Experimental Study On Treatment Of Rice Mill Effluent Using Chitosan As An Adsorbent

R.Uma
Dept. of civil engineering
Assistant Professor
P.S.R Engineering College
Sivakasi

S.AlwarDevi
Dept. of civil engineering
Under Graduate
P.S.R Engineering College
Sivakasi

M. Ajitha
Dept. of civil engineering
Under Graduate
P.S.R Engineering College
Sivakasi

Abstract— *In this present study, work was undertaken to treat the rice mill effluent in Puliangudi which is located nearby Tenkasi. The rice mill generates considerable amount of effluent from the soaked paddy, parboiled and boiler blow down operations. The treatment of the effluent is required to render the effluent suitable for discharge into inland surface waters. The coagulation cum adsorption process was carried out to treat the effluent. Here the adsorption nano particle used is chitosan powder, and the adsorption is confirmed by using UV- spectrophotometer. Thus the coagulation cum adsorption process gives a satisfactory result.*

Keywords— ***Effluent; coagulation; alum; chitosan adsorbent.***

I. INTRODUCTION

It is very much necessary to increasing awareness of the fact that clean environment is necessary for smooth living and better health of human beings. Primary milling of rice is the most important activity in food grains. These grains are grown and used in almost all parts of India. Due to industrialization and global competitive market trends, it has emerged as major industrial activity in small medium sector to cater the needs of increasing population. There are huge number of mills engaged in processing of rice and are spread over in almost all state across the country due to increasing trends.

Waste water coming from rice mill operations contains high concentration of organic and inorganic substances causing significant polluting phenomena. In order to sustain our global water supply, many environmental operation programs have been established to address pollution issues. Numerous environmental directives, regulations and legislation have been issued in order to define quality standards for water. The high chemical oxygen demand, suspended solids, conductivity, salinity, and total dissolved solids still pose an economical problem for the industries since these have been employed as major parameters. Parboiled rice production generally requires huge amount of water for soaking of the paddy. Hence water pollution may arise if not properly treated. Water pollution can cause by high levels of organic material present in waste water. To remove/reduce the concentration of organic or non-organic compound because some of the constituent compound found in industrial waste water is toxic to microorganism, Pre-treatment may be required before the industrial waste water can be discharged to a municipal collection system.

II. PHYSIO-CHEMICAL CHARACTERISTICS OF THE EFFLUENT

The sample collected was characterised initially on parameters such as Chemical Oxygen Demand (COD), Total suspended Solids (TSS), Total Solids (TS), Total Dissolved solids (TDS). Table 1 shows the initial characteristics of rice mill effluent.

TABLE 1. INITIAL CHARACTERISTICS

Parameters	***Influent characteristics***
Color	Turbid (yellowish brown)
pH	4.6
COD	531 mg/l
TSS	3675 mg/l
TS	7420 mg/l
TDS	3053 mg/l

III. TREATMENT PROCESS

A. COAGULATION PROCESS:

The Coagulation process was done using alum, as varying dosages. The Alum dosage are selected 50, 100, 150, 200, 250 and 300 in mg/L, Table 2 shows the treated efficiency of optimum dosage of alum.

Table 2. Jar test result

Alum Dosage (mg/l)	Turbidity (NTU)
50	143
100	138
150	132
200	121
250	140
300	152

From the above table we obtained the optimum value as 200 mg/l for alum,

The fig.1 shows the optimum value obtained for coagulant alum..

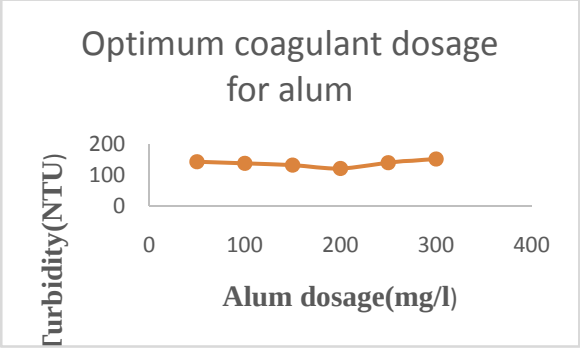

Fig.1. Optimum coagulant dosage for alum

B. ADSORBENT PROCESS:

Chitosan has been widely used in vastly diverse fields, ranging from waste management to food processing, medicine and biotechnology. It becomes an interesting material in pharmaceutical applications due to its biodegradability and biocompatibility, and low toxicity. Here the chitosan is used as the adsorbent nano particle and the adsorption is confirmed by using UV-spectrophotometer.

Chitosan as natural adsorbent aid improved COD and TSS removal efficiency by adsorption process

The characteristics of parameters are observed after the coagulation cum adsorbent process .

Table 3. shows the results of parameters obtained after coagulation cum adsorbent process.

Table 3. Adsorbent test result

Parameters	***Effluent characteristics after treatment***
pH	6.5
COD	99mg/l
TSS	856mg/l
TS	3451mg/l
TDS	1956mg/l

IV. RESULTS AND DISCUSSION

The coagulation cum adsorption process is carried out to remove the COD and TSS in the rice mill effluent. Here the results are listed in the table 4. This shows the removal efficiency percentage of parameters from the effluent.

Table 4. Removal Efficiency of parameters in the effluent

Parameters	***Removal efficiency of parameters(%)***
COD	81
TSS	76
TS	55.4
TDS	36

It is observed that the influent of COD is 520 mg/l. After the adsorbent process, the concentration is decreased into maximum of 126mg/l . Similarly for other parameters such as TSS, TS & TDS the concentration is considerably decreased and the removal efficiency of COD, TSS, TS &TDS are tabulated above.

V. CONCLUSION

Rice mill effluent was collected and characterized. Characterization of parameters such as COD, Total suspended solids, Total Dissolved solids and Total solids present in the effluent exceeded the effluent discharge standards. Hence in this phase, work has been done to remove the Total Suspended solids. For the removal of Total suspended solids we

have used Alum as coagulant and chitosan as adsorbent. The removal efficiency of Alum and Chitosan was determined. Removal efficiencies of chemical oxygen demand (COD) and total suspeneded solids (TSS) from rice mil wastewater was examined under a condition of chitosan dose (200 – 600 mg/l). Under the optimum working conditions such as agitation time of 4 min, initial pH of 4.5, chitosan dose of 600 mg/l and settling time of 20 min shows the removal efficiency of more than 80 % for COD and more than 75% for TSS. This results exhibited that, chitosan is found to be a suitable adsorbent to treat rice mill wastewater in terms of high removal efficiency of pollutants as well as protection of ecosystem by eliminating the creation of secondary pollutants.

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