SEWAGE TREATMENT PLANT (STP) AT DA-IICT

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1. Introduction

The DA-IICT was established in Gandhinagar in 2001. The architecture of DA-IICT is functional, but what surrounds it is a fascinating garden. The entire design was oriented to "Preserving the Environment".

To reuse the wastewater, the STP plant at DA-IICT was established in 2005. After recycling the wastewater, the filtered water is used in garden and fountain.

Pollution in Gandhinagar, in the broadest sense, includes all changes that curtail natural utility and exert deleterious effect on life of people. The crisis triggered by the rapidly growing population with the resultant degradation of the environment causes a grave effect on the quality of life.

Degradation of water quality is the unfavorable alteration of the physical, chemical and biological properties of water that prevents domestic, commercial, industrial, agricultural, recreational and other beneficial uses of water. Sewage and sewage effluents are the major sources of water pollution. Sewage is mainly composed of human fecal material, domestic wastes including wash-water and industrial wastes.

The growing environmental pollution needs decontaminating waste water that involves the study of characterization of waste water, especially domestic sewage. In the past, domestic waste water treatment was mainly confined to organic carbon removal. Recently, increasing pollution in the waste water leads to developing and implementing new treatment techniques to control waste water and other pollutants at DA-IICT. Therefore the concept of Sewage Treatment Plant was conceived.
2. Requirement of Sewage Treatment Plant at DA-IICT

Sewage treatment is the process of removing contaminants from waste water, primarily from household sewage. It includes physical, chemical and biological processes to remove these contaminants and produce environmentally safe treated waste water (or treated effluent).

The term "Sewage Treatment Plant" (or "sewage treatment works "in some countries) is nowadays often replaced with the term "waste water treatment plant"

Sewage Treatment Plants (STPs) were commissioned at DA-IICT for the following reasons

1) To recycle and reuse the treated waste water for gardens and fountain uses and for planting purpose. This will also minimize the environmental and health impacts of the sewage.

2) Treating waste water has the aim to produce an effluent that will do as little harm as possible when discharged to the surrounding environment, thereby preventing pollution compared to releasing untreated waste water into the environment.

![Fig 2.1 DA-IICT campus as seen from Google Earth data.](image)
3. Literature Survey

The study brought out large number of technological & managerial problems in operation of these STPs, out of 175 total identified STPs spread over fifteen States, the present report has included only 84 STPs of 13 different technologies spread over nine States of India. Information in the prescribed format has been received for seventy nine STPs from different agencies. The overall performance of forty five STPs has been found poor or very poor. Out of eighty four, performance of only eight STPs has been rated well, while that of thirty of these has been rated satisfactory. Capacity utilization in general was inadequate. Sludge handing appears to be most neglected in STPs operation. Alternate power supply facility is not available in most of the cases. Utilization of biogas generated from UASB reactors or sludge digesters is also not adequate in most of the cases. In this Chapter, an attempt has been made to bring out the facts on technological and managerial problems in operation of the STPs in India.

Fig. 3.1: State wise distribution of STPs in India

Source: Central Pollution Control Board.
Fig 3.2 Performance rating of STPs in India

Total scenario of STPs performance is dismal, as overall performance of 46 STPs has been found poor or very poor. Performance of only 8 STPs has been rated good while that of 30 other has been rated satisfactory.
4. **Methodology**

4.1 **Flow Diagram**

![Flow Diagram](image-url)
4.2 Stages of STP

Sewage treatment at DA-IICT involves three stages

- **Primary treatment**

It consists of temporarily holding the sewage in a mule tank where heavy solids can settle to the bottom while oil, grease and lighter solids float to the surface. The settled and floating materials are removed and the remaining liquid may be discharged or subjected to secondary treatment. Some sewage treatment plants that are connected to a combined sewer system have a bypass arrangement after the primary treatment unit.

![Mule Tank](image_url)

**Fig 4.1 Mule Tank**
Secondary Treatment

It removes the dissolved and suspended biological matter. Secondary treatment is typically performed by indigenous, water-borne micro-organisms in a managed habitat. Secondary treatment may require a separation process to remove the micro-organisms from the treated water prior to discharge or tertiary treatment.

Fig 4.2 Pre-settled Tank

Pre - settled Tank – Task of this tank is to clean the water and take out the sludge from the water and move to further process of cleaning.

Fig 4.3 Filtering Tank

Filtering Tank – This is also at the secondary treatment stage where the water is filtered which has come from the pre-settled tank.
➢ **Tertiary Treatment**

It is sometimes defined as anything more than primary and secondary treatment in order to allow rejection into a highly sensitive or fragile ecosystem. Treated water is sometimes disinfected chemically or physically (for example, by lagoons and microfiltration) prior to discharge into a river, or it can be used for irrigation of garden. If it is sufficiently clean, it can also be used for ground water recharge or agricultural purposes.

![Image of a sewage treatment plant](image)

**Fig. 4.4 Silicon sand filter**

Silicon Sand Filter (SiO₂) - It is the tertiary treatment in DA-IICT where the last process of recycling process is performed. In this stage, the chemical name silicon sand is used to clean the water for the final time and to make that to use again.
4.3 Design Considerations

Following points are considered during the design of sewage treatment plant:

- The design should not be done on the hourly sewage flow basis, but the average domestic flow basis.

- Instead of providing one big unit for each treatment more than two numbers small units should provided, which will provide in operation as well as no stoppage during maintenance and repair of the plant.

- Overflow weirs and the bypasses should be provided to cut the particular operation, if desired.

- Self cleaning velocity should be developed at every place and stage.

- The design of the treatment units should be economical; easy in maintenance should offer flexibility in operation.
5. **Advantages / Disadvantages of STP**

5.1 Advantages

- **Use of organic fertilizer**
  Recycling the waste creates organic fertilizer which is used for campus greenery.

- **Recycling of water**
  Recycled water is used again for the campus greenery through sprinkler irrigation.

- **Saving of energy**
  Pumping of water from bore well for campus use has been reduced substantially and thereby saving energy.

5.2 Disadvantages

- The STP plant setup requires infrastructure which includes material cost as well as manpower cost for its operation.

- If the filtered water is stored for a long time then after a certain days the problems of bacteria, ammonia will start increasing.

- During the process of treatment at the STP, the sludge is removed from the water. The process of removing the sludge is cumber sum.
6. Conclusions

1. The design of primary sewage treatment is for the predicted population of 5,000 and estimated sewage of 3.5 MLD.

2. The capacity of the sewage treatment plant storage can serve over 4-5 months continuously.

3. The structure of the STP plant is made in such a way that it can cope up with additional sewage.

4. The construction of the primary sewage treatment plant will prevent the direct disposal of sewage in nearby river and the use of treated water will reduce the surface and ground water contamination.
Bibliography