

Inuvialuit Environmental & Geotechnical Inc.



IEG Calgary Office
1338R - 36th Ave. NE Calgary, AB T2E 6T6
Tel: (403) 291-0777 • Fax: (403) 291-1150
www.ieg.ca

Our File: 5055-01
Via Fax

October 9, 2001

Indian and Northern Affairs Canada
Water Resources Division
3rd Floor, Bellanca Building
P.O. Box 1500
Yellowknife, NT
X1A 2R3

Attention: Meighan Wilson
Pollution Control Specialist

Dear Ms. Wilson:

Re: Petro Canada Water License No. N7L1-1759

Further to our telephone conversation of October 2, please find attached details of the wastewater treatment system that will be installed at Petro-Canada's 40 person service rig camp for their M-15 drill location. An equipment and process description and a flow diagram are included. The system has been designed and built by Travco Industrial Housing Ltd.

The M-15 well was drilled during the winter 2001 season. Testing and completion of the well will be conducted during the winter 2001/2002 operating season with the use of a service rig. Operations are anticipated to begin at the earliest in mid-December 2001 and will be completed by the end of April 2002. The service rig camp has a different type of wastewater treatment system than the drilling rig camp. A key difference is that the final method of treatment at the rig camp was UV disinfection and the system proposed for the service rig camp uses chlorine as the final treatment. The Quality Assurance/Quality Control (QA/QC) program currently in place for Petro-Canada's drilling operation does not include a test for residual chlorine. This test will be added to the QA/QC program and provided to the Analyst Under the Northwest Territories Water Act. The wastewater treatment system will operate under the same criteria outlined in Part D Section 4 of the Water License and will not result in contravention of any of the terms of the License or the Act.

INDIAN AND NORTHERN AFFAIRS - CANADA
N.W.T. DIVISION
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WATER RESOURCES DIVISION
YELLOWKNIFE, NT

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The wastewater treatment system that will be installed at the camp is the same type of system that was installed in 1995 an 80 man camp at the Diavik mine. Since that time, the system was replaced to handle an 800 person capacity and it is meeting 10/10 ratings for the water license issued through the Mackenzie Valley Land and Water Board.

In response to a third party audit of the Petro-Canada Rig #60 treatment system by Komex International Ltd., the following changes have been, or will be, made to the rig wastewater treatment system to improve its performance for the upcoming season:

- LEL (Lower Explosive Limit) and H₂S monitors have been installed in the shack with a red warning light mounted on the outside wall;
- a pump will be mounted over the first gathering tank;
- a larger UV light will be installed;
- a larger primary tank will be installed to accommodate surges;
- sample ports will be installed in the tanks inside the shack; and
- a grease trap was installed in the kitchen during the winter 2001 operating season.

Petro-Canada has purchased diagnostic equipment to supplement the regular testing for the QA/QC program. The equipment includes a 4-in-1 tool that measures total dissolved solids (TDS), electrical conductivity (EC), pH, and temperature as well as a colorimeter that measures chemical oxygen demand (COD) and ammonia levels. This equipment will be housed at the rig camp but will be available for use at the service camp. This will allow Petro-Canada to assess the quality of their discharge in a more timely fashion and to respond more quickly should the systems not function optimally.

If you have any questions or comments, please do not hesitate to contact me by phone at (403) 219-1269, by e-mail at eradley@sorel.ca, or via fax at (403) 291-1150.

Thank you.

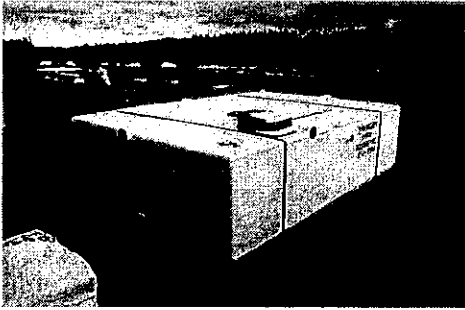
Sincerely,

INUVIALUIT ENVIRONMENTAL AND GEOTECHNICAL INC.

Erin Bradley
Erin Bradley
Project Manager

Raw Sewage Pump Station

The raw sewage pump station is a fabricated fiberglass tank, insulated and heat-traced.



This is installed separate from the treatment plant and all of the sewage from the camp flows into this pump station. There are four float switches (normally open circuitry) installed in this pump station, which control the two pumps. One switch (the lowest level switch) shuts the pumps off, the second switch starts the first pump, the third switch starts the second pump and the fourth switch turns on the high water alarm. An alternator in the main control panel alternates the pump's operation to equalize wear.

The two pumps are "Goulds", model 1GD-51G2AA grinder pumps with optional seal-failure alarms. These pumps are 2 HP, 3500 RPM, 208v, 3 ph, 60 Hz and are installed using conventional unions in the discharge piping to enable them to be removed for servicing.

It is important to be aware that cooking fats, oils and grease will congeal in the pump station and it should be controlled as much as possible.

Normal maintenance will involve routine monitoring the pump station's operation, observing for the build-up of fats, oils and grease (FOG) within the pump station, ensure the heat-tracing is operating properly, checking float switch operation and, by regularly recording the grinder pumps' hour meters, the operator can ensure the alternator is working properly.

If there is an accumulation of FOG in the pump station, manually remove these grease "balls" and increase the dosing of the Formula 60 engineered bacteria (or ensure that the Formula 60 is being dosed in accordance with the instructions).

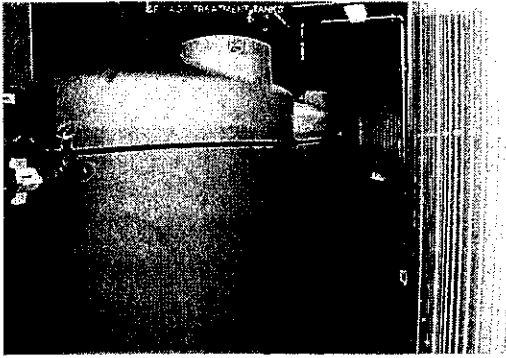
Float switch operation can be checked by occasionally manually tipping each float ball.

It is good practice to record the pump operating amperages upon start-up and on a regular basis thereafter.

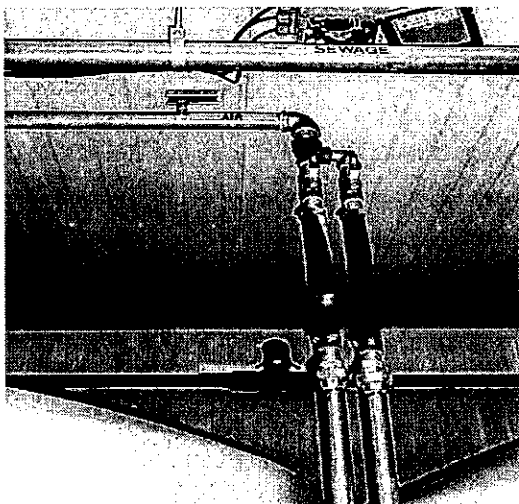
Flow Equalization and Pre-treatment Tanks

Two, 2500 USG (9.5 m³) polyethylene tanks are installed at the inlet end of the sewage treatment building.

These tanks are important because the camp will generate most of the sewage during two peak times, at around 6 AM and at around 6 PM, in accordance with the shift changes.



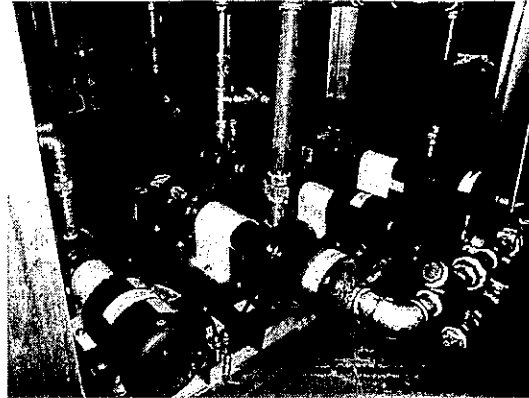
The incoming surges must be dampened out, otherwise the treatment plant will not operate effectively. The feed pumps pump out of these tanks at a slow, continuous rate to even-out the flow surges. These tanks are aerated



to keep them mixed and also provide some pre-treatment.

Feed pumps

The two feed pumps normally operate individually, with the operator alternating them weekly.



One pump runs continuously. The pump motors each operate through variable frequency drives (VFDs) to allow the operator to control the pumping rate. The pumping rate was originally set at $4 \frac{1}{2}$ USGPM or 17 l/m. This is equivalent to approximately 365 RPM or 19 Hz on the VFD.

The design capacity of the treatment plant is 4500 USGPD or $17 \text{ m}^3/\text{d}$. We are treating all of the sewage in 17 hours, which is the equivalent of $4 \frac{1}{2}$ USGPM. This ensures that the equalization tanks are empty when the morning surge begins.

There are two level switches in the equalization tanks, the lower one will shut the pumps off to keep them from running dry.

If the feed pumps run without liquid in them, they will be destroyed.

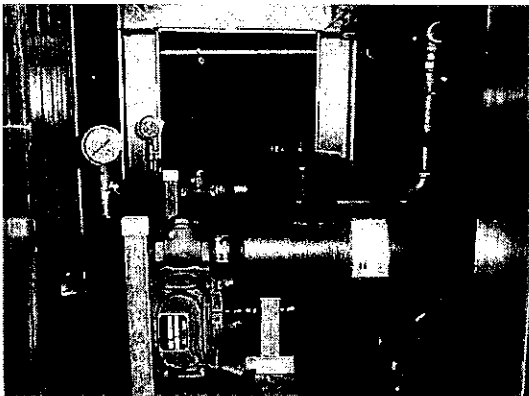
The second float switch is a high level alarm. This will also shut the raw sewage pumps off to prevent the equalization tanks from overflowing.

Important – if the pump motor wiring is disconnected for any reason, ensure that the pump rotates in the

correct direction. Running the pump in reverse rotation, for even for a fraction of a second will unscrew the rotor from the drive. The pump will have to be disassembled for repair.

Air blowers

The equalization tanks are continuously aerated, using one of the two blowers.

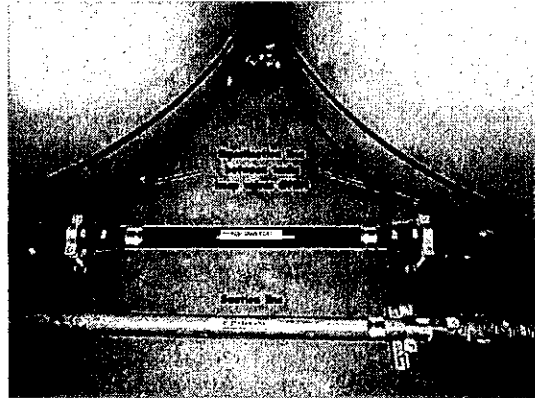


Only one blower is required to provide sufficient air for both mixing and pre-treatment. Maintenance of the blowers should be in accordance with their specific manuals. This maintenance will primarily consist of checking oil levels; cleaning the air filters and checking belt tensions. The operator should establish a pattern of alternating the blowers' operation, possibly once a week.

It is good practice to record and occasionally check the motor running amperages. The blower motor controls include hour meters.

Equalization line

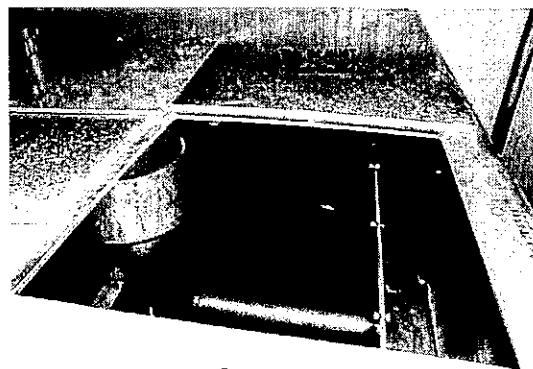
The two tanks are inter-connected and the inter-connection valves



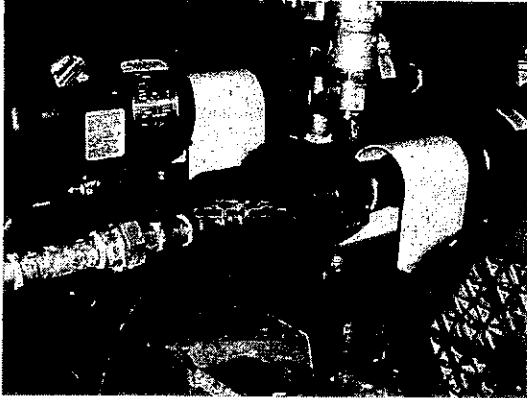
should be kept open at all times. There is minimal maintenance required with regard to these tanks, the operator should periodically test the operation of the high-level alarm switch and ensure it shuts the grinder pumps off. Visually observing the air pattern within the tanks will allow the operator to confirm the aeration system is operating properly.

Primary Clarifier

The pre-treated sewage is pumped into the primary clarifier where it is retained for 2-3 hours. This is a settling tank that permits the heavier constituents in the sewage to settle out of the sewage.

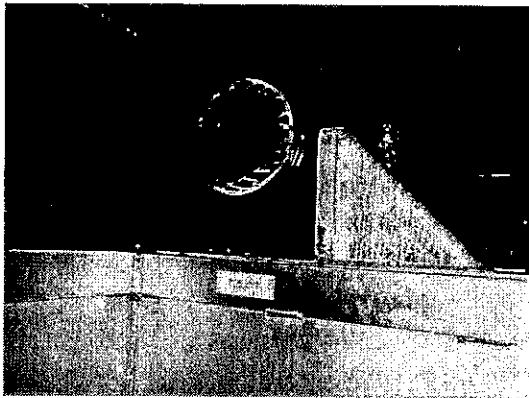


The settled solids collect in the bottom of the clarifier and are removed by the sludge pump (P-5) and pumped to



the sludge holding tank.

The primary clarifier is covered and ventilated with a small fan.



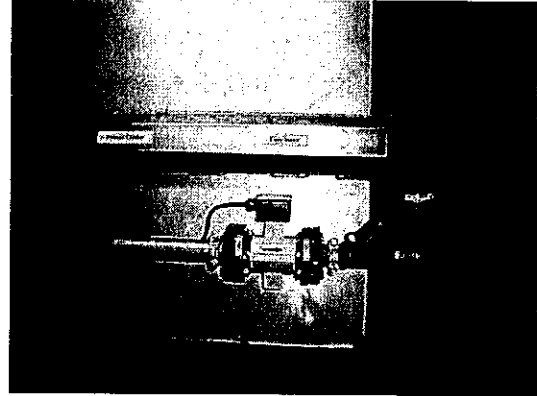
This is necessary to prevent the build-up of unpleasant odours and gasses within the sewage treatment building.

It is important that the ventilation fan runs continuously and that the access hatch on the primary clarifier remains sealed.

The primary clarifier gases are vented outside.

Flow Meter

A magnetic flow meter is installed in the pipe that runs into the primary clarifier.



Minimal maintenance is required for the primary clarifier, other than confirming the vent fan's operation and monitoring the sludge pump's operation. Improper sludge removal will reduce the plant's performance and regular sludge removal is essential. The operator can effectively monitor the sludge removal by observing the composition of the liquid that is pumped to the sludge holding tank. It should start thick and dark; becoming lighter and thinner just before the pump shuts off. Adjusting the sludge pump's run time will allow the operator to optimize sludge removal. This is not an activated sludge plant so there is no requirement to maintain any measurable sludge residual.

The operator should simply monitor the sludge pump's operation and the motor amperages.

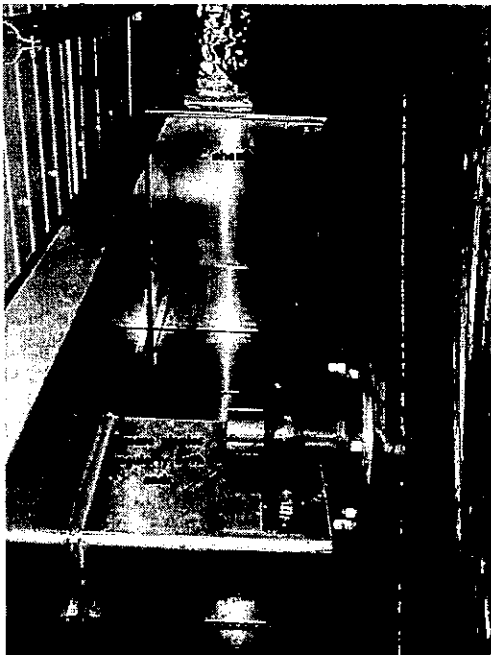
Important – if the pump motor wiring is disconnected for any reason, ensure that the pump rotates in the correct direction. Running the pump

in reverse rotation, for even for a fraction of a second will unscrew the rotor from the drive. The pump will have to be disassembled for repair.

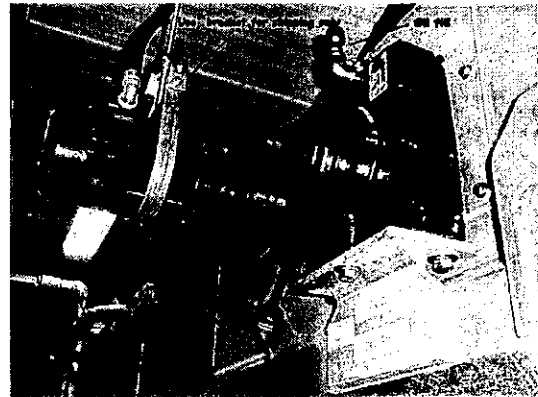
GEO-FORM Biological Treatment Module

This is where the actual biological treatment of the sewage occurs. Naturally occurring bacteria grow on the media "balls" and it is these bacteria that consume the organic materials in the sewage. The GEO-FORM drum rotates continuously, exposing the bacteria to food (when submerged) and to oxygen, when above the water.

It is the appearance and the smell of this portion of the treatment plant that will provide the operator his best single indicator of the plant's operation. Additional, more detailed information on the operation of the GEO-FORM process is available from BCA Industrial or Travco Industrial Housing Ltd.



The only mechanical maintenance required of the GEO-FORM rotor is routine greasing of the two shaft bearings and checking the gear box oil level.



This should be done every three months. The GEO-FORM runs continuously and the motor running amperage should be checked and recorded on start-up and then every few months after that.

The other part of the GEO-FORM's operation is the biological part. This is much more difficult to describe as it depends on the awareness and conscientiousness of the operator.

The GEO-FORM, (like all other biological treatment plants) relies on the biological or bacterial population to do the job. This means that the operator must ensure the bacteria are provided with a good environment in which they can thrive. This means that they must have food (sewage) and air. The air is provided by the GEO-FORM's rotation.

Colour and smell can gauge the "health" of the biological population. The ideal colour of the biomass or the naturally occurring "slime" is a brownish-grey. The proper odour is

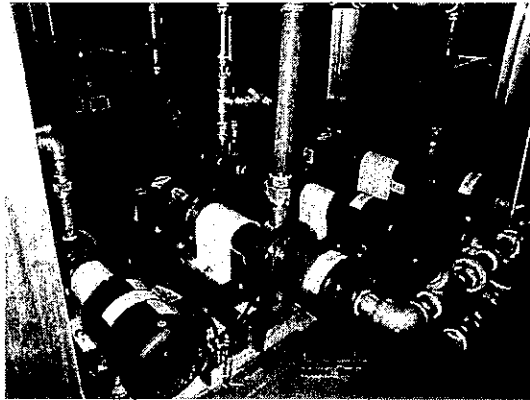
that of wet earth or a humus-like smell. A trouble-shooting guide is attached but the most probable problem we expect the operator to encounter is excess FOG. This means that the kitchen's grease traps are not being maintained properly and/or the regular dosing of the "Formula-60" engineered bacteria should be adjusted.

Given the proper "diet" and other living conditions, the GEO-FORM rotor requires no specific maintenance.

Routine checks and observation by the operator is the key to successful sewage plant operation and the GEO-FORM process is no exception.

Final Clarifier

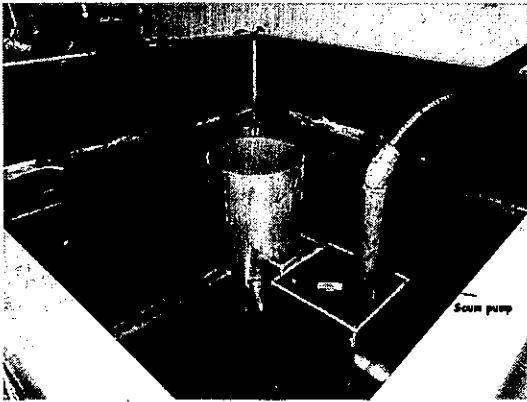
The sludge discharged from the GEO-FORM settles in the final clarifier. This sludge is primarily sloughed-off biomass from the media and unconsumed "food" that has passed through the treatment module. The sloughed biomass is essentially dead bacteria and this will form most of the final clarifier's sludge. The settled sludge is removed by the final clarifier sludge pump (P-6) and pumped to the sludge holding tank.



Maintenance of the final clarifier is similar to primary clarifier maintenance. The purpose of the final clarifier is to permit the sloughed-off biomass to settle-out of the liquid. If the final clarifier is kept clean, it will operate much more effectively.

If sludge is allowed to accumulate in the bottom of the final clarifier, it will start to decompose, make gas bubbles and float. That is why it's important to ensure that the sludge pump operates as efficiently as possible. The operator can see the sludge that is being removed, at the sludge holding tank. Ideally, the sludge pump will come on every 90 or so minutes and run for about 1 minute. The run time and frequency can be adjusted timers no. P6A and P6B.

The other pump that keeps the final clarifier clean is the scum pump, P-9.



This pump is installed in the scum pump box and is designed to skim the floating scum and return it to the equalization tanks. This pump should be adjusted to come on about every 90 minutes and run for about 1 – 1 ½ minutes. Timers no. P10A and P10B adjust the scum pump's run time. The scum pump's operation relies on the clarifier level being full so that the scum can flow into the pump box. This requires co-ordination between the sludge pump's operation and the scum pump's operation. Otherwise, the water level in the clarifier will be too low and the scum cannot flow into the scum pump box. Only careful set-up will permit this co-ordination

Maintenance of the sludge pump is the same as for the primary sludge pump.

Important – if the pump motor wiring is disconnected for any reason, ensure that the pump rotates in the correct direction. Running the pump in reverse rotation, for even for a fraction of a second will unscrew the rotor from the drive. The pump will have to be disassembled for repair.

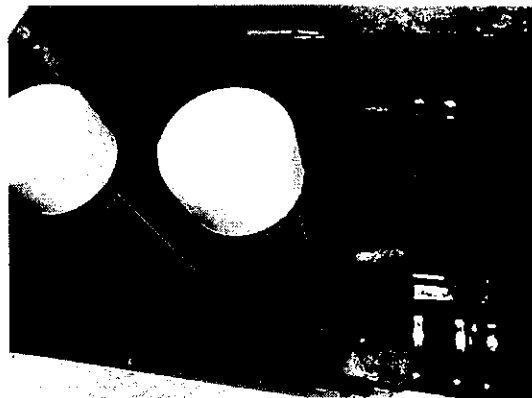
Scum pump maintenance is limited to regular observation of its

operation. The pump cannot be serviced.

Maintenance of the clarifier structure is limited to occasional cleaning of the discharge weirs.

Chlorine Tablet Feeder and Contact Chamber

After biological treatment, the effluent flows through an "Eltech" model 100 tablet-type chlorinator for disinfection.



The chlorine tablets slowly dissolve in the effluent, adding chlorine to the water. The residence time in the contact chamber ensures sufficient time for the chlorine to mix with and react with the effluent. The chlorine kills the coliforms in the effluent.

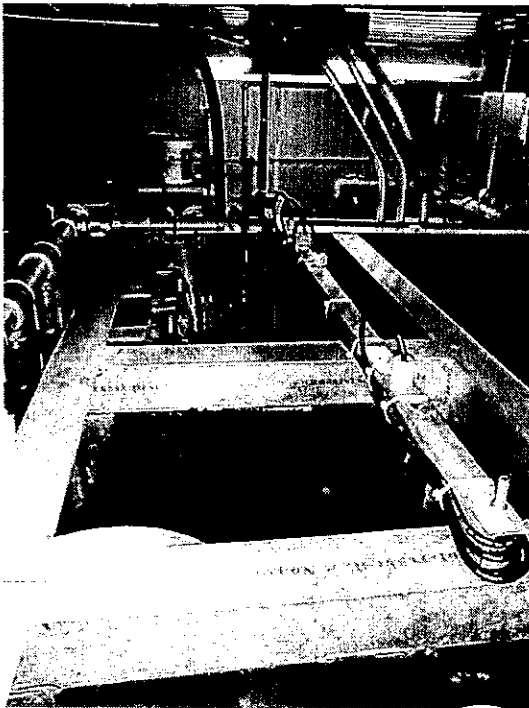
Operation and maintenance of the chlorine tablet feeder is limited to just ensuring the tablet feeder is full of tablets. Based on the plant's design flow, it is probable that only one feeder tube should be filled with tablets. In accordance with the instructions contained within the main manual, only fill the tube closest to the outlet with tablets and

then sample the effluent for coliforms and Cl_2 level.

Occasional cleaning of the feeder is the extent of required maintenance.

Effluent Pump Chamber

After disinfection, the effluent pours into the effluent pump chamber. Installed in this tank are two (2) "Goulds" model # 3885, submersible effluent pumps. These pumps are each powered with $\frac{1}{2}$ HP, 3500 RPM, 208v, 3 ph, 60 Hz motors. The pumps are mounted on Goulds model APD-20 slide-out discharge connections for easier removal when required for service.



The main control panel controls these pumps, through four (4) conventional normally open float switches. A high water alarm is installed.

The volume pumped per cycle can be adjusted if desired by changing the level of the float switches. The pump chamber is 2 ft x 3 ft so every foot of depth is equal to approximately 45 USG or 170 litres.

There is little maintenance required with this pump chamber, other than monitoring the pump's operation and cleaning the float switches required.

The operator should also occasionally check and record the pump running amperage.

Sludge Storage Tank

The two sludge pumps discharge to the sludge storage tank. This is a 500 USG ($1.9 m^3$) polyethylene tank with a manually controlled mixer.



Two (2) float switches are installed in this tank, one is a low-level switch to

stop the sludge pump that pumps from this tank to the sludge de-watering bagger; the upper level switch is for the high level alarm. The high-level alarm will also shut off P-5 and P-6 to prevent the sludge tank from overflowing.

Probably half of the operator's time will be spent dealing with the sludge systems. Successful operation of any sewage treatment plant depends on sludge control. The two sludge pumps (P-5 and P-6) both pump into the sludge holding tank but that's just the beginning of the sludge disposal process. This tank holds the sludge until sufficient volume has been accumulated to operate the sludge bagger.

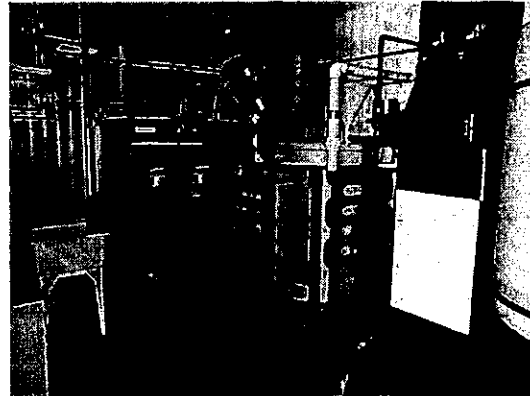
Operation and maintenance of this storage tank is limited to confirming the operation of the sludge mixer and the operation of the two float switches in the tank. The lower switch shuts the sludge bagger off and the upper switch controls high-level alarm. This HLA will also turn off P-5 and P-6.

The sludge mixer should only be turned on an hour or so before sludge de-watering is to begin, it is not necessary to keep it running continuously. Ensure that it rotates so that the propeller "pushes" the sludge away. If the propeller "pulls", the low-level float switch could become entangled in the mixer. This will severely damage the mixer.

Sludge Dewatering Bagger

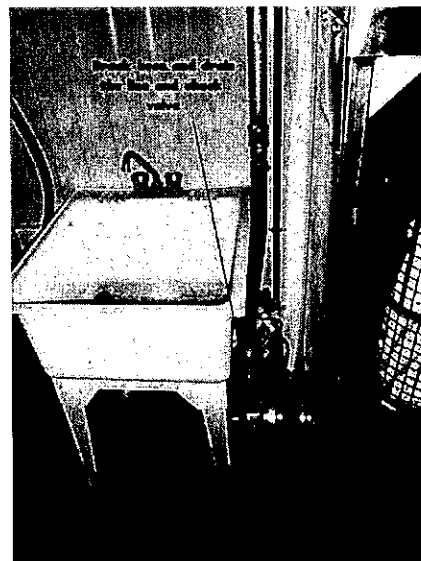
This is a "bag-type" sludge-dewatering device that consists of

sludge pump, polymer make-up system, polymer feed pump, 3-bag headbox and frame assembly and a control panel.



Polymer is mixed with potable water in the 100-gallon cone-bottom tank, and then a small amount of polymer is mixed with the sludge.

This causes the particles of sludge to clump together and when this mixture is pumped into the headbox, the free water easily drains through the porous bag walls and the sludge remains in the bags. The free water drains into the small pump tank located under the sink and returns



the water to the equalization tanks.

The sludge bags can be either incinerated the next day, or if the sludge is allowed to freeze and thaw a couple of times, it will dry even more and burn more readily.

Detailed operating and maintenance instructions are in this manual in the "Envirodyne" section and these are best studied carefully by the operator.

The most critical items here are to ensure there is sufficient polymer made-up when de-watering and that you are careful when mixing the polymer. This unit will not operate effectively without polymer.

Pay close attention to the consumption of both polymer and the bags. Ensure that you allow sufficient lead-time to get supplies to the site in time. If space and other conditions allow, we recommend freeze-drying the bagged sludge and then thawing it again. This will produce a dryer sludge, making it easier to incinerate. Also, if you allow the sludge to just sit in the bags as long as possible before the next sludge de-watering cycle, this will also help to make dryer sludge. If odours become a problem with the bagged sludge just sitting, put a bit of lime over the top of the sludge in the bags while they are sitting.

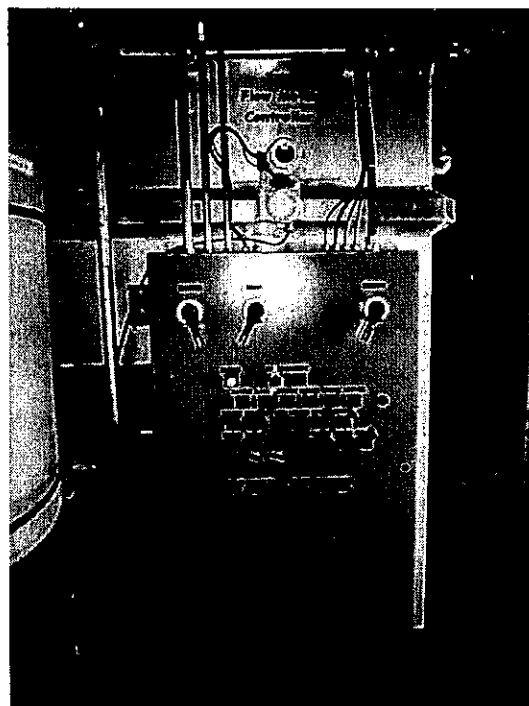
Good operation involves minimizing the amount of polymer used and we recommend the operator pay close attention to the polymer pump speed in order to easily reduce polymer consumption. Polymer and bags will

be the primary cost of operating the de-watering system.

We also recommend that the operator be particularly careful when installing new bags. This will reduce spillage and the possibility of them breaking.

Main Control Panel

The main control panel is the centralized control point of the treatment plant.

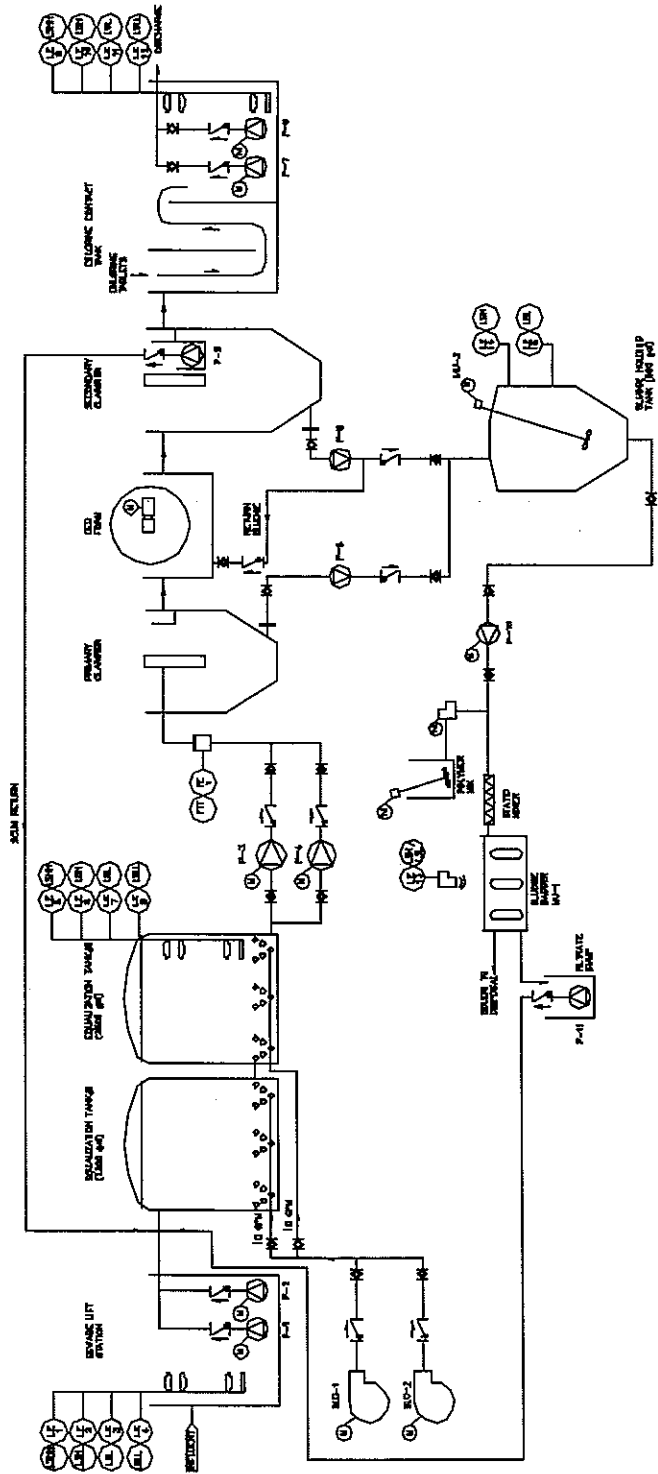


It incorporates the main disconnects, the separate motor run controls, the alarms and the pump running timers. Most components are traditional contacts and relays for easier servicing. All timers are easily adjustable and the flow meter read-out is immediately above the control panel for easy monitoring.

Detailed schematics are inside of the panel enclosure.

For operating details refer to the operating instructions and control panel schematics. Additional information of the plant details is on the process flow diagrams.

There is little maintenance required with the control panel; the operator is reminded that only qualified electricians should open the panel and work inside.



RAVCO
INDUSTRIAL HOUSING LTD.

PTI
Group Inc.

ENSERCO ENERGY SERVICES

WASTE WATER TREATMENT PLANT
PROCESS AND INSTRUMENTATION
DIAGRAM

DATE	A	BY	J.F.
REV.		DATE	2 OCT. '01
SCALE	N.T.S.	PROJECT NO.	WASTE PLANT
DRAWN BY		CHECKED BY	

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DIAGRAM

THIS DRAWING IS FOR DISCUSSION PURPOSES ONLY
BETWEEN TRAVCO/PTI & CLIENT
AND MAY NOT BE REPRODUCED