

Design & Fabrication of Disc Type Oil Skimmer

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Abstract- Recently in Mumbai, there occurred 2 cases of sever oil spill near sea shore affecting most of the aquatic life of the area. Also fishing and tourism were affected by this spillage. The environmental effects of such oil spills are not negligible as this is a global problem now days. Every year, there is 100 million US gallons of oil spill. This is equal to 100 large size gymnasium halls. The numbers though could not tell the actual harm caused to the environment by such oil spill as it is in numerous. So there is need of an effective way to clean this oil from the surface without actually wasting it. Now, in industries, to separate oil from other things like coolant and water, we use oil skimmers. There are various methods for this, of which disk type oil skimmer is one of the majorly used. This is because of its simple working and very high efficiency of around 90-95%.

Keywords- Oil Skimmers, Crude Oil, Oil Pollution, Spills, Disk and Belt skimmer

I. INTRODUCTION

Today world required speed in each and every field. Hence rapidness and quick working is most important. Now days for achieving rapidness, various machines and the equipments are being manufactured. In such a modern era of liberalization, small-scale industries are contributing in a big way to the growth of our country.

The engineer is constantly confronted with the challenges of bringing ideas and design into reality. New machines and techniques are being developed continuously to manufacture various products at cheaper rates and high quality. Taking into account the above contribution we have tried to manufacture such equipment, which is the accessory of machine tool to have the treatment to the cutting fluid after having used as a coolant. Because the coolant after having continuous use, gets mixed up with the lubricating oil and its property gets changed. Hence it becomes necessary to separate the oil from the mixture of the oil and the coolant.

Oil pollution occurs in harbor basins when leaks from shore facilities for the supply of diesel fuel to fishing vessels find their way into the harbor water; when vessels pump out oily bilge water in port; when used engine oil is dumped overboard and when an accident results in leakage of fuel oil.

A fishery harbor which is contiguous with the main harbor also faces the risk of major oil spills if the main port is a transfer point for crude oil or refined products from oil tankers.

To mitigate oil pollution, the fishery harbor manager should take necessary action to:

- Provide shore-based reception facilities for oily wastes (bilge water and spent oil) from vessels and
- Minimize leaks while bunkering.

In addition, he should be prepared to assist those responsible for containment and clean-up operations if a major oil spill occurs in the vicinity. Appropriate oil recovery tools like skimmers will prove useful in removing spilt oil from the harbor basin.

1. What is oil skimmer?

The oil skimming is the operation of removing or separating the oil from the oil polluted coolant. The oil and the coolant in the mixed form is collected in the containers. And one of the following classified methods are adopted to separate the oil from the coolant.

By separating the oil from the coolant by violently pouring the upper layer of mixture in the another container

- By soaking the oil layer using oil-soaking element.
- By skimming oil using flat belt arrangement

The first two methods are not accurate also these are time consuming and it requires sort of skill for its execution. The later one is simple and the oil can be separated without any fatigue and the process is accurate.

Oil being the lighter element as compared to coolant mixed with the water, it floats over the coolant. The endless belt running over the roller is adjusted such that the belt will violently smash the layer of the mixture coolant. The oil being the lighter and sticky will stuck to the belt. The belt then is rubbed against the resting scoop or the container where the oil is collected after separation.



Figure 1.

II. 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 tons 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 tons 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 tons 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.

Limitations:-In the occurrence of an accident and whenever sea water is reaches to its deposit, tanks, double bottoms or boxes containing pollutant liquids, their content must be transferred to the other intact containers, when possible. The spreading and also fragmentation of a slick limit the amount of oil available to be recovered within a given timeframe, termed the encounter rate.

III. CONSTRUCTION DIAGRAM & DESCRIPTION

A. List of Components:

- Dc gear motor
- Chain drive for power transmission
- Battery to store and supply power to motor
- Shaft on which oil skimmer Disc and belt is mounted
- Oil Skimming Disc and Belt
- Bearing
- Floating tube

B. Selection of Material:

The main objective in the fabrication of machine is the proper selection of material for the different part of a machine. Design engineer must have to be familiar with the effect of the manufacturing process and heat treatment have on the properties of material. The choice of material for engineering purposes depends upon the following factors:

- 1) Availability of the material.
- 2) Suitability of materials for the working condition in service.
- 3) The cost of materials.
- 4) Physical and chemical properties of materials.
- 5) Mechanical property of material.

The mechanical properties of the metals are associated with the ability of material to oppose mechanical forces and load.

- 1) Strength: It may be defined as the capacity of material to withstand load.
- 2) Stress: The internal resistance set up per unit cross-sectional area is called as stress.
- 3) Stiffness: The ability of a material to resist elastic deformation is called stiffness.
- 4) Elasticity: It is the property of a material by virtue of which it regains its original size shape after deformation the load causing deformation are removed.
- 5) Plasticity: Lack of elasticity is called plasticity.
- 6) Ductility: It is the property of material to undergo a considerable deformation under tension before rupture.

- 7) Brittleness: It is the property of fracturing a material without warning or without appreciable deformation.
- 8) Hardness: The ability of material to resist wear, abrasion, scratching or indentation by harder bodies is called hardness. The hardness of metal may be determined by the following test.

- 1) Brinell hardness test.
- 2) Rockwell hardness test.
- 3) Vickers hardness test and
- 4) Share scaleroscope

For a design engineer not only knowledge of material but also their properties is of great significance. Design engineer should use such a material for making of machine elements which has properties suitable for the conditions of operations. In addition to this he must be familiar with the manufacturing processes as well as the heat treatments have in the properties of the materials. Characteristics or mechanical properties mostly used in mechanical engineering practice are commonly analyzed from standard tensile tests. In engineering practice, the machine parts are subjected to various forces, which may be due to either one or more of the following:

- 1) Energy transmitted.
- 2) Weight resistance.
- 3) Change of temperature.

The selection of materials depends upon the various types of stresses which are set up during operation.

C. Material used:

1. Mild Steel:

Reasons:

1. Mild steel is readily available in market
2. It is economical to use

D. Properties Of Mild Steel:

M. S. has a carbon content from 0.15% to 0.30%. They can be only hardened because they are easily weldable. They are like wrought iron in properties. Ultimate tensile as well as compressive strength of these steel increases with increasing carbon content. They can be easily gas welded are electric or arc welded. Weld ability decreases with increase in carbon percentage. Mild steel serve the reason and therefore it was selected because of the above reason.

E. Bright Material:

It is a machine dawning. The mild steel plates and bars are forged in forging machine by means is not forged is the main basic difference between mild steel and bright metal. But the material are drawn from the dies in the plastic state. That's why the material has good surface finish than mild steel and has no carbon deposits on its surface.

IV. WORKING

Rotating Disc and Belt to attract oil which is dumped into collecting tank Entire assembly is on floating disk and belt with skimmer partially dipped in water for more contact . Solar panels charge the battery and runs the motor and make itself sustaining model . The rubber scraper is attached with disc and belt and collect oil in storage container

V. ADVANTAGES

There are many important positive points of this system as explained below:

- No external power is needed of skimming when used with solar power
- It reduced oil pollution of sea

VI. CONCLUSION

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 tons 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 which is one of the method of regaining the oil which is spilled. After designing our project and testing it we have concluded that we can regain about more than 90% by using oil skimmer. 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.

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