International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 05 Issue: 04 | Apr-2018 www.irjet.net p-ISSN: 2395-0072

MARINE POLLUTION AND ITS REMOVAL (OIL SPILLAGE)

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1. ABSTRACT

With increasing industrial activities in many parts of the world, a large amount of crude oil is being consumed daily with large number of offshore and onshore oil fields along with the transportation of crude and its product, the risk of oil spill increasing accordingly. Oil spill is one of the most series pollution that has a negative effect on the ecosystem and marine life.

Among all different adsorbent, Bio-mass waste is preferred as on oil clean up technology due to its Bio Degradation and buoyancy. This study investigates the adsorption of crude oil by preparing magnetic activated carbon using sugarcane, corn, and tea waste. Water sample with oil spillage was collected, treated and analyzed for water characteristics pH, DO, BOD, COD, hardness and turbidity.

Results showed that there was not much change in the pH, turbidity values but there was a slight increase in the BOD & COD values. On comparison with the three oil removal methods, the adsorption using the magnetic activated carbon - tea has higher absorption capacity.

2. INTRODUCTION

2.1 GENERAL

The marine environment is a dynamic and diverse network of habitats and species, interwoven by complex physical and ecological process that Interact with humans and their activities at many levels. Marine habitats and their associated communities are often grouped into ecosystems, e.g. the open ocean, deep sea, coral reefs, saltmarshes, rocky shores etc., although they are all connected and impacts on one ecosystem can affect others. Ecosystem structure and function are important features when assessing impacts. The Many benefits that humans receive from these habitats and communities are referred to as ecosystem services. The more obvious of these are the fish, shellfish and other foods that we consume, and the recreational or aesthetic benefits we derive from the sea. Additionally, many coastal communities have strong cultural and spiritual ties to the sea. However, there are many other less obvious services.

The marine plankton of the vast areas of open oceans plays a major role in the maintenance of our atmosphere by transferring carbon to the deep sea. The open oceans and deep sea areas are also home to many of the fish that we catch for food, but abundance and productivity increase greatly in shallower waters and closer to coastal areas. Coastal wetlands and some shallow water ecosystems, including saltmarshes, mangroves, kelp forests and sea grass beds, are particularly productive, providing much of the organic material that feeds neighboring shallow water ecosystems. They also provide food and

Shelter for young fish and many other species, protect our coasts from storms and flooding, and capture e sediments and organic waste that runs off the land. Mangroves and coral reefs also provide building materials, while new pharmaceutical products are increasingly being developed from the enormous diversity of marine species.

2.2 TYPES OF MARINE POLLUTION

1. Sedimentation
2. Agricultural runoff
3. Energy
4. Sewage
5. Solid waste
6. Plastic debris
7. Radioactive material pollution
8. Under water noise pollution
9. Eutrophication
10. Oil spills

2.3 OIL SPILLS

Oil spill is accidental or intentional release of liquid petroleum hydrocarbon into the ocean or coastal waters due to human activity mainly.

The oil initially floats in a layer up to several inches thick at the water surface which is spread and moved by wind and water currents. Immediately, more volatile components begin to separate and disperse into the atmosphere and water soluble components (called polycyclic aromatic hydrocarbons, PAHs) leach into the surrounding water. Lighter insoluble components form thin films that spread and move more extensively than the thicker oil. The warmer the sea and air temperature, the more rapidly these components separate. Wave action separates the mass into smaller areas and patches, and eventually into smaller globules, some of which emulsify ('mix') with seawater.

2.4 EFFECTS OF OIL SPILLS

1. Effects entire marine life

2. Blocks entrance of oxygen in water

3. Fishers hatch with twisted spines and deformed hearts

4. Effects the food web when oil reaches sea bed

5. Natural recovery process may require up to 10 years.

2.5 OBJECTIVES

1. To study about the various types of marine pollution.

2. To treat the oil spilled marine water by absorption using magnetic activated carbon.

3. To compare the characteristics of treated oil spilled water with the existing values

4. To utilize different biomass waste for the preparation of magnetically activated carbon for treating oil spillage and to suggest the best among them.

2.6 SCOPE

1. This study imparts a better solution for the treatment of oil spillage in marine water.

2. Stress the importance of preventing marine pollution and to protect the marine ecosystem.

3. Utilization of economic methods which are cost efficient for treatment of oil spillage.

2.7NEED FOR STUDY

1. Proper dispose of oil spills.

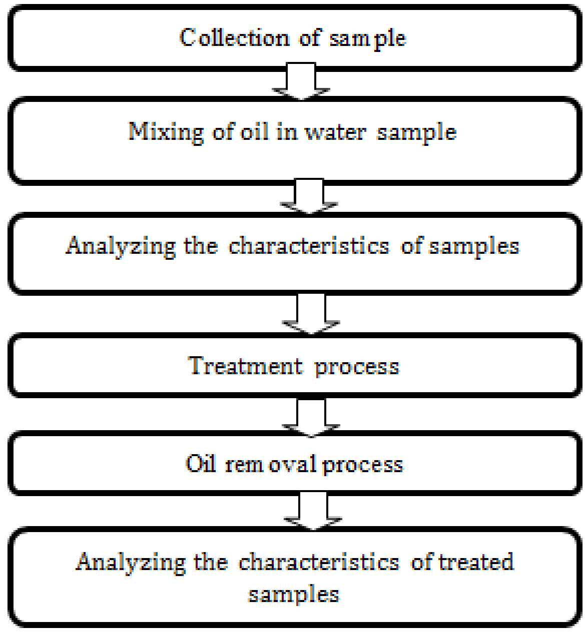
2. To prevent environmental pollution such as stopping skin diseases, odor and nuisance etc.,

3. Proper removal of oil spills in water.

3. METHODOLOGY

3.1GENERAL

This chapter deals with the methodology framed to carry out the project through the inferences made from literature review. It clearly explains the step by step procedure carried out and the detailed working of reed bed with the compared characteristics of untreated and treated effluents



4. COLLECTION OF RAW MATREIAL

1. We collected sugarcane waste at sugarcane juice shop in Anna Nagar. The quantity of collected sugarcane waste is 1kg.

2. We collected corn waste at corn shop in Red hills. The quantity of collected corn waste is 1kg.

3. We collected tea waste at tea shop in Thailavaram. The quantity of collected tea waste is 1kg.



Sugarcane waste **Corn waste** **Tea waste**

Fig:1 Fig:2 Fig:3

4.1 Collection of SAMPLE

We collected marine water at Marina Beach the quantity of marine water is 10 liters.

Fig: 4 - Water sample

Our project is aimed at removing crude oil from marine water.

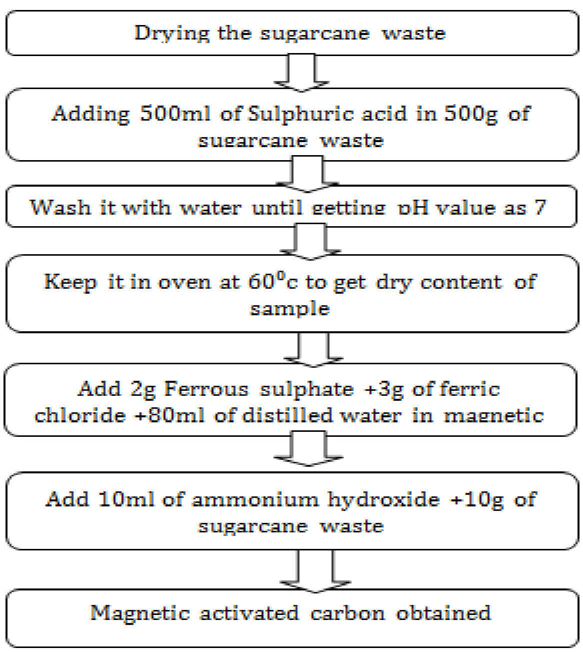
Mixture of naturally occurring hydrocarbons that is refined into diesel, gasoline, heating oil, jet fuel, kerosene and literally thousands of other products called petrochemicals crude oils are named according to their contents and origins.

Fig: 5 - Oil mix with sample

5. TREATMENT PROCESS

5.1 PREPARATION MAGNETIC ACTIVATED CARBON BY USING SUGARCANE WASTE

PROCEDURE:





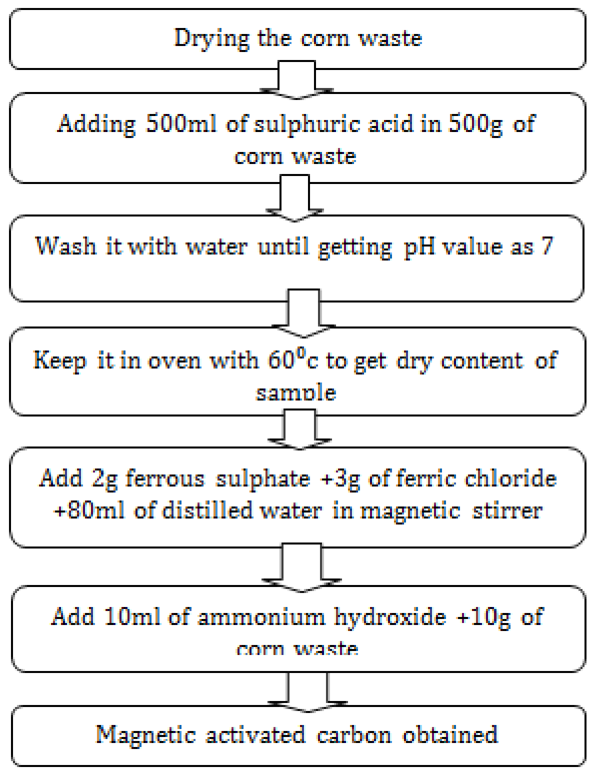
1.DRYING PROCESS 2.ADDING SULPHURIC ACID 3.WASHING PROCESS


4.SAMPLE IN OVEN 5.SAMPLE IN MAGNETIC STIRRER

Fig: 6 –Preparation magnetic activated carbon by using sugarcane waste

5.2 PREPARATION MAGNETIC ACTIVATED CARBON BY USING CORN WASTE

PROCEDURE:





1.DRYING PROCESS 2. ADDING SULPHURIC ACID WASHING PROCESS

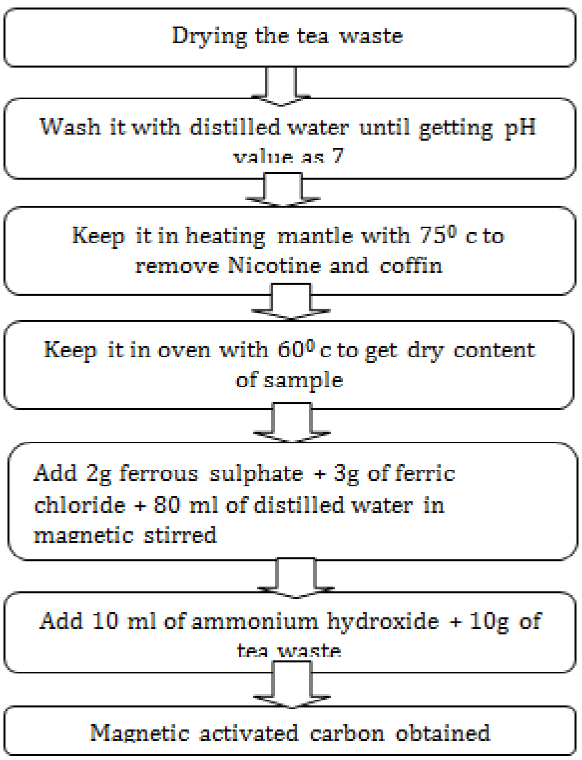
4. SAMPLE IN OVEN

5. SAMPLE IN MAGNETIC SRIRRER

Fig: 7 –Preparation magnetic activated carbon by using corn waste

5.3 PREPARATION MAGNETIC ACTIVATED CARBON BY USING TEA WASTE

PROCEDURE:



1. DRYING PROCESS

2. HEATING MANTLE

3. WASHING PROCESS

4. SAMPLE IN OVEN

5.SAMPLE IN MAGNETIC STIRRER

Fig: 8 –Preparation magnetic activated carbon by using tea waste

6. ANALYSING THE CHARACTERISTICS OF TREATED SAMPLE

6.1 DETERMINATION OF TURBIDITY

Turbidity measured this way uses an instrument called a nephelometer. With the detector set up to the side of the light beam. More light reaches the detector if there are lots of small particles scattering the source beam than if there are few. The units of turbidity from a calibrated nephelometer are called Nephelometric Turbidity Units (NTU). Sample is taken and kept in nephlometer to determine turbidity. Thus the turbidity value for

S.NO	SAMPLE	TARBIDITY Mg/l
1	Marine water	6
2	Marine water + oil mixing	8
3	After removal of oil by using sugarcane waste	6.32
4	After removal of oil by using corn waste	6.67
5	After removal of oil by using tea waste	7

Table 1: Turbidity values after treatment

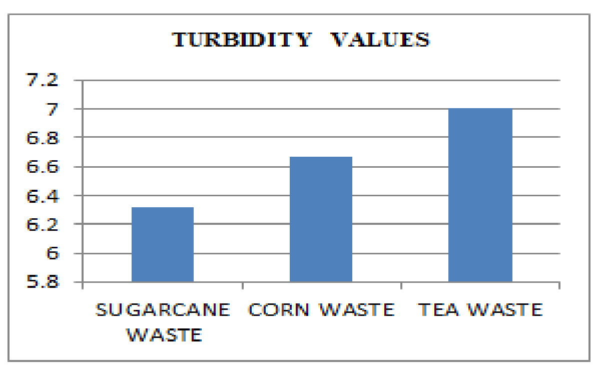


Chart 1: Turbidity values after treatment

6.2 DETERMINATION OF pH

The pH value of marine water indicates the negative log of hydrogen ion concentration present in marine water.

$$pH = -\log H^{+}$$

Sample is taken in a beaker and then pH electrodes were inserted and pH was determined. The value of pH measured for adsorption is

Sample is taken into a beaker and then pH electrodes were inserted and pH was determined. Thus the pH value for

S.NO	SAMPLE	Ph
1	Marine water	7.44
2	Marine water + oil mixing	6.56
3	After removal of oil by using sugarcane waste	7.22
4	After removal of oil by using corn waste	7.1
5	After removal of oil by using tea waste	7.31

Table 2: pH values after treatment

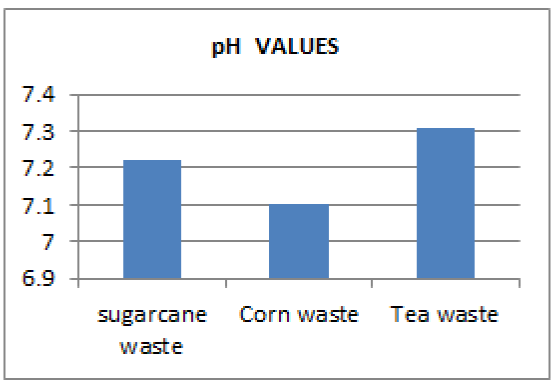


Chart 2: pH values after treatment

6.3 DETERMINATION OF BIOLOGICAL OXYGEN DEMAND

Biochemical oxygen demand (BOD) is a measure of organic pollutants, one of the causes of water pollution. In the organic carbon cycle, organic pollutants in water are oxidized by aerobic bacteria using dissolved oxygen.

$$BOD = \frac{((D_0 - D_5)\,[\text{Volume of bottle}]) - [C_0 - C_5]}{\text{Volume of sample}}$$

The value of Biochemical oxygen demand (BOD) measured for adsorption is

S.NO	SAMPLE	BOD (mg/l)
1	Marine water	26
2	Marine water + oil mixing	130
3	After removal of oil by using sugarcane waste	90
4	After removal of oil by using corn waste	115
5	After removal of oil by using tea waste	86

Table 3: BOD values after treatment

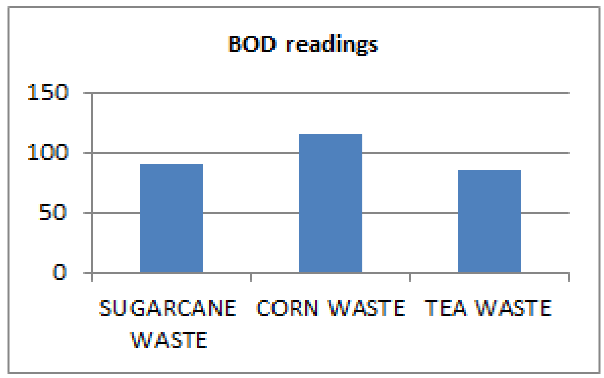


Chart 3: BOD values after treatment

The BOD efficiency after treatment using sugar cane is 30.8 %.

The BOD efficiency after treatment using corn waste is 11.53 %.

The BOD efficiency after treatment using tea waste is 38.5 %.

6.4 DETERMINATION OF CHEMICAL OXYGEN DEMAND

The chemical oxygen demand (COD) is the amount of oxygen consumed to completely chemically oxidize the organic water constituents to inorganic end products. It was carrying out to determine the organic oxidize able matters content of water samples.

COD = (volume of $Fe(NH_4)_2(SO_4)_2$ of (bank- sample)) x (eq. weight of oxygen

Normality x 1000) / volume of sample.

The value of the chemical oxygen demand (COD) measured for adsorption is

S.NO	SAMPLE	COD (mg/l)
1	Marine water	234
2	Marine water + oil mixing	550
3	After removal of oil by using sugarcane waste	492
4	After removal of oil by using corn waste	300
5	After removal of oil by using tea waste	224

Table 4: COD values after treatment

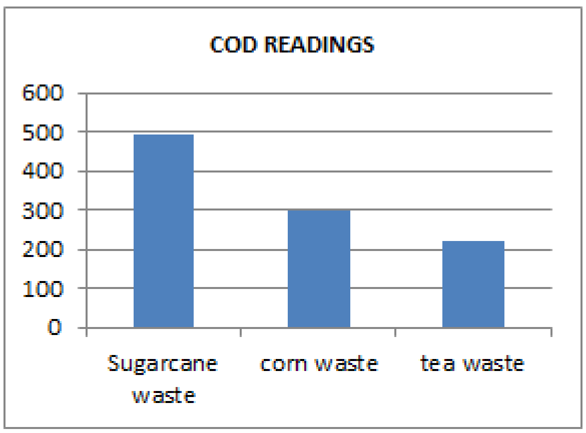


Chart 4: Turbidity values after treatment

The COD efficiency after treatment using sugar cane is 10.54%.

The COD efficiency after treatment using corn waste is 45 %.

The COD efficiency after treatment using tea waste is 59.27 %.

6.5DETERMINATION OF DISSOLVED OXYGEN

Dissolved oxygen is a measure of the amount of oxygen dissolved in the water column, and is a fundamental requirement for the maintenance of balanced populations of fish, shellfish, and other aquatic organisms, in marine water.

The value of The Dissolved oxygen (DO) measured for adsorption is

S.NO	SAMPLE	DO (mg/l)
1	Marine water	4
2	Marine water + oil mixing	3
3	After removal of oil by using sugarcane waste	3.4
4	After removal of oil by using corn waste	3.6
5	After removal of oil by using tea waste	3.72

Table 5: DO values after treatment

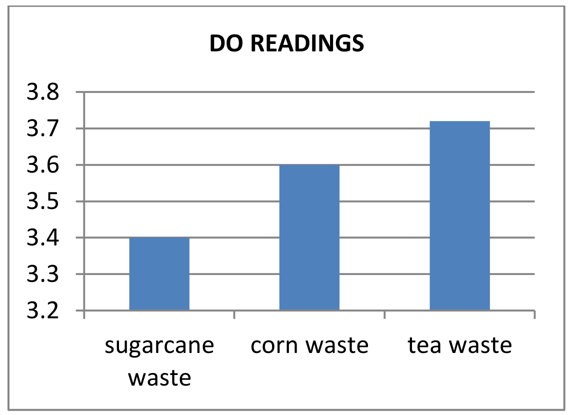


Chart 5: Turbidity values after treatment

6.6DETERMINATION OF HARDNESS

The ability of the water to from lather with the soap solution. This is due to the presence of carbonates and bicarbonates of calcium and magnesium.

Hardness in mg/l of $CaCO_3$ = Volume of EDTA x 1000/Volume of sample

The value of the hardness measured for adsorption is

S.NO	SAMPLE	HARDNESS mg/l
1	Marine water	4350
2	Marine water + oil mixing	4370
3	After removal of oil by using sugarcane waste	4365
4	After removal of oil by using corn waste	4361
5	After removal of oil by using tea waste	4355

Table 6: COD values after treatment

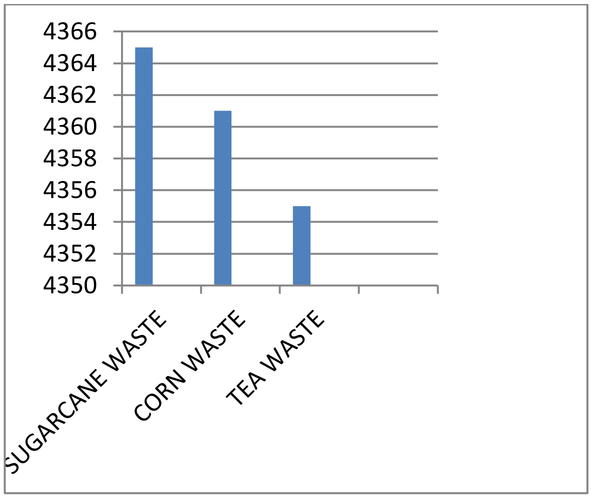


Chart 6: Turbidity values after treatment

7. COMPARING THE CHARACTERISTICS OF TREATED AND UNTREATED SAMPLE

S. NO	SAMPLE	PH	TURBIDITY (NTU)	BOD (Mg/l)	COD (Mg/l)	HARDNESS (mg/l)	DO (Mg/l)
1	Marine water	7.44	6	26	234	4350	4
2	Marine water + oil mixing	6.56	8	130	550	4370	3
3	After removal of oil by using sugarcane waste	7.22	6.32	90	492	4365	3.4
4	After removal of oil by using corn waste	7.1	6.67	115	300	4361	3.6
5	After removal of oil by using tea waste	7.31	7	86	224	4355	3.72

CONCLUSIONS

The water collected from the coastal region was analyzed to determine characteristics. The preparation of magnetic activated carbon was employed on lab scale to treat oil spilled marine water.

Magnetic activated carbon is prepared with the use of three type of Bio-mass wastes such as sugarcane, corn and tea wastes. After treating the oil spilled marine water with magnetic activated carbon (prepared with three type of waste).

The treated sample is analyzed and compared with untreated sample were PH, BOD and COD show a variation.

The system has proved that "use of Bio-mass waste" to treat the marine water with oil spillage.

In this water lacking world it is so helpful to treat the oil spilled marine water.

The treated water can be used to fulfill the domestic purpose other than drinking purpose.

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