		Capacity : 160 Lts Pressure : 1.5 Kg/cm2 Compressor make : ELGI	
24.	Flow meter	Size : 80/125mm Type : Electro Mechanical Make : Krohne Marshal	3 Nos
25.	Piping ,Fittings, Valves	Supply, Installation, Testing and commissioning all interconnecting piping (PB) within the plant room including GI"B" class Piping : Jindal/Eq Valves : Intervalve	1 Lot.
26.	Cable & Cable Trays	Supply, Installation, Testing and commissioning of GI Perforated cable trays with armored cables of Aluminum/Copper	1Lot.
27.	Control panel	Supply, Installation, testing and commissioning of suitable compartmental type control panel for electro mechanical above with spare feeders for Ventilation, dewatering, tank cleaning pumps back wash pumps and HNS system Make : Elavarthy	1Lot.

2.1 Preliminary/Primary Treatment

Preliminary treatment includes screening, grit removal, and flow monitoring. Primary treatment includes sedimentation and floatation. SBRs generally do not have primary settling tanks; therefore, effective removal or exclusion of grit, debris, plastics, excessive oil or grease, and scum, as well as screening of solids should be accomplished prior to the activated-sludge process.

2.1.1 Screening Influent Wastewater

Bar screens or mechanical screens should be used instead of grinders or shredders. Screening influent wastewater is a positive means of removing rags, sticks, and other debris before they can enter the treatment process. Grinders and shredders pass this material into the SBR where it can become woven together, making it difficult to remove. Removing debris from the wastewater stream before it reaches the basins is beneficial to both the treatment process and the settling phase—excess debris is not present to interfere with the solids that need to settle, resulting in a high-quality sludge blanket. Screens also provide protection for the pumps.

2.1.2 Influent-Flow Equalization

Flow equalization is critical where significant variations in flow rates and organic mass loadings are expected. Flow equalization is also important if a plant is expected to receive a significant amount of stepage or is taking in a significant amount of industrial wastes. Flow equalization is strongly recommended when a plant needs to achieve nitrification and de-nitrification. It is important to note, however, that the size of the influent equalization basin must be carefully considered because an oversized basin can cause negative downstream-treatment-process impacts. A plant utilizing an influent equalization basin will be able to have a true batch reaction. Influent-flow equalization benefits the SBR process in the following ways:

- Allows for a smaller SBR-basin size because it allows for storage until the process cycle is complete.
- Allows for one basin to be taken off line for maintenance or for seasonal variations. Routine maintenance is necessary for all tanks. For plants that have seasonal variations, taking one basin off line is cost-effective due to a reduced need for electricity, staff hours, and tank maintenance.
- Allows for scum and grease removal at a single point before it enters the SBR tank. Entrainment by mixing should not be the sole means of scum control. A mechanism or process for removing scum, grease, and floatables should be provided in the equalization tank.
- Allows plants that must denitrify to ensure that an adequate amount of carbon is available in the de-nitrification fill phase.
- Allows for an equal flow volume into the basin, keeping the food to microorganism ratio (F/M) fairly stable. As stated previously, each SBR design is unique and in some situations influent-flow

2.2 Sequencing Batch Reactor

2.2.1 Basin Design

Ideally, plant designs should have a minimum of two SBR basins and one flow equalization basin; however, every design is unique and one configuration does not fit all situations. All SBR designs should have a minimum of two basins to allow for redundancy, maintenance, high flows, and seasonal variations. Two basins allow for redundancy throughout the plant. If one basin is off line, the plant is still able to treat influent wastewater because of the equalization basin. If the basin microbiology becomes depleted in one basin, the biomass from the remaining basin can be used to restock the basin with depleted biomass. For this to happen, a means of transferring sludge between the two basins must be provided.

During storm events and high-flow periods, instead of bypassing the basins or blending the storm water, an additional basin can act as storage, or certain cycles can be shortened. In particular, the react cycle can be shortened under wet-weather conditions because of the diluted flow and the reduced time needed to treat the BOD. With higher flows, the fill phase and the idle cycle can also be shortened. A two-basin design also allows the plant to take one basin off line for draining and cleaning while the pre-flow basin and the one online basin remain fully operational.

For plants that have seasonal flow variations, a design that includes two treatment basins and an influent-flow-equalization basin allows one basin to be taken off line during the off season. This is important for seasonal plants, as it can save money by cutting electricity costs and reducing staff hours (fewer hours are spent on overall basin maintenance). The basin that remains on line is able to reseed the biomass in the off-line basin when the influent flow pattern peaks.

2.2.2 Flow-Paced Batch Operation

Flow-paced batch operation is generally preferable to time-paced batch or continuous inflow systems. Under a flow-paced batch system, a plant receives the same volumetric loading and approximately the same organic loading during every cycle. The SBR basin already has stabilized supernatant in it, which dilutes the batch of incoming influent.

Under a time-paced mode, each basin receives different volumetric and organic loading during every cycle, and the plant is not utilizing the full potential of this treatment method—the ability to handle variable waste streams. After each loading, the plant faces a whole new set of treatment conditions, making the operator's job more difficult.

Time-paced operation (if you are not adjusting the cycle time) can lead to under-treated effluent. A plant that receives heavy morning loadings, with a flow pattern that drops off after the first cycle, must deal with two different biologies in the basin unless adjustments are made to the cycle time. For example, one basin could be receiving an early morning load, which has a high organic and volumetric loading. The second basin could be receiving the afternoon loading, which has a lower organic and volumetric loading. Unless the time cycle is adjusted, it becomes difficult to operate under these conditions because the operator is essentially running two separate plants.

Another problem with time-paced operation is that if the plant is required to denitrify, it may not bring in an adequate carbon source needed for the bacteria to strip oxygen from the nitrate. This scenario would be especially problematic during periods of low flow. For an SBR to be effective, the plant must have proper monitoring, allow operators to adjust the cycle time, and have knowledgeable operators who are properly trained to make the necessary adjustments to the cycle.

2.2.3 Blower Design

Several smaller blowers are preferable to one large unit. It is not uncommon for SBR designs to incorporate a single blower per basin to provide aeration. However, operational efficiency can be enhanced when plants utilize several smaller blowers, instead of one large blower.

When a single blower per basin is used, it should be sized to provide maximum aeration under worst-case conditions. These conditions typically occur in the summer months, when higher temperatures decrease the amount of oxygen that can be dissolved in wastewater. For facilities that utilize a single blower per basin, a variable frequency drive should be considered.

In a plant configured with only one blower per basin, it is difficult to scale back on the aeration provided. With multiple smaller blowers, units can be taken off line when maximum aeration is not required. This results in electrical cost savings.

Fine-bubble membrane diffusers are preferable to coarse-air bubble aeration. Fine-bubble diffusers transfer more oxygen to the water due to increased surface area in contact with water. The same amount of air introduced in a big bubble has less surface area in contact with water than an equal amount of air divided into smaller bubbles. The amount of surface area in contact with water is proportional to the amount of oxygen transferred into water. Depth of aerators also plays a part in oxygen transfer, due to contact time. The deeper the aerator, the longer it takes for the bubble to come to the surface. Aerator depth is deepest when a tank is filled to the high-water level. If a plant is utilizing time-paced batch reactions, aerator depth is not optimal and oxygen contact time is not maximized.

Blowers in multiple units should be sized to meet the maximum total air demand with the single largest blower out of service.

2.2.4 Decanting

During the decant phase, operating under a flow-paced batch operation, no more than one third of the volume contained in the basin (i.e., the tank contents) should be decanted each time in order to prevent disturbance of the sludge blanket. The decant phase should not interfere with the settled sludge, and decanters should avoid vortexing and taking in floatables. The problem with decanting more than one-third is that it increases the chance that solids will be decanted into the effluent, thereby impairing the effluent quality. For the plant to run optimally, it is important that the decant volume is the same as the volume added during the fill phase. The length of the decant weir can have an impact that is very similar to that of the over-flow weir found in a clarifier. The flux (upward forces) caused by the discharge of the decant creates an upward force that may pull poorly settled solids up and out the discharge.

2.2.5 Bottom Slope

All basins should have a sloped bottom with a drain and sump for routine tank maintenance and ease of cleaning. Slope rectangular basins slightly to one corner to allow for hosing down the unit. Circular basins should be sloped toward the middle for maintenance. All SBR designs should include a means for completely emptying each SBR unit of all grit, debris, liquid, and sludge.

CHAPTER 3
OPERATIONAL SUGGESTIONS

3.1 Parameters to Be Monitored

Oxidation reduction potential (ORP), dissolved oxygen (DO), pH, and alkalinity are parameters that should be monitored by the Supervisor. Manufacturers determine what parameters can be monitored and controlled by the system. Monitoring of certain parameters is important, and the ability to adjust these parameters from a remote location is ideal. The operator needs to be able to add chemicals to raise the alkalinity and subsequently the pH. The set point should be an alkalinity value rather than pH based.

The operator should have the ability to fully control (i.e., modify) the plant-operating parameters, such as (but not limited to) cycle times, volumes, and set points.

Alkalinity monitoring and addition ensures that a pH of less than 7.0 does not occur. Nitrification consumes alkalinity, and with a drop in alkalinity, pH also drops. If a plant has adequate alkalinity, pH does not change, so it does not need to be raised. Chemicals that raise alkalinity, such as sodium bicarbonate and soda ash, are recommended over sodium hydroxide. Sodium hydroxide does not raise alkalinity; it does raise pH. for a discussion of the pros and cons of various chemicals used to increase alkalinity.

For plants that nitrify and denitrify, ORP monitoring is desirable. ORP is the measure of the oxidizing or reducing capacity of a liquid. DO varies with depth and location within the basin. ORP can be used to determine if a chemical reaction is complete and to monitor or control a process.

Operators need the ability to make changes that will modify these readings to achieve appropriate nutrient removal. ORP readings have a range and are site specific for each facility. General ranges are: carbonaceous BOD (+50 to +250), nitrification (+100 to +300), and de-nitrification (+50 to -50).

On-line dissolved oxygen meters are very useful in SBR operation. They allow operators to adjust blower times to address the variable organic loads that enter the plant. Lack of organic strength reduces the react time during which aeration is needed to stabilize the wastewater. DO probes can be used to control the aeration-blower run time during the cycle, which in turn reduces the energy cost of aeration.

3.2 Sampling

3.2.1 Proper Sampling Points

As with all wastewater treatment plants, SBR samples are collected and analyzed for both process control and compliance reporting. Sampling locations must be carefully considered. SBRs that utilize influent-equalization basins have more representative flow spaced composite samples because the discharge is consistent in volume. In other words, flow equalization and true batch reactions allow for easier composite sampling because the same volume is entering and exiting the basin during each cycle.

Twenty-four-hour effluent composite samples should be flow-paced and include samples collected at the beginning and end of each decant event.

3.2.2 Parameters to Monitor

Numerous parameters can be monitored for process control. Testing and monitoring of process control parameters requires planning and organization so that variances from the targeted performance goals are easily recognized. A list of typical process control parameters is provided in Appendix A.

3.3 Solids Retention Time – SRT

Solids retention time is the ratio of the mass of solids in the aeration basin divided by the solids exiting the activated sludge system per day. Exiting solids are equal to the mass of solids wasted from the system plus the mass of solids in the plant effluent.

Ensuring an adequate SRT is very critical to the SBR biological nutrient-removal design process. The design SRT for nitrifying systems should be based on the aeration time during the cycle, not the entire cycle time.

3.4 Sludge Wasting

Sludge wasting should occur during the idle cycle to provide the highest concentration of mixed liquor suspended solids (MLSS). The plant should be operated on pounds of MLSS and not concentration.

Sludge from the SBR basins can be wasted to a digester and/or holding tank for future processing and disposal. The digester-tank and sludge-holding-tank capacity should be sized appropriately, based on the sludge treatment and disposal method.

Supernatant from the sludge digester and/or holding tank should be returned to the head works or influent equalization basin so that it will receive full treatment. The facility should be designed so that the supernatant volume and load do not adversely affect the treatment process.

A high-level alarm and interlock should be provided to prevent sludge-waste pumps from operating during high-level conditions in the digester and/or holding tanks. Controls should be provided to prevent overflow of sludge from digester tanks and/or holding tanks.

Controls should be provided to prevent overflow of sludge from digester tanks and/or holding tanks.

CHAPTER 4
OPERATIONAL MAINTENANCE

Pumps

Pumps must be monitored regularly, correctly and accurately according to a specific plan which is made by a specially trained personnel. The following six parameters should be regularly monitored to understand how a pump is performing:

1. Suction pressure (Ps)
2. Discharge pressure (Pd)
3. Flow (Q)
4. Pump speed (N)
5. Pump efficiency (η)
6. Power.

The advantages regular monitoring of the pumps are -

1. No dismantling of the pump is necessary.
2. Offers cost savings and energy savings by increasing the pump availability and reliability coefficients for pumps.
3. The time to maintain the pump set maybe predicted and planned more accurately and in a qualified manner in line with predictive and planned maintenance strategies.
4. If a flow meter is installed to measure process liquid flow, then the pump monitor is able to verify the accuracy of the meter readings by calculating 'Q' from the empirical formula for power 'P'.

In addition, it is very important to monitor some other conditions for centrifugal pump during normal operation such as:-

1. Vibration monitoring.
2. Oil level and schedule oil Analysis

Routine inspections

Perform the following tasks whenever you check the pump during routine inspections:

- Check the level and condition of the oil through the sight glass on the bearing frame.
- Check for unusual noise, vibration, and bearing temperatures.
- Check the pump and piping for leaks.
- Analyze the vibration.
- Inspect the discharge pressure.
- Inspect the temperature.
- Check the seal chamber and stuffing box for leaks.
- Ensure that there are no leaks from the mechanical seal.
- Adjust or replace the packing in the stuffing box if you notice excessive leaking.

Three-month inspections

Perform the following tasks every three months:

•Check that the foundation and the hold-down bolts are tight.

•Check the mechanical seal if the pump has been left idle, and replace as required.

•Change the oil every three months (2000 operating hours) at minimum.

•Change the oil more often if there are adverse atmospheric or other conditions that might contaminate or break down the oil.

•Check the shaft alignment, and realign as required.

Annual inspections

Perform the following inspections one time each year:

•Check the pump capacity.

•Check the pump pressure.

•Check the pump power.

If the pump performance does not satisfy your process requirements, and the process requirements have not changed, then do the following:

1. Disassemble the pump
2. Inspect it.
3. Replace worn parts.

Routine maintenance (Can be made during pump operation)

Perform the following tasks whenever you perform routine maintenance:

- Clean bearing bracket from any oil if found.
- Check oil drain plug.
- Lubricate the bearings.
- Inspect suction and discharge flanges for any leak.
- Inspect pump casing for any unusual damage signs.
- Inspect the seal.
- If the pump is offline check the coupling and its shims for any damage.
- Make sure that the coupling guard s well tightened to pump base plate.
- Check that motor alignment bolts are all in place.

Blower operating checks

- **Daily checks –**

  With the blower running, check: Outlet temperatures.

  • Discharge pressure (when functioning under pressure).

  • Suction pressure (when functioning in vacuum conditions).

  • Absorbed power.

- **Check after first 50 hours**

  With the blower shut down, check: The oil level.

- Oil leaks.
- Auxiliary circuit leaks.
- Belt tension.

- **Check every 500 hours**

  With the blower shut down, check: The oil level.
  - Oil viscosity and condition.
  - Belt wear.
  - Flexible coupling inserts.
  - Auxiliary circuits.

Safety in the Plant:

The work of an Operator in a S.T.P. Presents many hazards that must be guarded against. Common type of accidents are injuries from falls, deaths from drowning and asphyxiation. Narrow walks, steps and platforms over tanks should be used carefully particularly in darkness, rains and wind.