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7.1.5: Water conservation facilities available in the Institution:

- Rain water harvesting
- Borewell /Open well recharge
- Construction of tanks and bunds
- Waste water recycling
- Maintenance of water bodies and distribution system in the campus

INDEX

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CERTIFICATE OF THE HEAD OF INSTITUTION

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Prof.Dr.Srinivasan.G,

Principal

<u>TO WHOMSOEVER IT MAY CONCERN</u>

This is to certify that, our institution has facilities for water conservation.

- **Rain water harvesting**
- **Borewell /Open well recharge**
- **Construction of tanks and bunds**
- **Waste water recycling**
- **Maintenance of water bodies and distribution system in the campus**

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POLICY MANUAL - RAIN WATER HARVESTING

RAINWATER HARVESTING

Rainwater harvesting is a sustainable method of collecting and storing rainwater that falls on rooftops, surfaces, or catchment areas, for various uses, such as irrigation, landscaping, flushing toilets, and even for drinking with proper treatment. This practice helps conserve water resources, reduce the strain on municipal water supplies, and prevent flooding in some cases.

Rainwater harvesting ponds are water bodies designed to collect and store rainwater for various purposes, such as irrigation, groundwater recharge, wildlife habitat enhancement, or even as a scenic feature in landscaping. These ponds are a part of rainwater harvesting systems and come in various forms, including small garden ponds, agricultural retention ponds, and large-scale community or industrial reservoirs.Rainwater harvesting ponds serve several important purposes, both functional and ecological. Their primary purpose is to capture and store rainwater, but the specific use of the stored water can vary based on the design and location of the pond. Here are some common purposes of rainwater harvesting ponds:

- Irrigation: One of the most common uses of harvested rainwater is for irrigation in agriculture, landscaping, and gardening. The stored water can supplement or entirely replace the need for using freshwater sources, which can reduce water bills and relieve pressure on municipal water supplies.
- Groundwater Recharge: In some cases, rainwater harvesting ponds are designed to allow water to percolate into the ground. This recharges groundwater aquifers, which is crucial for maintaining water availability, especially in areas with declining water tables.
- Wildlife Habitat Enhancement: Rainwater ponds can be designed to support aquatic and terrestrial wildlife. They provide habitat for various species, including birds, insects, amphibians, and aquatic plants. Such ponds can promote biodiversity and serve as valuable ecological assets.

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- Scenic and Aesthetic Appeal: Smaller rainwater harvesting ponds are often incorporated into landscaping for their aesthetic value. They enhance the visual appeal of gardens, parks, and residential properties, providing a peaceful and scenic environment.
- Storm water Management: Rainwater ponds can help manage excess storm water, preventing localized flooding and erosion. They act as retention basins that hold rainwater temporarily and gradually release it, reducing the risk of downstream flooding.
- Fire Protection: Some communities use rainwater ponds to provide a water source for firefighting. These ponds may be strategically located in areas where access to conventional fire hydrants is limited.
- Drought Mitigation: In regions with sporadic rainfall, rainwater harvesting ponds can serve as a drought buffer. During wet periods, the ponds fill up, providing a reserve of water to be used during dry spells.
- Industrial and Commercial Use: In industrial and commercial settings, rainwater harvesting ponds can be used for various purposes, such as cooling water for machinery, fire suppression, or non-potable uses in manufacturing processes.
- Potable Water Supply: In some cases, especially in rural or remote areas, rainwater harvested from ponds is treated and used for drinking and cooking. This is a more common practice in regions with limited access to clean, piped water.
- Educational and Recreational Value: Rainwater ponds can be used for educational purposes, teaching people about water conservation and environmental sustainability. They may also serve as sites for recreational activities such as fishing or boating.

The specific purpose of a rainwater harvesting pond will depend on local conditions, regulations, and the goals of the project. Design, construction, and maintenance considerations will vary accordingly to achieve the intended use effectively and sustainably.

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As a part of water conservation, saving and ground recharging, the water generated though rain the premises has been captured in the terrace through rainwater ducting and surface runoff through drainage and directed towards the rainwater harvesting tank constructed in the lowest or low laying area in the premises as per the contour. The surface runoff towards the pond has different stages of natural purification by providing natural settlement of the sediments and through percolation also.

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POLICY MANUAL - WASTE WATER RECYCLING

NEHRU COLLEGE
of NURSING

(Approved by Indian Nursing Council, Kerala Nurses & Midwives Council Kerala Government)
& Affiliated to Kerala University of Health Sciences

SEWAGE TREATMENT PLANT

Sewage Treatment Plant (STP) installed in the premises of the institution on 2013, having a capacity of 70 KLD with operating cycle of 24 hours per, the treatment is completed by Diffused Aeration followed by Filtration and Disinfection in the tertiary treatment process. The water tanks were constructed as semi underground by considering certain portion below the ground level and the treated water is being used for irrigation, flushing purpose in toilets and also discharging into soak pit. The output water having the parameters like, pH – 6.0 to 7.5, Oil & Grease –<10 ppm, COD – <100 ppm, Suspended solids – <20 ppm, BOD – <10 ppm., and the treatment scheme for the plant as follows.

The Effluent shall pass through a Bar Screen Chamber for removal of solids before entering the treatment plant. Oil and Grease shall be removed in the Oil & GreaseTrap, Screenings from Screen and scum from Oil & Grease Trap shall be removed daily and disposed safely.The pre-treated effluent coming as overflow from the Collection Tank will flow by gravity into the primary Clarifier tank and Aeration Tank. The influent with a BOD line range of up to 100 ppm is treated by aeration system (diffused aeration system) for the reduction of organic pollutants.The sludge generated during the aeration process shall be collected in the Clarifier/Settling Tank. From there the sludge shall flow to aeration tank using sludge pump (Recirculation).

The pre-treated effluent after Clarifier shall be collected in a Filter Feed Sump and from there will pass through a Pressure Sand Filter and Activated Carbon Filter and chlorination for the removal of suspended particles and traces of organics and Oduors.The effluent after Filtration and Disinfection will be passing through ACF and UV unit. And it is suitable for reuse for Re flushing and firefighting. Unused treated water may be discharged in to a Soak Pit within the compound.

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KERALA - 679522

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College Campus : Panayur Post, Vaniyamkulam, Ottapalam, Palakkad Dist., Kerala, Pin : 679 522
Phone : 0466 - 2226000, E-mail : info@nehrunursing.com, Web : www.nehrunursing.com

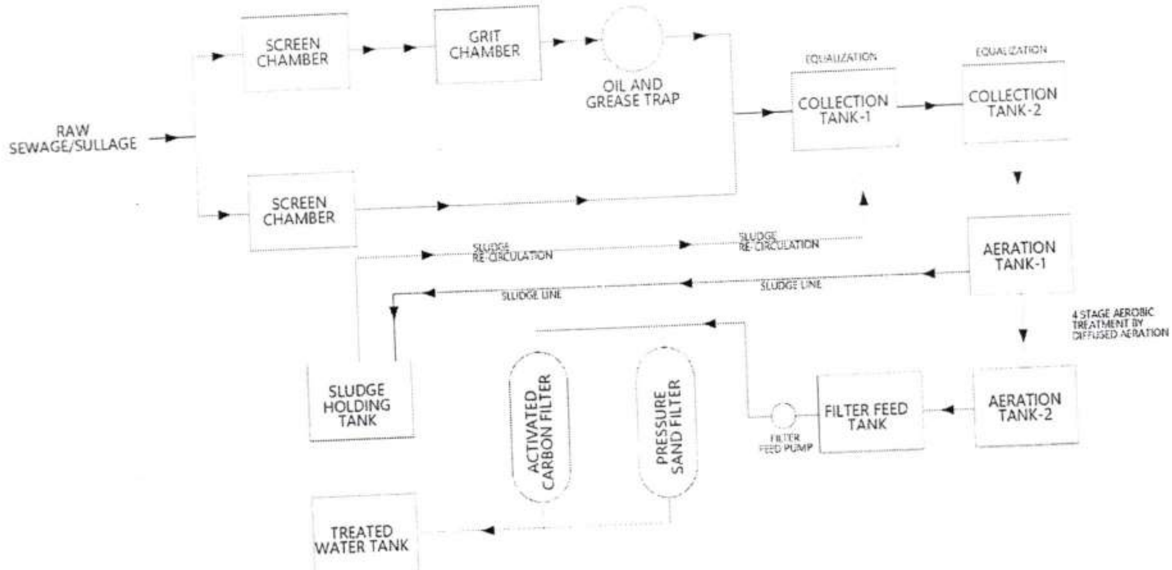

Figure : Layout of Sewage Treatment Plant

Effluent Treatment Plant

Effluent Treatment Plant (ETP) installed in the premises of the institution on 2018, having a capacity of 25 KLD to treat and purify industrial wastewater for safe discharge into the environment by removing solids, Oil & Grease, floating ad settable / suspended solid and organic matters and removal of biodegradable organic matters, residual suspended solids and dissolved solids. The treatment plant having 20 M^3 bio-media (PVC Corrugated media), pressure and sand filter having filter medias of sand and pebbles, Activated carbon filter and hydro chlorite dosing. The treatment has four stages as follows:

- Preliminary

  Purpose: Physical separation of big sized impurities like cloth, plastics, wood logs, paper, etc.Common physical unit operations at Preliminary level are:

  - Screening: A screen with openings of uniform size is used to remove large solids such as plastics, cloth etc. Generally maximum 10mm is used.
  - Sedimentation: Physical water treatment process using gravity to remove suspended solids from water.
  - Clarification: Used for separation of solids from fluids.

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- Primary

  Purpose: Removal of floating and settleable materials such as suspended solids and organic matter.

  Methods: Both physical and chemical methods are used in this treatment level.

  Chemical unit processes:

  - Chemical unit processes are always used with physical operations and may also be used with biological treatment processes.
  - Chemical processes use the addition of chemicals to the wastewater to bring about changes in its quality.
  - Example: pH control, coagulation, chemical precipitation and oxidation

  Chemical coagulation and Flocculation:

  - Coagulation refers to collecting the minute solid particles dispersed in a liquid into a larger mass.
  - Chemical coagulants like Al2 (SO4)3 {also called alum} or Fe2 (SO4)3 are added to wastewater to improve the attraction among fine particles so that they come together and form larger particles called flocs.
  - A chemical flocculent (usually a polyelectrolyte) enhances the flocculation process by bringing together particles to form larger flocs, which settle out more quickly.
  - Flocculation is aided by gentle mixing which causes the particles to collide.

- Secondary

  Methods: Biological and chemical processes are involved in this level

  Biological unit process

  - To remove, or reduce the concentration of organic and inorganic compounds.
  - Biological treatment process can take many forms but all are based around microorganisms, mainly bacteria.

  Aerobic Processes

  - Aerobic treatment processes take place in the presence of air (oxygen).

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OTTAPALAM, PALAKKAD DT
KERALA - 679522

- Utilizes those microorganisms (aerobes), which use molecular/free oxygen to assimilate organic impurities i.e., convert them in to carbon dioxide, water and biomass.

Anaerobic Processes

- The anaerobic treatment processes take place in the absence of air (oxygen).
- Utilizes microorganisms (anaerobes) which do not require air (molecular/free oxygen) to assimilate organic impurities.
- The final products are methane and biomass.

- Tertiary (or advanced)

  Purpose: Final cleaning process that improves wastewater quality before it is reused, recycled or discharged to the environment.

  Mechanism: Removes remaining inorganic compounds, and substances, such as the nitrogen and phosphorus. Bacteria, viruses and parasites, which are harmful to public health, are also removed at this stage.

  Methods:

  - Alum: Used to help remove additional phosphorus particles and group the remaining solids together for easy removal in the filters.
  - Chlorine contact tank disinfects the tertiary treated wastewater by removing microorganisms in treated wastewater including bacteria, viruses and parasites.
  - Remaining chlorine is removed by adding sodium bisulphate just before it's discharged.

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KERALA - 679522

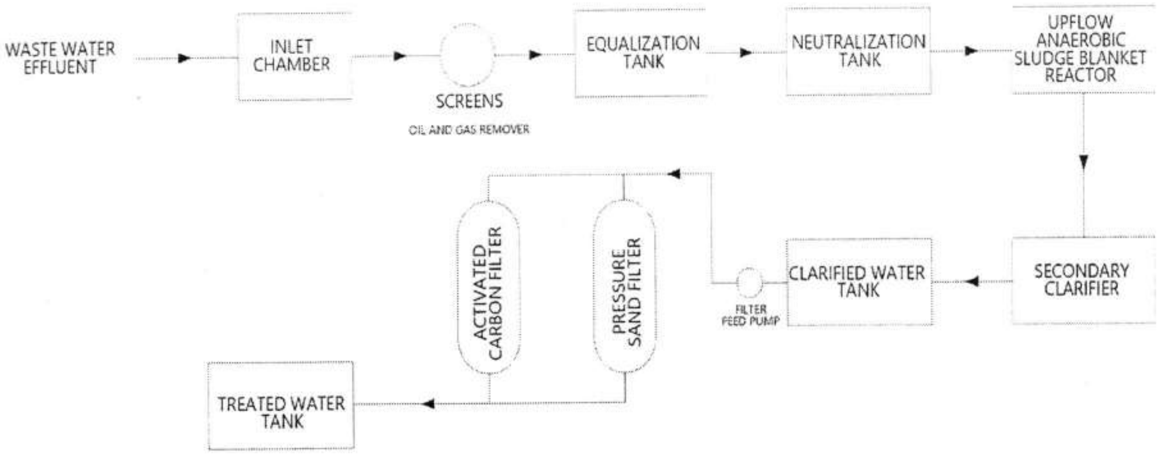

Figure : Layout of Effluent Treatment Plant

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OTTAPALAM, PALAKKAD DT
KERALA - 679522

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POLICY MANUAL -RO PLANT

REVERSE OSMOSIS PLANT

An Reverse Osmosis (RO) plant, also known as an RO water treatment plant, is a specialized facility designed to purify water by using the process of reverse osmosis. Reverse osmosis is a water treatment technology that uses a semi-permeable membrane to remove impurities, contaminants, and dissolved solids from water. RO plants are commonly used for various purposes, including drinking water purification, industrial processes, and wastewater treatment, hospital activities. pre-treatment techniques including softening, de-chlorination, and anti-scalent treatment. Following pre-treatment, high levels of pressure send water through a semi-permeable membrane, which retains all contaminants but lets pure water pass through. Energy requirements depend on the concentration of salts and contaminants in the influent water; higher concentrations require more energy to treat. Here's how an RO plant works and its key components:

a. Pre-Treatment: Before water enters the RO membrane, it usually undergoes pre-treatment processes to remove larger particles and contaminants. These pre-treatment steps may include:
    - Screening: Removing larger debris and particles through a physical screen.
    - Sedimentation: Allowing larger particles to settle at the bottom of a tank.
    - Coagulation and Flocculation: Adding chemicals to help smaller particles clump together and settle.
    - Chlorination or Ozonation: Disinfection to kill bacteria and microorganisms.

b. Reverse Osmosis: The heart of the RO plant is the reverse osmosis process, which involves forcing water through a semi-permeable membrane with tiny pores. Only water molecules can pass through the membrane, while contaminants, salts, minerals, and impurities are left behind. This process effectively removes a wide range of impurities, including:
    - Salts (such as sodium, calcium, magnesium)
    - Heavy metals (like lead, arsenic, and cadmium)
    - Organic compounds
    - Bacteria and viruses

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PANAYUR (P.O), VANIYAMKULAM
OTTAPALAM, PALAKKAD DT
KERALA 679522

- Pesticides and herbicides

c. Pressure: Reverse osmosis requires applying pressure to force water through the membrane. High-pressure pumps are used to create the necessary pressure differential across the membrane.
d. Permeate and Concentrate Streams: As water passes through the RO membrane, it splits into two streams:
    - Permeate (Product) Water: This is the purified water that passes through the membrane and is collected as the product. It is typically low in impurities and contaminants.
    - Concentrate (Reject) Stream: This stream, also known as brine or reject water, contains the impurities and contaminants removed from the feed water. It is usually discharged or further treated as necessary.
e. Post-Treatment: After the RO process, the permeate water may undergo additional treatment steps to adjust its pH, re-mineralize it (since RO can remove beneficial minerals), and provide disinfection to ensure the water is safe for consumption or industrial use.
f. Storage and Distribution: Purified water is stored in tanks and then distributed to consumers or industrial processes through a network of pipelines.

RO plants usage for various applications, including:

- Drinking Water Purification: RO systems are commonly used in household water purifiers to provide safe and clean drinking water.
- Hospital uses: RO is essential in dialysis, Operation theatre for preliminary wash, in scrub, etc.
- Desalination: RO is a crucial technology for desalinating seawater to produce fresh drinking water in arid regions.

The effectiveness of an RO plant depends on factors such as the quality of the feed water, the condition of the membranes, and the design and operation of the system. Regular maintenance and monitoring are essential to ensure the plant operates efficiently and provides high-quality purified water.

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KERALA - 679522