

Sewage Treatment Plant (STP) of the University

Batangas State University has an existing Sewage Treatment Plant (STP) with seven lifting stations that act as the main collection point of the wastewater from several buildings flowing via gravity and five chambers. Presented in the figure below is the actual Sewage Treatment Plant of the university.



The STP is composed of equalization tank to stabilize the waste, aerobic digester tank to eliminate anaerobic conditions in the tank and prevent settling of suspended solids, two sequencing bioreactor tank that also serves as an equalization basin that tolerates peak flows or peak loads in the effluent that equalize them in the batch reactor. The chlorine tank is also included for the disinfection of treated water.

The STP holds and treats the wastewater being generated. Sewage from septic tank will be transferred to lifting station and be transported to the STP by pumping system. The existing STP is of Sequencing Batch Reactor (SBR) type. It is being operated and maintained by technically skilled personnel to ensure the proper operation of the plant. The treated sewage was used for non-potable purposes such as landscape watering, road cleaning, fire reserved and equipment cleaning. The excess treated wastewater was being discharged to the receiving bodies of water. Prior to discharge and reuse, wastewater quality testing and analysis were conducted to assure that the quality is compliant to the DENR standard.



OPERATING MANUAL

BATANGAS STATE UNIVERSITY MAIN CAMPUS 1 SEWAGE TREATMENT PLANT

PLANT DESCRIPTION

Sewage Treatment Plant operation begins at the tail end of the main sewer line where all wastewater are directed into the lift station of the Sewage Treatment Plant. The raw water from the lifting station is pump into the Equalization Tank of the Sewage Treatment Plant after passing through a Bar Screen.

The Equalization Tank will be continuously aerated by submerged aeration, evenly distributed throughout the tank by coarse bubble diffusers. The holding Tank contains two (2) 2 Hp Submersible Sewage Transfer Pumps; one for SBR - 1 and one for SBR - 2. In case of breakdown of one of these pumps, the other is easily transferable to the other port by the Operator because of the quick disconnect system provided. Liquid level controls are provided for these pumps.

The Sequencing Batch Reactor (SBR) Tanks (SBR-1 & SBR-2) are provided with the following:

- i.) Air Diffusion system for Fine Bubble Diffusers and controlled by electro pneumatic solenoid.
- ii.) Static Decanter with discharge valve also controlled by solenoid.
- iii.) Waste Sludge Transfer Pumps to move excess sludge to the Aerobic Digester.

Operation of the SBR Tanks is programmed sequentially following the pattern below.

Fill	---	30 minutes
React	---	60 minutes
Settle	---	60 minutes
Decant	---	30 minutes
Waste Sludge/idle	---	0.75 cu.m. (During Decant; as needed)

All sequences are programmed in the Logic Controller and Operator is not authorized reprogram the Controller without IMBCI assistance, for the reason that the present sequence is the result of raw water flow pattern observed by qualified technicians over some period of time.



The Aerobic Digester is located at the far end of the Sewage Treatment Plant. It has a continuous supply of diffused air just like the Holding Tank. On it is the Diaphragm Pump that delivers sludge to the Filter Press whenever sludge dewatering becomes necessary. The Aerobic Digester is provided with an overflow pipe that returns excess supernatant flow of the Holding Tank.

The Treated Water Tank is provided with overflow pipe to deliver the treated water to the street level drainage. One pump is sufficient to handle all decanted clean water. They are wired for automatic alternating operation are provided for automatic pump control.

The Blowers are Roots Type Lobe blowers operating at about 1730 rpm. They supply air to all tanks needing diffused air. Only one blower is enough to supply all requirements, so that the other unit is only a spare. They are wired for automatic alternating operation. Both are provided with pressure regulation valves to avoid unnecessary buildup of air pressure.

The Chlorinator operation consists of a Solution Tank of 100 Liters. Capacity and a regulator box which has a calibration port. It operates by discharging the correct amount of chlorine solution directly into the Treated Water Tank. The chlorine dosage recommended is 3-5 ppm.

The Motor Control Center (MCC) is a free-standing NEMA 1 Enclosure. The Logic Controller is also installed inside.

OPERATING PROCEDURES

The Sewage Treatment Plant has been commissioned by IMBCI and made operational continuously. We have foreseen no decommissioning in the near future, but in the event recommissioning becomes necessary, I.M. Bongar & Co., Inc., should be contacted for this purpose.

Day-to-Day operation has been made simple by the Logic Controller, which provides all the necessary switching for alternating and sequential operation, twenty four (24) hours daily.

In the event of power outage, plant operation resumes where it stops if power is restored in 3 hours. Longer than 80 hours, the program of the Logic Controller is no longer applicable and power



outage of more than three (3) days will erase the program completely and reprogramming will become necessary. These scenario is however unlikely to occur since the building is equipped with standby generator.

Submersible Transfer Pump Operation. In the event of partial equipment breakdown, such as the Transfer Pump inside the Holding Tank, the Operator must pullout the pump and send it to a repair shop right away. In the meantime, the other pump will take its place by transferring it. The quick disconnect makes it easy for the operator to transfer the pump from one port to the other. In this operation, the Operator has to switch both pumps to manual (H) operation by moving the switches in the front panel of the MCC. When the water level reaches about 100mm below top of Decanter, the Operator manually stops the pump. However, if water level at the Holding Tank reaches low level, the operator stops off the pump operation. Operator has to make sure that the pump is connected to the SBR that has most recently decanted. When the repaired pump is returned, Operator drops it into the vacant location and switches the controls back to auto operation.

Decanter pump is used to remove the clear treated water, once the settle phase is completed, and then transfer to Chlorine Contact Tank for disinfection.

To refill the Aerobic Digester, operate the Waste Sludge Pump for five (5) to eight (8) minutes manually after every Decant sequence. Do this for both SBR, but operate the pump only after the Decant sequence when sludge is concentrated at the bottom of the SBR.

Blower Operation. The Blower is motor driven and provided with Fan Belt. Replace all Belts even if only one is defective. Keep proper tension of Fan Belts at all times. After replacing Belts, replace also the protective guard for operator's protection. The Blower has a sight glass for Oil Level visual. Add Oil SAE 40 when level is low. Replace the oil once every six (6) months.

The Blower is also provided with Air Filter element once a month by reverse blowing with air flow from the air compressor.

Replace the filter element when caked dust no longer blows out by reverse blowing. Replace the filters any way, once every six (6) months.

The operator regularly examine the Blowers for loose bolts and nuts and in the event of an unusual sound created, operator



must stop its operation immediately and call for technicians to investigate. Do not attempt to operate a defective blower, because it may increase the damage or cause injury to people.

Chlorination. Chlorine granules in form of Calcium Chloride is commercially available in pails or bags. Dissolve the granules 10 kgs of it inside the Solution Tank almost filled with water. Use a rod to mix and dissolve by giving it a few strokes at a time. The solution should be dripping to the Treated Water Tank at 16 gallons per day.

MAINTENANCE

Blower Maintenance has been discussed under blower operation. Filter, Fan Belt and Blower Oil are most important maintenance item for these Blowers. The operator should keep a log of replacement and spare items should be available from the warehouse.

The operator should continuously clean the inside of the Plant, including the top of Catwalks and bottom of walls. Cobwebs formed at the ceiling should also be removed. Regular maintenance of painted Pipes, railings and machinery, including walls should be done to provide the Plant with a wholesome look.

The operator must regularly skim the water surface for any floating garbage. All floaters inside the Decanter, garbage or not must be removed regularly. Floating garbage if any shall be disposed of like regular solid garbage.

The Bar Screen at the screening box has the tendency of clogging due to the usual garbage being flushed into the sewer system by building occupants. The operator should use a rake to harvest trapped solids by the Bar Screen and throw them as solid garbage, garbage bags should always be available to the operator at all times.

Finally, the Operator is not expected to be an Electrician. He is therefore admonished not to tinker with the Electrical Works. Worse of all, he is alone in the enclosed Sewage Treatment Plant and help would not be readily available in an emergency. Supervisory visit is strongly suggested regularly, nevertheless.



WARNING

THIS SEWAGE TREATMENT PLANT IS NORMALLY OPERATING ON AUTOMATIC MODE UNLESS RESET TO MANUAL OPERATION BY AN AUTHORIZED STP TECHNICIAN. ALL OPERATING SEQUENCES ARE THEREFORE CONTROLLED BY THE LOGIC CONTROLLER. IN THE EVENT OF EQUIPMENT MALFUNCTION, ONLY SWITCHING ITS CONTROL IN THE FRONT PANEL TO "OFF" POSITION SHOULD SHUT DOWN THAT PARTICULAR EQUIPMENT. INCASE OF POWER OUTTAGE, THE CONTROLLER SUSTAINS ITS PROGRAMMED LOGIC FOR A FURTHER 72 HOURS WITHOUT POWER. CALL I. M. BONGAR & CO., INC. IF THE OUTTAGE ALLOWANCE IS EXCEEDED, SINCE THE PROGRAM MAY HAVE BEEN CORRUPTED BEYOND THIS TIMEFRAME.