DESIGN AND DEVELOPMENT OF ROBOT FOR SEA OIL SKIMMING

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Abstract— The spillage of oil into the sea water due to accidents of transportations boats, leakage into the ship's also from the disposal of industrial wastes causes hug impact on damage alive and environments, fisherman and local authorities. The sea oil skimming robot is effectively used for collecting the oil spilled into sea water. This robot is beneficial over the number of oil skimmer which is available in markets .the use of oil skimmer robot helps collecting a oil over a longer distance. The rotary disk made from material of polypropylene and PVC materials remove up to 92% of hydrocarbon. This materials used for preparing disk is most economical and efficient over the conventional ones .recovery of oil is up to 92-94% by managing speed of rotary disk .the collected oil is further recycled for use.

Keywords— Oil Spillage, Oil Skimming Robot, Rotary Disk, Polypropylene.

1. INTRODUCTION

Oil is one of the precious crude and being used in many routine application of human life. It is not easy to determine the amount of oil spilled into sea every year but according to estimates, it is expected to be around 4 million tonnes in the whole planet and 600.000 tonnes only for Mediterranean

1.1 What Is An Oil Skimmer?

The collection of spilled oil is performed by means of special vessels called oil skimmer
Skimmers may be:
Self-propelled – Moved with thrusters for forward and backward movement operated by joysticks or levers. During an operation it is possible to position the skimmer in the place of greatest oil concentration.
Dynamic – Generally they are positioned on the bow or on side of a vessel. To make it possible for recovery of the oil and the movement of a vessel simultaneously.
Stationary – They are moved and retained by ropes by placing in the location with the greatest concentration of oil. For many years the response industry has been making efforts with the development of methods and equipment for the recovery of oil.

1.2 Disk Skimmers:

Disk skimmers have recovery capacities from 40-100m3/h and can be used for open sea operations. And it is dependent on number and size of discs. Tests are shown grooved discs can be highly effective. Disk skimmers work best with lighter types of oil and cannot handle emulsified oil. The weight and volume of these disks is quite large to the size and number of rotating disks. A oil skimmer achieve the desired level of water purity. Oil skimming is a cost-effective means of removing most of the oil before using more complicated and costly treatments such as chemical processes. Floating oil and grease cling to skimming media more easily than water, and has little affinity for the media. This allows oil skimming media in the shape of a belt to pass through a fluid surface to pick up floating oil and dirt with very little water. This oil material is subsequently removed from the media with wiper blades. Oil skimmers are simple and effective tools for removing oil, grease, dirt from water. A oil skimmer can achieve the desired level of water purity.

2. LITERATURE SURVEY

A great number of publications were found during this literature survey that was expressly devoted to Kaizen. However, some information was found on the cost and benefits of kaizen at companies. In doing this survey, it was proved that this research would be important in contributing studies on this project.
TORREY CANYON (United Kingdom, 1967)
TORREY CANYON is ran aground on pollard rock on the seven stones reef, it is near to the lands end, cornwall on 18 march 1967. Thousand tonnes of oil is spilling from the stricken vessel's ruptured tanks and during the next 12 days the entire cargo is close to 119,000 tonnes of Kuwait crude oil was lost.
ODYSSEY 9(Off Canada, 1988) On November 10th 1988, in the north Atlantic 700 miles of the coast of Nova Scotia while on voyage from sullom voe, Shetland islands to come by chance Newfoundland, the Liberian tanker ODYSSEY, in heavy weather almost fully loaded with a cargo of 132, 157 tonnes of north sea brent crude oil, broke into two and sank. As it sank fire started on the stern section and the surrounding oil caught fire.
AEGEAN SEA (Spain, 1992) On 3 December 1992, while ship is close to the port of La corona on the Galician coast, north west Spain , the Greek OBO carrier AEGEAN SEA,

during heavy weather, laden with 80,000 tonnes of north sea Brent crude oil, ran aground. The vessel is break into two and caught fire. Ship and spilled cargo burned for several days.

- **Mr. Anne Louise Brown-**

  The surface oil skimmer is a side mounted oil recovery system which is adoptable to many different boats. In the event of a small oil spill the sos is a very accessible solution for fisherman and local authorities involved in clean up.this paper describes the development of the system including technical analysis of each major component.

- **Arturo A. Keller and Kristin Clark-**

Increasing oil exploration, production and transport in Arctic waters will increase the risk of an oil spill occurring in cold and ice-infested waters. The mechanical oil spill recovery equipment currently used in warmer waters was not designed to collect much more viscous oils, or oil-ice mixtures. The presence of ice crystals in oil emulsions affects the adhesion processes between an oil slick and the surface of an oleophilic skimmer and prevents oil from being efficiently recovered. Novel drum skimmer surface geometry and materials, tailored to the conditions present under cold climates, are expected to significantly increase the rate of oil recovery, reducing cost and risk.

- **Suraj Burungale-**

Aim of this project is to remove the oily effluent from waste water of sugar factory. A free floating endless belt oil skimmer was developed as means of recovering spilled oil from surface water. The skimmer utilizes a unique high efficiency belt which is driven by motor. By removing oil we can preprocess water for other use. A free floating endless belt oil skimmer was developed as means of recovering spilled oil from surface water. The skimmer utilizes a unique high efficiency belt which is driven by motor. By removing oil we can preprocess water for other use. The contamination of oil is 80% is removed by means of belt.

- **Mr. Dhonde Diapk Panditrao-**

During the operating of crude oil, the transportation of crude oil requires the adoption of safety measures in port terminals. At sea accidents are further serious cause of oil pouring and cause of pollution. By careful optimization of the angle between the plane of the disk and the vertical plane, hence the efficiency of a conventional disk oil skimmer get doubled and this parameter is same as in belt oil skimmer. Therefore, this is particularly significant as it requires only a minimum effort to modify existing disk and belt skimmers. Results revealed in the presence of a minimum immersed area required for the offset angle to be effective. Around 80rpm optimum rotational speed was found, regardless of the design or operating parameters applied. The belt and disk skimmer will allowed the recovery of a high percentage of hydrocarbons in comparison to the traditional oil skimmers. The study of largest disk diameter, belt width and the oil film thickness of 20mm, obtaining the maximum improvement of 204% in oil recovery rate.

3 List of components:

- Shaft on which oil skimmer Disc is mounted
- Oil Skimming Disc.
- Bearing.
- Floating closed PVC pipe.
- Solar panel specification
- Collecting tank.
- DC gear motor.
- Battery to store and to supply motor.
- Chain drive for power transmission.
- Solar panel for battery charging.
- Propeller shaft and wheels for propulsion purpose.

Proposed sketch:

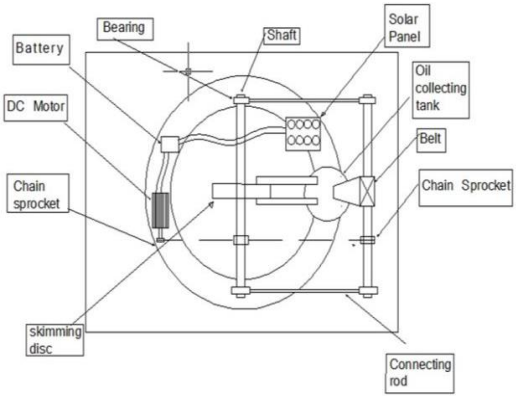

Fig. Schematic diagram of oil skimmer.

4 Methodology:

Step 1: Identification of problem:

During recent year there are lots of oil accidents happening in the ocean and it makes huge impact on the environment. At sea accident are serious cause of oil pouring and cause of pollution. During the operating of crude oil, the transportation of crude oil requires the adoption of safety measures in port terminals. At sea accidents are further serious cause of oil pouring and cause of pollution. By careful optimization of the angle between the plane of the disk and the vertical plane, hence the efficiency of a conventional disk oil skimmer get doubled and this parameter is same as in belt oil skimmer. Therefore, this is particularly significant as it requires only a minimum effort to modify existing disk and belt skimmers.

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Step 2: Selection of Material

Selection of material for disc from polypropylene and PVC where polypropylene, it is available and relatively inexpensive. It has a very resistance to absorbing moisture and flexible strength due to semi crystalline nature. And PVC (polyvinyl chloride) is also readily available and relatively inexpensive, it is dense and resistance to the chemical and alkalis. In this the

selection of motor for power transmission is also choosed.

Step 3: Design and Software modeling:

Design of disc-

Design of disk of circular shaped of the material of polypropylene and PVC. The diameter of disk is such that it can maximum contact with water.

Design of frame-

In the design of frame, the frame is made from a PVC pipes which are closed at its both ends.

Design of propeller-

In design of the propeller, propeller the shaft is designed with specified diameter and length for the proportional purpose. The propeller with the curved blades on it.

Software modeling of various components is done with help of different design software.

Step 4: Manufacturing of Skimmer:

In Manufacturing of skimmer, different mechanical mechanism and linkage are used. The linkage of wiper with rotary disk which direct the sticked oil on rotary disk and collect into collecting tank.

Step 5: Testing of oil skimmer:

Testing of how much amount of layer stick of oil at various speed, if speed increases the thickness of oil stick is decreases vise-versa on a rotary disk of material from both of above mentioned by the working of whole project.

5 Conclusions

As we have studied in the past oil spill has occurred several times. These oil spills have caused a great collision on ecological life around the region of spillage. The main causes of oil spills is because of the carelessness of transporting authority and sometimes due to unpleasant weather causing storm which results in spilling of large tones of oil in water. The spilled oil is waste oil as well as destroys the coastal life around it. While assembling for this project we have concluded that the oil spillage is not only harmful but also results in loss of lives and money. So the recovery of spilled oil is very necessary. Our project is oil skimmer robot, which is one of the methods of regaining the oil which is spilled. INDIA and other country where demand of oil is increasing rapidly, we think it will be very useful. So after regaining spilled oil we can use it for other purpose. The main purpose of project to remove the spilled oil from sea water. The project is important for increase the purity of a sea water .The waste oil can be recycled for other purposes like greasing, lubricating. Etc. And due to robotic nature of this project it is more important for removing spilled oil along larger distance.

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