

Oil Skimming using Electromagnetism

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Abstract- The spillage of oil into the environment is an ongoing concern. Marine oil spills draw much attention because the oil harms marine animals and floral life. Current methods to aid in cleaning up the oil include containment booms, oil skimmers, and dispersants. Chemical dispersants are a tradeoff between exposing coastal life to surface oil and exposing aquatic life to dispersed-chemicals. Traditional containment/diversion booms are very commonly used, but they alone cannot recover the oil. Additional machinery is necessary to aid in getting the oil out of the water. Other things such as large waves and wind can make the oil slip under or over the boom, causing it to become ineffective.

Keywords- Oil Skimming, Electromagnetism, electric oil skimming, high efficiency oil skimming, new methods of skimming

1. INTRODUCTION

An environmentally safe method was developed to clean up, recover and manipulate spilled oil in water and other surfaces. The Electromagnetic Mop (EMop) also provides a solution to contain, control and possibly stop oil leaks.

The engineer is constantly confronted with the challenges of bringing ideas and design into reality. New machines and techniques are being developed continuously to make various products at cheaper rate and high quality. Taking into account the above contribution we have tried to manufacture such equipment which is accessory the EMop replacing the aforementioned in non-toxic, safe and efficient manner while increasing the efficiency of remediation process. Our method has been tested and verified at laboratories as being the safest and most efficient method.

A. Introduction to Skimming

The Oil Skimming is a process of removing or separating the oil from oil polluted coolant. The oil and coolant in mixed form is collected in the containers and one of the following methods are adopted to separate oil from coolant. Oil being lighter than coolant, it floats over the coolant. The endless belt running over the rollers adjusted such that the belt will violently smash the mixed coolant Oil will stick to the belt.

2 CONFIGURATION

To make a electromagnetic oil skimmer one has to have a long pipe to carry fluids wound with copper wire to create electromagnetism when power is supplied.

Table1. Pipe Dimensions:

Length	2 Meter
Diameter	1 ½ inch.
Material	PVC
Holes Interval	30 cm
Holes diameter	1 inch

Table2. Copper Dimensions:

Diameter	22 Gauge
Length	1 km
Specification	Varnished
No. of winding	12/cm

Representational Model:



Fig.1 A visual model of Oil Skimmer

3 PROBLEM DEFINATION

It is estimated that between a million metric tons of oil are released into the world water every year of which more than 90% is directly related to human activities including deliberate waste disposal . Marine Oil Spills, Particular large-spills accident have received greater attention due to damage of environment . In India most of manufacturing industries release oil in nearby sea, lake or pond etc. Because of this our aquatic life is under great threat. To make an electronic skimmer .

Our aim is to design a skimmer using electric energy unlike current methodology. Removing oil over specific area without leaving waste. Designing a method to be used in large scale over the years. And keeping a check on price and maintenance as well.

4. FORMULATION

Oil Skimmer works on the principle of Faraday’s Law. Using Faraday’s Law of Electromagnetism we can create an environment were oil can be magnetized and made to attract towards the booms thereby covering large area.

By Using series of coils and passing AC current through it, the particles can be made to attract coils and hence pulling away oil with it. An arrangement of pipe will be made to pass the oil to the container hence retaining the oil harmlessly.

A. Advantages of oil skimming

Increase in tool life. Increase in coolant life. Better quality can be obtained. Increase in surface finish & accuracy. Increase in production rate. Increase in coolant supply. Increase in the life of coolant pump. Conserve wash water by removing oily wastes remove tramp oils from costly coolants prevent plugging of pipes, sprays, filters or sewers.

B. Limitation of oil skimming

To use Oil skimmer person needs to sprinkle oleophilic particles over the surface of water.

5. RESULT

In the following testing some parameters are kept constant which includes pipe length, pipe diameter,

pipe internal diameter, oil density. Iron filings, size, power supply. The parameters to be read are no. of copper turns, amount of filings sprinkled over surface (in grams) keeping the there other factors constant. The below values are the average of two readings.

Table2. Result Table

<u>Conditions</u>	<u>Readings(Oil Output in litres/min)</u>
1) Mass of iron filings = 0.5 g/cm ²	4
2) Mass of iron filings = 1 g/cm ²	4.65
3) Mass of iron filings = 1.5 g/cm ²	5.12
4) No. of copper turns = 9/cm ²	2.2
5) No. of copper turns = 18/cm ²	4.4
6) No. of copper turns = 27/cm ²	6.6

6.CONCLUSIONS

The oil recovery efficiency using current oil spill cleanup technologies (booms and skimmers) can be greatly improved by cascading the collected oil/water mixture with this new magnetic separation technique. In the preferred embodiment the collected oil phase is magnetized in a confined area (without trading off density and magnetization of the oil phase) using environmentally safe Fe₃O₄/Fe₂O₃ magnetic nanoparticles with oleic acid or other safe surfactants.

Confining the magnetization Step 2 also allows for minimal loss of material compared to dispersing magnetic material on the open water. The magnetic phase is then separated from the non-magnetic liquid phase using a novel permanent magnet separator, requiring no external energy. The magnetic nanoparticles are then separated from the magnetic phase using a HGMS system allowing for the magnetic nanoparticles to be recycled. These steps can be repeated to increase the oil recovery efficiency and minimize the oil remaining in the water.

7.REFERENCES

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