.									
T 937					7.6								
T 938					7.7								
T 939					7.4								

T 937	1.	Composite sample of total effluent to sanitary sewer - 11:25 a.m., 12:00 a.m., 2:30 p.m., 3:10 p.m.
T 938	2.	Grab sample of effluent to sanitary sewer - 2:25 p.m.
T 939	3.	Grab sample of effluent to sanitary sewer - 3:10 p.m.

10M-60-22690

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Barrie **Report to:** N. Gillies **c.c.**

Source: Barrie Plating & Anodising

Date Sampled: **by:** (rj)

Lab. No.	5-Day B.O.D.	Solids										
		Total	Susp.	Diss.								
	pH at Lab.	CHROMIUM AS Cr. TOT.	HEX.									
T-959	6.5	24.7	0.6									
T-960	2.6	10.0	2.3									
T-961	3.6	16.0	7.0									
T-962	4.9	21.5	14.5									

T-959	1	Chrome Effluent to Sanitary Sewer	Grab 4.00 PM
T-960	2	" " " " "	" 1.45 PM
T-961	3	" " " " "	" 2.45 PM
T-962	4	" " " " "	" 10.00 AM

5M-60-11403-65

BARRIE TANNING LIMITED

This industry, located on Bradford Street, was surveyed on June 10, 11, and 12, 1969. Continuous sampling was carried out from 9 p.m. on June 10 to 4:30 p.m. on June 12.

DETAILS OF SURVEY

Personnel Interviewed

Mr. A. Cook - President

Mr. R. Betts - Superintendent

Personnel Participating

N. A. Gillies - OWRC

G. Yuzwa - "

Description of Plant and Process

The plant has complete tannery facilities including hidehouse, full beamhouse, tanyard and finishing operations. A brief description of each operation follows:

Hidehouse

Cured hides are received and stored until split lengthwise to form sides. The sides are sorted and made into packs of approximately 5000 lbs. The sides forming a pack are processed through the beamhouse and tanyard as a unit.

Beamhouse

(a) Soaking - from the hidehouse the hides are taken to the beamhouse where they are first soaked to remove dirt, manure and salt and to replace water abstracted by the curing process. The soaking is carried out in vats equipped with paddles, by means of which the hides may be agitated.

A bactericide is added to the soak water in warm weather and the hides remain in the solution overnight, with the object of returning them as nearly as possible to their condition when removed from the animal.

(b) Hairburn - at the end of the soaking period, the soak water is drained off and the vat refilled with clean water to which a grease dispersant, sodium sulphydrate and lime are added. The paddle is run for five minutes every three hours during the day and the hides are then allowed to soak overnight. On the following day the paddle is run for five minutes every five hours until the morning (6 a.m.) of the third day. The solution is then drained off and the hides are washed with at least 3,000 gallons of water.

The object of the hairburn process is to remove hair, hair roots, the epidermis and certain undesirable soluble proteins.

(c) Fleshing - the dehaired hides are washed and removed from the hairburn vat and fed to a fleshing machine which, by the action of blades against the flesh side of the skin, removes flesh, fat and muscle tissue.

Tanyard

(a) Bating - after fleshing, the hides are moderately clean and free of hair, etc. However, they contain fairly large quantities of the alkaline hairburn solution and some undesirable natural substances (glue-like proteins held in the network of collagen fibres which, if not removed, would cause the finished leather to be hard), and these must be

removed.

The hides are placed in a drum which can be rotated and which has hollow axles through which water or solutions may be introduced. Approximately 1,000 gallons of water is added and the hides are washed for some fifteen minutes. An enzyme (bate) is added with ammonium sulphate and detergent and the drum is set in motion. After bating, the hides are again washed with water.

(b) Pickling - the bated hides must be brought to an acid condition, since the chromium salts used in the tanning process are insoluble in an alkaline medium. This is achieved by the addition of sulphuric acid to a pH of 1.6. However, if the acid were added alone, a condition of the hides known as acid swelling would result and common salt is therefore added before the acid. The drum is then run for approximately one hour.

(c) Tanning - the object of this process is to place the skin in a stable condition in which it will not putresce. In addition, tanning improves certain properties of the material such as abrasion resistance, heat resistance, flexibility and resistance to damage from cycles of wetting and drying. Calcium formate and the chrome tanning liquor are added to the pickled hides. The drum is rotated for five hours and then left stationary overnight. A fungicide is added and the pH of the solution is adjusted with sodium bicarbonate, thus increasing the fixation of the chrome with the skin fibre. The drum is run for two hours and

the solution is dumped. The tanned hides (now technically leather) are allowed to drain.

(d) Wringing, sorting and splitting - excess water is removed from the leather by wringing, the sides are sorted according to the final use to which the leather will be put and the thickness is adjusted by splitting on a band knife. The flesh side layer is known as a split and, while not possessing a grain, is valuable material for the manufacture of sueded leathers.

(e) Re-tanning, colouring and fatliquoring - the re-tanning operation is carried out to modify the properties of a chrome tanned leather and many tanning agents are available for this purpose. Vegetable extracts and synthetic materials are extensively used.

The chrome tanned leather is placed in drums, conditions of pH and temperature are adjusted to suit the tanning material being used and the drum is rotated for a period appropriate to the retan selected.

Colouring is done in the same drum using aniline derived dyestuffs, the pH being adjusted to regulate the rate of uptake of the dye. After dyeing, the leather is washed to remove excess dyestuff, acid, etc., in preparation for fatliquoring.

The object of fatliquoring is to lubricate the fibres for flexibility, and by careful selection of the type and amount of fatliquor a wide range of firmness or softness can be achieved. Oils and fatty substances derived from animal, vegetable and mineral sources are used,

either dissolved or emulsified in hot water. The leather and fatliquor are rotated in the drum until the required condition is reached.

After fatliquoring, the leather has passed through all wet processing and must be dried prior to finishing. Finishing consists of numerous steps which impart to the leather the properties desired for specific final uses. After finishing, the leather is graded and measured and is then ready for shipment to manufacturers of leather goods.

Production and Operating Data

Hours per day - 8

Days per week - 5

Number of employees - 170

Production volume - 6 packs (30,000 lbs)/day

Water Consumption and Distribution

Water is drawn from private wells and this supply is augmented by water purchased from the PUC. Consumption is at present approximately 180,000 gpd.

Distribution is estimated to be approximately as follows:

Sanitary and Domestic	4,000 gpd
Beamhouse	70,000 gpd
Tanyard	86,000 gpd
Pasting, finishing and miscellaneous	20,000 gpd

Sources of Liquid Wastes, Treatment and Disposal

Wastes arise from all operations in the beamhouse and tanyard as described previously, and from certain finishing operations. All

wastes, including 50% of the sanitary and domestic flow, are collected for treatment prior to discharge to the municipal sanitary sewer system.

Treatment includes screening, equalization, aeration and settling. Ozonators are provided to control odours and there are facilities for scum removal, sludge dewatering and sludge removal by tank truck for land disposal at the municipal disposal site.

A storage tank is provided to contain spent chrome tanning solution which is discharged to the treatment plant concurrently with the hairburn solutions which contain high concentrations of lime, sulphides and organic material.

A simplified flow sheet (Figure I) indicates the sequence of operations in the treatment plant.

Schedule of Operations

Since tanning is a batch process, there is no uniform flow to the waste treatment plant. The following schedules of operations for the tannery and the waste treatment plant are given to assist in correlation with the sampling programme and results of analysis.

TANNERY

Hour	Operation
0330	4 hairburn paddles drained 6 soak paddles drained* Spent chrome liquor discharged
0345	2 hairburn paddles drained
0400	all paddles and chrome liquor tank drained
0410	washing over of soak paddles commences

* No soaks are put in on Wednesdays or Thursdays. There is, therefore, no draining of soak paddles on Thursday and Friday morning. On these days operations commence at 0600.

Tannery (contd.)

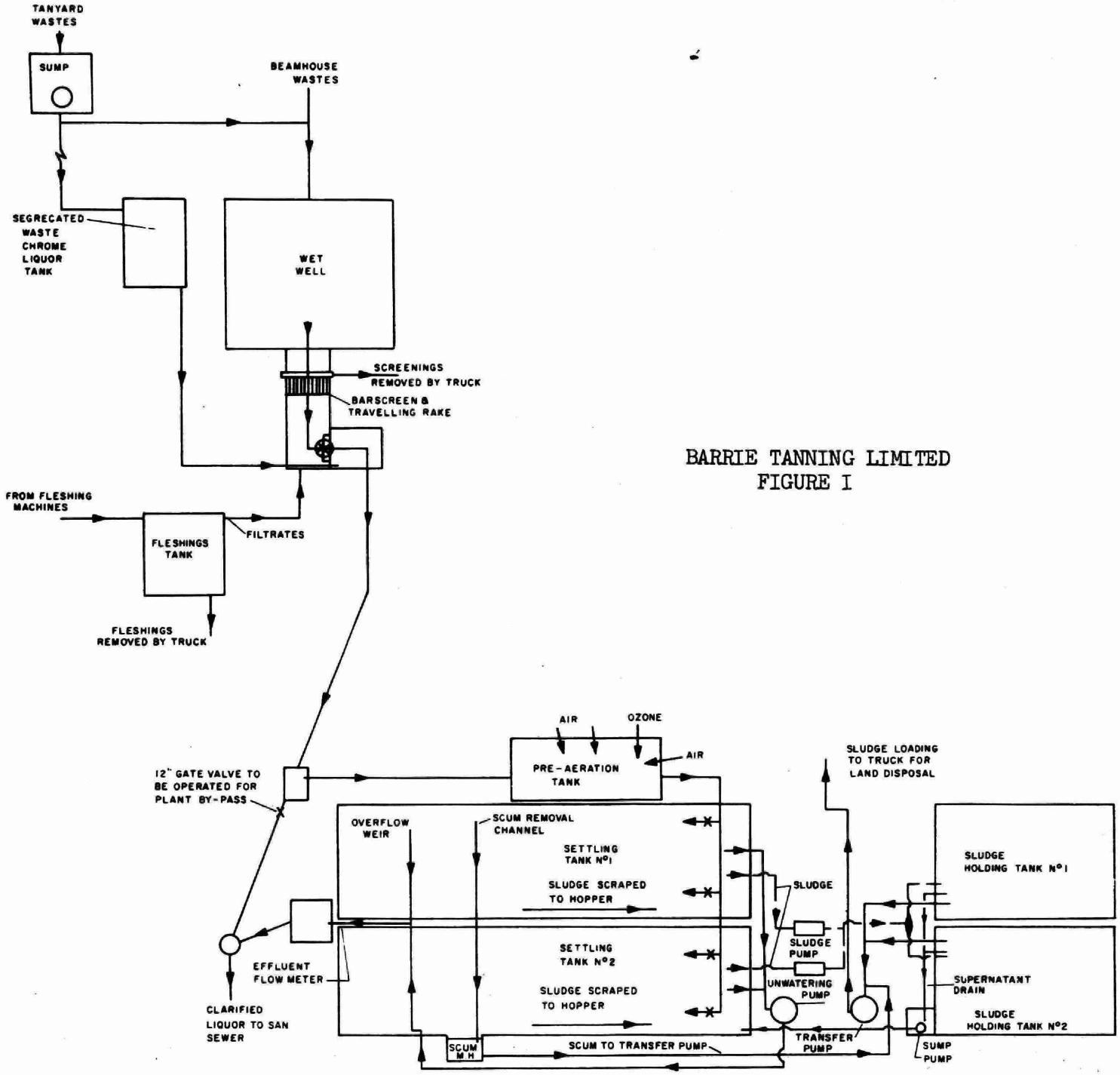
0600	soak paddles washed over washing over of hairburn paddles commences
0700	hairburn paddles washed over draining of 12 retan, colour and fatliquor drums commences
0800	retan, colour and fatliquor drums drained hairburn paddle draining commences (0800 - 1200 at approx. 45 minute intervals) Water flow from fleshing machines commences
0900	Washing of bating drums commences retan, colour and fatliquor drum draining commences (8 loads, finishing at 1600)
1015	Chrome tan liquor dumped to holding tank (3 packs)
1100	Chrome tan liquor dumped to holding tank (3 packs)
1500	fleshing machines flow ceases: last bating drum drained
1600	last retan, colour and fatliquor drum drained

WASTE TREATMENT PLANT

0330*	Settling tanks empty Tank #1 commences filling
0900⊕	Tank #1 filled Tank #2 commences filling
1330	Overflow to city sewer commences
1630	Overflow to city sewer ceases
2100	Unwatering pump started to discharge tank contents to city sewer
0300	Unwatering completed. Flow to city sewer ceases.

* 0600 on Thursdays and Fridays

⊕ 1100 on " "



BARRIE TANNING LIMITED
FIGURE I

Sampling and Analysis

A continuous sampling programme was conducted from 2100 hours on June 10 to 1630 hours on June 12.

Details of the sampling programme are shown in the following table:

SAMPLE	DATE	TIME	TYPE
Effluent to sanitary sewer	June 10	2115 - 0015	1/2 hr. comp.
" "	June 11	0045 - 0315	" "
Influent to W.T.P.	June 11	0020	grab
Spent chrome liquor	"	0100	"
Influent to W.T.P.	"	0400 - 0830	1/2 hr. comp.
" "	"	0900 - 1230	"
Effluent to san. sewer	"	1030 - 1200	1/2 hr. comp.
Influent to W.T.P.	"	0900	grab*
Effluent to san. sewer	"	1030	grab*
" "	"	1215	grab
" "	"	1300 - 1630	1/2 hr. comp.
Influent to W.T.P.	"	1330 - 1630	"
Effluent to san. sewer	"	2115 - 0015	"
" "	June 12	0045 - 0245	"
" "	June 11/12	2115 - 0245	1 hr. comp.*
Spent chrome liquor	June 12	0330	grab
Influent to W.T.P.	"	0545	grab
" "	"	0615	grab
" "	"	0630 - 1100	1 hr. comp.*
" "	"	0630 - 0930	1/2 hr. comp.
" "	"	1200 - 1600	1 hr. comp.*
" "	"	1000 - 1400	1/2 hr. comp.
Effluent to san. sewer	"	1400 - 1600	1 hr. comp.*
" "	"	1120 - 1630	1/2 hr. comp.
Influent to W.T.P.	"	1430 - 1630	1/2 hr. comp.

*Samples preserved with zinc acetate.

The samples were refrigerated until shipment to the OWRC laboratories for analysis. The analytical results are appended.

CALCULATION OF WASTE LOADINGS

The following waste loadings to the sanitary sewer system were calculated from the analytical results of the samples taken and from the waste volumes obtained from the flow recorder.

PERIOD	FLOW	BOD		SUSPENDED SOLIDS		DISSOLVED SOLIDS		TOTAL CHROMIUM		ETHER SOLUBLES	
	GALLONS	PPM	LBS	PPM	LBS	PPM	LBS	PPM	LBS	PPM	LBS
JUNE 10/11 2100 - 0015	55,000	1400	770	640	352	5940	3760	57	31	40	22
JUNE 11 0015 - 0330	44,000	1100	484	880	387	3810	1675	58	25	89	39
JUNE 11 1030 - 1200	43,000	1700	730	870	374	5760	2440	54	23	4	1
JUNE 11 1300 - 1630	38,000	1200	456	570	217	4510	1730	48	18	68	26
JUNE 11/12 2100 - 0015	53,000	1700	900	3560	1890	5080	2690	9.5	5	60	32
JUNE 12 0015 - 0330	43,000	1400	602	1010	435	3870	1760	7.0	3	65	28
JUNE 12 1120 - 1630	50,000	1500	750	980	490	4240	2120	13.0	6	103	52

The loadings for the complete processing day June 11/12 (0330-0330) are therefore;

Component	BOD	Suspended Solids	Dissolved Solids	Ether Solubles	Total Chromium
lbs.	2688	2916	8620	87	49

The total flow to the sewer over this period was 177,000 gallons.

WASTE TREATMENT PLANT EFFICIENCY

The waste treatment plant was designed to produce an effluent of a quality close to the limits contained in the City of Barrie By-law 66 - 69, in terms of BOD and suspended solids. Criteria used were;

	BOD (ppm)	SUSPENDED SOLIDS (ppm)
Influent	1200	1600
Effluent	300 (approx)	300 (approx)
Flow	175,000 gpd (approx)	
Flow rates	250 gpm (a.m.)	150 gpm (p.m.)

The approximate reductions in waste strength would then be 75% and 80%, BOD and suspended solids respectively.

Although the chemical characteristics of the influent to the plant were determined as part of the survey, it is difficult to relate these to the effluent characteristics in order to obtain efficiencies. The performance of the plant will therefore be compared with the design prediction in three ways:

1) Using the known effluent characteristics and the predicted efficiencies, theoretical influent characteristics may be calculated:

e.g. Flow rates 220 gpm (a.m.) 200 gpm (p.m.)

Flow 177,000 gpd

	BOD	SUSPENDED SOLIDS
Effluent	1500	1600
Efficiency	75%	80%
∴ Influent	6000	8000

From available literature it appears that a typical tannery raw waste has a BOD of 1000 - 1700 ppm and suspended solids concentration of 1300 - 2500 ppm and these figures demonstrate quite clearly that the influent characteristics calculated above are extraordinary. It can only be concluded that the treatment plant was achieving removals very much lower than those predicted.

2) Using the known effluent characteristics and the expected influent characteristics (obtained in a sampling programme carried out by the consulting engineer), theoretical efficiencies may be calculated:

	BOD (ppm)	SUSPENDED SOLIDS (ppm)
Influent	1200	1600
Effluent	1500	1600
Efficiency	-	0

(Flow and flow rates as in (1) above). Obviously, allowing for sampling and analytical error, the influent and effluent characteristics are equivalent and either the plant was achieving no treatment or the expected influent strengths are wrong.

3) Using the known effluent characteristics and influent characteristics derived* from the results of the survey, efficiencies may be calculated:

*Averages of all samples taken, with consideration being given to relative volumes (estimated).

	BOD	SUSPENDED SOLIDS
Influent	1800	1950
Effluent	1500	1600
Efficiency	16.7%	18%

(Flow rates as in(1) above)

Flows: Day I 175,000 gallons,
Day II 140,000 gallons.

It is interesting to note that the ratio of percentage removals SUSPENDED SOLIDS:BOD in this case is the same as that of the removals predicted by the consulting engineer.

DISCUSSION OF FINDINGS

The waste treatment plant operates partly on a fill and draw basis and partly on a continuous basis. Also, while some operating functions are under automatic control, others require manual control. For example, unwatering, air supply and sludge scraping and pumping are automatic, but influent deployment, sludge supernatant decantation and scum removal are achieved manually.

These factors, together with the batch nature of the tannery operations, preclude steady state functioning of the waste treatment plant and render it difficult to obtain highly accurate data. The calculation of the treatment plant efficiency should not therefore be taken as a definitive statement, but rather as a performance indicator.

Operation of the treatment plant may most conveniently be discussed in conjunction with the design considerations submitted by the

consulting engineer in June 1968, under the following headings:

1) Quantities of Waste

Design of the plant was based on production of five packs per day with a waste flow of some 175,000 gallons. During the survey, production was six packs per day but waste flow did not appear to have risen in proportion. The flow was found to be approximately 177,000 gallons.

Flow rates were estimated for design purposes to be 250 gpm in the morning and 150 gpm in the afternoon. At the time of the survey, these figures were estimated to be 220 and 200 gpm respectively. A peak flow of 300 - 400 gpm was expected at 0700, but this was not observed during the survey. However, a peak flow of some 500 gpm was encountered at noon.

2) Characteristics of Waste

Average influent waste strength was expected to be 1200 ppm BOD and 1600 ppm suspended solids. Averages found during the survey were, BOD > 1500 ppm and suspended solids approximately 2000 ppm. The highest BOD and suspended solids occurred in the early morning, as expected, but the afternoon flow was not found to be substantially weaker as stated by the consulting engineer.

The pH range over the period 0630 - 1630 was found to be 5.9 - 8.4 and was as high as 11.7 during dumping of the hairburn solution.

In the concentration of chromium, an inexplicable difference was found between the two days of the survey. On the first day the chromium

content of the waste ranged from 185 ppm to 52 ppm, but on the second day the range was from 13.4 to 8.0. The only processing difference between the two days was that on the second day no soaks were discharged. This would not, however, affect the chromium content in the manner found.

Grease content, as indicated by the ether solubles determinations, varied widely over the two days, ranging from 82 to 263 ppm.

The concentration of sulphide (not considered in plant design) in the waste appears to be higher in the morning than in the afternoon (87.5 vs. 25 ppm), and this is to be expected from the schedule of operations in the beamhouse.

3) Sizing of settling tanks

The settling tanks are sized so that one tank alone may be utilised for the first 3 to 4 hours of flow and then be allowed to stand for the next four hours while the other tank is filling. Therefore, the first tank has a period of four hours quiescent settling and tests on the morning waste had shown that two hours quiescent settling gave approximately 70% reduction in BOD and 88% removal of suspended solids. Tests on samples taken after 0700 showed that four hours quiescent settling gave 62% and 70% removal of BOD and suspended solids respectively.

From these figures, therefore, it would be expected that the discharge to the sewer would exhibit a marked reduction in BOD and suspended solids when compared with the influent to the plant. The figures obtained from the survey, however, show that the average suspended solids and BOD removals were less than 20%. In addition, the waste in the settling tanks

at the cessation of tannery operations at approximately 1630 are allowed to settle quiescently until 2100, a period of some four hours. Removals over this period were negative, apparently indicating an increase in BOD and suspended solids. This is not possible (since the dissolved solids content of the effluent was also greater) and this result must therefore be in error. However, the analytical results were checked and found to be correct, as was the sampling procedure, and it must be concluded that the small indicated increase is due to inherent deficiencies in the sampling and analytical techniques. It is obvious, however, that there was little or no reduction in BOD or suspended solids during this settling period.

From the calculations contained in the section WASTE TREATMENT PLANT EFFICIENCY, it is quite certain that this treatment plant was not operating with predicted efficiency. Two inter-related factors appear to be responsible for the poor performance,

1) influent waste strength greater than expected, and

2) overestimation of the capacity of the plant to treat the waste.

It is felt that the first contributes only slightly to the problem, since a calculation using influent characteristics indicated by the OWRC survey and the removals predicted by the consulting engineer indicates an effluent with BOD approximately 450 ppm and suspended solids approximately 400 ppm, only 25 - 30% of the actual effluent values, but close to the design concentrations.

The second factor is therefore much more significant and the reason for this overestimation may be errors either in the interpretation of results of settling tests or in the calculation of detention times in the waste treatment plant, or both. In an attempt to define the source of error more exactly, a test was carried out in which dye was introduced into the waste treatment plant influent and the time interval until the appearance of colour in the effluent was observed. The detention time was found to be less than one hour, which is far short of the design consideration.

During the period of the survey, it was noted that, for the most part, the plant was being operated according to the consulting engineer's instruction manual. There were, however, occasions when the influent was not promptly switched to the second settling tank upon the first becoming full, thereby allowing an effluent to discharge to the sewer contrary to operating procedures. On one occasion it was noted that upon filling the first settling tank, the wastes in that tank were allowed to flow to the second tank until the levels were equal. Both tanks were then filled simultaneously, again contrary to operating procedures.

CONCLUSIONS

At the time of this survey, the waste treatment plant was operating much below design predictions and was producing an effluent which did not comply with the terms of By-law 66-69, with respect to the concentrations of BOD, suspended solids and chromium, and the presence of sulphur

compounds in concentrations sufficient to cause an offensive odour.

The daily loadings to the sanitary sewer were found to be;

COMPONENT	LBS
BOD	2688
Suspended Solids	2916
Dissolved Solids	8620
Ether Solubles	87
Chromium	49

with a hydraulic loading of 177,000 gallons.

RECOMMENDATIONS

It is recommended that;

1) The waste treatment plant be re-designed, modified, extended or otherwise altered to allow treatment sufficient to produce an acceptable effluent.

2) The settling characteristics of the influent to the waste treatment plant be re-evaluated.

3) Operating procedures be strictly followed at all times.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTES

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Barrie **Report to:** N. Gillies * **c.c.** (rd)

Source: Barrie Tanning Ltd.

Date Sampled: June 11/69 **by:** G. Yuzwa & N. Gillies

Lab. No.	pH at Lab.	B.O.D.	SOLIDS Tot.	SOLIDS Susp.	SOLIDS Diss.	Total Chromium as Cr.	Ether Solubles	Calcium If Sufficient Sample	Sulfide as H_2S
T-1072	6.8	1400	6580	640	5940	57.	40	204	-- **
T-1073	6.6	1100	4690	880	3810	58.	89	160	---
T-1074	6.8	1100	3260	225	3035	13.1	38	140	---
T-1075	3.4	3400	60000	8000	52000	2200	53	* trace < 1 ppm	---
T-1076	8.4	2600	10530	2320	8210	75.	0	280	---
T-1077	6.4	1400	7880	2210	5670	185.	127	176	---
T-1078	6.4	1700	6540	870	5670	54.	4	196	---
T-1079	---	---	---	---	---	75.	---	---	50.

* done on filt. sample

** Broken in lab. accident.

T-1072	1.	Effluent to Sanitary Sewer (21:15 - 00:15) - 2
T-1073	2.	Effluent to Sanitary Sewer (00:45 - 03:15) - 2
T-1074	3.	Grab plant eff. to settling tank (00:20) - 1
T-1075	4.	Grab spent chrome liquor (01:00) - 1
T-1076	5.	Influent to Waste Treatment Plant (0400 - 08:30) - 2
T-1077	6.	Influent to waste treatment plant (09:00 - 12:30) - 2
T-1078	7.	Effluent to Sanitary Sewer (10:30 - 12:00) - 2
T-1079	8.	Influent to Waste Treatment Plant (09:00) preserved @ Zinc Acetate - 1

SM-60-12969

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Barrie **Report to:** N. Gillies **c.c.** (rd)

Source: Barrie Tanning Ltd.

Date Sampled: June 11/69 **by:** G.Y. & N.G.

Lab. No.	5-Day B.O.D.	Solids			Total Chromium as Cr.	Ether Solubles	Calcium as Ca If Sufficient Sample	Sulphide as H_2S	pH at Lab.				
		Total	Susp.	Diss.									
T-1080	---	---	---	---	43.	---	---	75.	---				
T-1081	2000	7770	2400	5370	135.	257	172	---	6.1				
T-1082	1200	5080	570	4510	48.	68	172	---	6.2				
T-1083	1500	5150	1570	3580	52.0	152	164	---	5.9				

T-1080	9.	Effluent to Sanitary Sewer (10:30) Preserved with Zinc Acetate - 1.
T-1081	10.	Effluent to Sanitary Sewer - Grab (12:15) - 1
T-1082	11.	Effluent to Sanitary Sewer (13:00 - 16:30) - 2.
T-1083	12.	Influent to Waste Treatment Plant (13:30 - 16:30) - 2.

- 40 -

5M-60-11403-65

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Barrie Report to: N. Gillies * c.c. (rd)

Source: Barrie Tanning Ltd.

Date Sampled: June 12/69 by: G. Yuzwa & N. Gillies

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	Total Chromium as Cr.	Ether Solubles	Chloride as Cl.	Calcium if suff. sample	Sulphide as H_2S
		Total	Susp.	Diss.						
T-1089	1700	8640	3560	5080	7.6	9.5	60	2912	153.	---
T-1090	1400	4880	1010	3870	6.8	7.0	65	1283	98.	---
T-1091	---	---	---	---	---	---	---	---	---	100.
T-1092	2000	69500	28300	41200	3.0	1150	940	12000	*	---
T-1093	5000	16770	6520	10250	10.9	140	410	4380	523.	---
T-1094	7000	29580	10540	19040	11.7	240	413	7620	1020.	---
T-1095	---	---	---	---	---	---	---	---	---	87.5
T-1096	2000	8140	2780	5360	7.3	13.4	263	1860	173.	---

* Sample Exhausted.

T-1089	13.	Effluent to Sanitary Sewer (2115 - 0015) June 11, 12 - 2.
T-1090	14.	Effluent to Sanitary Sewer (0045 - 0245) June 12 - 2.
T-1091	15	Effluent to Sanitary Sewer (2115 - 0245) June 11, 12 - 1.
T-1092	16.	Spent Chrome Liquor Grab (0330) June 12 - 1.
T-1093	17.	Influent to Waste Treatment Plant (Grab) (0545) June 12 - 1.
T-1094	18.	Influent to Waste Treatment Plant (Grab) (0615) June 12 - 1.
T-1095	19.	Influent to Waste Treatment Plant (0630 - 1100) June 12 - 1.
T-1096	20.	Influent to Waste Treatment Plant (0630 - 0930) June 12. 2.

5M 60—1311

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Barrie **Report to:** N. Gillies * **c.c.** (rd)

Source: Barrie Tanning Ltd.

Date Sampled: June 12/69 **by:** G. Yuzwa & N. Gillies

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	Total Chromium as Cr.	Ether Solubles	Chloride as Cl.	Calcium as Ca.	Sulphide as H_2S			
		Total	Susp.	Diss.									
T-1097	---	---	---	---	---	---	---	---	---	25.			
T-1098	1700	4830	1300	3530	6.6	8.0	82	937	91.	---			
T-1099	---	---	---	---	---	---	---	---	---	25.			
T-1100	1500	5220	980	4240	6.5	13.0	103	1264	100.	---			
T-1101	---	67600	---*	---*	---	1750	---	---	---	---			
T-1102	850	4040	1170	2870	6.5	10.0	151	708	78.5	---			

* Test could not be performed because of the nature of the suspended matter.

T-1097	21.	Influent to Waste Treatment Plant (1200 - 1600) June 12 - 1
T-1098	22.	Influent to Waste Treatment Plant (1000 - 1400) June 12 - 2.
T-1099	23.	Waste treatment plant Effluent (1400 - 1600) June 12 - 1.
T-1100	24.	Waste treatment plant Effluent (1120 - 1630) June 12 - 2.
T-1101	25.	Sludge (June 12) - 1.
T-1102	26.	Waste treatment plant Influent (1430 - 1630) June 12 - 2.

5M-60-11403-65

CANADIAN GENERAL ELECTRIC COMPANY LIMITED

This plant, located on Bradford Street, was surveyed on June 4 and 5, 1969.

DETAILS OF SURVEY

Personnel Interviewed

Mr. D. Shurtleff - Facilities Engineer

Mr. J. Coleman - Lab Technician

Personnel Participating

G. Yuzwa - OWRC

Description of Process

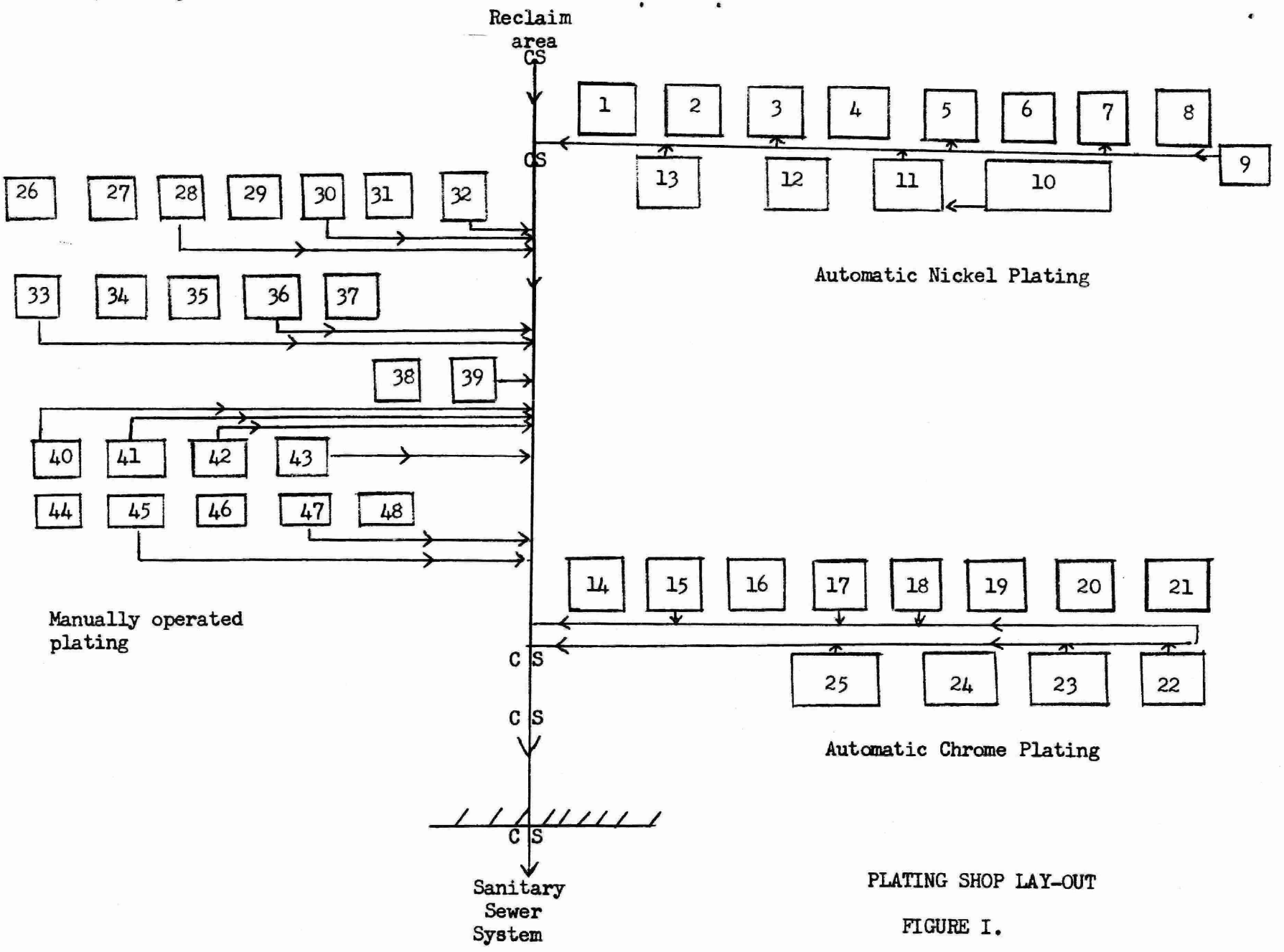
Outer shells for small kitchen appliances are fabricated from steel, aluminum, brass or copper and are plated with nickel or chromium as required. The flow through the automatic plating shop is illustrated in figure I and Table I, II, III, IV and V. Any parts which do not pass plating inspection are directed to the stripping area where the metal coating is removed. These parts are then directed back to the automatic plating line. Small parts such as brackets and bolts are plated in the manual plating area. The final products are small electric kitchen appliances such as electric toasters, kettles, irons, etc.

Operating Data

Employees - 900

Hours/day - 16

Days/week - 5



CS = composite sample

PLATING SHOP LAY-OUT

FIGURE I.

TABLE I

PROCESS SEQUENCE

NICKEL PLATING (Refer to Figure I)

STATION	OPERATION
1.	Alkali cleaner
2.	Spray wash (recirculated)
3.	Water rinse
4.	Acid tank - sulphamic fluoride
5.	Water rinse
6.	Electrical reverse anode clean
7.	Water rinse
8.	Acid tank - sulphamic fluoride
9.	Water rinse
10.	Nickel plating solution ($NiSO_4$, NiCl - cleaned and recirculated)
11.	Water rinse
12.	Water rinse
13.	Soap rinse

TABLE IA

PROCESS SEQUENCE

NICKEL PLATING (Refer to Figure I)

STATION	OPERATION
38.	Barrel nickel plating solution
39.	Water rinse

TABLE II

PROCESS SEQUENCE

CHROMIUM PLATING (refer to Figure I)

STATION	OPERATION
14.	Electrical reverse anode cleaner
15.	Water rinse
16.	10% H_2SO_4
17.	Water rinse (aeration)
18.	Water rinse
19.	Chromic acid plating bath
20.	Water rinse
21.	Water spray
22.	Water spray
23.	Water rinse (aeration)
24.	Water rinse (aeration)
25.	Hot soap rinse

TABLE IIA

PROCESS SEQUENCE

CHROMIUM PLATING (refer to Figure I)

STATION	OPERATION
33.	Water bath
34.	1/2% HNO_3
35.	Chromate
36.	Water rinse
37.	Hot water rinse

TABLE III

PROCESS SEQUENCE

ZINC PLATING (Refer to Figure I)

STATION	OPERATION
26.	Trichloroethylene degreaser
27.	Hot alkali cleaner
28.	Water rinse
29.	50% muriatic acid
30.	Water rinse
31.	Electrolytic zinc bath
32.	Perchloron rinse

TABLE IV

PROCESS SEQUENCE

BRIGHT DIP (Refer to Figure I)

STATION	OPERATION
40.	HNO_3 - H_2SO_4 solution
41.	Water rinse
42.	Water rinse
43.	Soap rinse

TABLE V

PROCESS SEQUENCE

ELECTROLESS NICKEL PLATING (Refer to Figure I)

STATION	OPERATION
44.	Alkali clean
45.	Water rinse
46.	Water rinse
47.	Water rinse
48.	Nickel plating solution (sodium hypophosphite + dil. $NiCl_2$)

Production Data

Small electric kitchen appliances - 1.75 million units per year

Water Consumption and Distribution

Distribution	Consumption (imp.gal/day)
Plating Shop	194,000
Coolant, boiler make-up	212,000
Domestic	18,000
Total	424,000

Sources of Liquid Wastes, Treatment and Disposal

Coolant for degreasers, welders and compressors as well as the boiler blowdown are directed to the storm ditch located on the south side of the plant.

All chrome and nickel plating wastes from the plating shop are directed to the municipal sanitary sewer system. The exact origin of these wastes is shown in Figure I.

All domestic wastes are directed to the municipal sanitary sewer system.

Sampling

Five-hour duplicate, composite, daily samples of all plating wastes and the total plant effluent were collected over a two day period. The sampling stations are shown in Figure I. A grab sample was collected at the point of cooling water and boiler blowdown discharge to the ditch, as oil contamination has occurred in this area.

All samples collected were submitted to the OWRC Laboratories for analysis.

Analysis

The in-plant samples were analysed for pH, nickel, chromium, solids and zinc. One of the duplicate samples from each station was preserved with NaOH and analysed for cyanide. The sample collected from the storm ditch was analysed for ether solubles. The analytical results of these samples are appended.

WASTE LOADINGS

Based on a total plant effluent of 212,000 gallons/day to the municipal sanitary sewer system, waste loadings were calculated and are shown below:

PARAMETERS	WASTE LOADING (lb/day)
Cyanide as HCN	0.3
Zinc as Zn	0.4
Suspended solids	31.8
Total solids	2180
Nickel as Ni	235
Hex. chromium as Cr	8.5
Total chromium as Cr	9.8

DISCUSSION OF FINDINGS

It is apparent that the level of contaminants in the effluent from C.G.E. is not in compliance with the City of Barrie By-Law 66-69.

The components of the waste present in excessive concentration are;

PARAMETERS	PLANT EFFLUENT TO SANITARY SEWER SYSTEM (ppm)	CITY OF BARRIE BY-LAW LIMITS FOR DISCHARGE TO A SANITARY SEWER SYSTEM (ppm)
Nickel as Ni	111	5
Total Chromium as Cr	4.6	3

The increases in nickel concentration may be illustrated as follows;

LOCATION	AVERAGE NICKEL CONCENTRATIONS (ppm)
Reclaim line rinse	0.26
After automatic nickel plating line	11.2
After manually operated plating line	64
Plant effluent to sanitary sewer system	122

The difference between the nickel concentrations in the samples taken after the manually operated plating line and those taken of the plant effluent to the sanitary sewer is inexplicable considering the operations carried out between these sampling points. It can only be assumed that sampling or analytical error is responsible for the discrepancy. It would be expected that the concentration of nickel would decrease between these two stations due to dilution by the flow from the chromium plating line.

The increases in total chromium concentration are illustrated below:

LOCATION	AVERAGE TOTAL CHROMIUM CONCENTRATION (ppm)
Reclaim line rinse	8.2
After automatic nickel plating line	1.15
After manually operated plating line	1.09
After automatic chrome plating line	5.5
Plant effluent to sanitary sewer	4.4

These results show the expected pattern of increase at each sampling point.

The analytical results of the samples taken from the perchloron tank indicate that there was sufficient chlorine present to oxidize the cyanide and that the pH condition was suitable, but the high concentration of cyanide found shows that oxidation was not being achieved. Since the tank was well mixed before sampling, it must be assumed that some cyanide was present as a complex, probably with iron, or that nickel was present in the solution.

CONCLUSIONS

Based on the results of the survey, it is obvious that adequate still rinsing was not being achieved.

Compressor cooling water which was being discharged to the ditch contained oil and was therefore unsatisfactory for discharge.

Destruction of cyanide was not being achieved in the perchloron tank, although conditions were apparently suitable for the reaction.

RECOMMENDATIONS

It is recommended that:

1) A fog spray rinse tank be installed between stations 10 and 11 (Figure I). This tank should be run empty and the accumulated contents should be returned to the plating bath as often as necessary. Similarly, a fog spray rinse between stations 19 and 20 (Figure I) would prevent chrome wastes from being washed to the sewer. Better operating procedures are also recommended in the manually operated plating area to prevent solutions from going to the floor drains after each drag out station.

   As an alternative to (or in addition to) the above, treatment facilities for the nickel and chrome wastes are recommended.

2) Before the addition of perchloron at station 32 (Figure I), this solution should be well stirred when caustic is added and a pH of approximately 11 should be maintained. Vigorous stirring should accompany the addition of perchloron to prevent precipitation of cyanide salts and incomplete oxidation of the cyanide.

3) the boiler blowdown should be directed to the municipal sanitary sewer system.

4) oil traps be installed in the cooling water effluent lines.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

1 p.p.m. = 1 mgm. / litre
= 1 lb./100,000 Imp. Gals.

Municipality: Barrie **Report to:** G. Yuzwa * **c.c.** (rd)

Source: Canadian General Electric

Date Sampled: June 4/69 **by:** G. Yuzwa

Lab. No.	5-Day B.O.D.	Solids			Ether Solubles	pH at Lab.	Free Chlorine	Cyanide as HCN	Zinc as Zn.	Chromium as Cr.		Nickel as Ni.
		Total	Susp.	Diss.						Tot.	Hex.	
T- 999		---	---	---	trace **	---	---	---	---	---	---	---
T-1000		---	3900	---	---	12.4	3000	138.*	260	---	---	---
T-1001		940	20	920	---	8.4	---	---	0.18	4.7	4.0	160
T-1002		1090	90	1000	---	8.1	---	---	0.13	4.6	2.4	191
T-1003		---	---	---	---	---	---	0.08*	---	---	---	---
T-1004		---	---	---	---	---	---	0.14*	---	---	---	---

* Test performed on preserved sample. ** less than 2 ppm

T- 999	1.	Drainage Ditch Adjacent to Plant.
T-1000	2.	Perchloron Tank.
T-1001	3.	Plant Effluent to Sanitary Sewer.
T-1002	4.	Nickel Line Effluent.
T-1003	5.	Zinc Line Rinse.
T-1004	6.	Final Effluent.

10M-60-22690

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Barrie Report to: G. Yuzwa c.c.

Source: Canadian General Electric

Date Sampled: June 5/69 by: G. Yuzwa

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	Cyanide as HCN	Nickel as Ni.	Chromium as Cr.		Zinc as Zn.			
		Total	Susp.	Diss.				Tot.	Hex.				
T-990		1120	10	1110	6.8	—	83.5	4.40	4.0	0.18			
T-991		—	—	—	—	0.14*	—	—	—	—			
T-992		340	5	335	7.1	—	4.2	5.55	5.1	0.18			
T-993		—	—	—	—	0.06	—	—	—	—			
T-994		4180	310	3870	12.6	—	64.	1.09	0.70	0.15			
T-995		—	—	—	—	0.10	—	—	—	—			
T-996		390	10	380	9.6	—	11.20	1.15	0.75	0.06			
T-997		440	10	430	4.0	—	0.30	8.2	5.7	0.28			

*Test performed on preserved sample.

T-990	1.	Plant Effluent to Sanitary Sewer
T-991	2.	Plant Effluent to Sanitary Sewer
T-992	3.	Final Effluent
T-993	4.	Final Effluent
T-994	5.	Zinc Line Rinse
T-995	6.	Zinc Line Rinse
T-996	7.	Nickel Line Effluent.
T-997	8.	Reclaim Line Rinse.

5M 60—1311

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Barrie **Report to:** G. Yuzwa * **c.c.** (rd)

Source: Canadian General Electric

Date Sampled: June 5/69 **by:** G. Yuzwa

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	Cyanide as HCN	Nickel as Ni.	Chromium as Cr.		Zinc as Zn.			
		Total	Susp.	Diss.				Tot.	Hex.				
T-998		---	---	---	---	1.5*	0.23	9.4	7.3	0.25			

* Test performed on preserved sample.

T-998	9. Reclaim line rinse.

10M-60-22690

CANADIAN TYLER REFRIGERATION LIMITED
UNIVERSAL COOLER DIVISION

This plant, located on Patterson Road, was surveyed on June 4, 1969.

DETAILS OF SURVEY

Personnel Interviewed

Mr. Walker - Plant Manager

Personnel Participating

P. Chisholm - OWRC

Description of Process

This company is engaged in the manufacture of freezers and refrigerators. The cabinets, fabricated from sheet steel, are washed in a detergent solution, rinsed and bonderised. They are then spray painted and sent to assembly. Coolant lines and coils are fabricated from copper tube and installed in the finished cabinets together with other mechanical and electrical components.

Operating Data

This plant employs 115 persons and operates one shift, five days per week.

Water Consumption and Distribution

All water used is drawn from the municipal supply. Consumption figures over the last six months are;

October, November	-	1,247,000 Imperial gallons
December, January	-	1,196,000 " "
February, March	-	1,199,000 " "

or approximately 27,300 gallons per day

In the manufacturing area, water is used as spot welder coolant, in air conditioners, in washing tanks and in the paint spraying area.

Sources and Characteristics of Liquid Wastes, Treatment and Disposal

There are four sources of waste in the plant.

(a) In the paint spraying booth a strong, downward draught of air carries excess paint droplets down to a water reservoir where they form a skin on the surface of the water. The water is occasionally agitated forming a slurry. Every Friday afternoon this water trap, containing 1800 gallons (Imperial) is emptied and directed to the sanitary sewer. Analysis of a sample of these wastes gave the following results:

BOD (ppm)	SUSPENDED SOLIDS (ppm)	pH
500	1000	7.4

This grab sample was taken on a Wednesday. It was ascertained that production did not vary from day to day. As there would be a further build-up of pollutants before the tank was emptied, these figures should be increased proportionally, i.e. by a factor of $^5/_3$.

The characteristics would then become;

BOD (ppm)	SUSPENDED SOLIDS (ppm)	pH
830	1665	7.4

Therefore loading (weekly)of wastes to the sanitary sewer would be;

(i) BOD

830 lbs. BOD = 1,000,000 lbs. H_2O

x lbs. BOD = 18,000 lbs H_2O

$$x = \frac{18,000 \times 830}{1,000,000}$$

$$= 14.86 \text{ lbs}$$

(ii) Suspended Solids

1665 lbs. suspended solids in 1,000,000 lbs H_2O

x lbs. suspended solids in 18,000 lbs H_2O

$$\therefore x = \frac{18,000 \times 1665}{1,000,000}$$

$$= 29.8 \text{ lbs}$$

(b) The other sources of wastes are in the section of the assembly line where refrigerator parts are first washed and rinsed with water, then dipped in a phosphate solution to prepare them for painting. This phosphate skin affords the paint better adhesion to the metal surface. A grab sample of the initial "Foskleen" wash solution was analysed with the following results;

BOD (PPM)	SOLIDS (PPM)			PH	ANIONIC DETERGENT AS ABS (PPM)
	SUSP.	DISS.	TOTAL		
120	75	3525	3600	4.9	200

This tank, containing 1373 gallons of waste is emptied to the sanitary sewers every three weeks. The above was sampled one week after the tank was last emptied. Therefore, these figures are not representative of what is being discharged to the sewer. A slightly increased BOD would be expected, the pH would be relatively unchanged, the solids would be trebled while ABS figures would be reduced. Therefore, possible results of "Foskleen" effluent after a full, three week period may be;

BOD (PPM)	SOLIDS (PPM)			pH	ANIONIC DETERGENT AS ABS (PPM)
	SUSP.	DISS.	TOTAL		
150	225	10,575	10,800	4.9	150

The BOD concentration is acceptable, but as would be expected in a soap solution, solids are high as is the concentration of anionic detergent. The pH of the waste, at 4.9, is low and should be buffered to bring it within by-law specifications.

After the "Foskleen" wash, the refrigerator parts are rinsed in a water bath. This bath, capacity 750 Imperial gallons, is emptied every Friday afternoon to the sanitary sewer. Analysis of a grab sample of the rinse water sample gave the following results;

BOD (PPM)	SOLIDS (PPM)			pH	ANIONIC DETERGENT AS ABS (PPM)
	SUSP.	DISS.	TOTAL		
3	5	295	300	7.4	0.7

Allowing for further contamination of rinse waters between Wednesday and Friday, the waste characteristics would still be well within by-law limits.

Following the water rinse, the parts then pass through a "Rinseal" phosphate wash tank, capacity 750 Imperial gallons. This tank is emptied every Friday to the sanitary sewer. Analytical results of "Rinseal" wash sampled on a Wednesday were;

BOD (PPM)	COD (PPM)	PH	SOLIDS (PPM)			PHOSPHATE AS P (PPM)
			SUSP.	DISS.	TOTAL	
No Result (Interference)	0	6.3	5	675	680	47.5

Again allowing for an increase of these figures due to two days extra washing before the tank is emptied, these results are satisfactory and within by-law limits. Though there are no objectives for phosphate, a note should be made of the relatively high phosphate result of 47.5 ppm (79 ppm over a five day period).

No treatment is given to the wastes and disposal is to the municipal sanitary sewer system.

DISCUSSION OF FINDINGS

The paint booth reservoir contents were found to be in excess of the by-law limits with respect to the concentrations of BOD and suspended solids, as was the case with the "Foskleen" wash solution. The other wastes were within the by-law limits, although in the case

of the "Rinseal" wash solution, no BOD concentration could be obtained due to analytical interference.

The volumes of the unsatisfactory discharges are relatively small and the contaminating materials are readily treatable in the municipal plant. There should therefore be no adverse effect on the efficiency of treatment due to the discharge of these wastes.

CONCLUSIONS

The BOD and suspended solids concentrations of certain waste discharges from this plant exceed the by-law limits. These, however, are batch discharges of small volume and should present no problems at the municipal treatment plant.

RECOMMENDATIONS

It is recommended that the company equip solution tank discharge pipes with a mechanism to ensure that the solutions are bled to the sewer slowly, thereby avoiding surges of high strength wastes in the effluent.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Barrie **Report to:** H. Gillies **c.c.**

Canadian Tyler Refrigeration Ltd.

Source: Universal Cooler Division

Date Sampled: June 4/69 **by:** P.Chisholm (rj)

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	COD	Phosphate as P	Anionic Detergent as ABS					
		Total	Susp.	Diss.									
T-955	500	1200	1000	200	7.4	3130	---	---					
T-956	3.0	300	5	295	7.4	31	---	0.7					
T-957	120	3600	75	3525	4.9	4800	---	220					
T-958	**	680	5	675	6.3	0	47.5	---					

** Interference inhibits analysis

T-955	1	Effluent to Sanitary Sewer from paint spray operation - 2.15 PM
T-956	2	" " " " " wash water tank - 2.25 PM
T-957	3	" " " " " "Foskleen wash" - 2.30 PM
T-958	4	" " " " " "Rinseal" Phosphate wash - 2.20 PM

5M-60-11403-65

CANADYLET-CLOSURES LIMITED

This plant, located on John Street, was surveyed on June 5, 1969.

DETAILS OF SURVEY

Personnel Interviewed

Mr. E. Elsworth - Plant Supervisor
Mr. C. Bradshaw - Plating Shop Foreman

Personnel Participating

G. Yuzwa - OWRC

Description of Process (Figures I and II and Tables I, II and III)

The raw materials used in the process consist of ABS and polypropylene plastics, brass, and tin coated steel. The metals, as received, proceed to the eyelet department where they are punched and formed. This unfinished product and various parts already formed are sent to the plating shop where they are electroplated with silver or brass. The sequence of operations in this area is shown in Figure II and Tables I, II and III. After being plated, these parts are buffed, inspected, lacquered and sent to the assembly line or to stores. The plastics are moulded and also sent to the assembly line or to stores. The finished product is then ready for distribution.

Production Data

cosmetic containers - no figures available

Operating Data

Employees	130 (days)
	25 (afternoons)
	4 (midnights)
Days/week	5

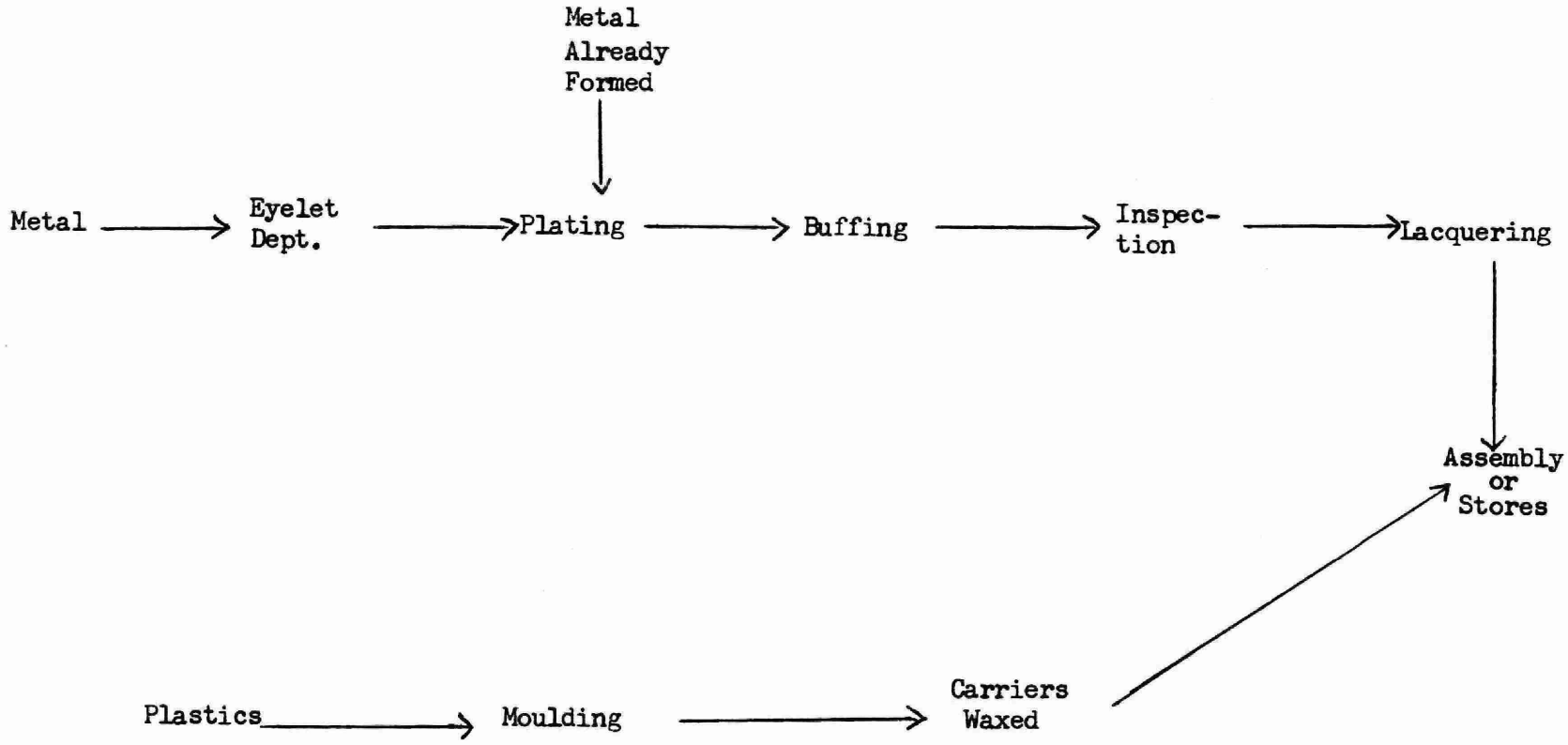


FIGURE I

PRODUCTION FLOW DIAGRAM

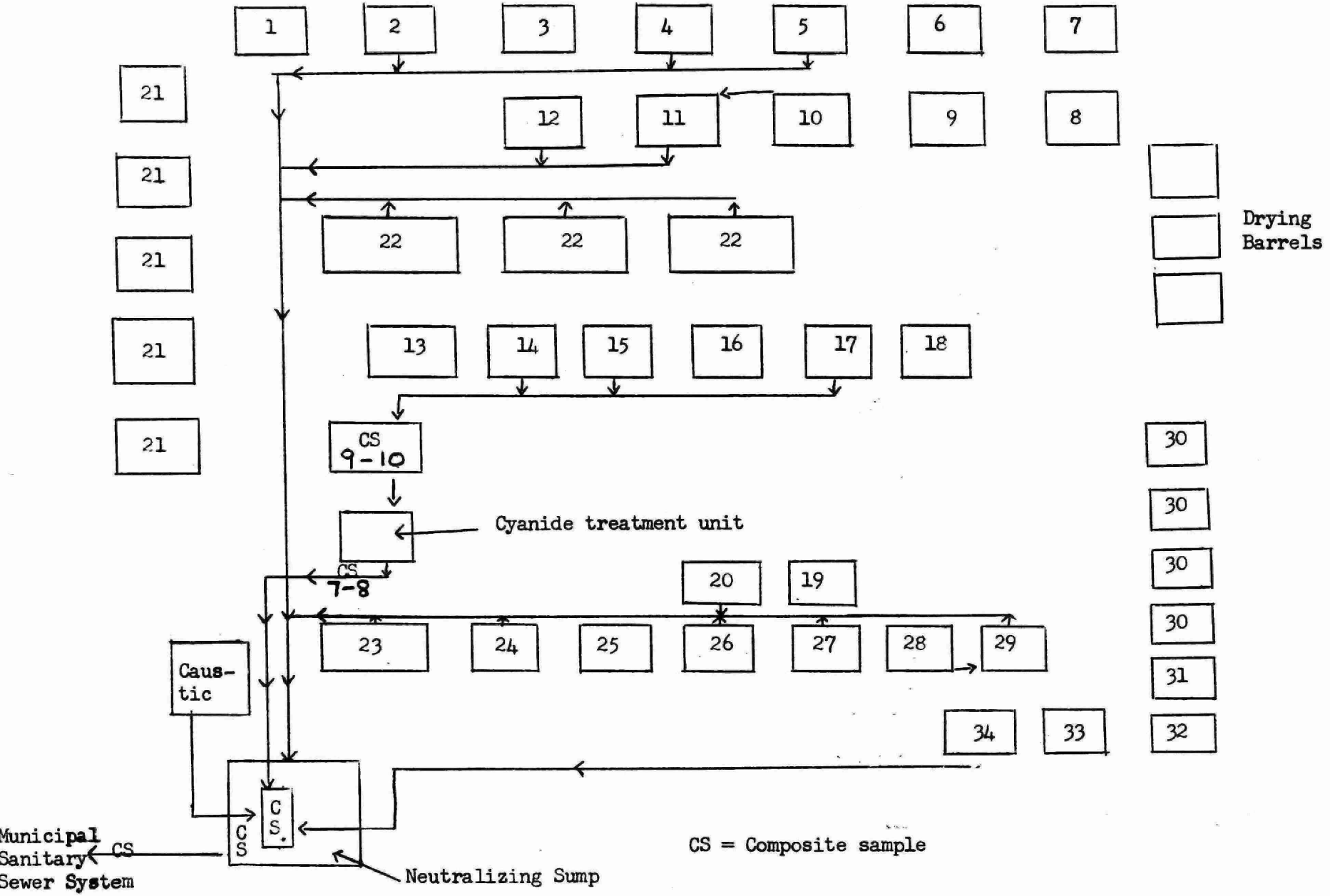


FIGURE II

PLATING SHOP LAYOUT

TABLE I

PROCESS SEQUENCE

SILVER PLATING (Refer to Figure II)

1. Alkaline electro-cleaning
2. Water rinse
3. 10% muriatic pickle
4. Cold water rinse
5. Cold water rinse
6. 10% KCN rinse
7. Silver plating solution) 5.5 oz/gal KCN
8. Silver plating solution) 3 oz/gal AgCN
9. Drag-out
10. Cold water rinse
11. Cold water rinse
12. Hot water rinse

TABLE II

PROCESS SEQUENCE

BRASS PLATING (Refer to Figure II)

13. 10% Muriatic pickle

14. Cold water rinse

15. Cold water rinse

16. Zinc plating tank

17. Cold water rinse

18. Zinc plating tank) 5.5 oz/gal. NaCN
) 4.5 oz/gal. $CuCN_2$
19. Zinc plating tank) 0.7 oz/gal. ZnC

20. Cold water rinse

21. Tumbling barrels (6 oz. grinding compound)
(3 oz. Na_2CO_3)
water

22. Burnishing barrels

TABLE III

PROCESS SEQUENCE

BRIGHT DIP (Refer to Figure II)

23. Water cooled bright dip (4 gal. H_2SO_4)
(1 gal. HNO_3)
(4 oz. muriatic acid)

24. Cold water rinse

25. 10% NaCN

26. Cold water rinse

27. Cold water rinse

28. Hot water rinse

29. Hot water rinse

POLYPROPYLENE PLASTIC STRIP (Refer to Figure II)

30. 4 tanks stripping solution (8 gal. methylene chloride)
(3 gal. methyl alcohol)
(1 pt. nitric acid)

31. 1 cleaning tank (50% methyl ethyl ketone)
(50% toluene)

ABS PLASTIC STRIP (Refer to Figure II)

32. 50% caustic bath (140°F)

33. Hot water rinse

34. Air-water spray

Water Consumption and Distribution

DISTRIBUTION	CONSUMPTION (Imp. gal/day)
Plating shop and cooling water	69,220
Domestic	3,180
Total	72,400

Sources of Liquid Wastes, Treatment and Disposal

The major source of liquid wastes is from the metal plating shop where plating solutions containing cyanide are used. The major portion of the cyanide bearing wastes is treated by alkaline chlorination and directed to the municipal sanitary sewer system via the neutralizing sump. This treatment consists of the oxidation of cyanides by the addition of chlorine gas at a pH of about 11:

$$2NaCN + 5Cl_2 + 12NaOH \longrightarrow N_2 + 2Na_2CO_3 + 10NaCl + 6H_2O.$$

A recent expansion in the brass plating line, however, has resulted in cyanide-contaminated wastes being directed, untreated, to the neutralizing sump, and thence to the municipal sanitary sewer system.

Wastes from the plastic stripping line are also directed to the municipal sanitary sewer system via the neutralizing sump.

Cooling water from the plastic moulding department and domestic wastes are directed to the municipal sanitary sewer system.

Sampling

Four-hour duplicate, composite samples were collected at various stations as shown in Figure II. One of these duplicates at each station

was preserved with NaOH for cyanide determination. All samples were submitted to the OWRC laboratories for analysis, the results of which are appended.

Analysis

All samples were analyzed for solids, free chlorine, pH, cyanide, silver, copper and zinc.

WASTE LOADINGS

The following waste loadings are based on a total plant effluent of 72,400 gallons per day to the municipal sanitary sewer.

PARAMETERS	LOAD TO MUNICIPAL SANITARY SEWER (lb/day)
Total solids	514.0
Suspended solids	50.6
Copper as Cu	3.3
Zinc as Zn	1.9
Cyanide as HCN	5.1

DISCUSSION OF FINDINGS

It is apparent from both the analytical results and the process flow diagram (Figure II) that the new brass plating line was placing a higher than necessary load on the municipal sanitary sewer system due to the absence of treatment. The analytical results show that the effluent from the treatment unit had a cyanide content of 1.4 ppm as HCN yet the cyanide concentration in the plant effluent to the municipal sanitary sewer system was 7.1 ppm as HCN, demonstrating the undesirable effects of the untreated brass plating effluent.

Also apparent from the analytical results is that sufficient chlorine was added to the cyanide treatment unit as evidenced by the presence of a free chlorine concentration of 70 ppm in the effluent. However, a pH of 9.0 in the influent to the cyanide treatment unit appears to indicate that insufficient caustic was added.

Again from the analytical results, it is apparent that there is inadequate mixing in the neutralization tank. A comparison of the plant effluent to the sanitary sewer and the contents of the neutralization tank follows:

PARAMETERS	PLANT EFFLUENT TO SANITARY SEWER	NEUTRALIZATION TANK
Total solids	710 ppm	920 ppm
Cyanide as HCN	7.1 "	3.4 "
Copper as Cu	4.5 "	8.3 "
Zinc as Zn	2.7 "	2.3 "

It is also apparent from the analytical results that the effluent to the sanitary sewer from this plant was in violation of the City of Barrie by-law limits for discharge to a sanitary sewer, as shown below.

PARAMETERS	CITY OF BARRIE BY-LAW LIMITS	PLANT EFFLUENT TO SANITARY SEWER
Cyanide as HCN	2 ppm	7.1 ppm
Copper as Cu	1 ppm	4.5 "

CONCLUSIONS

The excessive concentrations of contaminants in the waste flow appear to be due to faulty operation of the treatment equipment and to the fact that certain cyanide-bearing waste streams do not pass through the treatment unit.

It appears that inadequate mixing is being achieved in the neutralization tank.

At the time of the survey, the effluent from this plant did not comply with the City of Barrie By-law #66-69.

RECOMMENDATIONS

It is recommended that:

1) All cyanide-bearing streams be routed through the cyanide treatment unit.
2) The pH in the cyanide treatment unit sump be maintained at 11 to ensure complete oxidation of cyanide. At this pH the copper should also be precipitated.
3) Thorough mixing be achieved in the neutralization tank.
4) A settling tank be provided to allow precipitated metals to be removed from the waste stream before discharge to the sewer.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Barrie Report to: N. Gillies c.c.

Source: Canadylet-Closures Limited

Date Sampled: June 5/69 by: G. Yuzwa

Lab. No.	5-Day B.O.D.	Solids			Free Chlorine	pH at Lab.	Cyanide as HCN	Silver as Ag	Copper as Cu	Zinc as Zn			
		Total	Susp.	Diss.									
T-978		710	70	640	0	8.3	-	0.0	4.5	2.7			
T-979		-	-	-	-	-	7.1*	-	-	-			
T-980		920	80	840	0	8.1	-	0.0	8.3	2.3			
T-981		-	-	-	-	-	3.4*	-	-	-			
T-982		910	110	800	0	8.2	-	0.0	4.75	2.2			
T-983		-	-	-	-	-	6.1*	-	-	-	*Test performed on preserved sample.		
T-984		670	195	475	70	7.1	-	0.0	3.62	3.3			
T-985		-	-	-	-	-	1.4*	-	-	-			

T-978	1	Plant effluent to sanitary sewer
T-979	2	Plant effluent to sanitary sewer
T-980	3	Contents of neutralization sump
T-981	4	Contents of neutralization sump
T-982	5	Drainage ditches and CN treatment effluent
T-983	6	Drainage ditches and CN treatment effluent
T-984	7	Effluent from cyanide treatment unit
T-985	8	Effluent from cyanide treatment unit

5M 60—1311

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Barrie Report to: N. Gillies c.c.

Source: Canadylet-Closures Ltd.

Date Sampled: June 5/69 by: G. Yuzwa

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	Cyanide as HCN	Silver as Ag	Copper as Cu	Zinc as Zn				
		Total	Susp.	Diss.									
T-986		450	40	410	9.0	-	0.0	1.75	2.2				
T-987		-	-	-	-	15.6*	-	-	-				

*Test performed on preserved sample

T-986	9	Influent to cyanide treatment unit
T-987	10	Influent to cyanide treatment unit

5M 60—1311

CHRYSLER CANADA OUTBOARD LIMITED

The company operates two plants: #1 Plant (Motor Plant), located on Davidson Street, and the #2 Plant (Boat Plant), located on Ross Street, which are several miles apart, but administered by the same manager. These plants were surveyed on June 5, 1969.

PLANT #1 (Motor Plant)

DETAILS OF SURVEY

Personnel Interviewed

Mr. D. J. Critton - Manager

Personnel Participating

G. V. Buxton - OWRC

Description of Process

This plant contains a motor assembling operation. Parts are shipped from the USA and the motors are constructed at this site. Following assembly, the casing is spray painted and each motor is tested for performance. This site also serves as a warehouse and distribution centre for service parts.

Operating Schedule

Hours/day - 8

Days/week - 5

Employees - 55

Water Consumption and Distribution

Industrial and domestic water is obtained from the Barrie Public Utilities Commission. The consumption and distribution is as

follows:

Consumption approximates 25,000 gallons per month (average).

Distribution:

(a) Continuously overflowing test tank
(b) Air compressor coolant
(c) Water curtain in paint booth
(d) Domestic

Sources of Liquid Waste and Disposal

The sources of liquid waste are as follows:

1) Test Tank Overflow - A small tank is utilized for testing the assembled motors. A small quantity of detergent is added to the tank to prevent gasoline slicks from forming. The temperature is maintained at normal lake levels via the continuous addition of water. The small overflow is directed to the sanitary sewer. Any residue formed in the test tank is skimmed from the surface. The tank is emptied and cleaned four times yearly.

2) Paint Booths - A small quantity of water flows under the paint booth to remove fumes. This underflow is directed to the sanitary sewer. Any paint residue is periodically skimmed from the surface.

3) Air Compressor Coolant - This small volume of water is also directed to the sanitary sewerage system.

The total volume of wastes is estimated at less than 2000 gallons per day.

Sampling and Analysis

Grab samples of the paint booth effluent and the test tank overflow were collected and submitted to the OWRC laboratories for analysis in accordance with modifications of the procedures outlined in Standard Methods for the Analysis of Water and Wastewater, twelfth edition, an American Health Association Publication.

STATEMENT OF RESULTS

Table A summarizes the characteristics of the industrial effluent which discharges to the sanitary sewerage system. The limitations as outlined in By-law 66-69 of the Corporation of the City of Barrie are also shown. All concentrations except pH are expressed in parts per million (ppm).

TABLE A

SAMPLE	BOD	SOLIDS			PH	COD*	ETHER SOLUBLES (OILS)	DETERGENT AS ABS*
		TOT.	SUS.	DISS.				
SPRAY BOOTH EFFLUENT	190	1280	25	1255	8.7	475	-	-
TEST TANK OVERFLOW	-	-	-	-	7.8	607	38	5
BY-LAW LIMITS	300	-	350	-	5.5 - 9.5	-	15	-

COD* - Chemical Oxygen Demand

ABS* - Alkyl Benzene Sulphonate

CONCLUSIONS

The effluents from this plant appeared satisfactory for discharge to the sanitary sewerage system.

RECOMMENDATIONS

No recommendations will be made at this time.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Barrie **Report to:** G.V. Buxton * **c.c.** /rd

Source: Chrysler Canada Outboard Ltd.

Date Sampled: June 5/69 **by:** G.V.B.

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	C.O.D.	Ether Solubles	Detergent as ABS				
		Total	Susp.	Diss.								
T-971	190	1280	25	1255	8.7	475	---	---				
T-972	---	---	---	---	7.8	607	38	5				

T-971	1.	Grab 11:45 a.m. - Spray booth effluent to sanitary sewer.
T-972	2.	Grab 11:45 a.m. - Test tank overflow to san. sewer.

5M-60-11403-65

CHRYSLER CANADA OUTBOARD LIMITED

The company operates two plants: #1 Plant (Motor Plant), located on Davidson Street, and the #2 Plant (Boat Plant), located on Ross Street, which are several miles apart, but administered by the same manager. These plants were surveyed on June 5, 1969.

PLANT #2 (Boat Plant)

DETAILS OF SURVEY

Personnel Interviewed

Mr. D. J. Critton - Manager

Personnel Participating

G. V. Buxton - OWRC

Description of Process

Fibreglass inboard and outboard type boats are fabricated at this site. Special cloths are placed in steel molds and sprayed with an appropriate dyed resin. A small test tank is used periodically for testing the inboard motors.

Operating Schedule

Hours/day - 8

Days/week - 5

Employees - 70

Water Consumption and Distribution

Industrial and domestic water is obtained from the Barrie Public Utilities Commission. The consumption and distribution is as follows:

Consumption approximates 37,500 gallons per month (average).

Distribution:

(a) Air compressor coolant*
(b) Domestic
(c) Small intermittent test tank

*The large air compressor accounts for the majority of this consumption. The compressors are required to energize the resin pumps and operate the many power tools utilized throughout the plant.

Sources of Liquid Waste and Disposal

The only liquid waste from this plant is the cooling water from the large air compressor. This flow is directed to the sanitary sewerage system.

Sampling and Analysis

No samples were collected.

CONCLUSIONS

Since water is used only as a coolant for an air compressor, the effluent should be free of contamination.

RECOMMENDATIONS

It is recommended that the uncontaminated cooling water be discharged to the storm sewer system rather than to the sanitary sewer system.

CULLIGAN WATER CONDITIONING (BARRIE) LIMITED

This plant, located at 29 Penetang Street, was surveyed on September 17, 1969.

DETAILS OF SURVEY

Personnel Interviewed

Mr. P. R. Fobert - President

Personnel Participating

D. J. Harris - OWRC

Description of Plant and Process

This plant is involved in the reconditioning of water softening tanks. This is accomplished in two steps:

Backwashing

Water is flushed through the tank in the opposite direction to the normal flow. This raises the resin into a bin located above the tank. By controlling the overflow of water, the resin is washed free of solid contaminants without any of the resin itself being lost. Once the resin is clean, the flow of water is turned off and the resin settles back into the tank.

Regeneration

After backwashing, the tank is connected to a source of sodium chloride solution. The strength of this solution is dependent upon the type of resin being used in the tank. The solution removes the calcium and magnesium ions from the resin and replaces these with sodium ions. The tanks are then flushed with water and loaded on

trucks for despatching.

Operating Data

Employees - 11

Hours/day - 8

Days/week - 5-1/2

Production Data

100 tanks per day

Water Consumption and Distribution

Estimated water distribution is as follows;

Backwashing	-	9,000 gallons per day
Regeneration	-	15,180 " "
Domestic	-	220 " "
Total	-	24,400 gallons per day

Sources of Liquid Wastes, Treatment and Disposal

Domestic wastes are discharged to the Penetang Street sanitary sewer.

The only industrial wastes emanating from this plant are associated with the backwashing and regenerating operations described above. These wastes are discharged directly to the storm sewer without treatment.

Sampling and Analysis

At specific time intervals, grab samples were obtained of,

1) the effluent from the backwashing operation, and

2) the effluent from the tanks during the regeneration process.

DISCUSSION OF FINDINGS

The results of the analysis for suspended solids and iron are shown in graphical form in Figure I and Figure II. The OWRC objectives for iron (17 ppm) and suspended solids (15 ppm) concentrations are exceeded only during the initial stage of each wash. At an average of 10 backwashings per day and an approximate flow of 60 gallons/minute, the loadings of suspended solids and iron discharged to the storm sewer are 1.9 lbs and 0.5 lbs respectively.

The quantity of salt purchased by the company indicates that approximately 1,800 pounds of chlorides (calcium, magnesium and sodium) are discharged from this plant daily. The concentration of chloride (57,600 ppm) in the regeneration effluent is in excess of the OWRC objective (1500 ppm).

CONCLUSIONS

The concentrations of suspended solids, iron and chloride in the effluent discharged from this plant are in excess of OWRC objectives, however, the total loading of these materials should have no significant effect on Kempenfelt Bay.

RECOMMENDATIONS

There are no recommendations at this time.

FIGURE I

GRAPH OF SUSPENDED SOLIDS CONCENTRATION VS. TIME

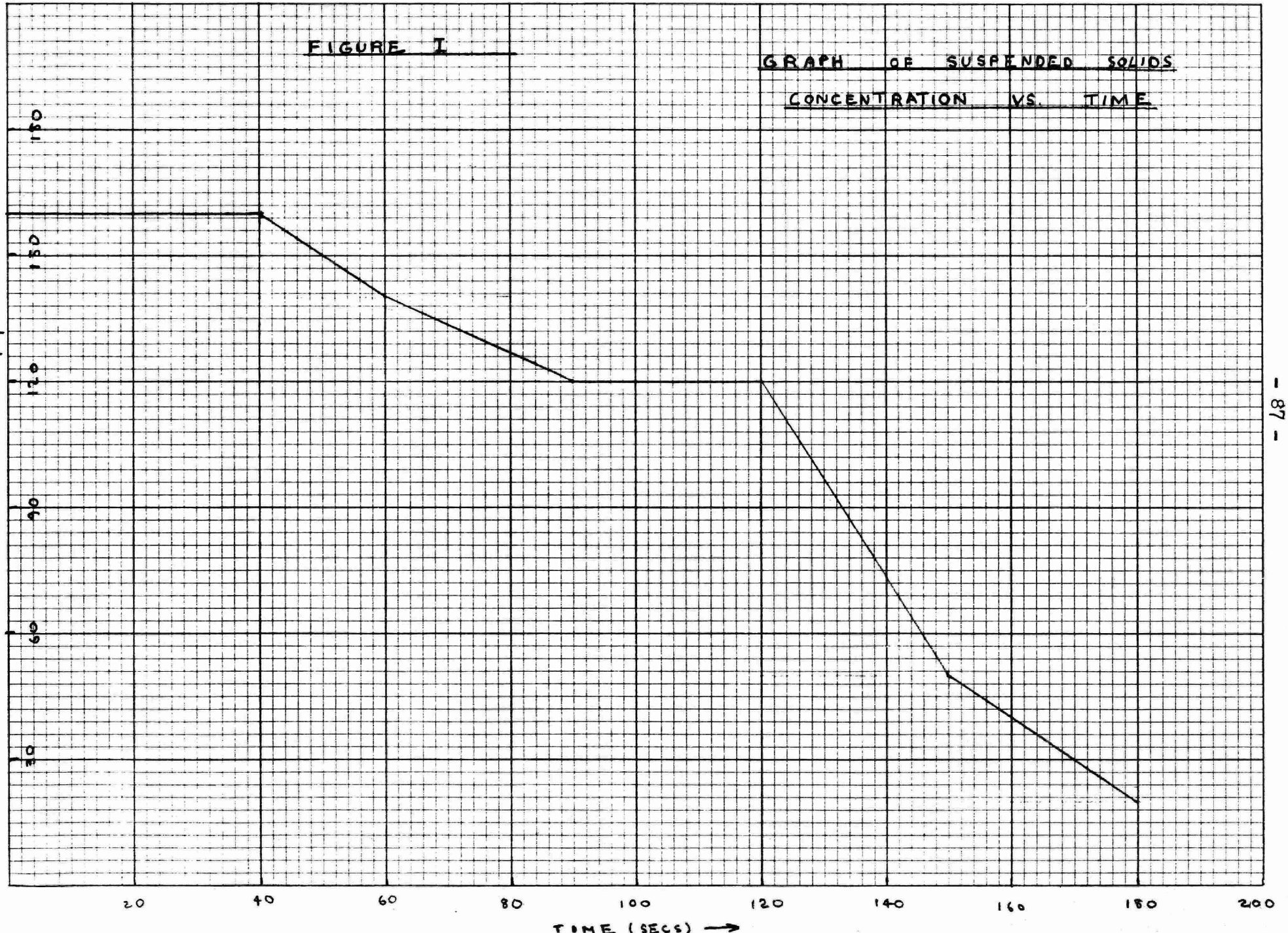
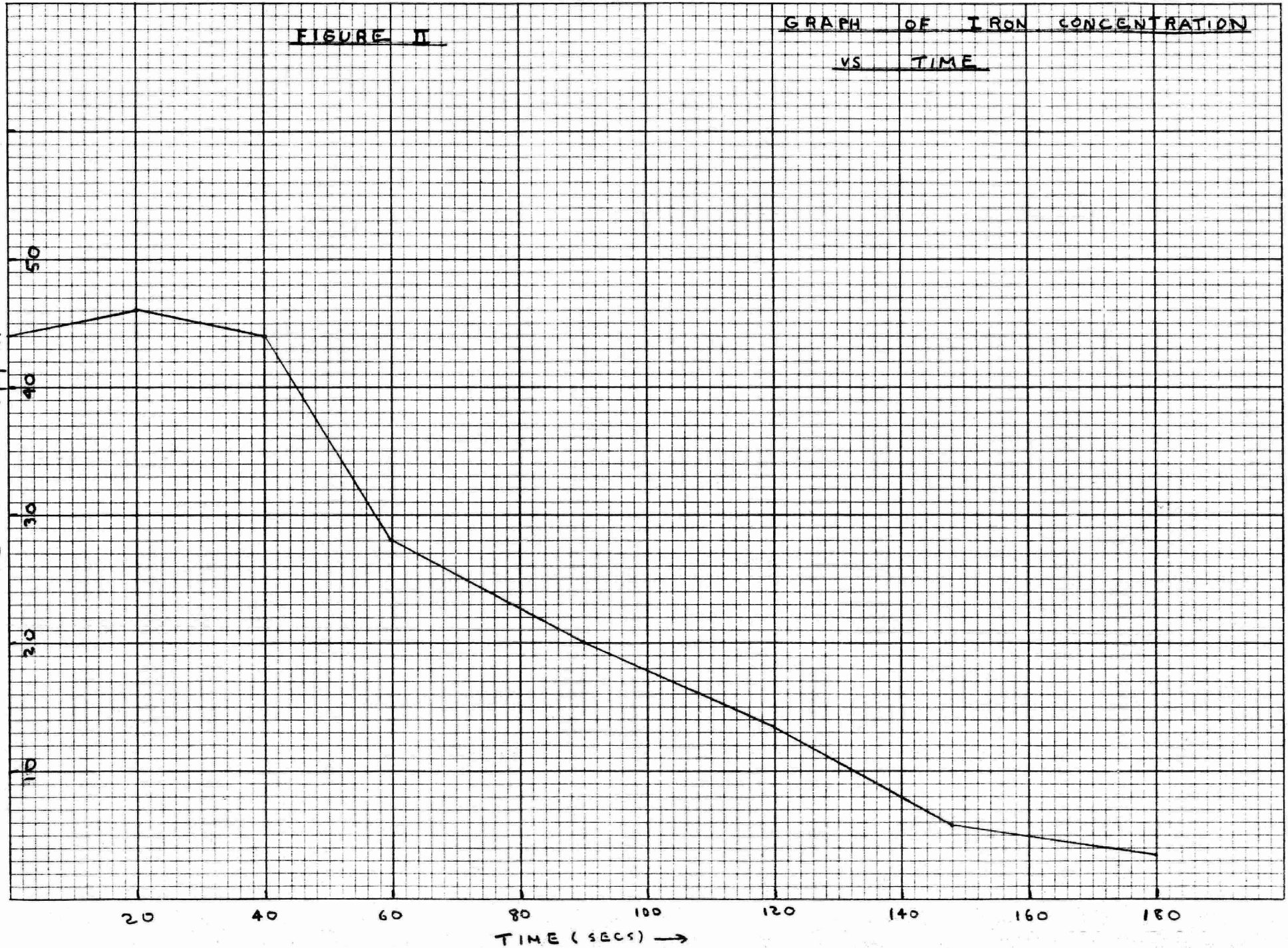


FIGURE II

GRAPH OF IRON CONCENTRATION VS TIME



ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Barrie Report to: D.J. Harris c.c.

Source: Culligan Water Conditioning

Date Sampled: Sept. 17/69 by: DJH br

Lab. No.	5-Day B.O.D.	Solids			Calcium as Ca	Magnesium as Mg	Chloride as Cl	Sodium as Na	pH at Lab.	Potassium as K			
		Total	Susp.	Diss.									
T 2245		11950	20	11930	5080	1632	6250	116	6.8	2.0			
T 2246		51840	35	51805	1660	1248	31790	16400	6.5	61			
T 2247		176000	-	-	19800	4560	57650	6540	6.5	82			

T 2245	1.	Strong regeneration water (at start)	Grab 3:30 P.M.
T 2246	2.	Dilute regeneration water	Grab 4:00 P.M.
T 2247	3.	Strong regeneration water	Grab 3:55 P.M.

5M 60—1311

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Barrie Report to: D.J. Harris c.c.

Source: Culligan Water Conditioning

Date Sampled: Sept. 17/69 by: DJH br

Lab. No.	5-Day B.O.D.	Solids			Turbidity Units	pH at Lab.	Iron as Fe						
		Total	Susp.	Diss.									
T 2248		1820	160	1660	40.	7.8	44.						
T 2249		550	160	390	40.	8.1	46						
T 2250		480	160	320	40.	7.9	44.						
T 2251		450	140	310	30	7.9	28						
T 2252		500	120	380	40	7.9	20.						
T 2253		520	120	400	25	8.0	13.4						
T 2254		530	50	480	8.	8.0	6.9						
T 2255		430	20	410	8.	7.8	3.4						

T 2248	1.	Backwash water	Grab	Start
T 2249	2.	"	"	20 sec.
T 2250	3.	"	"	40 sec.
T 2251	4.	"	"	1 min.
T 2252	5.	"	"	1 1/2 min.
T 2253	6.	"	"	2 min.
T 2254	7.	"	"	2 1/2 min.
T 2255	8.	"	"	3 min.

5M 60—1311

DE VILBISS (CANADA) LIMITED

This company located on Wood Street, was surveyed on June 3, 1969.

DETAILS OF SURVEY

Personnel Interviewed

Mr. D.C. Monroe - Vice-President, Manufacturing

Mr. W.D. Moorehouse - Plant Superintendent

Personnel Participating

G. V. Buxton - OWRC

Description of Process

Processing at this plant consists of the fabrication of the following types of equipment; paint spraying apparatus and associated compressors; paint booths; infra-red paint baking ovens. The operations include; machining, degreasing, painting, plating and assembling.

Degreasing is conducted in a totally enclosed, water cooled carbon tetrachloride degreaser. There are six paint booths which contain continuously recirculating water-wall curtains. The small plating department (summarized below) is used to provide corrosion resistant surfaces to various parts and fittings. There are facilities for plating cadmium, nickel and copper.

Plating Department

500	gallon	Nickel tank
50	"	" "
50	"	Cadmium tank
50	"	Copper flash tank
100	"	still Cadmium tank
60	"	Nickel rinse tank (overflows when in use)
60	"	Cadmium " " " "

Operating Schedule

Hours/day - 8

Days/week - 5

Employees - 200

Water Consumption and Distribution

Water is obtained from the Public Utilities Commission at a rate of approximately 5,151,000 gallons per year (20,000 gallons per day). This quantity is utilized in the following areas:

cooling waters and plating rinses - 15,000 gallons per day
domestic usage - 5,000 " "

Sources of Liquid Wastes and Disposal

The following table summarizes the sources of wastes and the method of disposal.

TABLE A

SOURCE	DISPOSAL
1. Spot Welder cooling water	Storm Sewer -----> Creek
2. Air conditioner cooling water	" "
3. Degreaser cooling water	" "
4. Plating rinse tank overflows	" "
5. Spent plating solutions	reclaimed by filtering
6. Paint spray booths	solids to dump, water recirculated
7. Domestic wastes	sanitary sewer

Sampling and Analysis

Grab samples were collected from the following areas:

1) Manhole in parking lot (providing access to creek flow)

2) Plating rinse overflow to storm sewer.

The samples were transported to the OWRC Toronto laboratories for analysis in accordance with modifications of the procedures outlined in Standard Methods for the Analysis of Water and Wastewater, twelfth edition, an American Health Association Publication.

STATEMENT OF RESULTS

Table B summarizes the analytical results. All results except pH are presented in parts per million.

TABLE B

SAMPLE	SOLIDS			PH	COD	CYANIDE AS HCN	NICKEL AS NI	CADMIUM AS CD	COPPER AS CU
	TOTAL	SUSPENDED	DISSOLVED						
CREEK FLOW	430	100	330	8.0	39	.02	0	0	.06
PLATING RINSE	330	5	325	7.9	7	1.3	0.1	0	.06
OWRC OBJECTIVES	-	15	-	5.5 - 9.5	-	0.1	1.0	1.0	1.6

DISCUSSION OF RESULTS

It was impossible to sample the total plant effluent discharging to the creek via the storm sewer. The storm sewer is connected to a

culvert which directs the creek flow under the company parking area. Samples were collected at a storm drain located in the parking area downstream of the storm sewer connection. Thus, the "creek flow" samples represent the plant effluent and subsequent storm flow dilution.

The high level of suspended solids probably resulted from either or both of the following; rainfall during the survey and sediment in the culvert being collected with the liquid sample. There does not appear to be any process source to account for the suspended solid content of the effluent.

The cyanide content of the plating shop effluent exceeds the OWRC water quality objective, but at the time of the survey the flow was receiving dilution with cooling water prior to discharging to the culvert and the creek flow did not indicate significant levels of cyanide. However, it is conceivable that at some time there may be little or no dilution by storm water or by cooling water. In that case the effluent probably would not meet OWRC objectives and would therefore require treatment to destroy the cyanide.

CONCLUSIONS

From the analytical results, it appears that under certain circumstances the plating shop effluent may not be acceptable for discharge to the creek, due to the concentration of cyanide.

Any accidental spill or discharge of working or spent plating solution would render the plant effluent unsuitable for discharge to the creek.

RECOMMENDATIONS

It is recommended that:

1) The plating shop effluent be treated to destroy cyanides.

2) Facilities be provided to ensure that no contaminating material will reach the creek in the event of an accidental spill or discharge.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Barrie **Report to:** G.V. Buxton **c.c.**

Source: DeVilbiss (Canada) Ltd.

Date Sampled: June 3/69 **by:** G.V.B. (rj)

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	COD	Cyanide as HCN	Nickel as Ni	Cadmium as Cd	Copper as Cu			
		Total	Susp.	Diss.									
T-933		430	100	330	8.0	39	0.02	0.0	0.0	0.06			
T-934		330	5	325	7.9	7	1.3	0.10	0.0	0.06			

T-933	1A	- Creek flow sampled at manhole and representing the total plant effluent - Grab 11.00 AM
T-934	2A	Plating rinse overflow to storm sewer - Grab 11.30 AM

5M-60-11403-65

DUFFERIN MATERIALS AND CONSTRUCTION LIMITED

This plant located on Tiffin Street, was surveyed on June 3, 1969.

DETAILS OF SURVEY

Personnel Interviewed

Mr. D. Featherstone - Plant Engineer

Mr. B. Ashe - Plant Supervisor

Personnel Participating

G. Yuzwa - OWRC

Description of Process (Figures I, II)

The raw materials, aggregate and cement, are stored in large, over-head, divided hoppers. These ingredients are gravity fed to a mixing hopper where water is added. A portion of this mix is directed to haulage trucks and trucked away as ready-mix. The remainder is directed to the concrete block production area. The distribution varies with the demand for ready-mix. The first step in the production of concrete blocks consists of a mixing hopper where the concrete is mixed to proper consistency. The concrete is then fed by gravity to the forming molds where the blocks are molded and inspected for correct size and structure. After being formed, the blocks are passed on, via a conveyor, to a steam heated chamber where they are dried for a period of 3 - 4 hours. The blocks are then air dried and stored in the yard until sold.

Production Data

Concrete Blocks	1.8 million per year
Ready-Mix	20,000 cubic yards per year

Operating Data

Employees	45
Hours/day	9 (18 in summer)
Days/week	5 (6 in summer)

Water Consumption and Distribution

Distribution	Consumption (imp. gal/day)
Wash-up and Process	33,600
Boiler Make-up	1,500
Domestic	900
Total	36,000

Sources of Liquid Wastes, Treatment and Disposal

The principal source of liquid waste from this plant is surface runoff from the plant property. Truck washing and off-spec batches of concrete pose other waste problems and, at present, these wastes are hauled to a total retention pit on the property where they are allowed to solidify. When the pit is filled, the contents are hauled to the city dump.

A minor source of liquid waste is the boiler blowdown. Since a low pressure boiler is in service here, there is no regular blowdown period and the number of blowdowns is unknown. These blowdowns are directed to the nearby creek via a sewer connection.

All domestic wastes are directed to the municipal sanitary sewers.

Sampling

Grab samples of the creek water were collected upstream and downstream of the plant effluent. The yard run-off had created a channel to the creek downstream of the plant effluent and a grab sample of this water was also collected. See Figure I for exact sample locations.

Analysis

The above three samples were submitted to the OWRC laboratories to be analyzed for alkalinity, solids and pH. The creek water, below the plant effluent, was also analyzed for ether solubles since a trace of oil was observed. The analytical results of these analyses are appended.

WASTE LOADINGS

Production figures related to waste loadings are inapplicable in this case because most of the water is consumed in the product. The run-off from the block storage area is highly irregular due to fluctuating levels of rainfall and short block storage periods and thus cannot be calculated.

DISCUSSION OF FINDINGS

The analyses of the samples showed that the OWRC objectives for discharge to a storm sewer were being exceeded. The suspended solids content of the creek downstream of the plant effluent was 660 ppm, whereas, the suspended solids content of the creek upstream of the plant

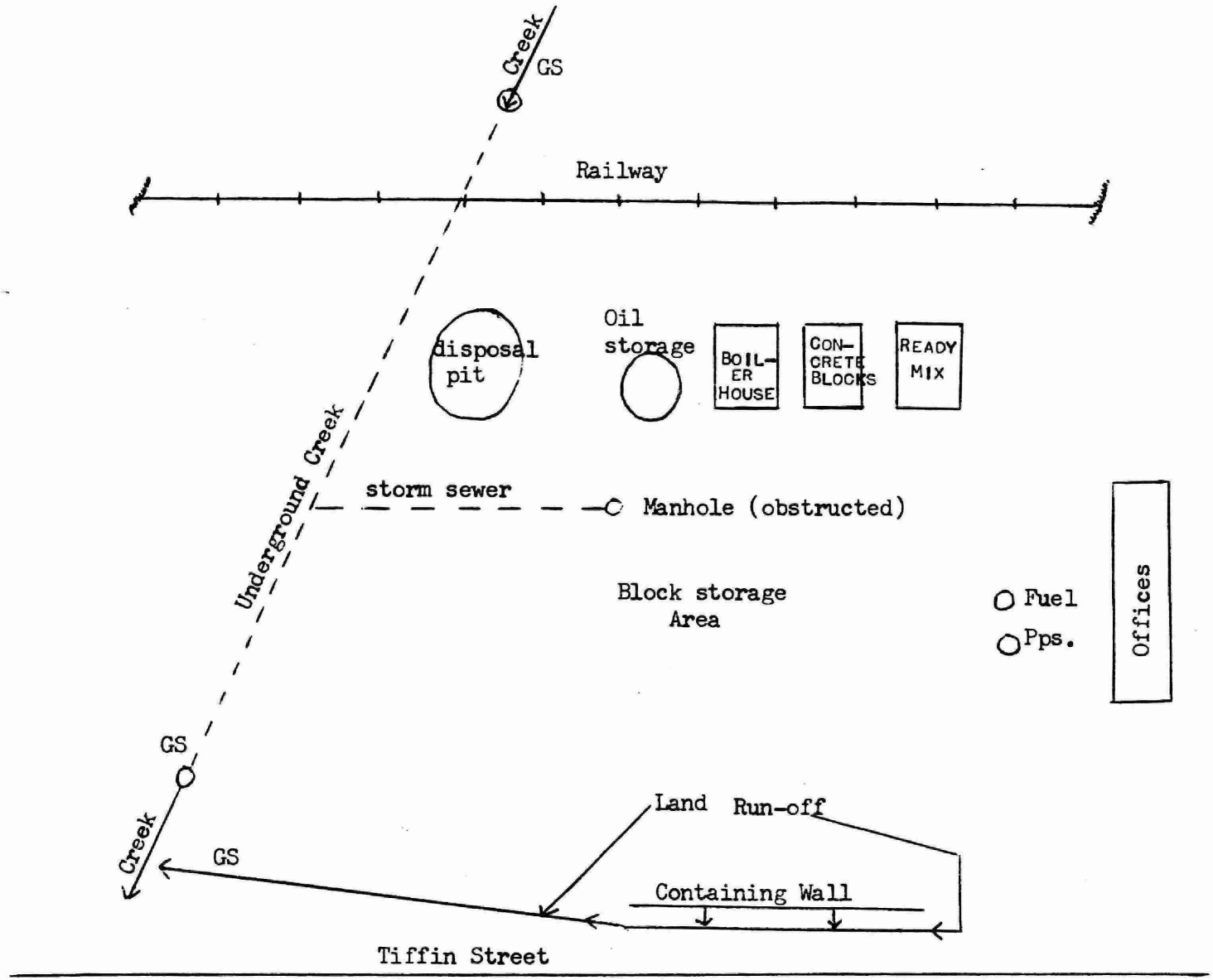
effluent was 30 ppm. These results could be higher than usual, however, because of construction in the area. The yard run-off does, however, indicate that alkalinity and suspended solids in concentrations of 507 ppm and 1175 ppm respectively, were being discharged to the creek at the time of the survey.

The run-off from this plant is affecting adversely the quality of the water in the creek. No estimate of the loadings will be attempted, since the quantity of run-off depends, to a large extent, on rainfall.

RECOMMENDATIONS

It is recommended that;

1) A rainwater collection channel be constructed around the yard and connected to a settling tank or basin for removal of suspended solids.
2) If necessary, chemical treatment of the settling tank (basin) effluent be provided.
3) All manholes, catch basins and pipes leading to the creek be blocked or diverted to flow through the rainwater collection system.



GS = Grab sample

FIGURE I

DIAGRAM SHOWING PLANT LAYOUT

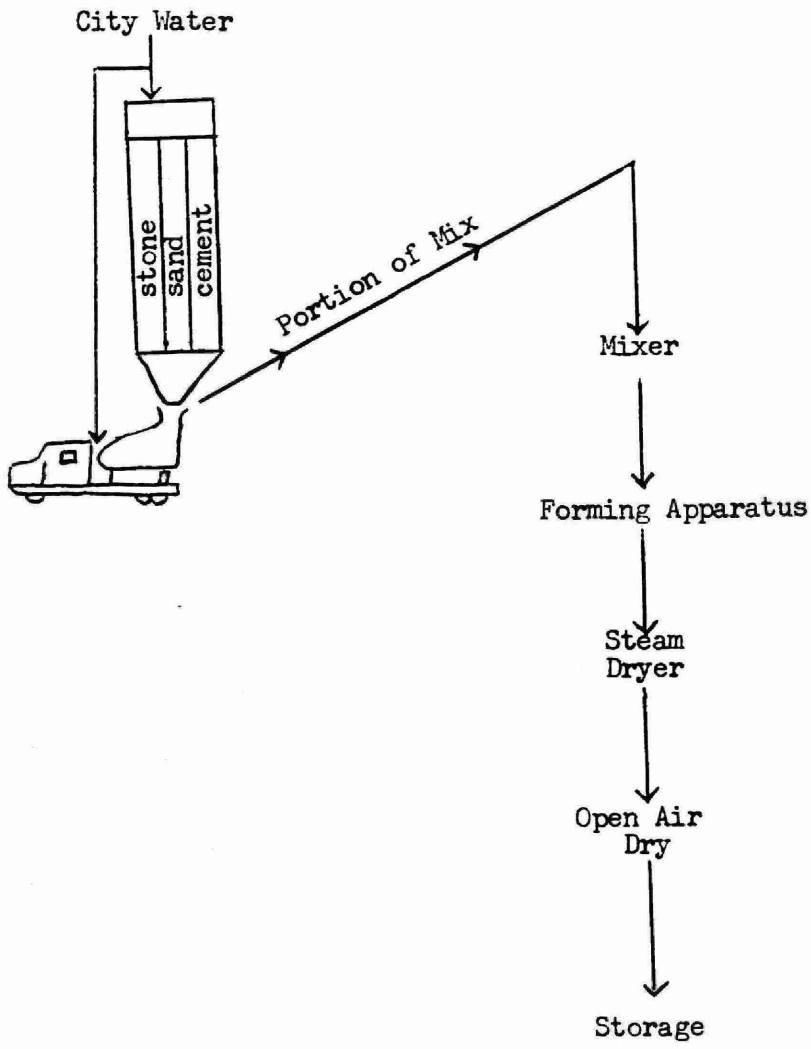


FIGURE II

DIAGRAM SHOWING CONCRETE AND CONCRETE BLOCK PRODUCTION

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Barrie **Report to:** N. Gillies **c.c.**

Source: Dufferin Mats. & Construction

Date Sampled: June 3/69 **by:** G. Yuzwa br

Lab. No.	5-Day B.O.D.	Solids			Alkalinity as $CaCO_3$	Ether Solubles	pH at Lab.						
		Total	Susp.	Diss.									
T 943		480	30	450	252	-	7.8						
T 944		930	660	270	182	trace *	8.0						
T 945		1930	1175	755	507	-	10.5						

* less than 2 ppm.

T 943	1.	Creek water before plant
T 944	2.	Creek thru property
T 945	3.	Yard run-off to creek

5M-60-11403-65

HILL REFRIGERATION OF CANADA

This plant located on Brock Street, was surveyed on June 2, 1969.

DETAILS OF SURVEY

Personnel Interviewed

Mr. W. W. Maddock - Plant Manager

Personnel Participating

G. V. Buxton

Description of Process

Commercial refrigerators and condensers are manufactured at this plant from the following raw materials; steel, aluminum, wood, paint, and polyurethane foam insulation.

The sheet metal casing is formed, welded and then directed to storage. From storage the fabricated sheet is transported to the bonderizing spray booth. In this booth the material is first cleaned with steam. A phosphate based bonderizer, to which small quantities of detergent and chromic acid have been added, is then sprayed on the metal. After bonderizing the material is rinsed by a water spray. The treated material is dried in an oven, then conveyed to the paint booths where it is sprayed with an acrylic based paint. The finished casing is stored prior to final assembly.

Copper coils for the condensers are produced by first bending copper tubes in the form a "U" and then sleeving opposite ends.

Compressed water is injected into the coils to expand them and form a seal with the sleeves.

Wooden support structures are constructed in the wood working section of the plant. The finished casings are mounted onto the wooden support structure along with an unpainted inner casing. Liquid polyurethane is injected into the sandwich area forming a solid insulation. The remaining required components such as motors, fans, etc, are then installed prior to shipping.

Operating Schedule		Production Volume	
Hours/day	- 8	Refrigerators	- 1800 per year
Days/week	- 5	Condensers	- 1000 per year
Employees	- 92		
Shifts	- 1		

Water Consumption and Distribution

Water for both industrial and domestic usage is obtained from the Barrie Public Utilities Commission at an average rate of 20,000 gallons per day.

The industrial usage of water consists of the following:

(a) spot welder coolant
(b) bonderizing solution make-up
(c) bonderizer spray rinse
(d) soda ash solution make-up
(e) water curtain for paint booths
(f) steam cleaning
(g) compressed water for condenser seals

Sources of Liquid Wastes and Disposal

The sources of liquid wastes are as follows:

(a) bonderizing operation
(b) paint booths
(c) spot welders
(d) condenser sealing operation

(a) Bonderizing Operation

Steam condensate from the cleaning operation discharges to the storm sewer system.

A concentrated solution of sodium bicarbonate is prepared in a 45 gallon drum. When the detergent and phosphate spray is in use a pump automatically cuts in drawing a previously calculated fixed rate of bicarbonate for neutralization purposes. This combined flow discharges to the storm sewer along with the subsequent rinse.

The present spray bonderizing technique is to be replaced by a conventional "tank" system in 1970.

(b) Paint Booths

The iron grate floor of the paint booth is placed on top of an 1100 gallon water tank. This water is kept recirculating to prevent the accumulation of paint fumes. A chemical additive called "Klarepon" (supplied by Du Bois Chemicals) is used to prevent algae formation and also to keep paint wastes floating so that they may be skimmed from the surface of the water. Approximately once per month this water tank is filtered (to remove paint solids) and the filtrate is discharged to the storm sewer system.

(c) Spot Welders

Cooling water for the spot welders is discharged to the storm sewer system. However, the company is presently considering recirculation of this water.

(d) Condenser Sealing Operation

Uncontaminated water from this operation is directed to the storm sewer.

All of the above storm sewer flows combine and discharge through one pipe to the road-side ditch adjacent to the plant (approximately 18,000 gallons per day).

All domestic wastes are directed to the municipal sanitary sewerage system (approximately 2,000 gallons per day).

Sampling and Analysis

A 40 oz. grab sample of the recirculated paint booth water was collected at 2:15 p.m.

Duplicate 40 oz. samples of the total plant effluent discharging to the road-side ditch were collected at 15 minute intervals between 2:45 and 4:45 p.m.

Both samples were submitted to the OWRC Toronto laboratories for analysis. The analytical results are appended.

WASTE LOADINGS

Table A shows the quantity of wastes discharged to the road-side ditch. These loadings are based on an average flow to the ditch of

18,000 gallons per day.

TABLE A

ANALYSIS	OWRC OBJECTIVE (ppm)	EFFLUENT CONCENTRATION (ppm)	LOADING (pounds/day)
Total Solids	-	250	45
Suspended Solids	15	5	0.9
Dissolved Solids	-	245	44
pH	5.5 - 9.5	8.0	-
COD*	-	3	0.5
Iron as Fe	17	0.24	0.04
Detergent as ABS	-	0	0.0

ppm - parts per million
*COD - chemical oxygen demand
ABS - alkyl benzene sulphonate

Sample Calculation

$$\frac{5 \text{ pounds of susp. solids}}{10^6 \text{ pounds of solution}} \times \frac{10 \text{ pounds of solution}}{1 \text{ gallons of solution}} \times \frac{18{,}000 \text{ gallons of solution}}{\text{day}}$$

$$= 0.9 \text{ pounds per day of suspended solids}$$

DISCUSSION OF FINDINGS

The grab sample from the paint booth was not obtained at the time of dumping. It was reported that the tank had been dumped two days before the survey on May 31, 1969. Thus, it can be assumed that the paint booth

sample collected represents a minimum concentration of contaminants.

Because of the manner in which bonderizing was being conducted at this plant it was not possible to collect a sample representing the wastes generated in this area.

CONCLUSIONS

The plant effluent to the road-side ditch was in compliance with the OWRC water quality objectives in terms of the analyses performed.

The monthly dumping of the 1100 gallons of paint booth wastes to the storm sewer is unacceptable.

RECOMMENDATIONS

It is recommended that;

1) the paint spray booth wastes be discharged to the sanitary sewer.

2) a more intensive investigation be carried out by the company on the quality of the wastes from the bonderizing operation, to determine if they are in compliance with the OWRC objectives on a continuing basis. (The concentration of phosphate should be checked.) If this study shows non-compliance with the objectives for discharge to a watercourse, the contaminated flows should be directed to the municipal sanitary system.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Barrie **Report to:** G.V. Buxton **c.c.** (rd)

Source: C.V. Hill (Canada) Ltd.

Date Sampled: June 2/69 **by:** G.V.B.

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	C.O.D.	Iron as Fe.	Detergent as ABS	Chromium as Cr.				
		Total	Susp.	Diss.					Tot.	Hex.			
T-935		340	40	300	7.9	328	---	---	---	---			
T-936		250	5	245	8.0	3	0.24	0	0.00	0.00			

T-935	1a	Grab 2:15 - Paint Booth water tank.
T-936	2a	Composite (2:45 - 4:45) 15 min. intervals - total plant effluent to road-side ditch.

5M-60-11403-65

IMPERIAL-EASTMAN CORPORATION (CANADA) LIMITED

This plant, located on Dyment Street, was surveyed on June 3, 1969.

DETAILS OF SURVEY

Personnel Interviewed

Mr. A. Palmer - Plant Manager

Mr. Bell - Production Manager

Personnel Participating

G. Yuzwa

Description of Process

Fittings are machined from bars and sent to the plating shop where cyanide-free zinc plating is carried out. The plating operation is illustrated in Figure I. After being zinc plated these fittings are rinsed in dichromate, olive drab or chromate solution depending on the colour required. The fittings are then ready for distribution.

Operating Data

Employees - 120

Hours/day - 9

Days/week - 5

Production Data

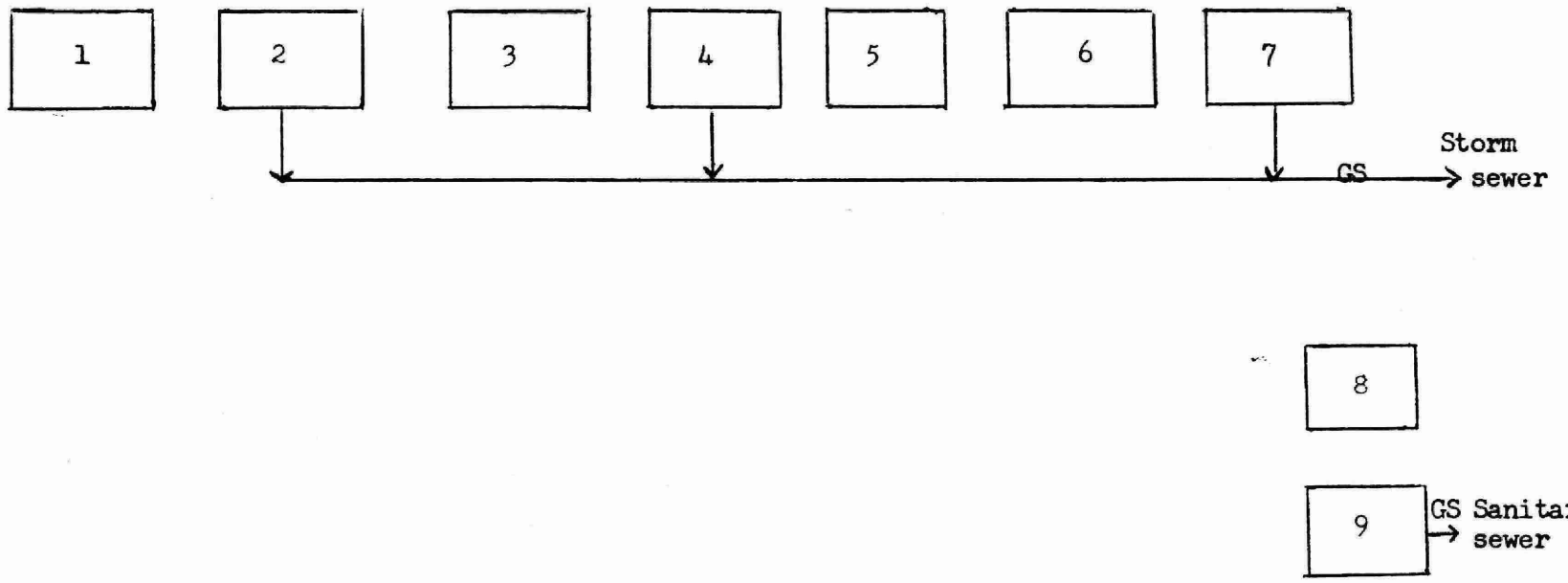
Zinc plated metal fittings and tubing - 2500 lb/day

Water Consumption and Distribution

Distribution	Consumption (gal/day)
Plating shop	13,450
Domestic	2,400
Total	15,850

FIGURE 1

PROCESS SEQUENCE



GS = GRAB SAMPLE

ZINC PLATING

1. ALKALINE SOAP WASH
2. WATER RINSE
3. MURIATIC PICKLE
4. WATER RINSE
5. PLATING CHLORIDE BATH
6. PLATING CHLORIDE BATH
7. WATER RINSE

CHROMATE DIP

8. DICHROMATE BRIGHT DIP
9. WATER RINSE

Sources of Liquid Wastes, Treatment and Disposal

The major portion of liquid wastes from this plant originates in the plating shop. Once each week the dichromate concentrate is treated with caustic soda, metal bisulphite and sulphuric acid. The sludge created from this reaction is hauled to the city dump and the supernatant is directed to the storm sewer. The overflow from all rinses in the cyanide-free zinc plating line is directed to the storm sewer. The water rinse overflow after the dichromate bright dip tank is directed to the municipal sanitary sewer system.

All domestic wastes are directed to the municipal sanitary sewer system.

Sampling

Grab samples of the storm sewer effluent and the sanitary sewer effluent in the plating shop were collected and submitted to the OWRC laboratories for analysis.

Analysis

The storm sewer effluent sample was analyzed for pH, zinc and solids. The sanitary sewer effluent sample was analyzed for pH and chromium. The results of these analyses are appended.

WASTE LOADINGS

The waste loading from the plating shop to the municipal sanitary sewer system is shown in Table I. These figures are based on the approximation that the zinc plating line consumes three times as

much water as the chromate rinse. It was impossible to obtain accurate flow figures in this area, but the volume of water from each rinse tank appeared to have approximately the same flow rate. The zinc plating line has three rinse tanks; the chromate line has one rinse tank. This results in approximately 3,362 gallons per day to be directed to the municipal sanitary sewer system and about 10,088 gallons per day to the storm sewer system from the plating shop.

TABLE I

PARAMETERS	LOAD TO MUNICIPAL SANITARY SEWER SYSTEM (lb/day)	LOAD TO STORM SEWER SYSTEM (lb/day)
Chromium as Cr	0.025	-
Zinc as Zn	-	2.0
Suspended solids	-	14.0
Total solids	-	80.0

DISCUSSION OF FINDINGS

It is apparent from the analytical results of the samples of the effluent to the storm sewer that this waste does not comply with OWRC objectives for discharge to a watercourse. Table II shows the OWRC objectives and the characteristics of the plant effluent.

TABLE II

PARAMETERS	PLANT EFFLUENT TO STORM SEWER	OWRC OBJECTIVES FOR DISCHARGE TO STORM SEWER
Suspended solids	140 ppm	15 ppm
Zinc as Zn	20 "	5 "

The plant effluent to the municipal sanitary sewer system is in compliance with the City of Barrie by-law limits for discharge to a sanitary sewer system.

The treatment of the chromate concentrate previously mentioned should be adequate if proper technique is employed. The supernatant, which is discharged to the storm sewer, amounts to a very small volume and is only dumped once each week.

CONCLUSIONS

At the time of the survey, the effluent to the storm sewer did not comply with OWRC objectives with respect to suspended solids and zinc concentrations. This appears to be due to inadequate dragout and rinsing facilities resulting in the excessive zinc concentration, and to lack of periodic cleaning of the plating shop sump.

At the time of the survey, the waste discharge to the sanitary sewer was satisfactory.

RECOMMENDATIONS

It is recommended that;

1) Adequate dragout and rinsing facilities be provided.

2) Periodic cleaning of the sump to remove solids be instituted.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Barrie **Report to:** N. Gillies **c.c.**

Source: Imperial Eastman

Date Sampled: June 3/69 **by:** G.Y. (rj)

Lab. No.	5-Day B.O.D.	Solids			Zinc as Zn	pH at Lab.	Chromium as Cr						
		Total	Susp.	Diss.									
T-940	----	800	140	660	20.	7.1	----						
T-941	----	----	----	----	----	7.4	0.73						

T-940	1	Storm Sewer influent
T-941	2	Sanitary sewer influent

5M-60-11403-65

KOLMAR OF CANADA LIMITED

This plant, located at 149 Victoria Road, was inspected on June 3, 1969.

DETAILS OF SURVEY

Personnel Interviewed

Mr. W. Hitch - Vice-President

Personnel Participating

P. Chisholm - OWRC

N. A. Gillies - "

Description of Process

Kolmar of Canada manufactures cosmetic and pharmaceutical products. There are three manufacturing departments; lipstick, powder and cream. For quality control reasons each department is a separate entity, i.e. manufacturing, filling and packaging in each area.

There are ten manufacturing vessels in the lipstick department. The raw materials are a variety of waxes and oils and they are heated and mixed in the steam-heated mixing vessels. When all the waxes are melted, the lipstick is coloured and matched to a "master" sample. After colouring, the molten lipstick is poured into frozen molds where it takes on the characteristic lipstick shape. The lipsticks are then attached to a conveyor belt and pass through two gas flames which melt the surface of the lipstick. The surface immediately hardens, giving the lipstick its gloss finish. The lipstick is then ready for packaging.

The system is similar in the powder department. The powders, basically a mixture of talcs, are mixed and coloured in the manufacturing vessels and again each shade has its own colour master. In the case of loose powders and talcum powders, the powder is taken from the manufacturing vessel to a production line where it is placed in containers and packaged. In the case of pressed powder, the powder passes through an automatic pressing machine before it is packaged.

The largest department is the cream department, where all wet products are manufactured. Cosmetics manufactured in this department include, lotions, creams, liquid make-up, after-shave and colognes. The manufacturing area is on a mezzanine so that the manufactured cosmetics can flow by gravity to the filling lines below. All the cosmetics manufactured in this department contain water, in most cases as high as 70% - 80%.

Operating Data

The plant has 205 employees and operates on a five day week. 185 employees work the day shift, the remainder the evening shift.

Water Consumption and Distribution

Water is drawn from the municipal supply and consumption for the eight months previous to the survey was:

December - January	1,145,000	Imperial	gallons
February - March	625,000	"	"
April - May	1,000,000	"	"
June - July	1,250,000	"	"

or approximately 20,000 gpd.

There is a constant flow of hot water to the kettles in the lipstick department. In the powder department, little water is used. 6% water is added to pressed powder to facilitate pressing of the cake.

By far the greatest amount of water is used in the cream department. 12,000 lbs. of cream, containing 80% water, are manufactured daily. All products manufactured in this department contain a high percentage of water. A large amount of water is used for washing vessels after a batch has been manufactured. Water is also used for the air conditioning system.

Sources and Disposal of Liquid Wastes

Contaminated wastes arise in all three departments as noted above. The wastes are generated as a result of washing of equipment. There is a small quantity of waste discharged from regeneration of the ion exchange resin in the de-ionised water system.

All contaminated wastes (10,000 gpd) are discharged to the sanitary sewer system, while cooling water and water from the air conditioner are discharged to the storm sewer system.

No treatment is given to any wastewater.

Sampling and Analysis

Grab samples of the flows to the sanitary sewer were taken over a five hour period and submitted to the OWRC laboratories for analysis. The analytical results are appended.

DISCUSSION OF FINDINGS

Due to the batch nature of the processes carried out at this plant, the analytical results show wide variation in the concentrations of BOD, ether soluble materials and suspended solids. It is therefore difficult to calculate the loading being exerted upon the municipal sewage treatment plant. However, from the nature of operations, it would appear that the average characteristics would lie between the maximum and minimum concentrations found by analysis. It is proposed, therefore, to assign the following loadings to this plant;

BOD lbs/day	SUSP. SOLIDS lbs/day	ETHER SOLUBLES lbs/day
30	4	10

It should be noted that these loadings are estimates only.

In terms of concentration, the effluent to the sanitary sewer was at times unacceptable for discharge, with respect to the concentrations of BOD and ether soluble materials. This appears to be due to the washing out of heavily contaminated vessels and the high concentrations probably do not persist for any lengthy period of time.

While no samples were taken of the effluent to the storm sewer, it is presumed that this flow is uncontaminated since it consists only of once-through cooling water.

CONCLUSIONS

The effluent from this plant to the municipal sanitary sewer system is, at times, unacceptable for discharge in terms of the limits contained in the sewer-use by-law.

The process is so variable that waste loadings could not be calculated. These, however, have been estimated for the purposes of the municipal survey only.

RECOMMENDATIONS

It is recommended that the company institute as far as possible procedures for "dry cleaning" of equipment prior to wet cleaning, in order to minimise the concentrations of BOD and ether soluble materials in the plant effluent.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Barrie **Report to:** H. Gillies **c.c.**

Source: Kolmar of Canada

Date Sampled: June 4/69 **by:** P. Chisholm (rj)

Lab. No.	5-Day B.O.D.	Solids			COD	pH at Lab.	Ether Solubles						
		Total	Susp.	Diss.									
T-963	200	----	50	----	347	8.1	34						
T-964	550	----	40	----	1170	8.1	112						
T-965	50	----	15	----	58	7.6	----						
T-966	----	----	----	----	----	----	4						
T-967	160	----	10	----	218	7.8	----						
T-968	----	----	----	----	----	----	18						
T-969	650	----	70	----	1100	8.1	----						
T-970	----	----	----	----	----	----	229						

T-963	1	10.40 AM
T-964	2	11.45 AM
T-965	3A	All samples effluent to sanitary sewer 1.55 PM
T-966	3B	" " " " " " "
T-967	4A	4.05 PM
T-968	4B	"
T-969	5A	2.50 PM
T-970	5B	"

5M-60-11403-65

LAKEVIEW PURE MILK DAIRY LIMITED

This industry, located on Dunlop Street, was surveyed on Thursday, June 5, 1969.

DETAILS OF SURVEY

Personnel Interviewed

Mr. R. Bowles - Plant Manager

Personnel Participating

P. Chisholm - OWRC

Description of Process

This is a conventional dairy, receiving milk, which is pasteurised and packed in bottles, cartons, jugs and pouches. Cream is also pasteurised and packed in bottles and cartons.

Production and Operating Data

Production volume	Milk 125,000 lbs/day (200,000 lbs/day July, August, September) Cream 3,000 lbs/day
Operating Schedule	Days/week 6 Hours/day 14
No. of Employees	22 (30 in summer)

Water Consumption

An unmetered amount of water is drawn from a private well. Water is also drawn from the municipal supply. Consumption over last six months:

February 1 - April 1	75,625 Gallons
April 1 - June 1	530,625 "
June 1 - August 1	2,397,500 "

Sources of Liquid Wastes, Treatment and Disposal

Liquid wastes arise from washing and rinsing of equipment, bottle and jug washing machines, and spillage and leakage from equipment. No treatment is provided for wastes and disposal is to the municipal sanitary sewer system.

Sampling and Analysis

Due to the difficulties of obtaining representative samples of waste from this type of plant, no samples were taken.

Calculation of Waste Loadings

Since no samples were taken, a theoretical calculation of the waste loadings will be used to determine the loading from this plant to the municipal sewage treatment plant. The following values are modifications of those taken from the publication of The United States Public Health Service, "An Industrial Wastes Guide to the Milk Processing Industry":

OPERATION	LBS.BOD/10,000 LBS MILK OR MILK EQUIVALENT
Receiving milk	2.0
Cream Pasteurisation, Cooling and Filling	2.0
Milk Pasteurisation, Cooling and Packing	7.0
Storage of Fluid Milk	0.5
Storage of Cream	1.0
Delivery (including truck washings)	1.0
	13.5

Milk Processed	-	125,000 lbs/day (200,000 lbs/day in summer
Cream Processed	-	3,000 lbs/day
Milk Equivalent of Cream	-	24,000 lbs/day

∴ Total Milk Equivalent = 150,000 lbs/day
(225,000 lbs/day in summer)

Daily BOD loading to sanitary sewers can, therefore, be calculated:

$$\frac{150,000}{10,000} \times 13.5 \text{ lbs}$$

i.e. 202.5 lbs (304 lbs in summer)

DISCUSSION OF FINDINGS

During the survey, there was little spillage of milk in the manufacturing area and housekeeping was of a generally high standard.

The water drawn from the city supply varies greatly from period to period. The PUC, noting this, have checked all meters and have been unable to find why there is such a variation of water supply. These variations bear no relation to the seasonal increase of production during the summer months. Also, the meters on the sanitary sewer connections are inoperative and no estimate of the volume of waste discharged to the municipal STP could be made.

CONCLUSIONS

This is a fairly "clean" operation and it is likely that the BOD loading calculated will not be exceeded, if the standard of housekeeping does not deteriorate.

RECOMMENDATIONS

It is recommended that a meter be installed to measure the volume of water taken from the well and that records of consumption be kept.

THE LUFKIN RULE COMPANY OF CANADA LIMITED

This plant, located at 164 Innisfil Road, was surveyed on September 25, 1969.

DETAILS OF SURVEY

Personnel Interviewed

Mr. S. E. Swetman - Vice President of Operations

Mr. W. Newport - Plant Superintendent

Personnel Participating

D. J. Harris - OWRC

Description of Plant and Process

This company is engaged in the production of steel tapes and rules. Since the major portion of the industrial wastes emanating from this plant is associated with the production of steel tapes, it is this operation which will be discussed in detail.

A flow diagram for the production of steel tapes is given in Figure I. There are four types of tapes made;

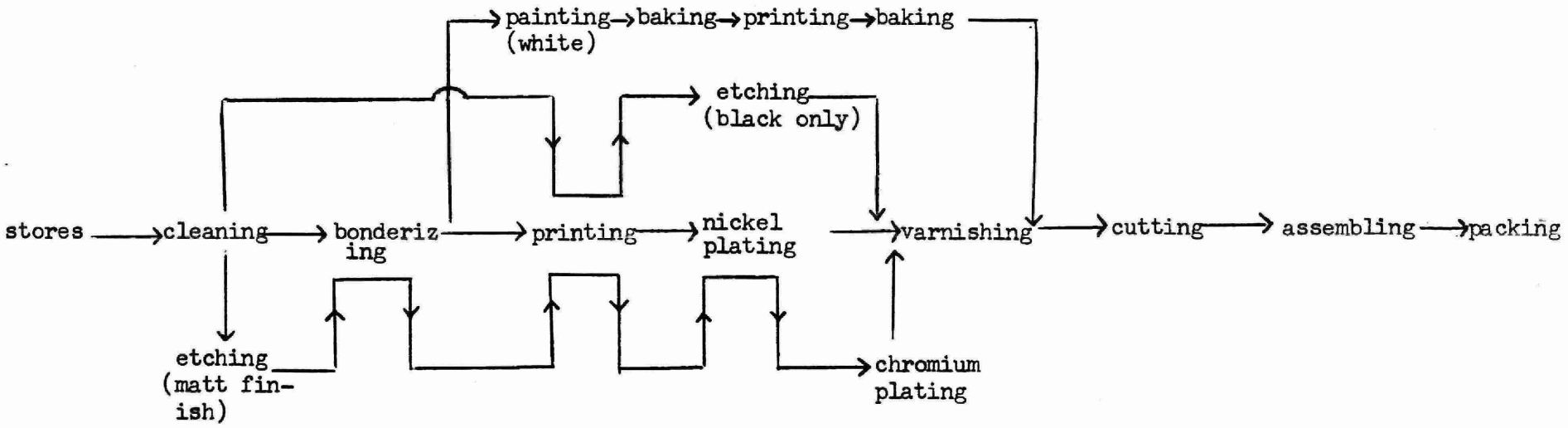
1) black tapes,

2) painted (white) tapes,

3) nickel plated tapes,

4) nickel-chromium plated tapes.

Schematic diagrams of the bonderizing, etching, nickel plating and chrome plating lines are given in Figure II, III, IV, and V respectively.



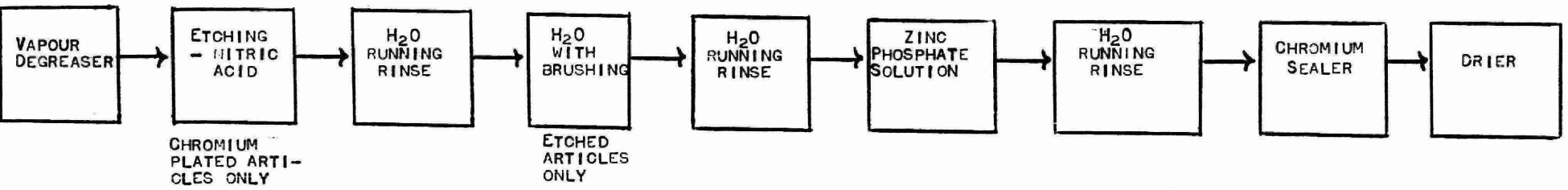
FLOW DIAGRAM FOR PRODUCTION OF

STEEL TAPES

FIGURE I

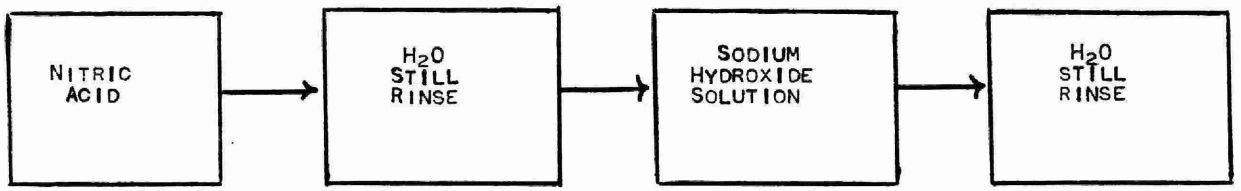
BONDERIZING LINE

FIGURE II



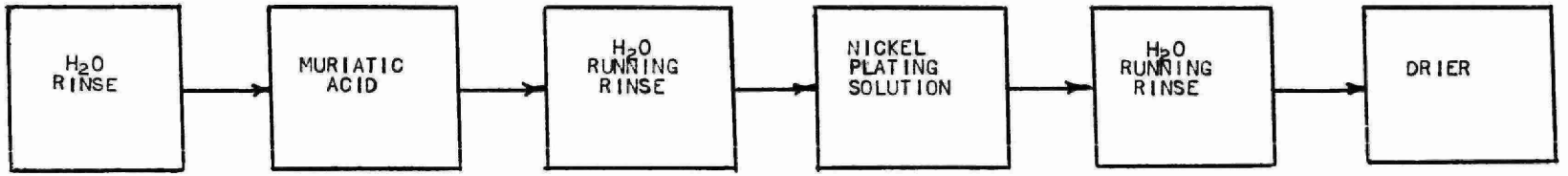
ETCHING LINE (Black Tapes)

FIGURE III



NICKEL PLATING OPERATION

FIGURE IV



CHROMIUM PLATING LINE

FIGURE V

Operating Data

Hours/day - 18

Days/week - 5

Number of Employees

Plant - 124

Office - 65

Water Consumption and Distribution

Approximate water consumption and distribution are as follows:

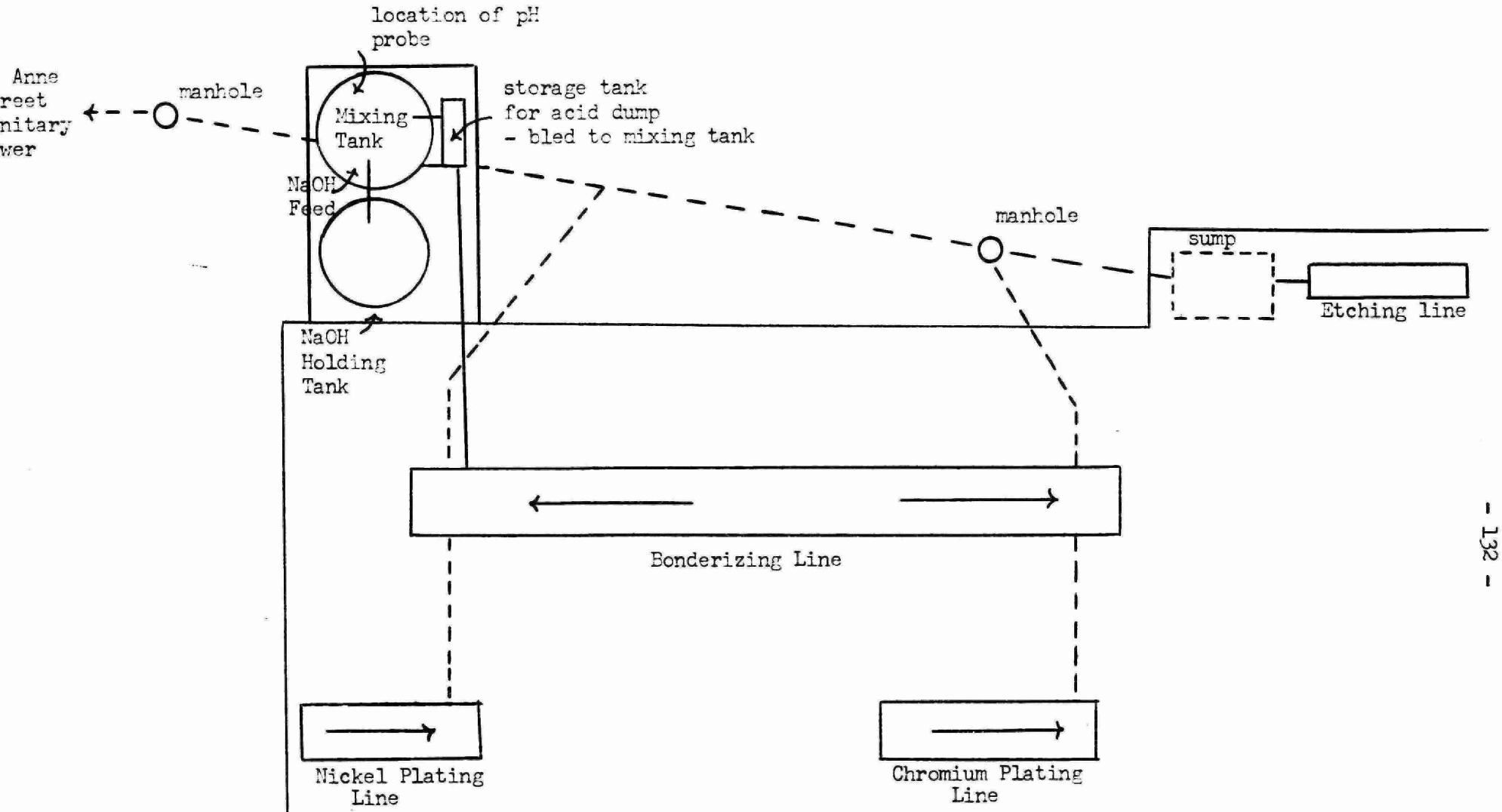
Bonderizing, plating and etching lines	- 45,500 gallons per day *
Domestic	- 5,200 " " "
Cooling	- 14,900 " " "
Total	- 65,600 gallons per day *

* Figures obtained from meter readings

Sources of Liquid Wastes, Treatment and Disposal

The domestic wastes and the cooling water from the two degreasers and a compressor are discharged to the Innisfil Street sanitary sewer.

The rinses and batch dumps of spent solutions from the etching, bonderizing, nickel plating and chromium plating lines are discharged to the Anne Street sanitary sewer as shown in Figure VI. All wastes that discharge to this sewer pass through a 1250 gallon mixing tank for automatic pH adjustment (sodium hydroxide automatically fed by pH controller-recorder).



THE LUFKIN RULE COMPANY OF CANADA LIMITED

BARRIE

FIGURE VI

Sampling and Analysis

On September 25, 1969, samples were composited at half-hour intervals between 1030 hours and 1430 hours at the following locations;

1) Plant manhole before mixing tank.

2) Inlet side of mixing tank.

3) Outlet side of mixing tank.

4) Total plant effluent to Anne Street sanitary sewer.

In addition, grab samples were obtained at the following locations;

1) Total plant effluent to Anne Street sanitary sewer (1445 hours).

2) Inlet side of mixing tank (1450 hours).

The samples were submitted to the OWRC Toronto laboratory for analysis. The analytical results are appended to this report.

WASTE LOADINGS

On the day of this survey, only the chromium plating line and bonderizing line were operating. The nickel plating line and etching line were closed down.

The waste loadings of chromium and iron to the Anne Street sanitary sewer were 1.6 and 2.5 lbs per day respectively. Chromium plating is conducted on a yearly average of once per week.

The approximate volume, strength and dumping schedule of the various spent solutions are given in Table I.

TABLE I

TANK CONTENTS	ORIGIN	QUANTITY OF CONTAMINANT	VOLUME (gallons)	FREQUENCY OF DISCHARGE
Nitric acid	bonderizing	7 gal. (60%)	70	1/day
Zinc phosphate	"	4 lb.	400	1/month
Chromium sealer	"	6 oz. (deoxylyte)	70	1/day
Nitric acid	etching	3 qts. (60%)	20	30/day
Sodium hydroxide	"	30 lb.	180	1/wk
Muriatic acid	nickel plating	5 gal.	35	1/wk

DISCUSSION OF FINDINGS

The analytical results of sample T-2272 indicate that the normal waste discharged from this plant during chromium plating and bonderizing complies with the limits as set out in the Municipal Sewer-Use By-Law (#66-69) except for the concentration of chromium. Since the chromium concentration (3.5 ppm) was only slightly in excess of the limit of 3.0 ppm, the waste may be considered acceptable.

At the time of this survey, the etching line was not being operated, however, a maintenance man noticed the etching room sump was clogged. He cleared the outlet of the sump allowing the discharge of several dumpings of acid. Two samples, T-2267 and T-2268, were obtained

during this discharge. The analytical results of these samples indicate that the pH of the final effluent dropped to 3.2, considerably outside the acceptable range of 5.5 ---> 9.5. There was a large discrepancy noted between this value and that indicated by the company's pH controller-recorder (7.4).

CONCLUSIONS

The results of this survey show that on the day of sampling, the normal plant effluent discharging to the Anne Street sanitary sewer closely complied with the limits in the Municipal Sewer-Use By-Law.

The drop of the pH value to 3.2 during the acid discharge demonstrates that the neutralization system cannot adequately handle large batch discharges. It also appears that the pH controller-recorder is not operating effectively.

RECOMMENDATIONS

It is recommended that;

1) a further survey be conducted by the City of Barrie of the operations within this plant to evaluate the acceptability of the waste discharged to the Anne Street sanitary sewer during the operation of the nickel plating line and etching line,

2) the company investigate the apparent malfunction of the pH controller-recorder,

3) the company instruct their personnel that there is to be no batch discharge of strong wastes to the sanitary sewer, regardless of the circumstances,

4) cooling water be discharged to the ditch instead of the sanitary sewer.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Barrie Report to: David J. Harris c.c. /rd

Source: The Lufkin Rule Co. of Canada Ltd.

Date Sampled: Sept. 25/69 by: D.J. Harris

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	Chromium as Cr.		Nickel as Ni.	Copper as Cu.	Iron as Fe.	Phosphates as P.	C.O.D.
		Total	Susp.	Diss.		Tot.	Hex.					
T-2269	**	600	90	510	6.7	3.25	0.0	0.13	0.04	36.	1.1	16
T-2270	**	330	60	270	7.0	3.35	0.0	1.0	0.04	16.6	1.1	12
T-2271	**	430	40	390	6.8	3.25	0.0	0.93	0.04	16.	1.1	12
T-2272	**	320	10	310	7.0	3.50	2.3	1.0	0.03	5.4	0.96	12
Municipal Sewer-Use By-Law Limits			350		5.5 - 9.5	3.00		-	1.0	-		

** Interference inhibits analysis.

T-2269 1. Plant manhole before mixing tank (10:30 a.m. - 2:30 p.m.)

T-2270 2. Inlet side of mixing tank (10:30 A.M. - 2:30 P.M.)

T-2271 3. Outlet side of mixing tank (10:30 A.M. - 2:30 P.M.)

T-2272 4. Total plant effluent (10:30 A.M. - 2:30 P.M.)

10M-60-22690

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Barrie Report to: David J. Harris c.c.

Source: The Lufkin Rule Company of Canada Ltd.

Date Sampled: by:

Lab. No.	5-Day B.O.D.	Solids			Chromium as Cr.		Phenols in ppb	Copper as Cu	Iron as Fe	Phosphates as P		pH at Lab.	Alkalinity as $CaCO_3$
		Total	Susp.	Diss.	Tot.	Hex.							
T-2268	**	1430	150	2180	1.70	0.0	4	0.23	285.	2.0		3.0	0
T-2267	**	1460	205	1255	2.25	0.0	12	0.28	258.	2.0		3.2	0
Municipal Sewer-Use By-Law Limits			350		3.00			1.0				5.5 - 9.5	

** Interference inhibits analysis

T-2268 2. Inlet side of mixing tank (Grab: 2:50 p.m.)

T-2267 1. Final Plant Effluent (Grab: 2:45 p.m.)

5M 60—1311

MANSFIELD DENMAN GENERAL COMPANY LIMITED

This industry, located on John Street at Dyment Road, was surveyed on June 3, 1969.

DETAILS OF SURVEY

Personnel Interviewed

Mr. V. Brittnell - Plant Engineer

Personnel Participating

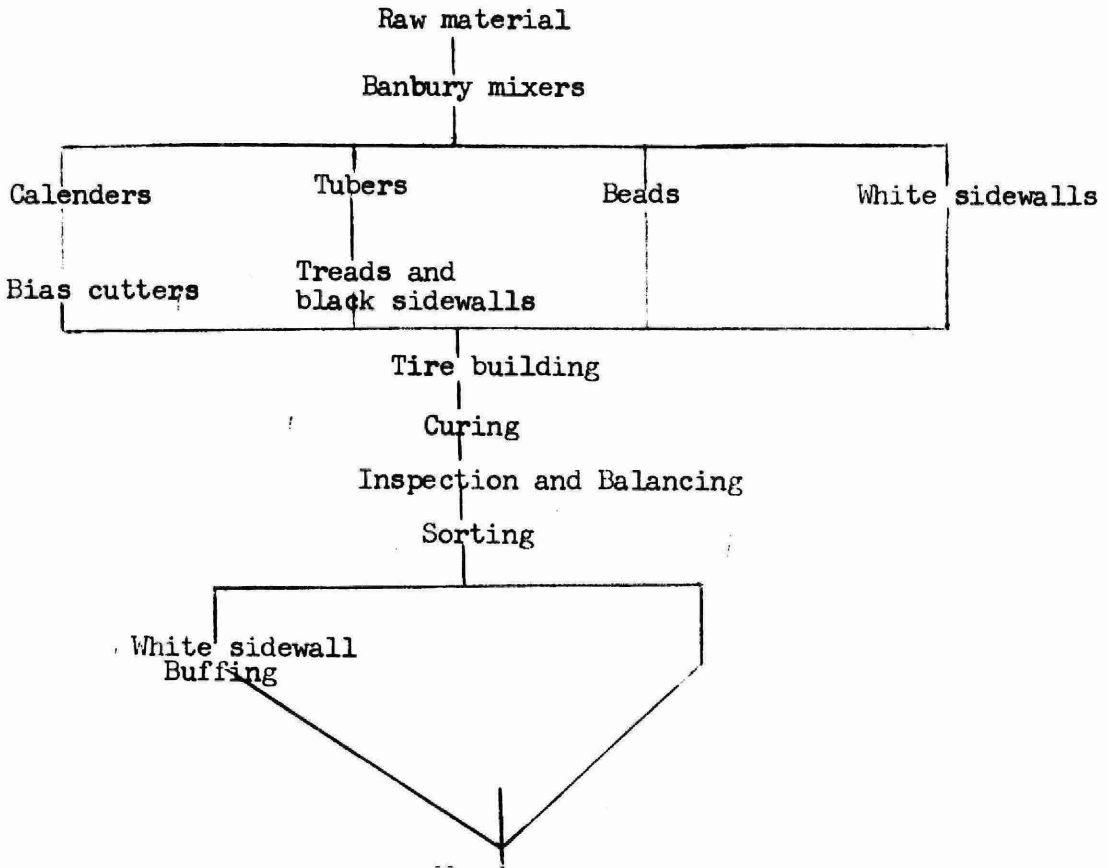
N. A. Gillies - OWRC

Description of Plant and Process

This plant produces rubber tires for the automotive industry.

The raw material mix used depends to a great extent on the class of use to which the finished tire will be put. However, some of the ingredients are; rubbers, oils, accelerators (mostly complex organo-sulphur compounds), sulphur, zinc oxide, stearic acid, waxes, carbon black, anti-oxidants (complex amines), wire and nylon, rayon and polyester cord.

A simplified flow chart follows:



A full description of the process steps may be found in the literature pertaining to this type of industry.

Production and Operating Data

Hours per day - 24

Days per week - 5

Number of Employees - 420

Production volume - Not available

Water Consumption and Distribution

Water, obtained from the PUC, is presently used at a rate of some 570,000 gallons per day.

Distribution is as follows:

Cooling calender rolls " mill rolls " banbury mixers " tread stock " tubers " hot water cure presses	)	418,000
Hot Water cure presses		47,500
Boiler makeup		29,500
Sanitary and Domestic		10,000

There is approximately 25% recirculation of cooling water.

Sources of Liquid Wastes, Treatment and Disposal

Wastes arise from cooling of machinery, hot water cure presses, boiler blowdown and sanitary facilities. No treatment is given and the wastes are discharged as follows:

WASTE	VOLUME	SEWER
Sanitary and Domestic	10,000 gpd	Sanitary
Boiler Blowdown	1,200 "	"
Cooling Water	123,800 "	"
Cooling Water	340,000 "	Storm

Approximately 50 gpd of rubber solvents, soapstone solution, talc and oil are discharged to a seepage pit on the property.

Sampling and Analysis

Since, with the exception of boiler feed, water is used only for cooling it was not considered necessary to obtain samples.

DISCUSSION OF FINDINGS

Almost all water used in this plant is for cooling purposes. Approximately 1200 gpd of water is discharged to the sewer from boiler blowdown, and represents the only contaminated flow to the sewer. This minute quantity will exert an insignificant load upon the municipal treatment plant.

Although 25% of the water for cooling is recirculated, no chemicals are added and, since this water does not contact the product, the effluent quality should be similar to that of the city water supply.

However, the absence of a significant organic loading does not mean that disposal of this waste in the sanitary sewer is satisfactory. In fact, this large volume (124,000 gpd) exerts a considerable

hydraulic loading on the municipal plant and this method of disposal of cooling water must be considered to be unsatisfactory.

CONCLUSIONS

This industry exerts upon the municipal sewage treatment plant an insignificant wastes loading. However, the large volume of cooling water being discharged to the sewer imposes a considerable hydraulic loading and this method of disposal is unsatisfactory.

RECOMMENDATIONS

It is recommended that;

1) All uncontaminated cooling water be discharged to the municipal storm sewer.
2) Boiler blowdown be discharged as at present to the sanitary sewer.
3) Contaminated wastes other than boiler blowdown continue to be discharged to the seepage pit.

MOLDEX LIMITED

This plant, situated on Vespra Road, was surveyed on June 4, 1969.

DETAILS OF SURVEY

Personnel Interviewed

Mr. Powell - Plant Manager

Personnel Participating

P. Chisholm - OWRC

Description of Process

Toilet seats are manufactured at this plant. There are two separate processing operations, one using a sawdust base, the other a polystyrene plastic base.

In the former, the sawdust base is pressed to shape in a power press. After pressing, the seat is placed on a slowly moving conveyeor belt on which it is air cooled and spray painted. No water is used in this process even for cooling. The paint spray section is cleaned annually during the two week close-down period. This cleaning is carried out with solvent soaked rags which are burnt after use, therefore, constituting no water pollution problem.

The second process consists of heating and colouring, with powder colours, the plastic in an extruding machine. The plastic is then extruded and pressed to shape in a power press. After pressing, the seat is water cooled.

Operating Data

This plant operates twenty four hours a day, five days a week. Thirty persons are employed.

Water Consumption and Distribution

Water is obtained from two sources, namely from a private well and from the City of Barrie. Well records show that consumption amounts to 7,500,000 gallons per year. Consumption of city water runs consistently at 31,000 cu.ft. per month giving a total daily consumption of 39,000 gals. The only manufacturing use of water is that of cooling. The presses in the plastic seat operation are water cooled as are the seats, after pressing. Cooling water is also used in the oil pressure pumps.

Sources of Wastes, Treatment and Disposal

Wastes consist of cooling water and this is utilized as outlined above. No treatment is given and all cooling water is discharged to the storm sewer system.

Sampling and Analysis

It was considered not necessary to obtain samples since water is used only for cooling, on a "once through" basis.

DISCUSSION OF FINDINGS

Water is used only for cooling and therefore it should not be contaminated. The wastewater is discharged to the storm sewer and since it appears to be uncontaminated, no problems should be experienced.

CONCLUSIONS

Conditions at this plant were satisfactory at the time of the survey.

RECOMMENDATIONS

No recommendations will be made at this time.

PLASTOMER LIMITED

This plant, located at 151 John Street, was surveyed on September 22, 1969.

DETAILS OF SURVEY

Personnel Interviewed

Mr. J. Moore - plant engineer

Personnel Participating

D. J. Harris - OWRC

Description of Plant and Process

This company produces plastic molded parts such as electrical switches and electric iron chassis. Both injection molding and compressed molding techniques are used.

Operating Data

Hours/day - 24

Days/week - 5

Number of Employees - 150

Water Consumption and Distribution

Estimated water distribution is as follows:

sanitary	-	3,000	gallons	per	day
cooling	-	44,000	"	"	" *
Total	-	47,000	"	"	"

*Obtained from well

Sources of Liquid Wastes, Treatment and Disposal

Wastes are produced in the cooling of molds (direct contact) and the cooling of hydraulic oil (heat exchanger), and they are discharged to the storm sewer. The domestic wastes are discharged to the sanitary system.

The only other liquid waste requiring disposal is the spent hydraulic oil and it is hauled to the City garbage disposal site.

Sampling and Analysis

A grab sample was obtained of the cooling water discharged to the storm sewer. The sample was submitted to the OWRC laboratories in Toronto for analysis and the results are appended.

CONCLUSIONS AND RECOMMENDATIONS

Analysis of sample T-2244 indicates that, at the time of this survey, the cooling water discharged to the storm sewer complied with OWRC water quality objectives for discharge to a watercourse.

It is recommended that the spent hydraulic oil be treated with an absorbent material before haulage to the City dump.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

1 p.p.m. = 1 mgm. / litre
= 1 lb./100,000 Imp. Gals.

Municipality: Barrie **Report to:** D.J. Harris **c.c.**

Source: Plastomer Ltd.

Date Sampled: Sept. 17/69 **by:** D.J. Harris mm

Lab. No.	5-Day B.O.D.	Solids			Phenols in ppb	Ether Solubles	pH at Lab						
		Total	Susp.	Diss.									
T2244					0	3	7.5						
OWRC Objectives					20	15	5.5 - 9.5						

T2244 1 Plant Cooling Water Effluent (Grab 4.15 p.m.)

10M-60-22690

ROBSON LANG LEATHERS LIMITED

This plant of Robson-Lang Leathers Limited, was surveyed on June 3 and 4, 1969.

DETAILS OF SURVEY

Personnel Interviewed

Mr. J. Traub - Plant Superintendent
Mr. R. Marshall - Plant Engineer

Personnel Participating

G. V. Buxton

Description of Process

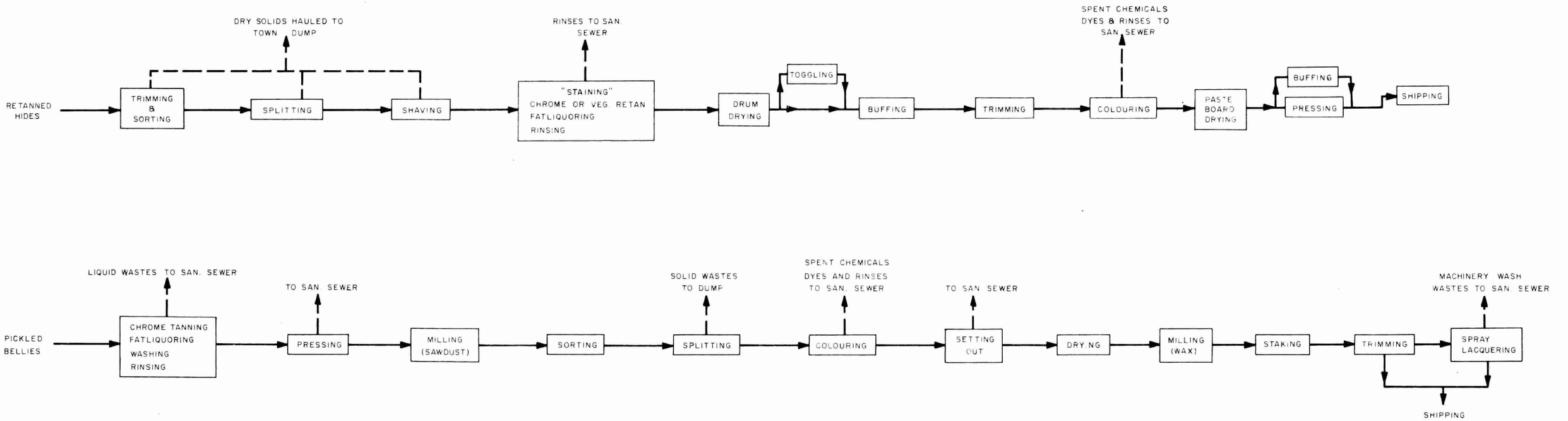
For eight months of the year (April - November) processing at this plant consists of the retanning and finishing of "splits" and "pickled bellies". The flow diagram (Figure I), outlines the operations conducted on each of the following lines.

Splits

The raw material for this line is previously tanned hides. These hides are first sorted and trimmed to provide uniformity in size and shape. The hides are directed to a splitting machine where a sharp, rapidly moving, horizontal band knife cuts the hide to a uniform thickness. A shaving machine equipped with a helical cutting blade provides a fine adjustment and control over the overall thickness of the skins and at the same time conditions the surface. The next composite operation is that of "staining". A nine hundred pound load of hides is placed into a revolving drum and chrome or vegetable retanning, fatliquoring washing and

ROBSON — LANG LEATHERS
PROCESS FLOW DIAGRAM

FIGURE I



69-81-IW

rinsing is carried out over a period of several hours. The staining procedure varies according to the type of leather to be produced. The retanning imparts properties of additional tanning agents. Fatliquoring makes the hide more flexible through lubricating the fibers. The stained hides are then dried on rotary drums. Any wrinkled skins are stretched and held in position on a perforated frame by means of clips called toggles. The frames are placed in an oven for drying. The hides are then conveyed to a "buffing" machine where mechanical sanding is utilized to improve the grain surface. The hides are once again trimmed and then directed to the colouring drums. The dyeing operation requires: the addition of wetting agents, pH adjustment with ammonium hydroxide, addition of emulsifiers, colouring with anniline derived dyestuffs, and various rinses. After colouring, the hides are pasted on a board and dried in an oven. Final buffing is used to improve the texture of the finished hide prior to shipping.

Pickled Bellies

The bellies follow a somewhat different process path, the hides being initially tanned in a five stage procedure requiring approximately 4-1/2 hours for about 5280 pounds of bellies. The purpose of tanning is to convert the skin into a stable, non-putrescible material and the procedure requires the addition of the following chemical ingredients: Stage 1, calcium formate, detergent and sterisol; Stage 2, trivalent chromium; Stage 3, sodium bichromate and sodium chloride salts; Stage 4, various sulfides; Stage 5, sulfuric acid.

After tanning the bellies are pressed, milled with sawdust to soften the leather and then sorted into various sizes and thicknesses. Following this, the hides are split, dyed and "set out". The "setting out" operation preconditions the hides for drying, removing excess water and wrinkles. Next, the hides are hung overnight to dry. The dried bellies are then milled with either wax or chalk to soften them. A subsequent "staking" operation mechanically softens the leather making it more pliable. The staked hides are sent either directly to shipping or to a final lacquering operation depending on the finish required.

From December to March a small beam house is operated for the processing of deer, elk and moose hides. When raw hides are being processed the additional operations required include: soaking, unhairing, fleshing, bating and pickling. However, these operations were not being conducted at the time of this survey.

Operating Schedule		Production Volume
Hours/day	- 9	10,000,000 ft^2 of leather per year
Days/week	- 5, 6	
Employees	- 160	
Shifts	- 2	

Water Consumption

This plant obtains water from two sources; the Barrie Public Utilities Commission and a drilled well located on the plant site. Approximately 27,000,000 gallons per year are obtained from the well and

about 20,000,000 gallons per year from the PUC.

Sources of Liquid Wastes and Disposal

(a) "Roof Drains" carry only rain and runoff water to Lake Simcoe.

(b) "Boiler Blowdown" is conducted about once per shift. The boilers utilize soft water and no treatment chemicals are added. Approximately 1500 gallons per day of boiler blowdown are directed to Lake Simcoe.

(c) "Pump Exhaust" which amounts to about 200 gallons per day and results from the condensation of steam from a steam pump - to Lake Simcoe.

(d) "Water Softener Regeneration" wastes result from the daily backwashing of the ion exchange column. The initial backwash is conducted using approximately 200 gallons of a concentrated brine solution, followed by an unmeasured quantity of clean water rinse. All of this waste is discharged to Lake Simcoe.

The industrial waste flow to the sanitary sewer system is metered and the quantity of wastes is approximately 41,000,000 gallons per year. (approximately 143,000 gallons per day based on an average operation of 5-1/2 days per week). An estimate of the distribution of this waste is as follows:

Staining Wastes	- 40%
Colouring wastes	- 50%
Chrome tanning wastes	- 5%
Dust collector effluent	- 3%
Lacquer washings	- 2%

The staining wastes consist primarily of rinse waters. There is approximately one hour of continuous rinsing per 900 lbs of retanned hides processed.

The colouring wastes also consist mainly of rinse waters. Any wetting agent, base, emulsifier or unconsumed dye would be directed to the sanitary sewer with the rinse water.

Dust from the "buffing" operation is retrieved from the exhaust via a water spray. This flow containing fine solids in suspension is directed also to the sanitary sewer system.

Water is used to wash continuously the lacquering machinery. This contaminated waste is also directed to the sanitary sewer.

All of the flows (except some washrooms) are directed through a mechanical screening device for coarse solids removal prior to discharging to the municipal sanitary sewerage system.

During the period of beam house operation, liquid wastes from the soaking, unhairing, bating and pickling operations are directed to the sanitary sewerage system. Wastes from the fleshing machine are trucked daily to the municipal sanitary landfill site for disposal.

Sampling and Analysis

Table A summarizes the samples collected on June 4, 1969.

TABLE A

SAMPLE POINT	SAMPLE DURATION	REMARKS
1. Total plant effluent	4 hour composite	15 minute intervals
2. Liquid waste from the colouring operation	grab 1:30 p.m.	batch discharge to sanitary sewer
3. Liquid waste from staining operation	grab 1:30 p.m.	"
4. Chrome tanning wastes	grab 3:30 p.m.	"
5. Brine concentrate from water softener regeneration	grab 11:00 a.m.	periodic discharge to Lake Simcoe
6. Dust collection effluent from buffing operation	grab 3:45 p.m.	continuous discharge to sanitary sewer

The samples were transported to the OWRC Toronto laboratories the same evening for analysis in accordance with modifications of the procedures outlined in "Standard Methods for the Examination of Water and Wastewater", twelfth edition, an American Health Association Publication. The analytical results are appended.

WASTE LOADINGS

Table B summarizes the characteristics of the total plant effluent discharging to the sanitary sewerage system and compares these results with the limitations as outlined in By-law 66-69 of the Corporation

of the City of Barrie. The pounds per day loadings are based on an average waste flow of 143,000 gallons per day.

TABLE B

ANALYSIS	BARRIE BY-LAW #66-69 LIMITS (ppm)	EFFLUENT CONCENTRATION (ppm)	WASTE LOADING POUNDS/DAY
BOD	300	340	488
Total Solids	- ,	2000	2860
Suspended Solids	350	270	388
Dissolved Solids	-	1730	2480
pH	5.5 - 9.5	6.5	-
Ether Soluble Materials	100	76	109
Total Chromium	3	24	34
Hexavalent "	-	0	0
COD	-	1140	1638
Total Kjeldahl Nitrogen	-	20	29
Sulphides as H_2S	-	0	0
Chlorides as Cl	-	402	576

Sample Calculation

$$\frac{340 \text{ lbs } BOD_5}{10^6 \text{ lbs of waste}} \times \frac{10 \text{ lbs of waste}}{1 \text{ gallon of waste}} \times \frac{143{,}000 \text{ gallons of waste}}{\text{day}}$$

$$= 488 \text{ lbs/day}$$

DISCUSSION OF FINDINGS

At the time of the survey, the beamhouse was not in operation and the effluent to the sanitary sewer therefore represents the minimum loadings which will be experienced during the year.

The total plant effluent to the sanitary sewer was found to have concentrations of BOD and chromium in excess of the limits set in by-law 66-69, although the BOD content was not greatly in excess. The chromium concentration, however, was at a level which raises concern about the possible effect of this material on the efficiency of treatment at the municipal sewage treatment plant.

The chromium, fortunately, is in the trivalent state and is thus amenable to treatment before discharge to the municipal sewers.

The batch discharges of dyeing liquor, fat liquor and chrome tanning liquor each have concentrations of contaminants which are excessive, but the volumes of these discharges are relatively small and with adequate mixing and equalisation they should not prove to be objectionable.

Other discharges from this plant appeared to be satisfactory at the time of the survey.

CONCLUSIONS

The effluent from this plant to the municipal sanitary sewer system was found to be unsuitable for discharge, due to the concentrations of BOD and chromium.

Several batch discharges were found to have concentrations of contaminants in excess of the by-law limits, but were of small volume and thus could be rendered innocuous by equalisation.

The loadings to the sanitary sewer system will be greater during the period of beamhouse operation.

RECOMMENDATIONS

It is recommended that:

1) Equalisation facilities be installed for the concentrated batch discharges.
2) Treatment facilities to remove chromium from the equalised waste be provided.
3) A further survey be carried out to determine the waste loading to the sanitary sewer when the beamhouse is in operation.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Barrie **Report to:** G.V. Buxton * **c.c.** /rd

Source: Robson Lang Leathers Ltd.

Date Sampled: June 4/69 **by:** G.V.B.

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	Ether Solubles	Chromium as Cr.		C.O.D.	Total Kjeldahl	Sulphides as H_2S		Chlorides as Cl.
		Total	Susp.	Diss.			Tot.	Hex.					
T-949	340	2000	270	1730	6.5	76	24.0	0.0	1140	20.	0.0		402
T-950	160	4170	150	4020	3.2	---	---	---	1260	19.0	---		---
T-951	300	1540	180	1360	7.5	106	---	---	1365	---	---		---
T-952	3000	63600	1400	62200	3.2	---	600.	0.0	13600	---	---		---
T-953	---	---	---	---	6.4	---	---	---	---	---	---		1200
T-954	40	500	150	350	7.1	---	---	---	195	---	---		728

(Triplicate Mix Samples together)

T-949	1	ABC		Comp. (11:15 - 4:15) 15 min. intervals - total plant effluent to sanitary sewer.
T-950	2	AB	(Dup.)	Grab 1:30 p.m. - dyeing liquor batch discharge to san. sewer.
T-951	3	AB	(Dup.)	Grab 1:30 p.m. "Staining" fat liquor batch discharge to san. sewer.
T-952	4	AB	(Dup.)	Grab 3:30 p.m. - Chrome tanning liquor batch discharged to san. sewer.
T-953	5			Grab (11:00 a.m.) - Brine Concentrate for softener regeneration - discharged to Lake Simcoe.
T-954	6			Grab (3:45 p.m.) water spray collecting dust from buff sander and discharging to san. sewer.

5M-60-11403-65

SARJEANT COMPANY LIMITED

This plant located on Mary Street, was surveyed on June 3, 1969.

DETAILS OF SURVEY

Personnel Interviewed

Mr. B. Godden - Field Manager

Personnel Participating

G. V. Buxton - OWRC

Description of Plant and Processes

There are essentially two plants at this site. The first plant consists of general offices, warehouse facilities and a fuel oil storage area. Materials necessary for construction are stock piled in the warehouse. This site serves as a retail outlet for construction materials and fuel oil.

The second plant located across the street is a "ready-mix" concrete plant. Prewashed sand and gravel are purchased from C. Varcoe Limited thus, no gravel washing is conducted at this site. Specified amounts of cement, sand, gravel and water are mixed and loaded from a hopper into the concrete trucks. Each truck carries a water reservoir to enable the driver to adjust the moisture content of the concrete at the job site. The company own the trucks but maintenance and repair work is carried out at a local garage.

Production and Operation Data

Production	Operating Schedule
- 20,000 cubic yards per year	Hours/day - 9 Days/week - 5 Employees - 14

Water Consumption and Distribution

Approximately 125,000 gallons per month of water are obtained from the Barrie Public Utilities Commission. This quantity is utilized in the following areas:

- concrete production
- truck water storage
- truck rinsing
- domestic purposes

Sources of Liquid Wastes and Disposal

As previously mentioned, most of the water used in this operation is consumed in the concrete product. The majority of truck washings are conducted at the job site utilizing water from the truck reservoir to rinse the internal area of the tank after a load has been poured. On occasion a truck returns to the plant still partially loaded with concrete. This concrete is unloaded and the rinsing is conducted on the adjacent land-fill site in agreement with the City of Barrie.

Sampling and Analysis

No samples were collected because of the intermittent nature of this operation and the fact that there should be no runoff of wastes.

CONCLUSIONS

There should be no runoff of wastes to a watercourse from the washing of trucks or disposing of concrete if the operators are conscientious and careful.

RECOMMENDATIONS

Control must be exercised so that there is no runoff of wastes resulting from this operation.

SEVEN-UP (ONTARIO) LIMITED

This plant located at 49 Anne Street, was surveyed on June 3, 1969.

DETAILS OF SURVEY

Personnel Interviewed

Mr. Harrison - Plant Superintendent

Personnel Participating

P. Chisholm - OWRC

Description of Process

Soft drinks are processed and bottled at this plant. Each batch is processed in one of four stainless steel tanks. The processing consists of diluting the specific soft drink concentrate with water, and colouring the solutions. The soft drink is then pumped from the processing tank to the automatic filling line. There is no waste from vat washings as one tank is always used for the same flavour. The only waste in this department is from spillage. The filling line is a conventional, automatic line and constitutes little or no water pollution problem.

There is also an automatic bottle washing machine in the manufacturing area.

Operating Data

15 persons are employed at this plant on a one shift, 5-1/2 day per week basis.

Water Consumption and Distribution

All water used at this plant is drawn from the municipal supply. Monthly consumption is approximately 150,000 Imperial gallons. Water is used in manufacturing the soft drinks. There is a constant flow of water to the bottle washing machine.

Sources of Liquid Wastes, Treatment and Disposal

The bottles are initially water rinsed to remove solids, i.e. matches, cigarettes. They are then washed for 15 minutes in a 4% sodium hydroxide solution, rinsed with 1% sodium hydroxide solution and rinsed again with water. There is a constant overflow from both rinsing tanks to the sanitary sewer system. This overflow contains some of the sodium hydroxide solution and amounts to approximately 85,000 Imperial gallons per month.

Every 8 - 10 weeks both caustic tanks are emptied to the sanitary sewers and the tanks are refilled with fresh caustic solutions. This means a release of 800 Imperial gallons of partially spent 4% sodium hydroxide and 200 Imperial gallons of 1% sodium hydroxide to the sanitary sewer in one day.

Sampling and Analysis

A six-hour composite sample was taken of effluent from the bottle washing machine to the sanitary sewer. The results were;

BOD	COD	pH
42 ppm	85 ppm	12.2

DISCUSSION OF FINDINGS

The pH of this effluent to the sanitary sewer was above the by-law limits. The cause of the high pH is the presence of caustic (sodium hydroxide) in the overflow from the bottle washing machine.

The batch dumps of caustic should be neutralised to meet the by-law limits before they are directed to the sanitary sewer. The wastes could be directed to a holding tank where acid should be added to ensure that the pH is satisfactory before discharge to the sewer.

CONCLUSIONS

The effluent from this plant to the sanitary sewers has a pH in excess of the by-law limits, but is otherwise acceptable for discharge.

The periodic dumping of spent caustic solutions is unacceptable due to the high pH.

RECOMMENDATIONS

It is recommended that facilities be installed to neutralise the rinses prior to discharge to the sanitary system.

It is also recommended that the batch dumps of caustic solutions be neutralised prior to discharge to the sanitary sewer system.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Barrie **Report to:** N. Gillies **c.c.**

Source: 7 - Up

Date Sampled: June 2/69 **by:** N.G. br

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	COD							
		Total	Susp.	Diss.									
T 942	42				12.2	85							

T 942	1.	Total wash effluent to sewer	Composite

5M-60-11403-65

SMITH'S FARM DAIRY (BARRIE) LIMITED

This industry, located on Penetang Street, was surveyed on June 5, 1969.

DETAILS OF SURVEY

Personnel Interviewed

Mr. M. Smith - Owner

Personnel Participating

N. A. Gillies - OWRC

Description of Plant and Process

This is a conventional dairy, receiving milk, which is pasteurised and packed in bottles, cartons and jugs. Chocolate milk is also made and packed in cartons. Cream is received, pasteurised and packed in bottles and cartons.

Production and Operating Data

Production volume	- Milk*	11,000 lbs/day
	- Cream*	300 lbs/day
Operating Schedule	- Days/week	5
	- Hrs/day	8 (approx)
Number of employees	-	16

* No significant seasonal variation

Water Consumption

Water consumption, based on figures supplied by the Public Utilities Commission, is approximately 10,000 gallons/day.

Sources of Liquid Wastes, Treatment and Disposal

Liquid wastes arise from washing and rinsing of equipment, bottle and jug washing machines, spillage and leakage from equipment.

No treatment is provided for the wastes and disposal is to the municipal sanitary sewer system.

Sampling and Analysis

Due to the difficulty in obtaining representative samples of the waste from this type of plant, no samples were taken.

CALCULATION OF WASTE LOADINGS

A theoretical calculation of the waste loadings will be used to determine the contribution of this industry to the load on the municipal sewage treatment plant.

The following values are modifications of those taken from the publication of the United States Public Health Service, "An Industrial Wastes Guide to the Milk Processing Industry":-

Operation	lbs BOD_5/10,000 lbs milk or milk equivalent
Receiving milk	2.0
Cream Pasteurisation, cooling and filling	2.0
Milk pasteurisation, cooling and packing	7.0
Storage of Fluid Milk	0.5
Storage of Cream	1.0
Delivery (including truck washing)	1.0
Total	13.5

Milk processed - 11,000 lbs/day*

Cream processed - 300 lbs/day*

*Approximate figures based on 23 day month.

Total Milk or Milk equivalent processed - 13,500 lbs/day

From these figures, the daily BOD_5 loading to the sanitary sewer may be calculated to be

$$\frac{13,500}{10,000} \times 13.5 \text{ lbs}$$

or 18.25 lbs

DISCUSSION OF FINDINGS

During the survey it was noted that there was little spillage or leakage of milk. This operation is therefore considered to be "clean" and it is felt that low loss figures may appropriately be used.

Although 18.25 lbs/day of BOD_5 indicates a product loss of 177 lbs/day, or 1.3% of production, which may be open to argument, it is nontheless proposed to assign to this industry that quantity of BOD.

CONCLUSIONS

Based on a theoretical calculation, this industry discharges to the municipal sanitary sewer 18.25 lbs/day of BOD_5, and 10,000 gallons/day of water. There is no significant seasonal variation.

RECOMMENDATIONS

No recommendations will be made at this time.

WEST BEND OF CANADA LIMITED

This industry, located on John Street, was surveyed on June 3, 1969.

DETAILS OF SURVEY

Personnel Interviewed

Mr. B. Baker - Plant Engineer

Personnel Participating

N. A. Gillies - OWRC

Description of Plant and Process

This plant produces kitchen equipment (pots, pans and coffee percolators) from stainless steel and aluminum.

Stainless steel is received in roll form and aluminum is received as blanks. These materials are processed as follows:-

Aluminum: The blanks are pressed to the desired shape and are washed to remove dirt and machine oil. At this stage the product may be fitted with handles and knobs and sent for packing and dispatch to the customer, or a teflon or porcelain coating may first be applied.

Stainless steel: The steel rolls are fed to a blanking press to produce blanks for the various product lines being produced. The blanks are then pressed to the desired shape, sanded, degreased and buffed to a high luster. The product is washed to remove oil and dirt, is rinsed and dried and accessories are fitted before packaging and dispatch to the customer.

Operating Data

Hours/day - 16*

Days/week - 5

Number of employees - 230

*Small second shift

Water Consumption and Distribution

Present water consumption, from figures supplied by the Public Utilities Commission, is approximately 62,500 gpd.

Distribution is as follows:

Sanitary - 5,000 gpd

Cooling - 47,500 gpd

Rinsing - 10,000 gpd

Sources of Liquid Wastes, Treatment and Disposal

Wastes are produced in the washing and rinsing operation, in cooling of presses and from the sanitary facilities.

No treatment is provided for any of the waste flows.

The wash machine wastes (running rinse and detergent tank) and sanitary wastes are discharged to the sanitary sewer, while cooling water is discharged to the storm sewer.

Sampling and Analysis

Grab samples were obtained of the wash machine rinse water and of the wash machine detergent tank.

The samples were submitted to the OWRC laboratories in Toronto for analysis and the results are appended.

WASTE LOADINGS

From the analytical results and the water consumption figures, the following waste loadings are obtained:

1) Wash machine rinse water

Daily volume = 10,000 gpd

Concentration = 48 ppm BOD_5

∴ Loading = 4.8 lbs BOD_5/day

2) Wash machine detergent tank

Frequency of dumping = 3/week

Volume of tank = 1500 gallons

Concentrations = 1100 ppm BOD_5
430 ppm ether solubles

∴ Loadings = 16.5 lbs BOD_5/dump
6.45 lbs ether solubles/dump

DISCUSSION OF FINDINGS

Since this plant operates on a continuous basis during the processing period, it was deemed sufficiently accurate for the purposes of this survey to obtain grab samples. The sample from the detergent tank was taken approximately one-half day before dumping and is therefore considered to represent approximately 80% of the loading when the tank is dumped.

The wash machine rinse water was found to have a pH of 9.5, the upper limit set by By-law 66-69. The detergent tank was found to be unsuitable for discharge with respect to all tests performed.

Although the concentrations of contaminants in these wastes are high, the loadings exerted upon the municipal sewage treatment plant are quite low and should have little or no adverse effect upon treatment at the plant. It would be advisable, however, to have these high strength solutions bled slowly into the sewer.

The cooling water which is discharged to the storm sewer is used in heat exchangers and does not come into contact with the hot medium (press oil) or with any other machinery or product. This water, while not submitted for analysis, was visibly free of contamination with oil and, since there is no re-use, was considered to be free also from chemical contamination. The cooling water could become contaminated only if a leak developed in a heat exchanger and this should be noted quickly by plant personnel.

CONCLUSIONS

This plant was found to be using for industrial purposes some 57,500 gallons of water per day, of which approximately 47,500 gallons are used for cooling and are discharged uncontaminated to the storm sewer system.

The remaining 10,000 gallons per day are used for rinsing and are discharged to the sanitary sewer exerting upon the municipal treatment plant a loading of 4.8 lbs/day of BOD_5.

A small volume (1500 gallons) is discharged to the sanitary sewer three times per week and, although of fairly high strength, should have little or no adverse effect on the municipal treatment plant. This waste exerts a further loading of 16.5 lbs of BOD_5 and 6.45 lbs of ether

solubles approximately every second day.

RECOMMENDATIONS

It is recommended that the contents of the wash machine detergent tank be bled slowly to the sanitary sewer.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Barrie **Report to:** N. Gillies **c.c.** (rd)

Source: West Bend of Canada Ltd.

Date Sampled: June 3/69 **by:** N. Gillies

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	Ether Solubles							
		Total	Susp.	Diss.									
T-947	48				9.5	---							
T-948	1100				10.6	430							

T-947 1. Wash Machine Rinse (To San. Sewer) 11:10 A.M.

T-948 2. Wash Machine Tank 11:20 A.M.

5M-60-11403-65


9693600000945 1