FREMONT WASTEWATER TREATMENT PLANT HISTORY

The Fremont wastewater treatment plant was originally built in 1946-49, consisting of one primary tank, two trickling filters, one final settling tank and two digesters. These original facilities were designed for a flow of 2.0 MGD. Sludge was dewatered in glass-enclosed sludge drying sand beds after anaerobic digestion. At that time, the east side (Sandusky Avenue) and west side (Front Street) intercepting sewers, the Middle Street Pump Station, and the Walnut Street Siphon, which all previously transported sewage to the Sandusky River, were constructed to transport dry weather sewage to the WPCC.

Significant improvements were made to the plant in 1964. These improvements included pre-aeration and grit removal facilities, a second primary tank, the primary building, a third trickling filter, two secondary clarifier tanks, and 6 aeration tanks. A filter building was also constructed for vacuum filtration of sludge. The original secondary clarifier was converted to an intermediate settling tank. These facilities had a design capacity for an average daily flow of 7 MGD and peak flow of 13.75 MGD.

Further improvements were made in 1976. A compressor housing was added to the digester control building. A sludge concentrator building was constructed for chemically conditioning and dewatering Waste Activated Sludge (WAS). Existing foam control pumps were removed and plant effluent pumps were added. The sludge drying beds were removed and the sludge concentrators (belt filter presses) were installed for aerobic sludge dewatering. The intermediate settling tank was converted to a sludge storage tank.

In 1981, two existing RAS pumps were replaced and one was rebuilt. Also, two of the three existing raw sewage pumps were replaced with submersible pumps. A sludge loading station was added for the transfer of sludge from the holding tanks (the old intermediate tank) to the land application tankers.

The 1988 improvements included the addition of tertiary treatment (sand filtration), a sludge gravity thickener, an improved fine bubble aeration system (EIMCO), and two (2) new secondary clarifiers, all of which were included in recommendations in the 1985 Fremont Facilities Plan. Design capacity was increased to 9.2 MGD average daily flow through the tertiary sand filters with a peak of 14.0 MGD. A current flow diagram is included as enclosure (4-1).

A. Raw Sewage Lift Station

Raw wastewater enters the plant at two locations, via the 30”west side interceptor sewer at the digester control house and through a 14” and 10” lines from the North Street siphon.

The raw sewage from the digester control house passes through either a 25-inch comminutor or a manually raked bar screen upstream of the raw sewage wet well. The flow is then pumped up to the pre-aeration building from the raw sewage lift station. This station consists of two submersible Flygt pumps; each rated at 2800 gpm at 43’ TDH, and one new Gorman Rupp (2.5 MGD) pump rated at 1389 gpm at 50 TDH. The flow from this lift station is metered by a 16”, 0 to 12 MGD magnetic flow meter located on the pump discharge header. A high water alarm (visual, flashing blue light) was installed to guard against flooding the control house basement if any of the pumps should happen to stop for any reason (power outage, plugged up, etc.). The WPCC has not accepted septic tank waste from local septic tank haulers for at least eight (8) years, even though I set up a plan to accept specified quantities on specific days. The septic waste can be discharged from the licensed septic tank haulers into the main flow channel just ahead of the raw sewage pump station and can be mixed with sewage and treated.

B. North Street Siphon Flow

The 14" line and a 10" line from the North Street Siphon enters the pre-aeration building and is metered by magnetic flow meters. The 14" line is an overflow line and is used only during high flow conditions.

Wastewater from the North Street Siphon is discharged into the influent channel where it mixes with the raw sewage pumped from the Control House lift station and this mix then enters the pre-aeration tanks. A manually cleaned bar screen is located in the North Street siphon channel.

C. Grit Removal and Pre-Aeration

Following the comminutor, the wastewater from the raw sewage lift station in the digester control house is joined with the flow from the North Street Siphon and enters the pre-aeration tank. This tank is divided into an aerated, 58,000-gallon grit removal section with spiral roll (provided by pre-aeration blowers), and a Jeffrey screw conveyor. A torque-flow pump with a capacity of 200 gpm at 35' TDH pumps the grit to a cyclone separator for removal of water. Grit is further drained and dried in a specially constructed concrete drainage station and then hauled to an approved landfill. There is approximately 6.8-9.1 cubic yards of grit generated per million gallons of flow.

The grit removal station is followed by a 65,000-gallon pre-aeration section utilizing a cross-roll aeration pattern. Air for the pre-aeration system is provided by three centrifugal blowers each rated at 324 cfm at 8 psig. The degritting and pre-aeration process can be bypassed when the tank is cleaned. The pretreated wastewater then flows by gravity to the primary clarifiers. The sediment (grit) from the cleaning operation is then placed on a specially designed drainage pad and ultimately disposed of at a local landfill.

D. Primary Treatment

Two primary clarifiers are used for primary treatment. Each primary clarifier is 70 feet in diameter with a side water depth of 11 feet and equipped with Eimco sludge collectors. Mechanical skimming equipment is also provided to continuously remove scum from the surface of the settling tanks. The water from the skimming operation discharges to a well where it is pumped back into the primary tanks and these skimmings are added to grit for disposal. The design parameters for the primary settling tanks (with two tanks in service) are:

Item	Fremont WPCC	10 State Standards
Surface loading @ 9.2 mgd	1196 gpd/ft 2	1000 gpd/ft2
Surface loading @ 7.6 MGD	987 gpd/ft2	1000 gpd/ft2
Weir rate @ 9.2 mgd	11397 gpd/lin ft	
Suspended Solids Removal %	40%-60%	
Biochemical Oxygen Removal %	20%-30%	33%

It is clear that at the tertiary rated flow of 9.2 MGD the primary surface loading rate exceeds the 10 State Standard. Fortunately, the average daily flow for the last several years has not approached the 9.2 MGD flow rate. Table 4-1a on page 25 of this chapter provides a detailed analysis of flow and primary treatment efficiencies. This data seems to correlate well with the performance data of these clarifiers that they are not performing exceptionally well.

There are two 10” piston duplex sludge pumps, rated at 150 gpm at 40’ TDH, which are used to transfer primary sludge from the tanks to either the digesters or a new (1988 improvements) (50’ diameter, 13’ SWD) gravity thickener. This flow is metered by a magnetic flow meter on the discharge of the pump. Waste activated sludge is pumped to a chamber upstream of the Primary tanks and is combined with the influent prior to primary settling. Primary effluent flows by gravity to the settled sewage wet well in the aeration building.

E. Settled Sewage Pump Station

Four (4) vertical mixed flow pumps deliver the settled sewage (primary effluent) to the aeration tanks from the settled sewage wet well. Each pump is rated at 3600 gpm at 20’ TDH. A high water alarm (visual, flashing blue light) was installed to guard against flooding the settled sewage well should the pumps stop working for any reason. If the pumps would stop pumping, the settled sewage would back up in the lines feeding the settled sewage wet well and spill over into the East sludge holding tank.

F. Aeration

The aeration system is currently being operated as a conventional activated sludge process utilizing the step-feed arrangement. Each of the six (6) aeration tanks is 150’ X 28’ X 15’ WD. Settled sewage and return activated sludge are fed into tanks in a step-feed type arrangement, with Return Activated Sludge (RAS) added at the influent end and settled sewage added at multiple locations. All six (6) tanks are each provided with 304 Wifley Webber fine bubble diffusers in a tapered aeration arrangement. These tanks are gated for series or parallel flow with optional sewage entrance at five points along each tank.

Air for the tanks and channels is provided by two (2) 150 hp small Hoffman centrifugal blowers at 3500 cfm each at 8.0 psig and two (2) 300 hp centrifugal blowers at 7000 cfm each. Air supplied to the aeration tanks is metered with Dall tubes and Venturi tubes. Signal converters then send 4-20 milliamps signals to converters/recorders.

Return Activated Sludge (RAS) is drawn from the center of the secondary clarifiers through 18 inch diameter lines and is delivered to the RAS wet well through 24 inch diameter lines. The RAS is pumped to the influent end of each of the aeration tanks through the RAS channel, which is located along the outside perimeter of the aeration basin. There are three RAS pumps available for use but only two are used most of the time and there is room to add a fourth one (onsite, not installed). The RAS pumps are controlled by variable frequency drives located in a control panel on the aeration building blower deck. The RAS pumps are generally set to operate at about 90%-95% of capacity, (2800 gpm), resulting in approximately 6.5 MG returned per day, about 86% of the daily permit flow (7.6 MGD). Historically, RAS rates have averaged at or slightly more than 100% of the daily average flow (see table 4.1 for recent daily average flows), slightly higher than the Ten States Standard upper limit guideline of 100%. Experience has proven that two RAS pumps operating at 90-95% are adequate to maintain the desired secondary clarifier levels, and that often when the third pump is turned on, the blankets are not improved dramatically, as the detention time is reduced in the clarifiers. The extra RAS pump actually creates a less compact, more watery sludge, which does not settle as well. Accurate flow metering is not currently available for either the RAS or ML lines, although during the 1988 improvements, Healy Ruff doppler transducer flow measuring devices were installed on the RAS and ML lines with remote readouts in the administration and aeration buildings. These doppler flow- measuring devices worked for only a short time after the 1988 improvements, and the Healy Ruff system is not operational at this time. Each year, for the last several years, I have asked for funding to purchase and install new flow meters for the RAS and ML lines, but limited funding dictated that other, more pressing needs be addressed.

Waste Activated Sludge (WAS) is drawn from the RAS wet well by the wasting pump, a Vaughn variable frequency drive chopper pump, located in the aeration building basement. The waste pump is generally set to operate at 90-100% of its capacity (50-125 gpm), depending on where the waste sludge is being pumped, either the primary headworks or the gravity thickener. The volume of sludge wasted (WAS) from (0.075 MGD) or returned to the aeration system (RAS) (6.5 MGD) is determined by reviewing the daily data: clarifier blanket levels, RAS suspended solids concentration, Mixed Liquor (ML) suspended solids data, the loading on the plant (BOD, Suspended Solids) the F/M (Food-to-Microorganism) and SVI (Sludge volume index). An accurate flow meter is in place to measure the volume of sludge wasted daily with a remote readout located in the aeration building break room. The activated sludge and secondary system operational controls are discussed in more detail later in this chapter, in sections 2b4, and 3c4b. The WAS is pumped to either the primary clarifier headworks or the gravity thickener, depending on the sludge blanket levels in each. In an effort to take a little of the strain off the primaries, recently we reduced the volume of WAS to the primaries to roughly 1/3 of the daily volume (20-25,000 gallons per day). The other 2/3 (60-75,000 gallons per day) of the WAS is pumped to the gravity thickener and a 1% solution of cationic polymer (0.07 gpm) is flash mixed in with the WAS as an aid in thickening.

While there are six aeration tanks available for use in treatment, in the summer only four or five may in use at any one time. This arrangement allows for routine cleaning of the diffusers each year, generally during the summer when the biological activity of the microorganisms is greatest. Further, because of the increased activity of the microorganisms in the aeration basin during the summer, fewer microorganisms are needed to accomplish the treatment, hence fewer aeration tanks are needed. If, however, only four or five tanks are in service and the pollutant loadings increase dramatically, threatening NPDES compliance, an aeration tank could be put back in service relatively quickly. At any rate, the fifth and sixth aeration tanks are placed back in service before the winter, generally by the end of October, sooner if necessary. Similarly, while only two of the three secondary clarifiers are used during the summer for the same reasons as the aeration tanks, the third clarifier is put in service before winter, generally by the end of October. Extra strength loading from the industrial community has, at times, resulted in organic over-loading of the aeration system resulting in operational issues (discussed later in this chapter.), ranging from decreased dissolved oxygen levels to filamentous bacteria and secondary clarifier instability. When filamentous bacteria begin to proliferate, chlorination of the RAS is used to kill the filamentous bacteria. Chlorine is fed at about 400-450 pounds per day to the RAS through a diffuser submerged in the RAS channel. Microscopic examination of the RAS and the ML is conducted to determine when the chlorination of the RAS can be stopped. Polymer can be, and often is, applied to the ML during these operational challenges as a settling aid to offset the turbidity caused by chlorination of the RAS. Cationic polymer is added to the mixed liquor in the mixed liquor channel just prior to discharge into the secondary clarifiers. Control strategies and methods are discussed in greater detail later in this chapter (2 b 4, 3c4b).

Assimilation of BOD and suspended solids is accomplished in the activated sludge process by the microorganisms with a great deal of success, as is detailed later in this chapter (2 b 4). Nitrification, the oxidation of ammonia (NH3), takes place in the activated sludge process as well, and removal efficiencies have averaged over 98% for the last several years, as detailed in enclosure 4-9. The only exception to this removal efficiency was in 2001 and shortly thereafter when the WPCC was dealing with the effects of a suspected toxic chemical, SAS305. A more detailed account of the WPCC experience with SAS305 is contained in chapter 8, Research. The actual removal efficiencies for BOD and suspended solids are detailed later in this chapter (2 b 4), and in table 4-3 on page 38.

G. Final Settling

Three settling tanks can be used for secondary settling. One older settling tank (East clarifier, 1964 improvement) is 80 feet in diameter with a side water depth of 10 feet. The remaining two (North and South Clarifier, 1988 improvement) are 80 feet in diameter with 13 foot side water depth. The north and south clarifier receive the majority of the flow when three clarifiers are used, and except during clarifier tank cleaning operations, all of the flow when only two are used. The clarifiers are of the center feed, center RAS draw off design with clarified effluent drawn off from the side. The RAS is drawn to the center well by use of suction sludge collectors attached to the tank sweep. Sludge draw off is adjusted as necessary by manually adjusting the RAS valves on the RAS lines in the aeration basement; when the north and south clarifier are operational the north and south RAS valves are wide open; when the east clarifier is operational as well, the east clarifier RAS valve is throttled back slightly. Proper valve location for adequate RAS draw off has been determined through operational experience and the valve location is marked for future reference.

Periodically the sludge collectors will get plugged up with thick sludge or debris and require cleaning to maintain proper operation. Cleaning of the sludge collectors is accomplished by using high-pressure water hoses or the Jet Vactor suction truck. The north and south secondary clarifiers can be taken out of service for cleaning or repairs, but not at the same time and only when the east clarifier is on line, and if possible, during periods of low flow. Mixed liquor flow to the North and South clarifier is regulated by manually adjusting the weir in the splitter chamber to allow more or less flow to each tank. Mixed liquor flow to the East clarifier is regulated by mechanically raising or lowering the flow gate on the aeration basin mixed liquor channel to allow more or less flow to the clarifier. Each tank is equipped with sight-well collectors for return of settled activated sludge. The design parameters for the secondary clarifiers are:

Item	Fremont WPCC	10 State Standard
Average design sewage flow @ 9.2 MGD	2200 gpm	
Peak sewage flow @ 14.0 MGD	3240 gpm	
Surface rate @ 9.2 MGD	610 gpd/ft 2	1000 gpd/ ft2
Return sludge capacity	7200 gpm	

Weir rate @ 9.2 MGD	7020 gpd/lin. Ft	30,000 gpd/lin. Ft

It is clear that the surface rate and weir rate at 9.2 MGD are well below the 10 State Standard, unlike the primary clarifiers. This data seems to correlate well with the performance data of these clarifiers that they are performing exceptionally well.

Activated sludge to be returned to the aeration tank is pumped by two (2) mixed flow pumps rated at 2800 gpm at 20' TDH with two identical units for standby. Waste activated sludge is pumped to the primary settling tanks and the gravity thickener using a Vaughn VFD Chopper Pump. The Return Activated Sludge (RAS) pumps are controlled by variable frequency drives.

The recirculating pump station may be used to recirculate final effluent or waste activated sludge back to primary settling. Two (2) pumps at 1660 gpm at 14' TDH, one (1) pump at 250 gpm at 13' TDH and one variable speed drive, 0-250 gpm, are used for this station.

H. Chlorination – Sodium Hypochlorite

Disinfection of the secondary effluent is accomplished by utilizing sodium hypochlorite bleach solution to chlorinate the final effluent. The hypo-chlorite system replaced the gaseous effluent chlorination system which was installed in 1964. Raw sewage and RAS can be chlorinated using the old chlorination cylinder system. RAS is only chlorinated when necessary to control filamentous bacteria. The raw sewage has not been chlorinated while I have been the Superintendent, but if the situation warranted (to oxidize specific pollutants prior to primary treatment) it could be done utilizing 100 pound cylinders and the old style chlorinator. Chlorinated secondary effluent flows through a baffled contact chamber designed to provide 16 minutes contact time at 9.2

MGD. To assure adequate bacterial control, the secondary effluent is chlorinated to provide a residual of 0.35 mg/l and the residual is measured four times per shift to assure adequate chlorination.

The sodium hypo-chlorite chlorination system was installed in 2001 by the WPCC maintenance personnel, as a less expensive option to installation of safety measures (scrubbers, alarms, sensors, etc.) for the gaseous chlorine system.

The gaseous system is still operational as a backup for effluent disinfection, and is used when the Return Activated Sludge (RAS) is chlorinated for filamentous bacteria. As a safety precaution and to comply with chlorine safety regulations less than 2500 pounds of chlorine is maintained on site.

The hypo-chlorite system consists of two (2) three thousand (3,000) gallon double walled plastic storage tanks manufactured by Protecto-Plas, and three (3) 0.21 gpm variable frequency drive chemical metering pumps manufactured by Prominent, Inc. The storage tanks are equipped with level sensors and alarms for safety.

The sodium hypo-chlorite system is situated in the aeration building, ideally located above the chlorine contact chamber for ease of addition. The secondary effluent flows through the chlorine contact chamber and receives a dose of sodium hypo-chlorite designed to produce a residual of 0.35 mg/l chlorine. Experience has shown that this dose is effective in providing fecal coliform reduction prior to tertiary filtration. Chlorine residual analyses are conducted by the shift operators at least four times per shift, three shifts per day and the pump percentage feed rate can be adjusted as necessary manually.

Further, a remote readout of the tertiary effluent chlorine residual meter is located in the operator break-room to provide information to increase or decrease the hypo-chlorite feed rate. The WPCC NPDES permit requires fecal coliform control during the summer months (May through October), but the secondary effluent is chlorinated year round to help minimize bio-fouling of the tertiary sand filters. The hypo-chlorite solution is supplied by a chemical supplier in 4000 gallon tankers, determined by yearly competitive bidding, and safety measures have been installed to prevent instances of over-filling (sensors, alarms, operator attendant, etc.). The sodium hypo-chlorite is roughly 15% chlorine active ingredient and over time the chlorine does vapor off. The storage tanks have been enclosed in paneled room in the aeration building in an attempt to minimize the loss of active ingredient.

The final effluent (tertiary effluent) is de-chlorinated to less than 0.038 mg/l chlorine prior to discharge into the Sandusky River utilizing Sodium Bisulfite. This solution is deliberately over fed at approximately 0.012 gpm to assure that the effluent chlorine residual is not exceeded. A more detailed discussion on this is included in section J of this chapter, tertiary treatment.

I. Phosphorus Removal and Polymer Addition

Phosphorus removal may be accomplished using alum, ferrous sulfate and ferric or ferrous chloride. Currently ferrous chloride is used. One 12,000 gallon heated fiberglass holding tank and two (2) chemical feed pumps are used in this process. Each diaphragm pump has a capacity of 0 to 213 gpm at 75 psig and initially ferric chloride could be fed at two different locations, preaeration and aeration. Currently ferrous chloride is being used for phosphorous control and it is added at the aeration tanks, so the lines to the preaeration were removed. Phosphorous analyses are conducted by the laboratory staff at least three times per week and the results are used to adjust the ferrous chloride feed to meet the effluent limit of 1 mg/l. Ferrous chloride is purchased through the annual competitive bidding process, and is supplied in 4000 gallon tanker trucks. Safety procedures and unloading protocols (operator attendant) were written and are posted to guard against spills or leaks. A spill containment kit is located in the Chemical feed building (old concentrator building) to minimize the impact of a spill or leak.

Addition of polymers as a settling aid may also be accomplished by utilizing the polymer mix system and feed pumps. This includes one 400-gallon mix tank and two, 0 to 3 gallons per minute Moyno progressive cavity, variable speed pumps. Polymer addition to aid in settling is often used when chlorinating for filamentous bacteria control. The type of polymers used at the WPCC is determined by conducting jar tests, and currently a cationic polymer is being used. The polymer is purchased in 55 gallon drums and these drums are stored in our Chemical Feed building (old concentrator building). Fortunately, we do not use a substantial volume of polymer on an annual basis so this chemical is not purchased through the yearly competitive bidding process, but based on which one performs the best. The characteristics of the Fremont wastewater can change from season to season and jar tests are conducted as necessary to determine the proper polymer to be used. As a general rule polymer use is initiated to improve settling when the RAS is being chlorinated for filamentous bacteria control. A dramatic increase in the SVI over a few days coupled with a microscopic revelation of filaments results in the need for chlorination and polymer use. Polymer addition is not used as the solution to the problem, only as a short-term fix, used while the causes of the clarifier instability are determined and solutions implemented. The polymer solution is prepared as a 10% solution and when polymer use is indicated (filaments, chlorination, unstable clarifiers, etc.), the initial dose is usually high (20%, 0.6gpm) and then gradually reduced to about 10% (0.3gpm) over the next three shifts as the situation warrants. Jar testing and operational experience has shown that this dosage and feed procedure has worked well.

J. Tertiary Treatment

After secondary treatment and chlorination, the effluent then passes through four (4) low head, traveling-bridge sand filters. These filters are rated at 2.3 MGD each with a solids loading of 30-50 mg/l, and can be backwashed (initiated through head loss or timing) without shutting the filters down.

The final effluent is discharged and metered through a Parshall flume, then out a 30-inch diameter outfall sewer to the Sandusky River. The tertiary effluent is continuously monitored for chlorine residual, dissolved oxygen, pH, and temperature in addition to the flow. The data is locally recorded and transmitted to remote readouts in the aeration building break-room. If the River level is too high for gravity discharge of the effluent, an effluent pump is available at the discharge chamber and is programmed to start-up when the water in the discharge chamber reaches a pre-set elevation. Prior to this pump installation in 2005, WPCC effluent was discharged into the Sand Road Pond during high river water events and was then pumped over the floodwall using two (2) PTO driven 10,000 gpm (gallons per minute) marsh pumps.

Backwash from the filters is directed to a 25,585 gallon mud well. Three (3) 400 GPM Flygt submersible pumps pump the backwash water from the mud-well to the WPCC headworks. A high water alarm (visual, flashing blue light, audible, siren) has been installed to guard against over-filling the mud-well if the mud-well pumps should happen to stop working for some reason. Since this flow enters before metering equipment, this daily flow must be subtracted from our influent daily flow readings. After tertiary treatment, the effluent is dechlorinated using Sodium Bisulfite to meet the effluent limit of 0.038 mg/l.

One 12,000 gallon storage tank is used to store Sodium Bisulfite and one of the two chemical feed pumps is used to dechlorinate the tertiary effluent. Sodium Bisulfite may be added at two locations, the tertiary effluent channel and the secondary effluent wet well, depending on the situation. When the plant is treating in excess of the 9.2 MGD capacity of the tertiary filters, a portion of the flow is bypassed around the filters. The bypassed water, secondary clarifier effluent, has been chlorinated prior to the bypass and is mixed with the tertiary effluent downstream of the tertiary. We have the capability of feeding Sodium Bisulfite at the bypass chamber and at the tertiary effluent channel to meet the NPDES permit of 0.038mg/l.

K. <u>Laboratory Facilities</u>

The laboratory facility, located in the Administration Building, has the equipment to perform the analyses for many parameters, including: temperature, dissolved oxygen (DO), 5-day CBOD, chemical oxygen demand, suspended solids, pH, ammonia, Total Kjeldahl Nitrogen (TKN), phosphorus, chlorine residual, nitrate, nitrite, heavy metals (atomic absorption spectrophotometer), alkalinity, grease and oil, fecal coliform, sludge analyses, chlorides. The laboratory was upgraded in the 1988 improvements and is currently staffed by one Chemist and one lab technician. The lab staff is supplemented by an Operator Tuesday through Friday if the operations work load permits. These two operators are training for the Lab Analyst exam and assist in the daily lab operations as appropriate.

L. Industrial Pretreatment Program

The City of Fremont's Industrial Pretreatment program was approved by the Ohio EPA in 1985 and implemented in 1986, and is administered by the Chemist (Compliance Control Chemist).

Initially there were sixteen (16) Significant Industrial Users (S.I.U.) and all were issued Wastewater Contribution Permits. Several industrial users have ceased operations over the years for a variety of reasons, but mostly due to economic reasons (merges, relocation, lack of efficiency, aging facilities, etc.). Currently, there are eight (8) Significant Industrial Users, three (3) Categorical and five (5) Non-Categorical. These SIU's are primarily made up of food processors, paper product producers, and various miscellaneous industries (can plant, battery manufacturer, foam matting plant, and automotive plastics).

The industrial users make up for approximately 15% of the WPCC hydraulic loading, 60% of the organic loading, and 30% of the suspended solids loading.

Each Industrial User Wastewater Contribution Permit delineates control parameters and discharge limits for the industrial user. An extensive sampling, analysis, and inspection program has been established by the WPCC staff resulting in exceptional permit compliance. Instances of permit exceedances by any industrial user are handled promptly. A phone call is placed with the particular industry advising them of the exceedances. Depending on the nature of the exceedances, a notice of violation letter may be sent requesting a written response. If the situation warrants, a Show-Cause Hearing may by scheduled whereby industry officials can personally explain specifics regarding their permit exceedances. Director's Findings & Orders may be issued if the exceedances are of a serious magnitude (plant disruption, loss of treatment, etc.) The Industrial User is provided an opportunity to appeal the Findings and Orders to the Appeals Board, made up of several City Council members and the Mayor. The appeals board has the authority to accept, modify or reject the findings and orders issued by the Director. Generally, the Appeals Board and the Director follow the recommendations of the plant Superintendent. In the twenty (20) year life of Fremont's Pretreatment Program, these procedures have worked exceptionally well.

M. Sludge Digestion

Sludge is pumped from the primary tanks and the gravity thickener to the digester control house. The gravity thickener sludge is made up of Waste Activated Sludge (WAS) from the Return Activated Sludge well. The thickened sludge is approximately 2.5-3.5% total solids and 69.0-77.0% volatile solids. Approximately 40,000 gallons of WAS is pumped to the thickener daily, and approximately 30,000 gallons of thickened sludge is transferred to the digesters daily, depending on the sludge blanket levels in the thickener.

There are two (2) digesters, each 45 feet in diameter and 23 feet deep, with a combined capacity of 547,000 gallons. One tank, the south digester, is equipped with a Walker Process gas floating lid, operated at 8" water column. This lid can store approximately 10,000 cubic feet of gas. The other digester, the north, is equipped with an Atara lid with a small gas holding capacity compartment that floats on sludge. Both digesters are equipped with a Walker Process gas lifting system for recirculation of gas to mix the contents and control the scum. Three gas compressors, which include one standby unit, are used for this purpose. The excess gas not used for mixing is vented to the atmosphere. In an effort to improve the digester mixing, and help meet the 40 CFR 503 sludge regulations, four (4) external draft tube EIMCO mixers were installed in 1994, two in each digester. These mixers are operated continuously and the rotation of the mixer is reversed regularly to provide cleaning of the impellers.

Both digesters are heated: The North digester with a 300,000 BTU/hour boiler and the South digester with a 520,000 BTU/hour boiler. The hot water is recirculated with two pumps into a hot water jacket around the draft tube area. In an effort to maintain heat in the digesters, dirt was mounded up around them. The digester temperature has stayed relatively constant at about 102 degrees Fahrenheit. The digesters are loaded regularly each shift with primary sludge and aerobic sludge from the gravity thickener. Digested sludge is withdrawn from the digesters using two 10" piston pumps and is pumped to one of the two sludge holding tanks/thickeners for storage. The sludge digestion process at the City of Fremont currently produces a Class B sludge.

N. Sludge Holding Tank and Loading Station

There are two sludge holding/thickener tanks that are used under normal operating conditions. One is an 80 foot diameter by 9 foot water depth tank (East Holding) that holds 340,000 gallons and is equipped with three (3) submersible Flygt mixers. The second tank (West Holding) is also an 80 foot diameter tank with a 10 foot water depth and a capacity of 376,800 gallons. Each of these tanks can be supernated, with the supernatant going to secondary treatment or back to the headworks of the plant.

In case of a prolonged period of wet weather, the three original trickling filters, which were converted to auxiliary sludge holding tanks, can be used for storage. Each of these auxiliary tanks (filters) is 80 feet in diameter with a 4 foot water depth and collectively provide an additional holding capacity of approximately 450,000 gallons. At current sludge production rates, the plant has a total holding capacity of 1,155,000 gallons or 52 days. To meet the required storage time of 120 days, agreements have been made with the sludge hauling contractor to press and transport cake to a local landfill.

When the City first started land application of sludge, the hauling and application was performed by City personnel or a contractor. Through cost analysis, contracted hauling has proven to be the most economical. The City, therefore, sold the sludge hauling equipment, tankers, semi truck, and land application trucks and now approximately 12,000,000 gallons of sludge is land applied annually.

The sludge is applied either on the surface and incorporated into the soil or subsurface injected to farmland. Approximately 350-450 acres per year are required for this operation, and the City has access to over 3000 acres of approved sites. Site data (volumes applied, soil analysis, sludge nutrient concentration, etc.) is maintained on file at the WPCC for each approved site.

With the advent of the 40 CFR 503 Sludge Regulations and the adoption of these regulations by the State of Ohio, it appears that Class A sludge is the most desirable. Plans have been prepared, but not implemented, to convert the existing anaerobic digesters to the Autothermal Thermophilic Aerobic reactors and create a Class A product. As funding is identified, these plans or something similar will be implemented.