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Study on Removal of Oil in Seawater using Agricultural Waste Ashes

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Abstract:

The study involves the removing of oil spillage in the seawater by using agricultural waste ashes in solidifier method. This research finds out the cost effective, low environmental impacts and higher efficiency to remove the oil spillage with use of ashes. This paper is taken the easily availability agricultural ashes like as maize cobs ash, rice husk ash and sugarcane bagasse ash. Furthermore, this paper focused on the dosage and absorption level of ashes to removal the crude oil and then chemical experiments conducted on P^H, Alkalinity, Turbidity, DO, COD and BOD in seawater when after/before of adding ashes. Ultimately, the research resulted to the best absorbent ash was sugar bagasse ash, which 0.35g absorbed the 1ml of crude oil compared to best other ashes.

Keywords—Agricultural ashes, crude oil and seawater.

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I. INTRODUCTION

Hydrocarbon fuels are main parts of energy sources in development countries. The most countries drilling rig in sea and deliver the lakh tonnes of petroleum crude oil in containership. The oil spillage occurred in drilling rig in sea and accident time of tanker ship. At the time, the lakh tonnes of crude oil spilled into the sea surface and offshore area. It is effects on the sea wildlife and also breathing problem for human life. Oil can impair a Sea bird's ability to fly, preventing it from search widely for food or break free from predators. As they groom, birds may imbibe the oil coating their feathers, irritating the digestive tract, altering liver function, and causing kidney damage.

Together with their diminished foraging capacity, this can rapidly result in dehydration and metabolic imbalance. The oil spill blocks the sun rays and contact with atmosphere. The oil spillage is controlling by physical, chemical and biological method. The research chosen the absorption and solidified method.

II. COLLECTION AND PREPARATION OF SAMPLES

A. Crude Oil

Crude oil is main energy source of the world. It is only taken in gulf countries. Crude oil contains the fuel of petrol, diesel and LP gases, etc. It was collected from the petroleum crude oil in Chennai Petroleum Corporation Ltd, Chennai.

B. Seawater

Seawater was collected from the kovalam beach, Kanchipuram district. This was collected from 1m depth of sea for the absence of waves. The beach is special one. The soil erosion is barrier by artificial wall in seashore area.

C. Agricultural Ashes

Agriculture is backbone of Indian economy. The agricultural waste burned on this land. This was affected on soil and ground water characteristics. Because, the agricultural ashes was effectively recycle to use for removal of oil in seawater. Rice Husk Ash (RHA) was collected from the SNR rice mill, Lalgudi. Sugarcane Bagasse Ash (SBA) was collected from the Kothari sugar mill, katur. Sugarcane bagasse was one of the by-products of sugar industries. The baggage was using the fuel of heating process and producing the electrical energy for in turbine process. Maize Cobs Ash was collected from the agricultural land near Kanakiliyanallur. Maize was major amount of cultivated in Tamilnadu and around state in India.

III. PREPARATION OF RAW MATERIAL

The ashes were first dried-up the oven in 100^0C in 3 hours duration. The water content of ashes was dried. Then, the ashes were sieved into the mechanical shaker in 75micron sieve in 30minutes duration.

IV. ANALYSING THE CHARACTERISTICS OF ASHES ADDING SAMPLE

A. *P^H value*

P^H value was intimates the acidity and alkalinity concentration of water. Normally, the sea water value present the above 8 ranges. In this process beginning, the empty sample of sea water was tested and then testing before adding of ashes. This test main aim is find out the impact of seawater when adding ashes.

TABLE 1: P^H VALUES FOR SEAWATER ADDITION OF ASHES

Sl.No	Material of mixing	P^H Value
1	Empty seawater	8.02
2	RHA mixed seawater	8.81
3	SBA mixed seawater	8.57
4	MCA mixed seawater	9.73

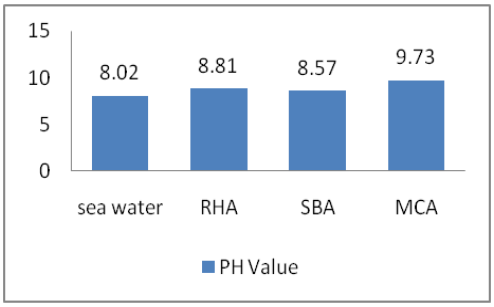

Fig 1: Graph for P^H variations

B. *Turbidity Test*

Turbidity test determines an availability of Settleable solids in seawater. It was detected by using an electronic turbidity meter. Normally, turbidity of seawater ranges from <1 NTU to 5 NTU. In the process, the seawater was tested before and after the addition of ashes.

TABLE 2: TURBIDITY VALUES FOR SEAWATER ADDITION OF ASHES

Sl.No	Material of mixing	Turbidity (NTU)
1	Empty seawater	1.2
2	RHA mixed seawater	2.2
3	SBA mixed seawater	0.1
4	MCA mixed seawater	0.7

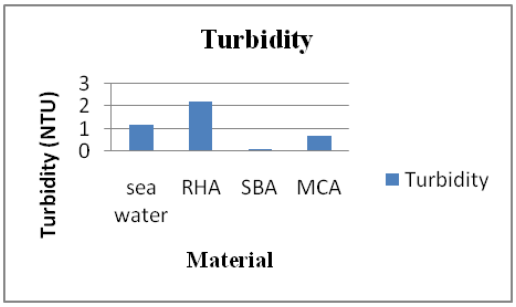

Fig 2: Graph for Turbidity variations

C. Alkalinity

Alkalinity denotes the amount of basicity present in seawater. The amount of acid required for the seawater base level neutralization gives an amount of alkalinity present in it. It is found by the titration method.

TABLE 3: ALKALINITY VALUES FOR SEAWATER ADDITION OF ASHES

Sl.No	Material of mixing	Alkalinity (mg/l)
1	Empty seawater	120
2	RHA mixed seawater	130
3	SBA mixed seawater	125
4	MCA mixed seawater	145

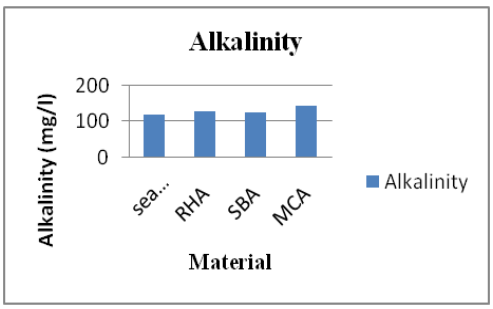

Fig 3: Graph for Alkalinity variations

D. Dissolved Oxygen

Dissolved Oxygen gives the amount of oxygen soluble in the seawater. If dissolved oxygen level is higher (4 – 5 mg/lit), then the seawater is found to be less polluted. If dissolved oxygen level is low (below 4mg/lit), then it is more accurate to pollution. Dissolved oxygen is found by titration method.

TABLE 4: DISSOLVED OXYGEN VALUES FOR SEAWATER ADDITION OF ASHES

Sl.No	Material of mixing	DO (mg/l)
1	Empty seawater	5.22
2	RHA mixed seawater	4.872
3	SBA mixed seawater	4.784
4	MCA mixed seawater	4.698

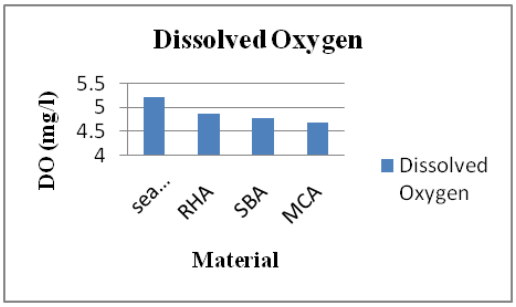

Fig 4: Graph for Dissolved Oxygen variations

E. Biological Oxygen Demand

Biological Oxygen Demand is representing the amount of dissolved oxygen required by aerobic biological organism to degrade an organic and inorganic content in the seawater. The BOD is varying from 2 to 6 mg/L. Here, the Biological Oxygen Demand in seawater before and after the addition of ashes is discovered.

TABLE 5: BOD VALUES FOR SEAWATER ADDITION OF ASHES

Sl.No	Material of mixing	BOD (mg/l)
1	Empty seawater	5.22
2	RHA mixed seawater	3.48
3	SBA mixed seawater	3.04
4	MCA mixed seawater	2.61

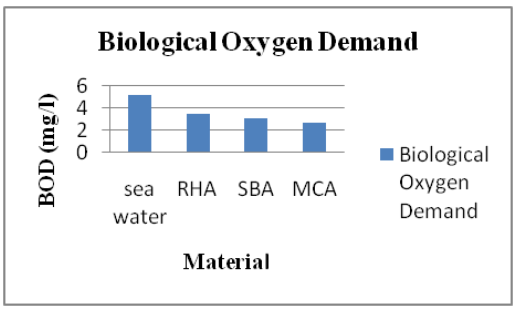

Fig 5: Graph for COD variations

F. Chemical Oxygen Demand

COD defines the amount of oxygen required by chemical reaction to degrade the organic and inorganic content in the seawater. The COD is varying from 5 to 30000 mg O_2 L^{-1}. Here, the Chemical Oxygen Demand of seawater before and after the addition of ashes is discovered.

TABLE 6: COD VALUES FOR SEAWATER ADDITION OF ASHES

Sl.No	Material of mixing	COD (mg/l)
1	Empty seawater	760
2	RHA mixed seawater	860
3	SBA mixed seawater	790
4	MCA mixed seawater	810

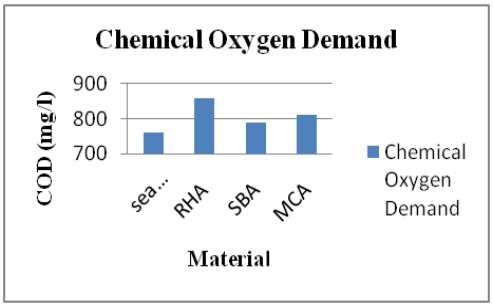

Fig 6: Graph for chemical Oxygen Demand variations

V. ANALYSING THE ABSORPTION LEVEL AND DOSAGE FOR ASHES BETWEEN CRUDE OIL

A. Absorption level:

All ashes are having a property of absorption. The ashes immersed in crude oil for about 10 minutes time interval by using metallic sieve 75µm. The dry ashes were as 100g of quantity in sieve and noted as A_1. Then the ashes immersed in crude oil were weighted as A_2.

Absorption Quantity A_b (g/g) = (A_2/ A_1)

Where,

A_b- Absorption quantity in (g/g),

A_1- Dry ash weight in grams,

A_2- Oil immersed ash weight in grams.

TABLE 7: ABSORPTION VALUES FOR SEAWATER ASHES AND CRUDE OIL

Sl.No	Material of mixing	A_b (g/g)
1	RHA mixed with crude oil	1.2
2	SBA mixed with crude oil	1.8
3	MCA mixed with crude oil	1.6

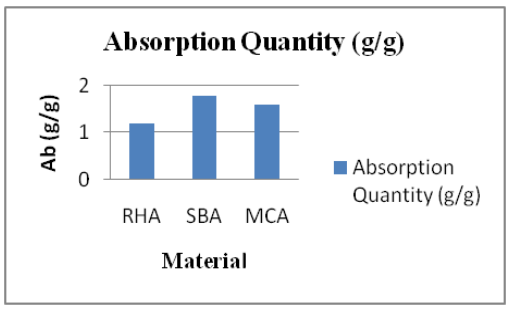

Fig 7: Graph for Absorption value for ashes

B. Dosage

The seawater was taken in the 1 litre beaker of 500ml level. The petroleum crude oil spilled into the beaker for 10ml of height. The ashes were weighted in weigh machine, shows 20g. Each ash of 20g are taken in separate beaker and sprayed. Then, carefully note down the quantity of ashes during transformation of oil from liquid to semi-solid state.

TABLE 7: DOSAGE VALUES FOR SEAWATER ASHES AND CRUDE OIL

Sl.No	Material of mixing	Dosage (g)
1	RHA mixed with crude oil	8.1
2	SBA mixed with crude oil	3.5
3	MCA mixed with crude oil	15.3

VI. COMPARING THE CHEMICAL CHARACTERISTICS OF AGRICULTURAL ASHES

In the above results were comparing, P^H, Alkalinity and Dissolved oxygen value doesn't occurred the major changes. But, Turbidity, Chemical and Biological Oxygen demand were having the greater than changes occurred. RHA and SBA don't impact the sea water characteristics, but MCA was more impact the seawater. This was impact the dissolved oxygen level and Turbidity of seawater. So, the biodiversity of sea will be affected. In dosage and absorption test, Sugarcane bagasse ash achieved the greatest goal of this investigation.

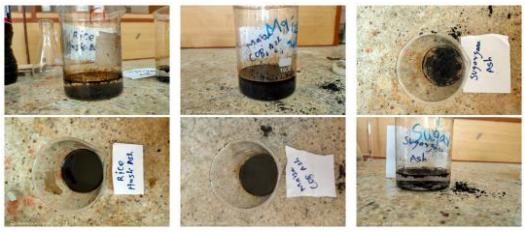

Fig 8: Result for removal of oil in seawater

VII. CONCLUSION

From the research the Rice Husk Ash (RHA) and Sugarcane Bagasse Ash (SBA) preferred to remove the oil spill in eco-friendly nature. But, RHA was found to absorb the oil and floats on the surface of seawater. If RHA quantity gets increased, then the semi-solids of immersed ash settled down in bottom of the seawater. This causes impact on corals and seaweed. Furthermore, the small fishes that feed corals and seaweed for food tends to death. But, SBA was best oil absorber which breaks the bond between crude oil and seawater. And also SBA have the higher amount of silica dioxide (SiO_2) which is relatively water insoluble compared to other minerals. So, we suggest that the Sugarcane Bagasse Ash (SBA) is one of the best oil absorber, water insoluble and eco-friendly to remove the oil spillage in seawater. The solidified of oil extracted from the seawater by using belt conveyor. Ultimately collection immersed ashes used for fuel of heating process, power production process (replacement of coal) and feed to the refineries to lower the amount of by-products.

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