

DESIGN AND FABRICATION OF FLOATING OIL SKIMMER

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Keywords:

Oil skimmer; Rotating skimming discs; Joystick; Arduino mega

Introduction:

An Oil spill is the release of a liquid petroleum hydrocarbon into the environment, especially the marine ecosystem, due to human activity, and is a form of pollution. Oil spills can have disastrous consequences for society; economically, environmentally, and socially. As a result, oil spill accidents have initiated intense media attention and political uproar, bringing many together in a political struggle concerning government response to oil spills and what actions can best prevent them from happening. The term is usually given to marine oil spills, where oil is released into the ocean or coastal waters, but spills may also occur on land. Oil spills at sea are generally much more damaging than those on land, since they can spread for hundreds of nautical miles in a thin oil slick which can cover beaches with a thin coating of oil. These can kill seabirds, mammals, shellfish and other organisms they coat.

- Human impact: An oil spill represents an immediate fire hazard. The Kuwaiti oil fires produced air pollution that caused respiratory distress.
- Environmental impact: There is no clear relationship between the amount of oil in the aquatic environment and the likely impact on biodiversity

Several methods were incorporated and devised to clean up oil spills like adheres to skimming media, such as a belt, tube, rope, mop, or disk. The media then runs back to the machine to be wiped clean in order to achieve the latter.

Objectives:

1. The objective of this project is to design a disc type oil skimmer in order to achieve efficient process that removes floating oil and grease from liquid.
2. The floating oil adheres to skimming media in this case being a rotating disc. The media then runs back to the machine to be wiped clean.
3. The apparatus thus helps in removal of high-grade oil from the surface of water in seashore and rivers. The water pollution is majorly reduced by the setup.

4. The capacity is high and oil collection rate is excellent depending on the size and number of discs, oil skimmer is easy to install.

Methodology:

1. Oil skimmer system consists of Battery, Rotary Encoder, Joystick, Arduino Mega, DC Motors and Drivers, Propellers, Rotary Disc.
2. A battery in this skimmer is used to supply power to the Arduino Mega and drive three DC motors. Two DC motor are connected to the propeller.
3. When propeller rotate in the clockwise direction oil skimmer moves in right direction but when propeller rotate in anticlockwise direction oil skimmer moves in left direction.
4. The third DC motor is connected to a rotary disc that functions to attract and separate the spilled oil. All three DC motor are connected to the motor driver and Arduino Mega and speed and direction of rotation of the motor can be controlled using a joystick.
5. The float of oil skimmer is made of PVC (Polyvinyl Chloride) pipe, as it provides ample buoyant force to keep the whole module afloat.
6. For the rotary discs, we had two options to go with, either it was mild steel discs or acrylic discs but after an experiment carried out it was concluded that acrylic discs were more efficient and hence we went with acrylic material for the rotary disc module.
7. The rotary flaps to move the boat are made out of mild steel with an conventional approach to the design of the rotating flap.
8. The frame to house the electronics and the tray to collect the skimmed oil is made out of mild steel and the vipers are attached accordingly to scrape the oil of the disc.

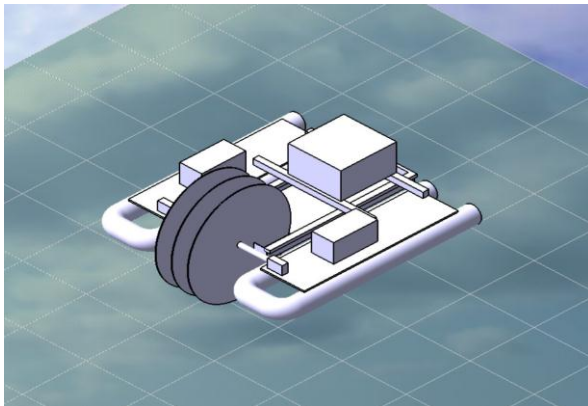


Figure 1. Design of floating oil skimmer

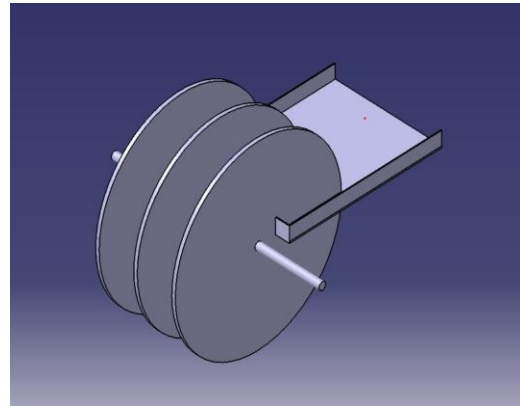


Figure 2. Design of Rotating disc module



Figure 4. Fabricated Float and Rotary flaps



Figure 5. Fabricated float and Disc

Conclusion:

The oleophilic property of the disc was first tested out in order to determine and confirm the proof of concept, The float to house the rotary flaps, the motor, the electronics out of PVC was successfully built and the required rotary disc of the specific dimension required were cut out successfully and the conventional rotary flaps were built to dimension, The rotary module was successfully incorporated into the float built to make possible a floating oil skimmer, where the high grade oil polluted into the ocean or any waterbody is successfully and efficiently cleaned out of the water body leading to the successful attainment of the objective.

Scope for future work:

1. The apparatus thus helps in removal of High-grade oil from the surface of water in seashore and rivers. The water pollution is majorly reduced by the setup.
2. The capacity is high and oil collection rate is excellent depending on the size and number of discs, oil skimmer is easy to install.
3. They minimize the human efforts in oil removal process.
4. The direct contact of human with these High-grade oils will affect them physically, The setup will eliminate those kind of problems.
5. The fabricated project will be simple in design and economically feasible with respect to cost.
6. This project has a high scope of automation with the necessary development in technology and sensors this boat is capable of automatically skimming oil based on the density and color difference present in the water body
7. The size and the number of the discs can be varied accordingly to increase the skimming rate of oil
8. The discs can be swapped also accordingly to the high grade oil in order to increase efficiency of the skimming process.