iJRASET
International Journal For Research in Applied Science and Engineering Technology



# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

**Volume:** 7 **Issue:** VII **Month of publication:** July 2019

**DOI:** http://doi.org/10.22214/ijraset.2019.7159

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
*ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177*
*Volume 7 Issue VII, July 2019- Available at www.ijraset.com*

# Performance Evaluation of Industrial Wastewater Treatment Plant at Taloja, Navi Mumbai, Maharashtra, India

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***Abstract:** This study has been done for the performance evaluation of industrial effluent treatment plant of a chemical industry located at Taloja MIDC, Navi Mumbai. The effluent treatment plant is designed with full fledged capacity of 340 m3/day with 100 % recycle and reuse.*
*The effluent is analyzed for various waste water parameters majorly such as Chemical oxygen demand (COD), Biological oxygen demand (BOD), Total Dissolved solids (TDS), pH, Total Suspended solids (TSS) etc. The effluent samples were collected from December 2018 to June 2019 of various streams.*
*Results of raw water of COD and BOD were on higher side. It observed that at the end of treatment plant the COD, BOD, TDS, TSS were reduced with high efficiency. Parameters were within the permissible limit as prescribed by Maharashtra pollution control board (MPCB), India.*
***Keywords:** Industrial effluent treatment, chemical industry, COD, BOD.TDS, MBR*

## I. INTRODUCTION

The chemical industry is one of the leading industries in the Indian market sectors. As the production is increasing day by day of chemical industries, the effluent generation also has increased on a large scale. This effluent has a high COD, High BOD, also pH which is mostly alkaline in nature.
This effluent has to be treated with proper effluent design system, otherwise it can harm the local environment by the discharging the untreated effluent. Monitoring of this effluent can be done, such as what type of treatment is required for this effluent. Monitoring can help you indentify the characteristics of the effluent. Performance evaluation is needed for the whole systems which installed in the treatment plant. With the help of this we can understand the problems in treatment plant, so that we can minimize the problems with it. The obtained results from the performance evaluation can be very useful for improvement in operational and maintenance area if needed and also for the waste reduction strategies.

### *A. Need of Study*

Performance evaluation is an important part after the erection and commissioning of the effluent treatment plant for discharge standards given by MPCB or CPCB. Many manufacturing industries generate effluent from their process activity which can be highly polluted to the environment, for that much industry doesn't have proper treatment for treating effluent. So inlet and outlet parameters should be studies to be done for upgradation of the plant with the help of the performance evaluation of the Industrial ETP.

### *B. Objectives of Work*

To monitor the performance of the Industrial effluent treatment plant and also to evaluate the efficiency of treatment plant.

## II. MATERIALS AND METHOD

The project involved establishing sampling locations at the study area, sample design and sample analysis. The first step of the project is to conduct a reconnaissance survey in the study area to identify and establish suitable sampling locations. The sample design includes ascertaining sample size, sampling duration, methods of sampling, duration of sampling and preservation techniques. Sample analysis involves the method used for analyzing each of the parameters.

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### *A. Sampling Methods*

The methods used for sampling will be grab sampling. This technique of sampling is particular sample or measurement is taken at a exact time or over a minimum period of time which would be feasible. This is the most common method of sampling used in various environmental laboratories. The person required for grab sampling should have sufficient knowledge of sampling and should be skilled.

### *B. Analysis of Sample*

The sample of effluent will be collected from different unit of effluent treatment plant. For this performance evaluation study the pollution parameters such as such as BOD, COD, TSS, pH, TDS etc. are taken. Analysis of this sample have done and depend on that results the efficiency has been decided.

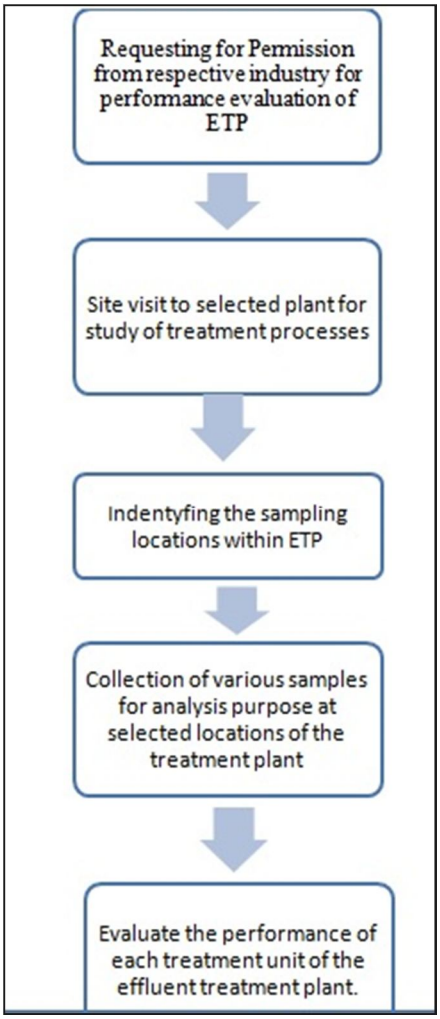



Fig: Flow chart of Methodology

| Sr.No | Units of ETP | No of units |
|---|---|---|
| 1. | Equalization Tank | 1 |
| 2. | Settling Tank | 1 |
| 3. | Aeration Tank | 2 |
| 4. | MBR Tank | 2 |
| 5. | Reverse Osmosis | 1 |

Table: Units of Effluent Treatment Plant

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Figure: Satellite image of Effluent Treatment Plant

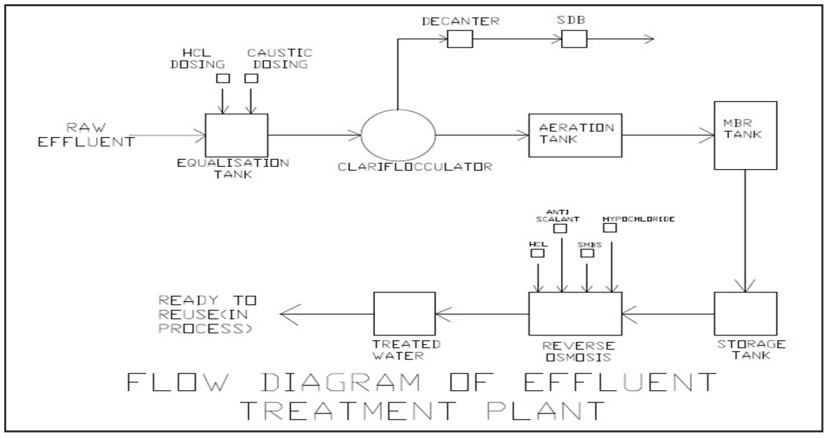



Figure: Schematic Diagram of Existing Effluent Treatment Plant

## III. RESULTS AND DISCUSSION

### *A. Results of pH*

| Sr.no | Sampling locations | | | |
|---|---|---|---|---|
| | Inlet Tank | Outlet Clariflocculator | MBR Permeate | RO Permeate |
| 1. | 10.51 | -- | 7.24 | 7.04 |
| 2. | 9.78 | 8.27 | 7.28 | 7.03 |
| 3. | 8.26 | 7.98 | 7.43 | 7.10 |
| 4. | 10.24 | 8.79 | 7.56 | 7.24 |
| 5. | 9.38 | 8.41 | 7.51 | 7.14 |
| 6. | 9.76 | 6.67 | 6.94 | 7.19 |
| 7. | 8.98 | 8.02 | 7.24 | 7.11 |
| 8. | 9.41 | 8.52 | 7.67 | 7.32 |
| 9. | 8.04 | 7.65 | 7.22 | 7.14 |

Table : Results of pH

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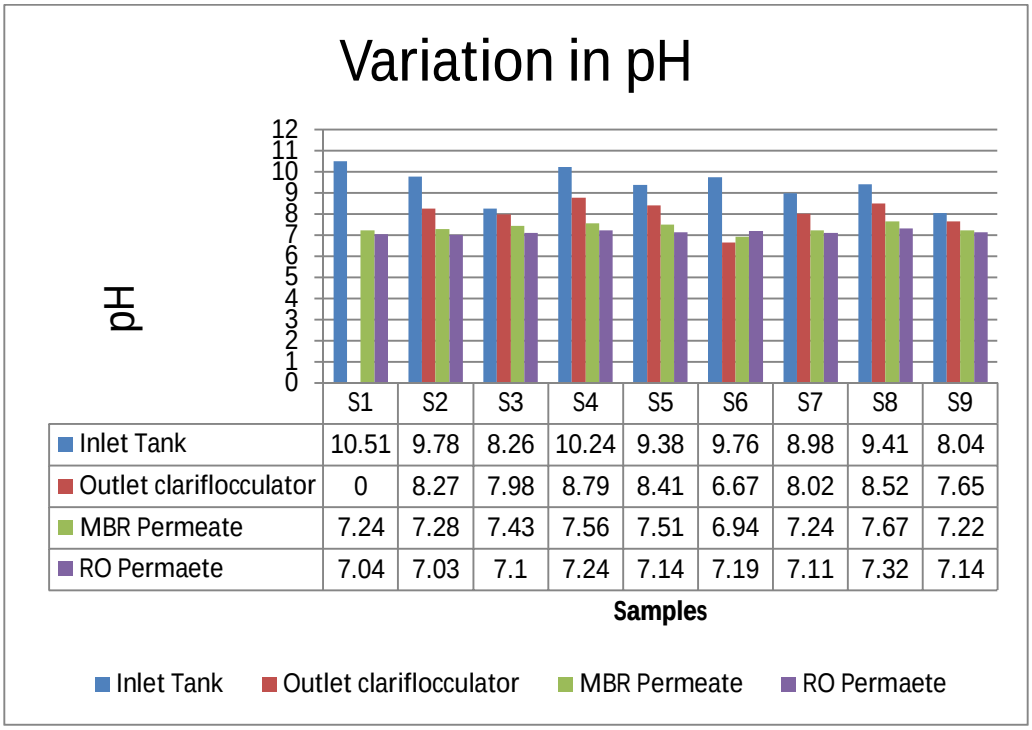



Figure: Variation in pH

*B. Results of COD*

| Sr.no | Sampling locations | | | | |
|---|---|---|---|---|---|
| | Inlet Tank | Outlet Clariflocculator | MBR Permeate | RO Permeate | Removal Efficiency (%) |
| 1. | 12972 | -- | 132.8 | 75.2 | 99.28 |
| 2. | 11844 | 12220 | 338.4 | 131.6 | 98.88 |
| 3. | 7990 | 8554 | 112.8 | 54.3 | 99.32 |
| 4. | 9547 | 9985 | 147.7 | 62.8 | 99.34 |
| 5. | 8268 | 8579 | 198.5 | 84.3 | 98.90 |
| 6. | 5452 | 3083 | 75.2 | 56.4 | 98.96 |
| 7. | 3984 | 1267 | 158.4 | 97.9 | 97.54 |
| 8. | 5287 | 2656 | 549.0 | 171.5 | 96.75 |
| 9. | 2341 | 821 | 178.2 | 108.9 | 95.34 |
| | | | | Average Removal Efficiency | 98.25 |

Table: COD Results

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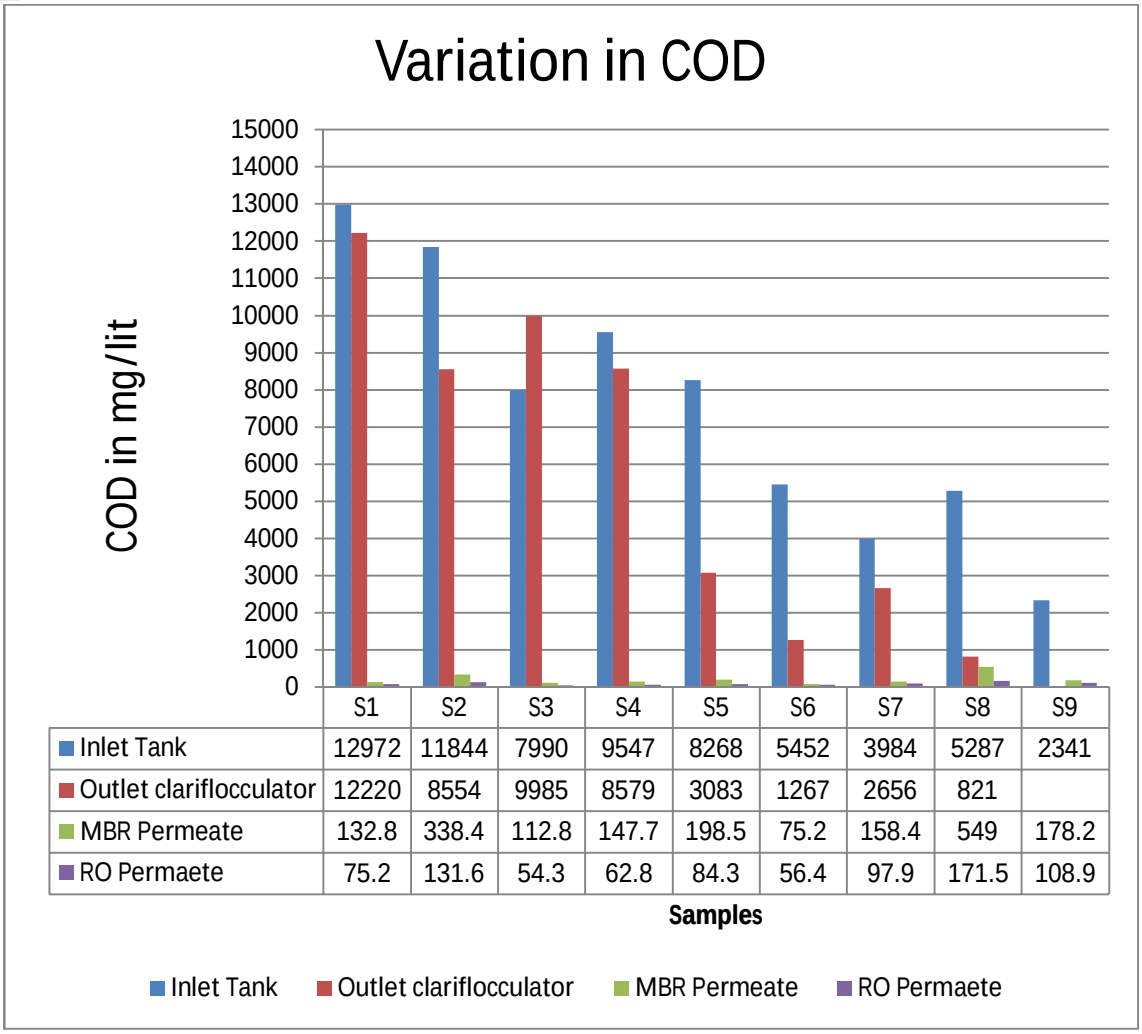



Figure: Variation in COD

*C. Results of BOD*

| Sr.No | Sampling locations | | | | |
|---|---|---|---|---|---|
| | Inlet Tank (mg/lit) | Outlet Clariflocculator | MBR Permeate | RO Permeate | Removal Efficiency (%) |
| 1. | 320 | -- | 40 | 16 | 95.00 |
| 2. | 920 | 632 | 113 | 38 | 95.86 |
| 3. | 294 | 579 | 97 | 26 | 91.11 |
| 4. | 598 | 887 | 69 | 31 | 94.81 |
| 5. | 1258 | 1749 | 138 | 53 | 95.78 |
| 6. | 1040 | 1840 | 123 | 45 | 95.67 |
| 7. | 774 | 1278 | 147 | 76 | 90.18 |
| 8. | 841 | 1262 | 162 | 64 | 92.39 |
| 9. | 532 | 424 | 77 | 20 | 96.24 |
| | | | | Average Removal Efficiency | 94.11 |

Table: BOD Results

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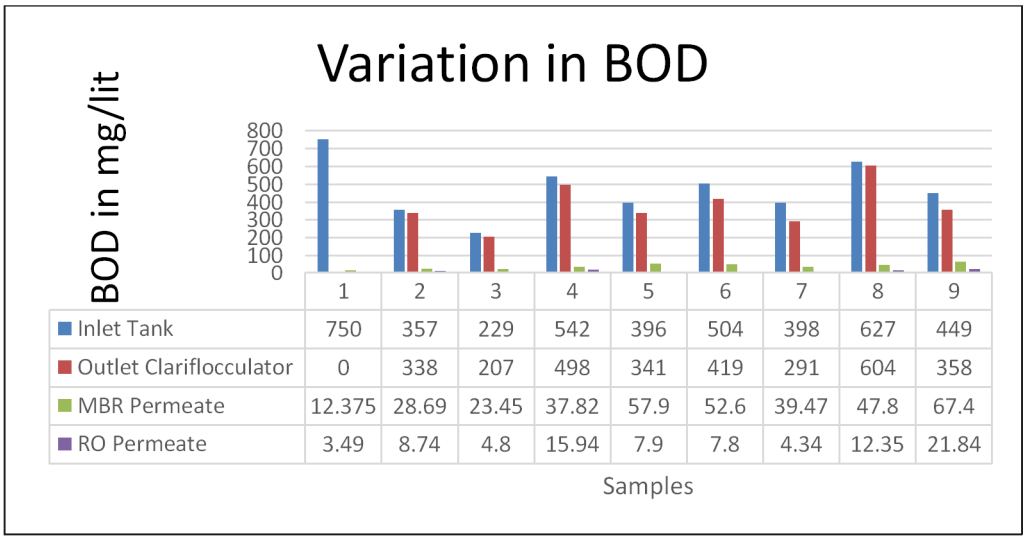



Figure: Variation in BOD

*D. Results of TSS*

| Sr.No | Sampling locations | | | | Removal Efficiency (%) |
|---|---|---|---|---|---|
| | Inlet Tank (mg/lit) | Outlet Clariflocculator | MBR Permeate | RO Permeate | |
| 1. | 320 | -- | 40 | 16 | 95.00 |
| 2. | 920 | 632 | 113 | 38 | 95.86 |
| 3. | 294 | 579 | 97 | 26 | 91.11 |
| 4. | 598 | 887 | 69 | 31 | 94.81 |
| 5. | 1258 | 1749 | 138 | 53 | 95.78 |
| 6. | 1040 | 1840 | 123 | 45 | 95.67 |
| 7. | 774 | 1278 | 147 | 76 | 90.18 |
| 8. | 841 | 1262 | 162 | 64 | 92.39 |
| 9. | 532 | 424 | 77 | 20 | 96.24 |
| | | | | Average Removal Efficiency | 94.11 |

Table: TSS Results

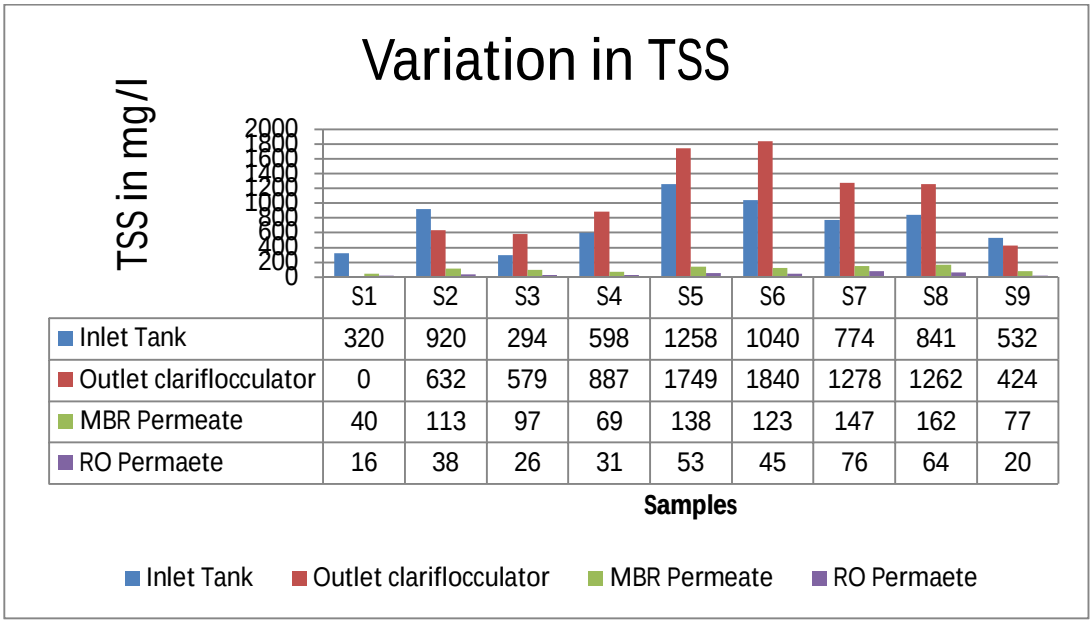



Figure: Variation in TSS

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*E. Results of TDS*

| Sr.no | Sampling locations | | | | |
|---|---|---|---|---|---|
| | Inlet Tank (mg/lit) | Outlet Clariflocculator | MBR Permeate | RO Permeate | Removal Efficiency (%) |
| 1. | 3600 | -- | 1658 | 260 | 92.77 |
| 2. | 3820 | 3900 | 1400 | 254 | 93.35 |
| 3. | 3430 | 3510 | 1359 | 247 | 92.79 |
| 4. | 3640 | 3790 | 1574 | 332 | 90.87 |
| 5. | 2274 | 2890 | 1622 | 271 | 88.08 |
| 6. | 1438 | 2314 | 1498 | 158 | 89.01 |
| 7. | 4274 | 4698 | 1979 | 376 | 91.20 |
| 8. | 3847 | 4178 | 1628 | 304 | 92.10 |
| 9. | 2485 | 2144 | 879 | 247 | 90.06 |
| | | | | Average Removal Efficiency | 91.13 |

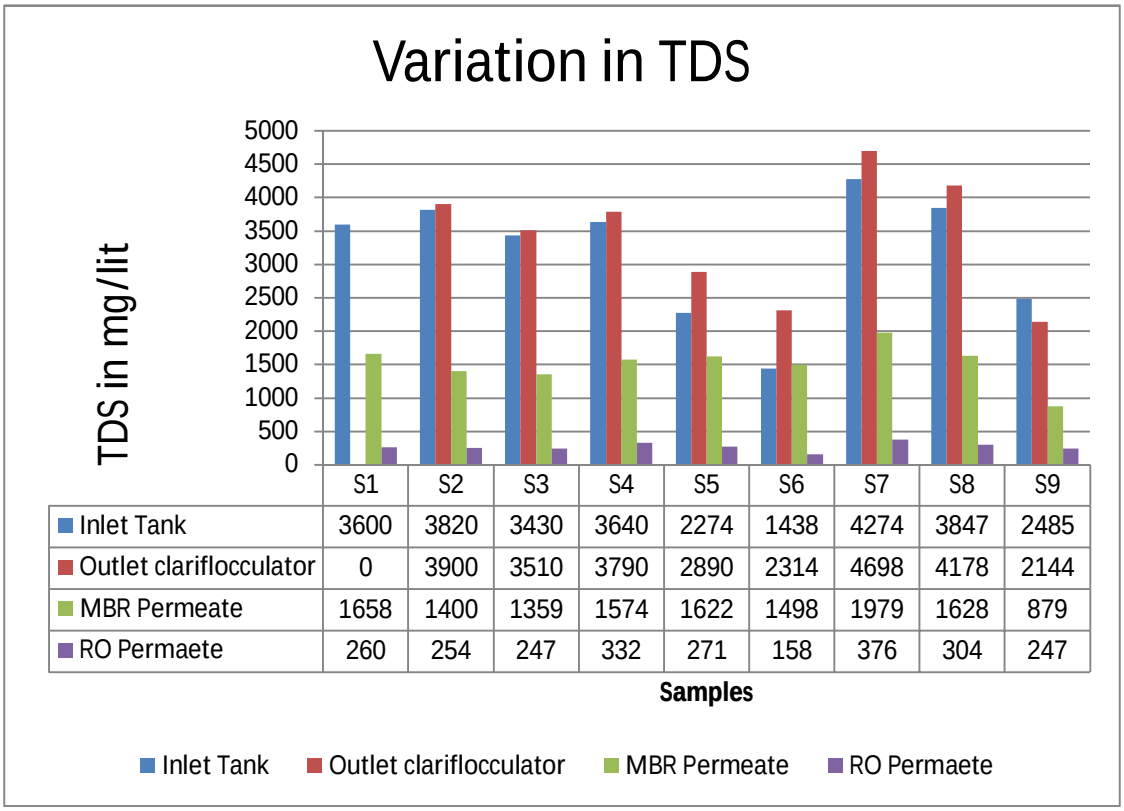



Figure: Variation in TDS

## IV. SUMMARY AND CONCLUSION

The pH of Overall plant varies from 7-7.4 during the study period. The COD removal Efficiency of Overall plant varies from 95.34% to 99.28% during the study period. The Overall Average COD removal efficiency of the treatment plant is 98.25%.The BOD removal Efficiency of Overall plant varies from 95.13 % to 99.53 % during the study period. The Overall Average BOD removal efficiency of the treatment plant is 97.83 %.. The TSS removal Efficiency of Overall plant varies from 90.18 % to 96.24 % during the study period. The Overall Average TSS removal efficiency of the treatment plant is 94.11 %. The TDS removal Efficiency of Overall plant varies from 88.08% to 93.35% during the study period. The Overall Average TDS removal efficiency of the treatment plant is 91.13 %.

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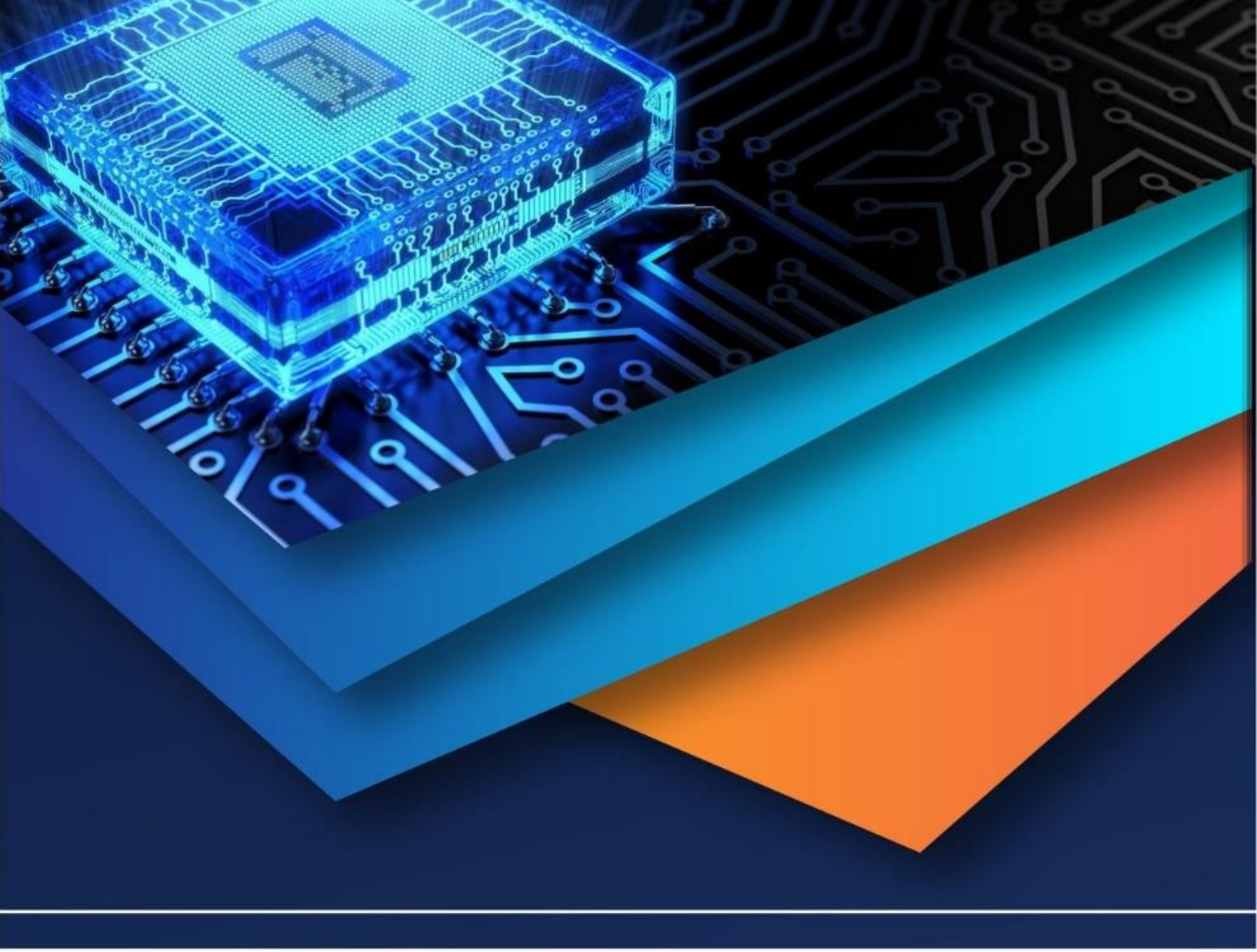
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