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| Title: **STP** | | | | Page 1 of 6 | |
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| Originated by | | Concurred by | | Approved by | |
| K.V.S.Adithya  (Engineer Facilities) | | P.Pavan Kumar  (Sr. Engineer – Facilities) | | B.Ambika Prasad  (Manager-Facilities) | |
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**Objective:**

Standardize procedure for operation of Sewage treatment plant to obtain maximum efficiency.

**Policy:**

To ensure that plant is operated without trouble and least breakdowns.

**Responsibility:**

STP operator / Shift Engineer

**Procedures:**

1. Check bar-screen chamber. Clear from clogging materials if any.
2. Check the water level of equalization tank. Always maintain a proper level
3. Start Air Blowers for aeration of fluidized aerobics and for other system.
4. Check resistibility of PVC balls and if found loaded with grease and solid fluid plan wash the same with fresh water.
5. Start Raw sewage pumps to transfer water from equalization tank to Aeration tank.
6. Clean Aeration tank surface area and clarifier tank from any algae formation or clogging materials.
7. Check fluidize sludge from clarifier tank is transferred/ drained periodical to sludge Holding tank.
8. Fix liquid chlorine dosage to disinfect the treated water.
9. Start transfer water pump i.e. filter feed pumps for filtration through PSF (pressure sand filter) and ACF (Activated carbon filter).
10. Check pressure drop in the filters and back wash the filters if the drop is more that 0.5Kg/cm2
11. Test quality of water and treated water for its designed TDS, BOD level and ph value.
12. Check for the proper functionality of HNS system for proper irrigation & flush water supply.
13. Check and ensure the working of drain pit de-watering pumps. Divert water from the drain pit chamber when required.
14. Check sludge volume in sludge holding tank. Divert the water to aeration tank. Check for suspended solids in SHT by settling test. If adequate quantity available for centrifuge, start centrifuge feed pumps.
15. Start Centrifuge for de-watering the liquid sludge. Collect the output sludge in a tray and recycle the liquid output.
16. Record parameters in the log sheet

**Bar Screen Chamber:**

The effluents flow by gravity into the Bar Screen chamber, where SS type Bar Screen is provided. The screen provided will arrest suspended matter such as rag, paper, vegetable wastes, leaves, cotton waste etc and have to be cleaned by hand rake manually. This screenings should be collected at regular intervals and further disposed of by landfill / burying.

**Equalization Tank:**

The screened effluent from the bar screen chamber flows into equalization tank by gravity. The tank acts as a holding tank for the raw effluents. In order to homogenize the quality of waste water, as well as to feed waste water at a uniform rate to the rest of the treatment plant. To prevent odor mixing, by means of diffused aeration comprising coarse bubble diffuses. Air blowers should be in operation as long as the inflow is present. In any case, blower should not be rested for more than one hour to prevent odor and process related problems.

**Aeration Tank:**

Aeration tank is main reaction tank for the biological process. As the waste water flows into the tank an equal quantity of tank contents over flows into Clarifier tank. Fine pore diffusers (Tubular Membrane Diffusers) have been provided. For aeration operate them continuously round the clock, as long as there is normal waste water flow into the tank.

**Clarifier Tank**:

The over flow from aeration tank is led into the settling tank i.e. Clarifier by gravity. It is provided with Hopper Bottom for settlement of suspended solids. The excess sludge from settling tank is drawn to sludge holding tank through sludge pumps, sludge pumps are also provided for recalculating the thickened Biomass back to the aeration tank in order to maintain the design MLSS (Mixed Liquor Suspended Solids)

**Clarified Water Sump:**

The over flow from secondary settling tank flows by gravity to the clarified water sump and it is pumped through a pressure sand filter, Activated Carbon Filter and on line chlorination is provided for disinfection.

**Pressure Sand Filter**

The Treated Effluent from the sump is pumped to pressure sand filter. This is a pressure vessel equipped with a perforated under drain plate, fitted with polystyrene strainers, filter media comprises of graded filter is gravel/sand. The clean filter water comes out from pressure led to AC Filter.

**Activated Carbon Filter:**

The filtered water from the pressure sand filter passes through an Activated Carbon Filter which comprises of vertical pressure vessel. The pressure vessel is equipped with a perforated plate comprising of polystyrene strainers at the bottom, perforated brass strainers at the top. In between the filter media comprising 900 MM deep activated carbon granules over a bed of graded gravel on line chlorination is provided for disinfection before disposal to final sump.

**Sludge Holding Tank:**

Excess sludge from the Clarifier is collected in sludge holding tank which is provided with course bubble diffusers to thicken the sludge and the same is pumped to Centrifuge for dewatering by means of Centrifuge feed pumps.

**Final Sump:**

After treated and chlorinated the effluent is collected in this tank. Whenever water is required it can be pumped for gardening. Water is continuously pumped to flats for flushing purpose by the HNS (Hydro pneumatic system).

**Centrifuge**:

Thickened sludge from Aerobic Digester is pumped to Centrifuge to dewater the sludge. The de-watered sludge from is collected to a tray from the sludge chute of the centrifuge. It is manually disposed as manure or carted out. Filtrate will be diverted to Aeration tank.

**PROCEDURE FOR PUTTING INTO NORMAL FILTRATION:**

Before starting the filter, all the valves should be fully closed. After starting one of the pumps and ensuring that the inlet pressure gauge is showing delivery pressure, proceed as follows:

**PRESSURE SAND FILTER**

V1 = Filter Inlet

V2 = Filter Outlet

V3 = Backwash Inlet

V4 = Back Wash Outlet

V5 = Air pressure valve

**Activated Carbon Filter**

V6 = Filter Inlet

V7 = Filter outlet

V8 = Backwash Inlet

V9 = Backwash Outlet

V10 = Air Release Valve

* Open Filter Inlet valve **V1**.
* The Air valve **V5** on top of the filter will release the air from inside the filter with a hissing noise and will close by itself when the filter is full.
* Immediately on observing the rise in pressure in the outlet pressure gauge of the filter, open the outlet valve **V2**. Now the filtration is on.

**Backwashing the Filter:**

Backwashing the filters to wash out the dirt accumulated on top of the filter beds is an essential part of the operation routine. The frequency of backwash depends upon the turbidity of the water to be filtered. The filter is provided with a gauge panel on which are mounted two pressure gauges connected to the inlet and outlet of the filters. The difference in the gauge readings will indicate the loss of head through the filters. Normally, a head loss of 6 feet (3 PSI) is allowed and if it exceeds, backwashing has to be taken up.

Backwashing is done by sending a current of water at a high rate through the filter bed in a reverse upward direction. The high velocity agitates the filter sand bed, loosens and carries away the accumulated dirt out through the backwash drain pipe.

**Procedure for Backwashing the Filter:**

This consists of the fallowing steps:

* Close all valves of the filter and stop the pump.
* Open Backwash inlet and outlet valve **V3** & **V4** fully.
* Start both pumps and immediately open their delivery valves fully. Observe the dirty water coming out of ht the drain pipe. This backwashed water can be led into the Equalization tank.
* Continue the operation until the water comes out is clear.
* Stop the pump and close the valve **V3** & **V4**.

**CAUTION:**

The filter beds should not be allowed to become dry at any time. Otherwise under dry conditions, the filter media will cake up. Afterwards it will be difficult to break it by back washing. Whenever, the filter is to be shut down, close all valves tightly and lock up the water inside the filter.

Leaky valves & joints should be attended to immediately. An efficiently backwashed filter will show a head loss of 1 to 2 feet at normal flow. In due course, due to accumulation of dirt on the filter bed, the head loss increases. When it reaches 6 feet or 3 psi or 0.2 kg /cm2, the filter has to be backwashed immediately. Do not operate for long periods at high head losses.

**NOTE:**

Life of the activated carbon depends upon the quality of feed inlet from the pressure filter. When the carbon bed is exhausted, it has to be replaced. It is anticipated that the carbon bed will last minimum 6 months.

**ACTIVATED CARBON FILTER:**

The filter water from the Pressure Sand Filter passes through an Activated Carbon Filter which comprises of Vertical Pressure vessel, perforated plates fitted with polystyrene strainers at the bottom, top and in between the filter media comprising 900 mm deep Activated Carbon granules over a bed of Graded Gravel. Outlet is led to final sump. One on line chlorine solution is dosed into the line for disinfection before disposal.

**PROCEDURE FOR AC FILTER INTO NORMAL OPERATION:**

To operate Activated Carbon filter procedure as under

* Keep all the valves of the A.C. Filter closed.
* Open valve **V6.**
* Water flows into the Carbon Filter.
* After ensuring that the Filter is full and under pressure open the outlet valve **V7.**
* Filter is now in operation and the inlet water flows through the Carbon bed. This will result in absorbing Residual odor and color if any.

**BACK WASHING THE A.C. FILTER:**

Back washing the carbon filter periodically is necessary to remove any dirt and to thoroughly agitate and homogenize the carbon bed. This may be done once as a routine. The strainers on the top of the filter prevent the carbon granules from getting washed out only the fines are washed out.

**Proceed as follows:**

* Keep all valves of the Carbon Filter closed.
* Open the Backwash inlet valve **V8.**
* Start two treated effluent pumps and the Pressure Filter in normal mode.
* Now open the Back washing drain valve **v9.**
* Carbon Filter back washing is now on.
* Backwashing for about 5 to 10 minutes should be sufficient.
* After backwashing close all valves and stop the pump.

**TO SHUT DOWN THE A.C. FILTER**

Close inlet and outlet valves **V6 & V7.**

# Safety Precautions

1. Never descend into any tank for whatsoever reason, unless another operator is also present.
2. Check and ensure the safety guards are intact.
3. DO NOT Carry out any work while pump is in operation.
4. Exercise care while making up chemicals solution for dosing. Use safety equipments.
5. Keep and maintain coupling guard, motor covered at all the times.
6. When working on Air blowers, Motors and Pumps, switch off respective motor at the panel.
7. Never run the pumps with Inlet and Outlet valves closed.
8. Lock out/Tag out the power supply from incomer before commencing any maintenance.
9. Care must be taken while opening rusted nut bolts which are prone to be broken / cause slippage.
10. Ensure thorough cleanliness of the area before and after the maintenance work.
11. While inspecting the pump in operation, keep safe distance.

**Revision Guide:**

Any change in the system needs review of SOP.