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# Temporal Variation and other Physico-Chemical Parameters of Untreated and Treated Water Quality of Sewage Treatment Plant (STP), Agra

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## Abstract

*Wastewater is also used for secondary purposes and must be treated before it is released into another water body, so that it does not cause further pollution of water resources. Wastewater comes from a variety of sources, everything that you flush down in your toilet or rinse down the drain is wastewater and it also come from agricultural and industrial sources. Present study was aimed to estimate the water quality parameter such as COD, BOD, pH and TSS of water from the Sewage Treatment Plant (STP) of Jaganpur area, Dayalbagh, Agra. Temporal variation in COD, BOD, pH and TSS value of treated water of STP was also assessed. Results indicated that the physico-chemical properties like COD, BOD, pH and TSS is high in untreated sewage water and low in treated water which is used in secondary purposes. It was observed that better water quality was found after treatment. Instead of discharging the untreated water on the nearby bodies of water it is proposed to let it pass through the STP plant.*

**Keywords** : Temporal variation, Physio-chemical, Treated, Untreated, Sewage water

## Introduction

Water is important because it is needed for life to exist .Water pollution is a huge problem and powerful enough to lead the world on a path of destruction. Water is used in almost every important human chores and process. Due to the expanding human population competition for water is increasing day by day, water resources on earth are diminishing rapidly.Many pollutant threaten water supplies but the most widespread , especially in developing countries is the discharge of raw sewage into natural waters which has affect detrimental on the quality and quantity of existing fresh water resources. Water is abundantly available in nature. It is an essential constituent of all animal and vegetable matter and forms about 75% of the matter of earth' and plants crust Perks et al(.2004).

Availability of clean and potable water has become a key issue in several developing countries.(Okoh A.I., 2007). Report given by Central Pollution Control Board (2005) stated that domestic sewage disposal from cities and

towns is the largest source of pollution of water bodies in India. A large number of rivers stretches are severely polluted as a result of discharge of domestic sewage. Pollution of water bodies can be prevented by treating domestic sewage water and it can be used for irrigation, reduce the demand for fresh water in irrigation sector and result in huge savings in terms of nutritional value of sewage in irrigation(Awasthi et.al.2011) .To mitigate the pollution of water and reduce the heavy flux of sewage of domestic as well as industry, into the river concept for sewage treatment was started in India. Presently over 200 full-scale UASB plants are in operation for the treatment of both domestic and industrial wastewaters worldwide (Fallowfield and Garrett, 1985; Bahgat et al., 1999) . Sewage Treatment Plant (STP) of Agra (Jaganpur 14 MLD capacity) comes under the YAP(Yamuna Action Plan),YAP was formulated in early 1990 for the state of Uttar Pradesh, Haryana ,Delhi where major part of Yamuna river flows. The YAP was funded by JBIC (formerly OECF, Japan) under a soft loan bilaterally agreed arrangement .With respect to the application of UASB technology, the experience gained in India is unique and diverse. India is one of the leading countries in terms of the amount of sewage volume treated by the UASB process (Sato et al 2007)

## Methodology

Water samples have been collected from STP, Jaganpura, Dayalbagh ,Agra which is located at the geographical location of 27°13′0" North, 78°1′0"East. This sewage plant is designed to treat 14MLD per day.

Wastewater samples were collected from influent and effluent at different time periods to check temporal variations in water quality. Samples were collected in a 5 litre bottle which has been previously washed with 10%$HNO_3$ to remove any adhered salt from bottle and add few drops of acid to main quality of water.

Collection was done at different time periods from early morning to early evening to check the temporal variation. Treated and Untreated sample analysed by following the Standard Method Examination of Water and Wastewater given in "Environment and Pollution" of Ambast (1990) and APHA (1998).

## Result & Discussion

**Table (1):** Untreated sewage water quality parameter STP

| Days | DO (mg/l) | BOD( mg/l) | COD( mg/l) | pH | TSS( mg/l) |
|---|---|---|---|---|---|
| 1st | 0.3 | 226 | 380 mg/l | 7.63 | 460 mg/l |
| 5th | 0.7 | 223 | 495 mg/l | 7.65 | 500 mg/l |
| 10th | 0.2 | 234 | 510 mg/l | 7.78 | 437 mg/l |
| 15th | 0.8 | 222 | 502 mg/l | 7.61 | 531 mg/l |
| 20th | 0.4 | 242 | 485 mg/l | 7.7 | 533 mg/l |
| 25th | 0.8 | 224 | 508 mg/l | 7.60 | 410 mg/l |

**Table (2):** Treated sewage water quality parameter of STP

| Days | DO (mg/l) | BOD( mg/l) | COD( mg/l) | pH | TSS( mg/l) |
|---|---|---|---|---|---|
| 1st | 3.8 | 29 mg/l | 134 mg/l | 7.5 | 47 mg/l |
| 5th | 4.1 | 28 mg/l | 143 mg/l | 7.59 | 32 mg/l |
| 10th | 4 | 28 mg/l | 145 mg/l | 7.59 | 48 mg/l |
| 15th' | 3.4 | 30 mg/l | 140 mg/l | 8.6 | 43 mg/l |
| 20th | 3.2 | 30 mg/l | 135 mg/l | 7.6 | 33.3 mg/l |
| 25th | 4 | 27 mg/l | 135 mg/l | 7.6 | 47 mg/l |

**pH-** pH values varied from 7.60 to 7.78 in the influent water and after treatment of STP water the pH value ranged from 7.5 to 8.6 so. There is no such changes found in pH values in treated STP water. This is because there are neither major industries nor other major activities in the area that could cause extreme changes in pH of the effluent.

**Dissolve Oxygen**-During the investigation DO of untreated water ranges between 0.2 to 0.8mg/l. These values are very low due to the higher amount of micro-organisms and also due to the mixing of industrial and municipal solid waste in sewage water. After treatment the DO of water increase upto 3.2 to 4.0mg/l. This changes in DO determine biological changes.

**Biological Oxygen Demand-** During study untreated water BOD ranges between 222mg/l to 242mg/l which is quite high and not suitable even for irrigation purpose. BOD is the most widely used parameter to measure water quality parameter. After referring both table 1 and 2 BOD was higher in the untreated STP water rather than treated STP water. BOD was higher because of extensive use of organic waste in untreated waste water. But after treatment the BOD was reduced.

**Chemical Oxygen Demand-** In untreated influent of STP the COD values ranged from 380mg/l to 510mg/l while after treatment COD decreased upto 134mg/l. It was concluded that COD value of untreated water was much higher and not safe for various secondary purposes, this higher value is because of huge load of chemicals in the waste water. But after treatment of STP water the COD value decreased considerably.

**Total Suspended Solid-** The table1 revealed that the TSS of untreated water was very high ranging from 410mg/l to 533mg/l(table1). This higher value is because of many suspended waste present in water. After treatment values of suspended solids came down to 32mg/l( table 2).

**Table (3):** Temporal variation in treated water of STP

| Time | pH | DO (mg/l) | BOD (mg/l) | COD (mg/l) | TSS (mg/l) |
|---|---|---|---|---|---|
| 7:00am | 7.1 | 4 | 28 | 126 | 58 |
| 10:30am | 7.9 | 5.2 | 24 | 96 | 47 |
| 2:00 pm | 8.1 | 4.4 | 26 | 122 | 43 |
| 6:0 pm | 7.8 | 3.8 | 29 | 152 | 64 |

It was concluded from the table 3 that BOD, DO ,COD and TSS of water was higher during morning and evening. The amount of oxygen dissolve in water varies daily and seasonally. The changes in water quality is due to photosynthesis by many aquatic plants and algae in water during day time because higher the sunlight intensity increases the rate of photosynthesis. The level of oxygen concentration in aquatic ecosystem is dependent on temperature, photosynthetic activity, respiration of biotic communities and organic loading.

## CONCLUSION

The maximum and minimum value of BOD, COD, TSS and pH of treated water show that these parameters were largely reduced to 70 to 80% and the value of these parameters are within the limit of WHO 2004 and BIS 1991,use

for the secondary purpose such as irrigation, agriculture, construction, industrial cooling etc. So the waste water treatment is essential for maintaining the water quality. To improve the quality of water, sewage treatment plant are essential. Sewage treatment is the process of removing the contaminant from wastewater to produce liquid and solid suitable for discharge to the environment or for reuse. It is a form of waste management. Sewage water is a complex matrix with many distinctive chemical characteristics. These include the high concentration of BOD, COD, TSS, pH .The present study reveals the assessment of physiochemical parameters like COD, BOD, pH and TSS which were present in high concentration in untreated sewage water and considerable low values were recorded in final treated water. The performance of Agra sewage treatment plant was evaluated which has shown its capability to reduce BOD, COD, pH and TSS from the untreated sewage water. During afternoon the dissolved oxygen of treated water is higher as compare to morning because the photosynthesis by many aquatic plants is higher in morning time. From the above study it was observed that better water quality was found after treatment.

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