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TREATMENT OF OIL SLUDGE FROM OIL EFFLUENTS

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Abstract- Oil effluent from oil industry seems to be heavy in oil content and if not disposed off properly leads to environmental and health problems. Also since it has got large amount of oil which is precious source of energy, is lost. Oil effluent is decomposed/ treated over a past few decades either by land filling or drying. However land filling again leads to environmental pollution. Therefore drying is more opted over land filling because the sludge that we get after drying can be used as potential fuel. However, high moisture content resists burning. This paper investigates the treatment of oil sludge from oil effluent by saponification followed by treatment by citric acid.

Keywords –Oil Sludge, Saponification, Environmental Pollution

I. INTRODUCTION

The oil effluent is the waste obtained from oil industries after extraction of virgin oil. If oil waste is put into stream water drains or sewers, they can affect waterways and coastal waters [1]. When dumped in soil or sent to landfill, they can migrate into ground and surface waters though numerous land treatment processes. In addition, uncontrolled used oils are a threat to plant and animal life. It has to be treated and then disposed off properly. There are several ways for treating the oil effluent. In this paper an attempt has been made to identify a proper method for treatment of such effluents and the reuse and proper disposal of products of treated effluent.

Oil effluent is saponified using NaOH as alkali to produce black soap and the oil sludge. Further the oil sludge is treated to remove its water content. Traditionally the oil sludge is either land filled or dried followed by burning. In order to burn it at an adequate degree of efficiency, the maximum moisture content of the product should be 45%, which can be achieved by drying [2]. The above described method has following disadvantages:

- Requires expensive installation equipment which leads to high capital cost.
- Requires continuous supply of electricity
- Labor force to load and unload the oil sludge
- High operating cost.
- The constant drying parameters cannot be ensured continuously
- The quantity of water evaporated highly depends on environmental and climatic conditions.

In response to these problems and environmental protection, there is a growing trend to regenerate and reuse waste oil sludge. The splitting of fats by saponifaction of oil effluent is a traditional method. This method involves a reaction of oil with an alkali producing black Soap and oil sludge. The obtained sludge is further treated with citric acid to remove its moisture content. After removal of moisture the oil sludge so obtain is of great importance, as it has high heat value (Calorific value) which may be used as fuel having less carbon contain thus overcoming the environmental issues. Chemicals and materials required to carry this process

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successfully is less expensive and also easily available in market. Moreover this method is easily achievable in lab scale.

II. EXPERIMENTAL WORK

2.1. Material used

Oil Effluent used was brought from a private company. All chemicals used in the experiments are analytical reagent grade. NaOH, Citric acid and NaCl was issued from industrial laboratory.

2.2. Method

Add measured amount of oil effluent with NaOH and water in a beaker. Heat the mixture on a heating mantle with constant stirring. Continue heating the mixture for 20-30 min at constant temperature of 50°C. . Reduce the heat until the temperature drop at 37°C. Add salt and stir the mixture frequently. Allow the mixture to cool down and settle in separating funnel. The lower layer of oil sludge is removed from the upper black-soap layer. The oil sludge thus obtained is reacted with citric acid, added slowly in to beaker with constant stirring at 50°C.The sludge starts to dewater and results in formation of fuel. The obtained fuel is removed, dried, weighed and stored. Water is recycled back to the reactor vessel.

(A) Oil effluent **(B) Fuel**

Fig.1: Experimental work

III. OBSERVATIONS:

Table.1: Observation of experimental work

SN.	*Weight of Effluent (Gms)*	*Weight of oil sludge (Gms)*	*Weight of fuel (Gms)*	*Citric acid (Gms)*	*Weight of fuel after evaporative (Gms)*	*Water removed (%)*
1.	200	296.5	44	51.92	43.38	98.6
2.	150	212.0	36.82	47.72	36.34	98.7
3.	100	146.36	28.12	36.59	27.81	98.9
4.	75	51.74	10.69	12.93	10.61	99.9
5.	50	30.40	7.65	7.60	7.65	100
6.	25	12.76	0.37	3.19	0.37	100

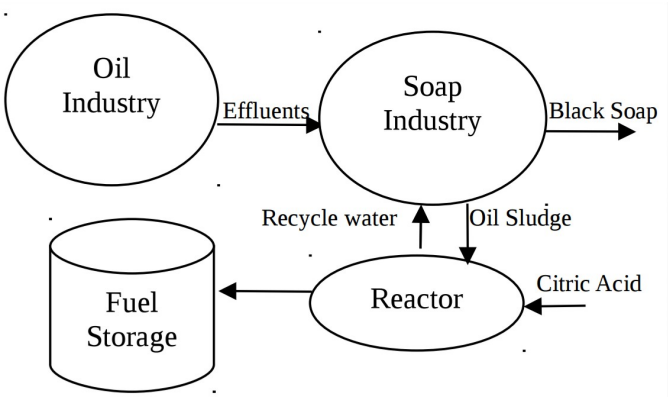

Fig.2: Flowchart of process

IV. RESULT AND DISCUSSION

The observations were used to plot a graph between log Effluent v/s log citric acid.

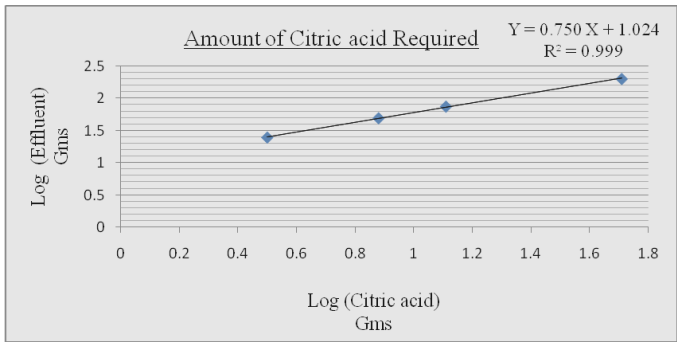

Fig.3: Amount of Citric acid required

From the plot we get the following Equation:
Log (E) =0.750 *log (C) + 1.024
Where E: Amount of Effluent
C: Amount of Citric Acid
The above equation is used to calculate the rough value of citric acid to be added to the known amount of effluent treated.

The plot between % Moisture removed v/s runs was done

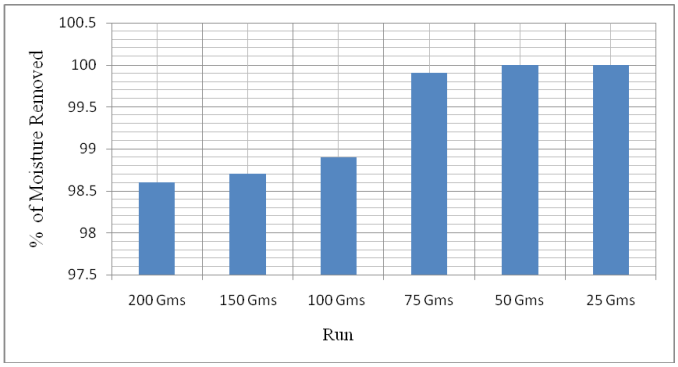

Fig.4: Efficiency of Citric Acid

The above plot is used to estimate the efficiency of citric acid to remove the moisture content in sludge. It can be seen that this process efficiently removes 90-100% of moisture.

V. CONCLUSIONS

The oil effluents contains large amount of oil and if not disposed off properly leads to environmental and health problems. Oil effluent is decomposed by land filling or drying. However land filling again leads to environmental pollution and high moisture content resists burning of dried product. Here oil sludge is treated by saponification followed by treatment by citric acid. The efficiency of removal of moisture content of sludge by treating it with citric acid was found to be between 95-99 %. Testing of the obtained fuel after removal of moisture content was done from ISO certified lab where in the gross calorific value was found to be 3667 kcal/kg which is high as compared to conventional fuel. The Calorific values of some fuels are:

Fuel	**Calorific Value (Kcal/Kg)**
Bituminous Coal	3582.6
Sulfur	2197.328
Vegetable waste	3000
Cattle dung	1000
Wood	3500
Cotton seed oil	10026.30
Bio-diesel	9204.121
Jet fuel	9600

Moreover the carbon content of the fuel was found to be 10.80%. The above result obtained shows that the treatment of oil sludge from oil effluent by saponification followed by treatment by citric acid is the best mehod for removal of moisture content from it.

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