International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 5 Issue 09, September-2016

Domestic Sewage Waste Water Treatment by using Electro-Coagulation Process

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***Abstract*- In, India huge quantity of Domestic Waste Water is generated, and remains untreated. These waters find their way into the nearby rivers, ponds, lakes, etc. and thus cause pollution of water sources. Most of the existing domestic waste water treatment plants uses old technologies for treatment and the treated water from these plants have limited usages. This paper presents the difference in treated water quality obtained from a conventional Sewage Treatment plant and the other obtained from an electro-coagulation method of treatment. It also analyses the benefits of electro-coagulation method of domestic waste water treatment over the conventional methods of treatment.**

Key Words: Conventional methods of treatment, Domestic Sewage Treatment Plant, Electro-coagulation, Pollution of Water Sources.

I. INTRODUCTION

Domestic waste water is generated through various human activities such as bathing, washing, cleaning, etc. More than 80% of water supplied for domestic usage got converted into domestic waste water. Domestic waste water is generated almost everywhere, i.e in Villages, Towns, Cities, and Schools. But only few are equipped to provide treatment to the domestic waste water generated. In, India only metro cities and some municipalities provide treatment to the domestic waste water generated. Due to lack of funds and usage of old technology the treated water from these plants are of very poor quality, so they hardly find any commercial usage. In, India to meet the rising demand of water from Industries and Agriculture, it is thus required to develop a modern and cheaper waste water treatment technology to treat the domestic waste water, which will not only be able to meet the rising water demand but will also prevent the pollution of rivers, ponds, lakes, etc. Electro-coagulation method of waste water treatment, though a very old technology can be utilized for treatment of domestic waste water as the quality of water obtained from it is far better from the one obtained from a conventional sewage treatment plant. The treated water obtained from the Electro-coagulation method of waste water treatment can be utilized commercially and thus it has the potential to generate revenue to the municipal corporations, which will encourage them to take up the domestic waste water treatment in a more professional manner.

II. SCOPE

The scope of this study is to determine the difference in effluent quality of the domestic sewage before and after treatment through the electro-coagulation process. Here, the laboratory test is used to find the differences based on water quality parameters of Turbidity, COD, TSS and pH. The water quality of a domestic sewage treatment plant is also assessed during this study. The treated and untreated samples were collected from a Domestic Sewage treatment plant for analysis and it was compared with the water quality achieved from the electro-coagulation process of waste water treatment based on certain important parameters of water quality.

III. OBJECTIVE

The main objective of the research is to:

- Differentiate the Sewage waste water properties in terms of Turbidity, COD, TSS and pH before and after treatment, through a conventional Sewage Treatment Plant.
- Differentiate the Sewage waste water properties in terms of Turbidity, COD, TSS and pH before and after treatment through an electro-coagulation process.
- Comparison of the treated water quality from the domestic sewage water treatment plant and the one obtained from an electro-coagulation treatment process.

IV. METHODOLOGY

The samples of treated and untreated effluents were collected from a Conventional Sewage Treatment Plant. Electro-coagulation model was developed for treating the Domestic Sewage waste water. The Sewage Treatment Plant laboratory facilities were used to analyze the treated and untreated samples.

The study was conducted in the Laboratory of a Domestic Sewage Treatment Plant. The samples for analysis were collected from the raw water collection tank of untreated domestic waste water and the treated water samples were collected from the Treated Water Tank of the Domestic Waste Water Treatment Plant.

Electro-coagulation Reactor with monopolar electrodes connected in parallel was used in this experiment. The reactor was having a volume of 2.9 liter (12.5 cm length x 12.5 cm width x 18.2 cm depth) and was fabricated with acrylic sheet of thickness 6 mm. Aluminum plates (11.6 cm x 8.5 cm) with a thickness of 0.5 mm were used as the electrode for the experiment. The entire electrode assembly was fitted on non-conducting materials and hanged above the electro-coagulation tank. A regulated direct current supply (0-30 V, 15 A) was used for the experiment. The experimental setup is shown below in Figure 1

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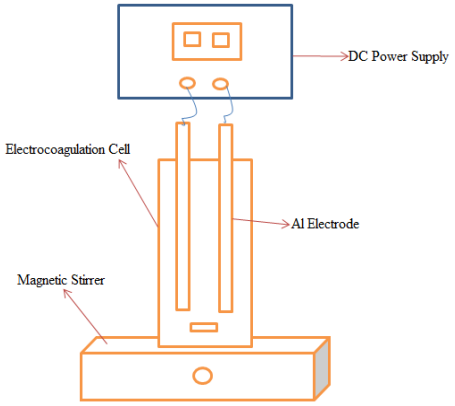

Fig. 1: Electro-coagulation Reactor Model

V. RESULTS AND DISCUSSIONS

The analysis result of untreated Domestic Sewage sample is presented in the table 1

S. No.	Parameters	Unit	Results
1.	Turbidity	NTU	224
2.	Chemical Oxygen Demand (COD)	mg/l	352
3.	Total Suspended Solids (TSS)	mg/l	330
4.	pH	-	6.52

Table 1: Analysis result of untreated Domestic Sewage sample

The analysis result of treated Domestic Sewage sample from a Domestic Sewage Treatment Plant is presented in the table 2

S. No.	Parameters	Unit	Results
1.	Turbidity	NTU	74
2.	Chemical Oxygen Demand (COD)	mg/l	85
3.	Total Suspended Solids (TSS)	mg/l	39
4.	pH	-	8.15

Table 2: Analysis result of treated Domestic Sewage sample from a Domestic Sewage Treatment Plant

The analysis result of treated Domestic Sewage sample from Electro-coagulation reactor model presented in the table 3

S. No.	Parameters	Unit	Results
1.	Turbidity	NTU	12
2.	Chemical Oxygen Demand (COD)	mg/l	14
3.	Total Suspended Solids (TSS)	mg/l	10
4.	pH	-	6.72

Table 3: Analysis result of treated Domestic Sewage sample from Electro-coagulation reactor model

Comparison of effect on Turbidity from both treatment processes

The comparison of Turbidity is presented in Fig.1.

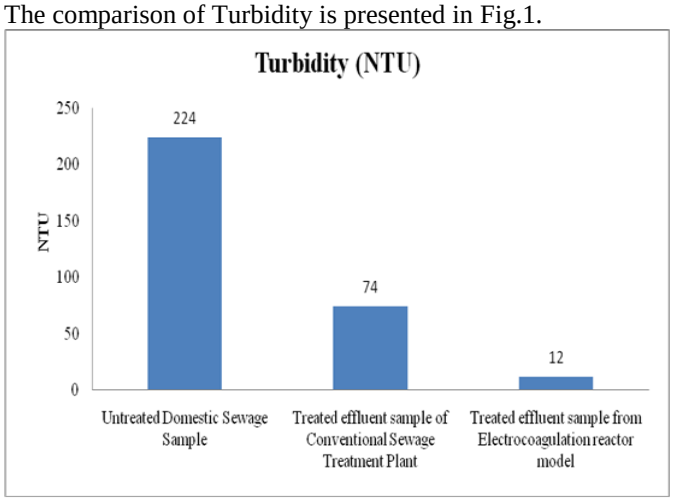

Fig. 1: Turbidity Graph

The above graphs indicate that the Turbidity of Untreated Domestic Sewage Sample was measured to be 224 NTU, which on treatment through the conventional Sewage Treatment Plant reduced to 74 NTU. The Untreated Domestic Sewage Sample when treated with EC process its Turbidity was found to be 12 NTU which is 16.2% less than what we achieved through the conventional method of treatment.

Comparison of effect on Chemical Oxygen Demand (COD) from both treatment processes.

The comparison of COD is presented in Fig. 2

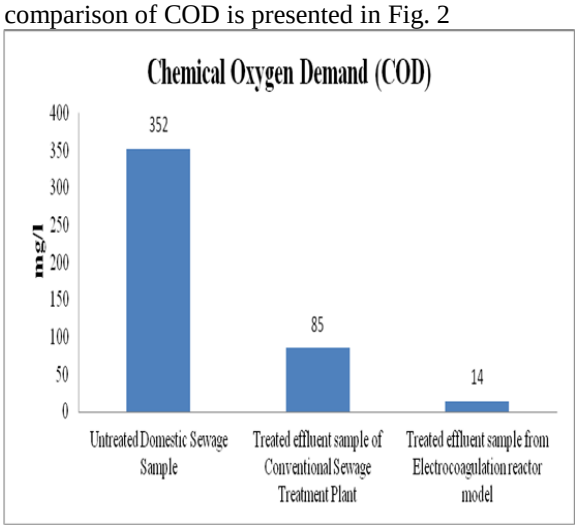

Fig. 2: COD Graph

The above graphs indicate that the COD of Untreated Domestic Sewage Sample was measured to be 352 mg/l, which on treatment through the conventional Sewage Treatment Plant reduced to 85 mg/l. The Untreated Domestic Sewage Sample when treated with EC process its COD was found to be 14 mg/l which is 16.4% less than what we achieved through the conventional method of treatment.

Comparison of effect on Total Suspended Solid (TSS) from both treatment processes

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Vol. 5 Issue 09, September-2016

The comparison of TSS is presented in Fig. 3.

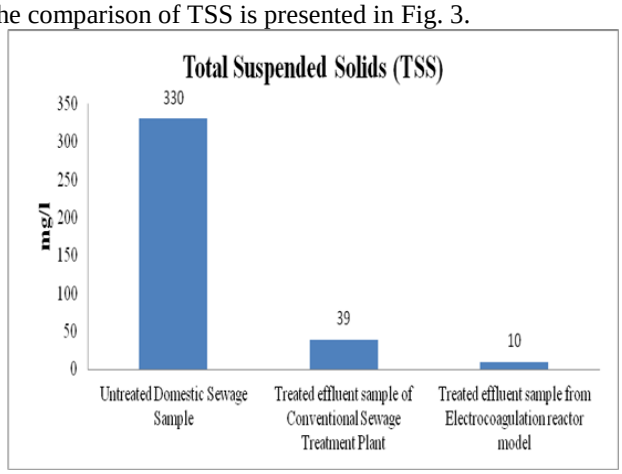

Fig. 3: TSS Graph

The above graphs indicate that the TSS of Untreated Domestic Sewage Sample was measured to be 330 mg/l, which on treatment through the conventional Sewage Treatment Plant reduced to 39 mg/l. The Untreated Domestic Sewage Sample when treated with EC process its TSS was found to be 10 mg/l which is 25.6% less than what we achieved through the conventional method of treatment

Comparison of effect on pH from both treatment processes

The comparison of pH is presented in Fig. 4.

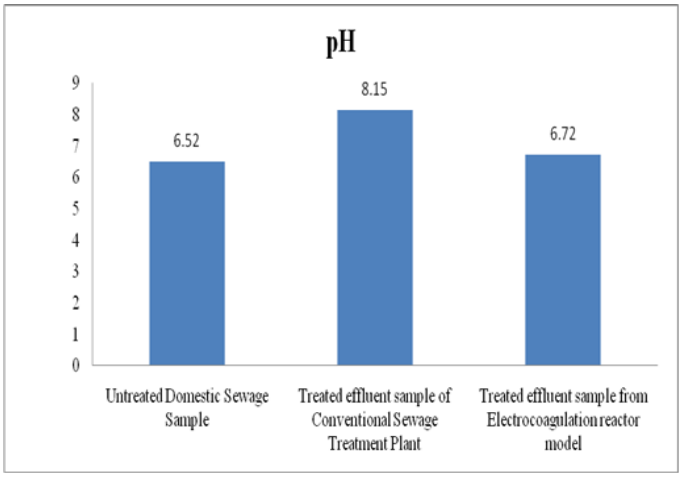

Fig. 4: pH Graph

The above graphs indicate that the pH of Untreated Domestic Sewage Sample was measured to be 6.52, which on treatment through the conventional Sewage Treatment Plant increased to 8.15 mg/l. The Untreated Domestic Sewage Sample when treated with EC process its pH was found to be 6.72.

VI. CONCLUSION

On the basis of the study conducted and the result obtained, I can conclude that:

- Electro-coagulation is the technology which can be installed for the treatment of Domestic Waste water as it provides better result than the conventional method of waste water treatment.
- EC method of treatment is very much beneficial as it provides water quality which can be reused for various applications whereas the treated water from conventional systems are not fit for various applications.
- EC technology can also be employed along with conventional method of treatment in existing Sewage treatment plants to improve the treated water quality.
- Natural resource i.e Water can be saved by installing and operating EC based treatment plants for treating the domestic sewage and re-utilizing it for various purposes.
- It is an environmentally sound technology as it does not require chemicals for treatment and also generate very less sludge as compared to other methods of waste water treatment.

Acknowledgment: Authors Amar Pratap Singh & Dr. Amit Singh Thakur highly Acknowledge the Head, Department of Chemical Engineering, Mewar University for providing research facilities.

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