FIELD WORK REPORT

Submitted by

S7 CIVIL STUDENTS

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in

CIVIL ENGINEERING

under

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

CREATING TECHNOLOGY
LEADERS OF TOMORROW

Department of Civil Engineering

JYOTHI ENGINEERING COLLEGE

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CHAPTER 1

Field Visit 1

Location : Wonderla water treatment plant, Banglore

Date : 01/10/2019

Faculty Accompanied: Asst.Prof. Jestine J Thannickal and Asst.Prof. Shiny Shajan

1.1 Introduction

Fig 1.1 Wonderla Wastewater Treatment Plant

Wonderla is the only park in India to use Reverse Osmosis Treatment Technology for treating water in pools. Reverse Osmosis is the same technology used by leading packaged drinking water manufacturers. The park has a fully-fledged water quality control laboratory which carries out 90 rigorous tests on a regular basis. Fig 1.1 shows the wonderla wastewater treatment plant.

1.2 Wastewater Treatment Plant

There are five water-recycling plants in the park, one each for drinking water, pool water, sewage, restaurant wastewater and Bengaluru Water Supply Sewerage Board water.

In the subsequent sections, components and functioning of wastewater treatment plant will be discussed.

1.2.1 Overview

Sewage treatment process are often classified as:

i. Preliminary treatment
ii. Primary treatment
iii. Secondary treatment
iv. Tertiary or final treatment

1.2.2 Preliminary Treatment

Preliminary treatment involves separation of floating materials (like tree branches, wood, paper etc.) and also heavy settleable inorganic solids. Bar screens are provided for removal of large floating bodies.

Grit chambers or detritus tanks are provided for removal of grit and sand particles. Grit consists of sand, gravel, cinders, and other heavy materials. It also includes organic matter such as eggshells, bone chips, seeds, and coffee grounds. Grit removal is helps in reducing formation of heavy deposits in aeration tanks, aerobic digesters, pipelines, channels, and conduits; reducing the frequency of digester cleaning caused by excessive accumulations of grit; and protecting moving mechanical equipment from abrasion and accompanying abnormal wear. Skimming tanks are provided for removal of oil and grease.

Flow equalization basins are provided for maintaining uniform flow conditions for better efficiency of secondary treatment unit. Basins provide a place to temporarily hold incoming sewage during plant maintenance and a means of diluting and distributing batch discharges of toxic or high-strength waste which might otherwise inhibit biological secondary treatment (including portable toilet waste, vehicle holding tanks, and septic tank pumpers). Fig 1.2 shows an equalization tank.

Fig 1.2 Equalisation Tank

1.2.3 Primary treatment

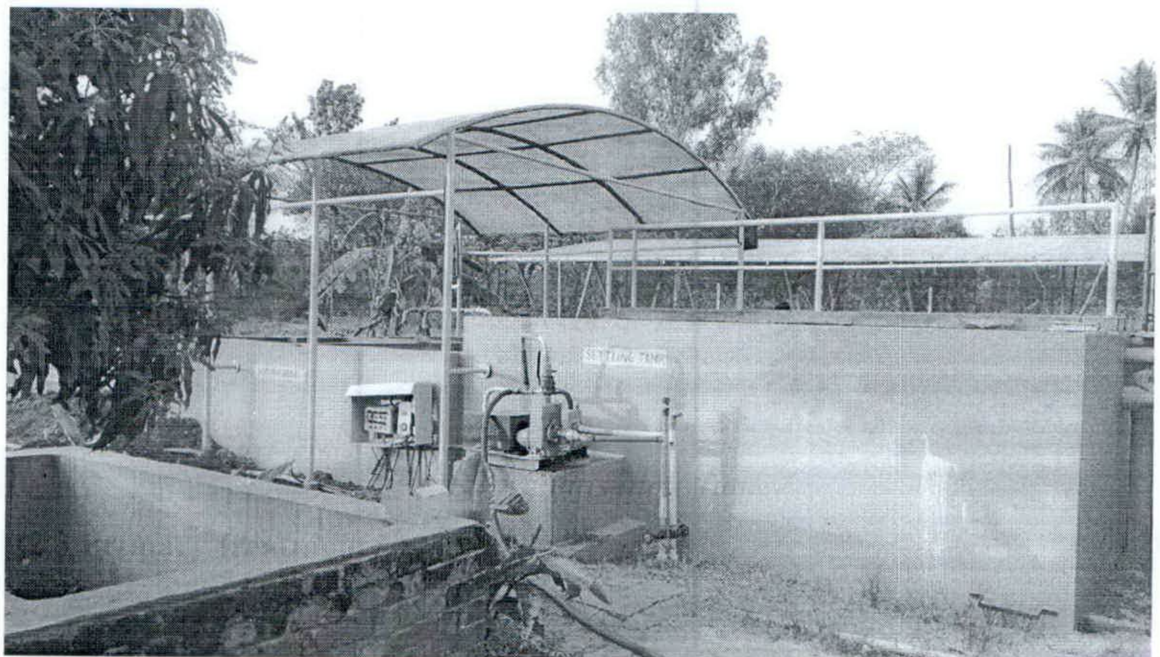

Fig 1.3 Primary Settling Tank

In the primary treatment stage, sewage flows through large tanks, commonly called pre-settling basins, primary sedimentation tanks or primary clarifiers. The tanks are used to settle sludge while grease and oils rise to the surface and are skimmed off. Primary settling tanks are usually equipped with mechanically driven scrapers that continually drive the collected sludge towards a hopper in the base of the tank where it is pumped to sludge treatment facilities. Fig 1.3 shows a primary settling tank.

1.2.4 Secondary treatment

Secondary treatment involves further treatment of the effluent, coming from the primary sedimentation tank.it usually consists of biological conversion of dissolved and colloidal organics into biomass that can subsequently be removed by sedimentation.

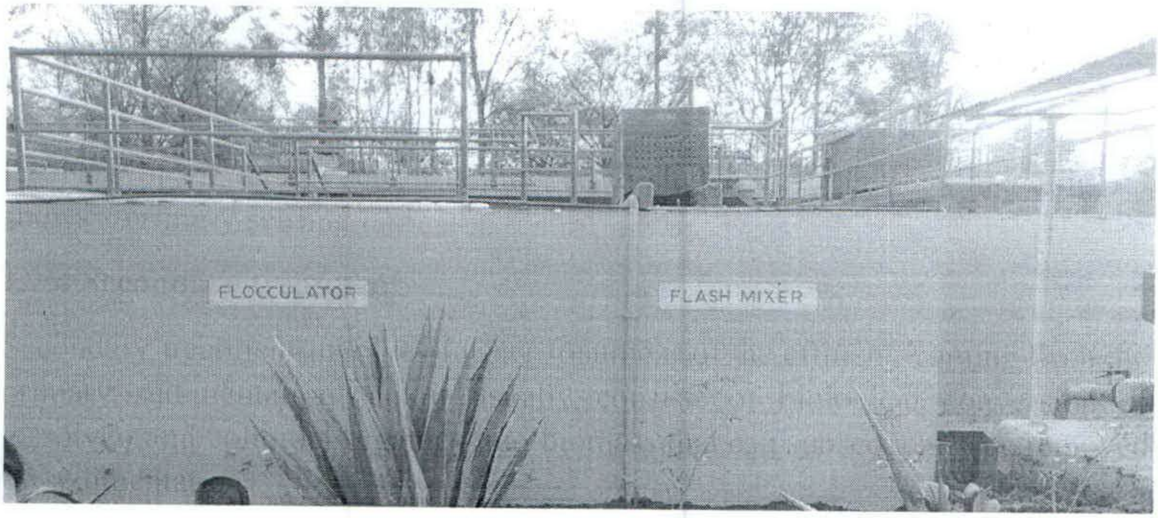

Fig 1.4 Flocculator and Flash Mixer

Fig 1.5 Secondary Clarifier

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Contact between microorganisms and the organics is optimized by suspending the biomass in the wastewater over a film of biomass attached to solid surfaces. Recirculating a portion of biomass maintains a large number of organisms in contact with the wastewater and speeds up the conversion process, stones or other solid media are used to increase the surface of biofilm, growth mature biofilms peel off the surface and are washed out to the settling basin with the liquid underflow. Part of the liquid effluent may be recycled through the system for additional treatment and to maintain optimal hydraulic flow rates. Fig 1.4 shows a flocculator and flash mixer. Fig 1.5 shows the secondary clarifier.

Secondary systems produce excess biomass that is biodegradable through endogenous catabolism and by other microorganisms. Secondary sludge are usually combined with primary sludge for further treatment by anaerobic biological process. The end products are principally methane, carbon dioxide, liquids and inert solids. The liquids contain large concentration of organic compounds and are recycled through the treatment plant. The solid residue has a high mineral content and may be used as a soil conditioner and fertilizer on agricultural land. Other means of solids disposal may be by incineration or by land filling. Fig 1.6 shows blower room for drying the sludge.

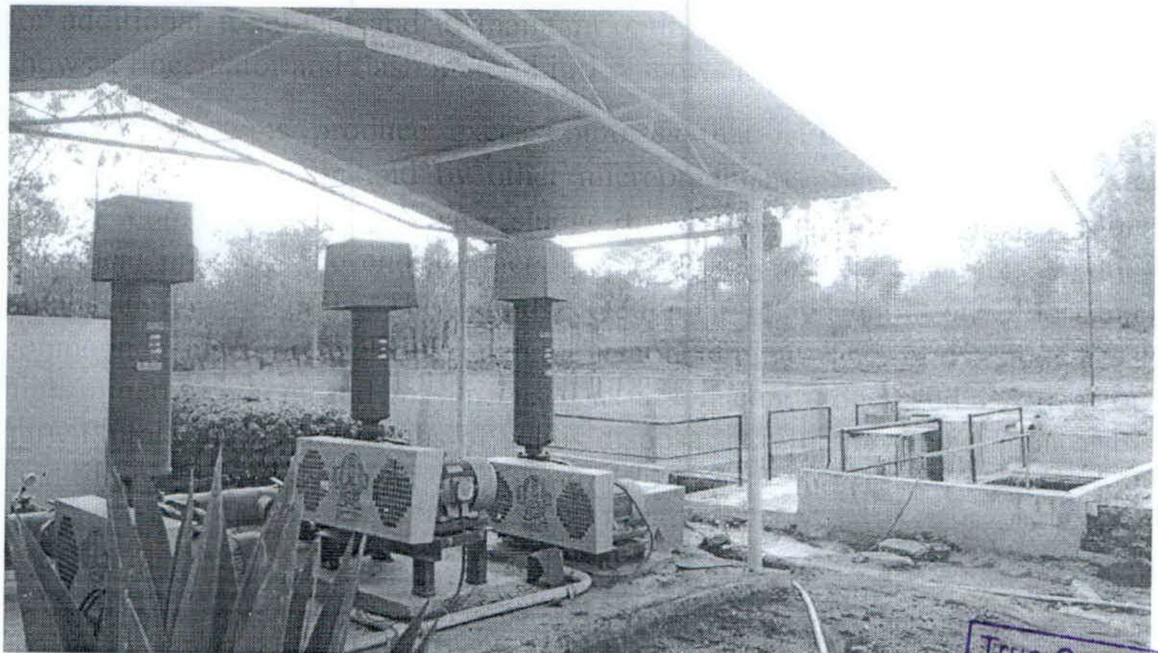

Fig 1.6 Blower Room

1.2.5 Tertiary or final treatment

Tertiary treatment consists of removing the organic load left after the secondary treatment and particularly to kill the pathogenic bacteria. The purpose of tertiary treatment is to provide a final treatment stage to further improve the effluent quality before it is discharged to the receiving environment (sea, river, lake, wet lands, ground, etc.). More than one tertiary treatment process may be used at any treatment plant. If disinfection is practiced, it is always the final process.

Some of the tertiary treatments include:

i. Filtration:
Sand filtration removes much of the residual suspended matter. Filtration over activated carbon, also called carbon adsorption, removes residual toxins. Fig 1.7 shows sand filter units.

Fig 1.7 Sand Filter Units

ii. Lagoons or ponds:
Lagoons or ponds provide settlement and further biological improvement through storage in large man-made ponds or lagoons. These lagoons are highly aerobic and colonized by native macrophytes. Fig 1.8 shows the ponds for tertiary treatment.

Fig 1.8 Oxidation Ponds

iii. Nitrogen removal

Nitrogen is removed through the biological oxidation of nitrogen from ammonia to nitrate (nitrification), followed by denitrification, the reduction of nitrate to nitrogen gas. Nitrogen gas is released to the atmosphere and thus removed from the water.

iv. Disinfection

The effectiveness of disinfection depends on the quality of the water being treated (e.g., cloudiness, pH, etc.), the type of disinfection being used, the disinfectant dosage (concentration and time), and other environmental variables. Common methods of disinfection include ozone, chlorine, ultraviolet light, or sodium hypochlorite. Chloramine, which is used for drinking water, is not used in the treatment of waste water because of its persistence. Fig 1.9 shows a tank containing hydrochloric acid used for disinfection.

Fig 1.9 Hydrochloric Acid for Disinfection

1.3 Conclusion

The visit to Wonderla water treatment plant was literally a live classroom experience for us. One could see and understand the different steps of treatment of wastewater. The instructor had clearly explained about each and every unit processes involved. 85 percent of treated waste water was reused for gardening and other secondary activities, and the remaining 15 percent (with higher amount of salts) was used as fertiliser for nearby coconut tree plantation.

Consequently there was only minimal wastage of water, thus making it sustainable.

CHAPTER 2

FIELD VISIT 2

Location: Ashirvad conmix

Date: 02/10/2019

Faculty accompanied: Asst. Prof. Jestine J Thannickal and Asst. Prof. Shiny Shajan

2.1 Introduction

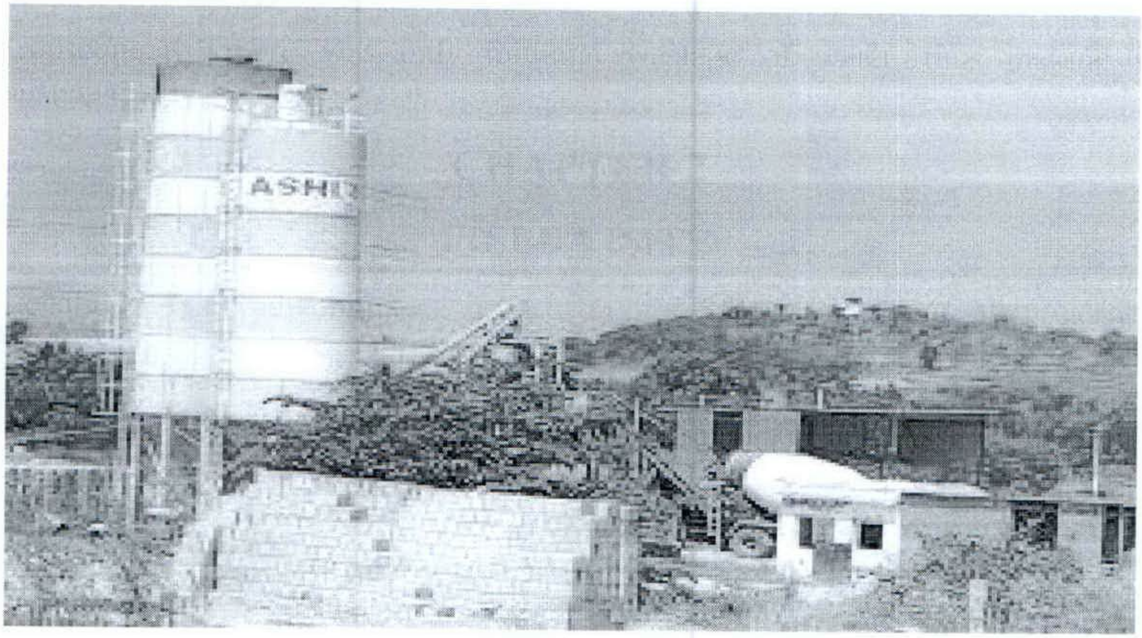

Fig 2.1 Ashirvad Conmix

Ashirvad conmix is a ready mix plant situated in Mysore. In the present scenario ready mix concrete are widely gaining wide acceptance. Ready mix concrete is concrete that is manufactured in a batch plant, according to a set engineered mix design. They also have a well-equipped laboratory for testing the design mix. Fig 2.1 shows a batching plant of Ashirvad commix.

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2.2 Ready Mix Concrete

Ready-mix concrete is normally delivered in two ways: barrel truck or in–transit mixers, volumetric concrete mixer. In transit mixers, the barrel truck delivers concrete in a plastic state to the site. In volumetric concrete mixer, the ready mix is delivered in a dry state and then mixes the concrete on site. Ready-mix

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concrete is batched or manufactured under controlled conditions. It can be transported and placed at site using a number of methods.

Batch plants combine a precise amount of rock, sand, water and cement together by weight, allowing specialty concrete mixtures to be developed and implemented on construction sites.

Materials are combined in a batch plant, and the hydration process begins the moment water meets the Portland cement, so the travel time from the plant to the site is critical over longer distances. Some sites are just too far away; however, the use of admixtures, retarders and fly ash can be added to slow the hydration process, allowing for longer transit time.

Concrete may shrink as it cures. It can shrink 1/16 inch (1.59mm) over a 10 foot long area (3.05 meters). This causes stress internally on the concrete and must be accounted for by the engineers and finishers placing the concrete.

Concrete has a limited lifespan between batching / mixing and curing. This means that ready-mix should be placed within 30 to 45 minutes of batching process to hold slump and mix design specifications. Modern admixtures and plasticizer and water reducers can modify that time span. However, it is limited in scope. The amount and type of admixture added to the mix is very important.

2.3 Conclusion

Ready-mix concrete is often preferred over other materials due to the cost and wide range of uses, from bird baths to high rise buildings and bridges. It has a long life span when compared to other products of a similar use, like road ways. It has an average life span of 30 years under high traffic areas compared to the 10 to 12 year life of asphalt concrete with the same traffic. They are specifically batched and designed according to consumer needs and mixes.

Visiting the commix plant was a wonderful experience. The automated batching plant, mini mix plants, transit mixers, concrete pumps etc. were some of the equipments worth knowing.

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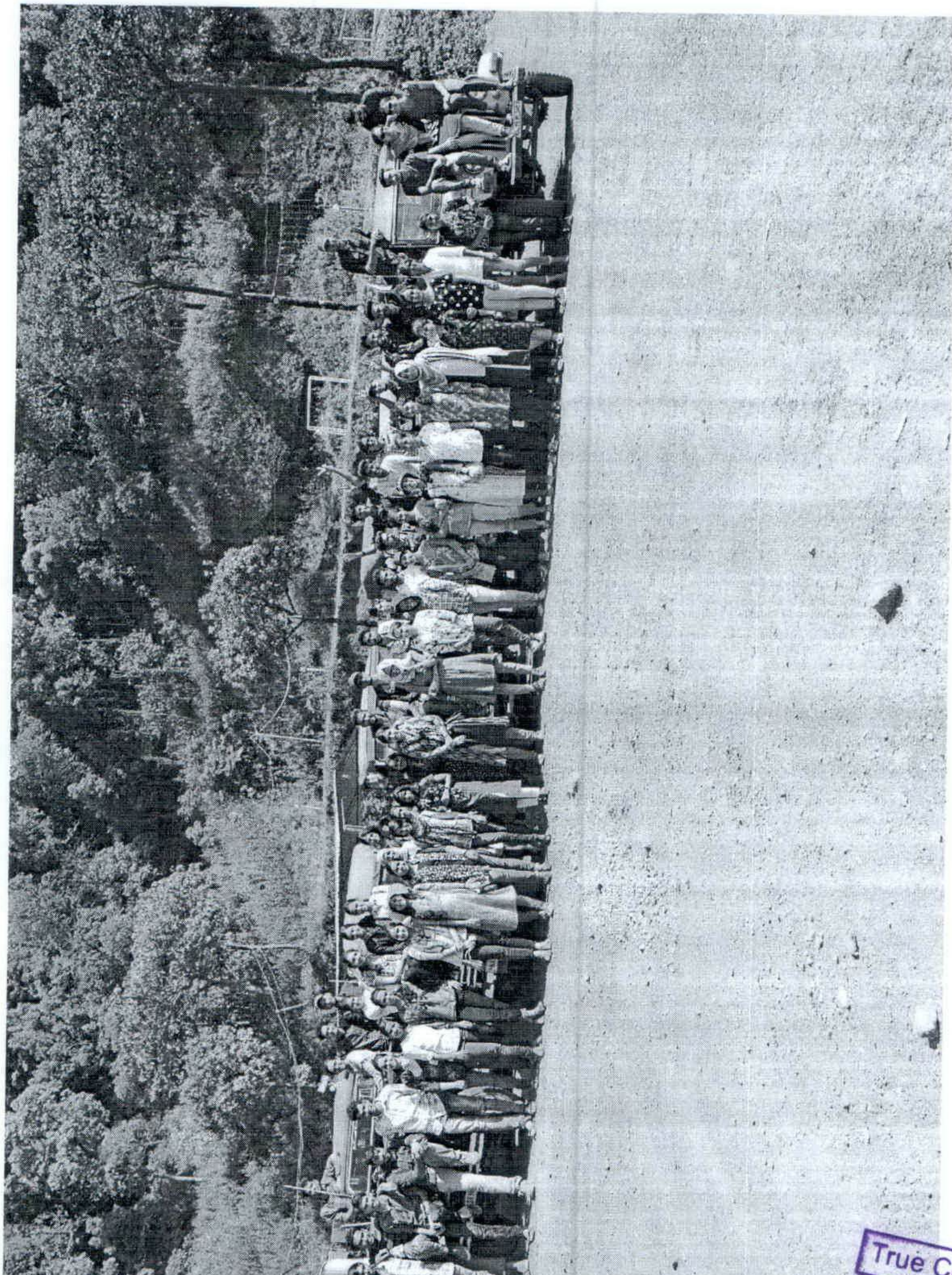

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