

## DESIGN OF DISC TYPE OIL SEPERATOR

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**Abstract**— This paper deals with the separation of oil and water to find out the better solution for oil recovery from the water surface misture Empress oil spill to produce oil free water. Also a deal with the fabrication of mechanical equipment to separate oil from the water. Oil and water separator is mechanical equipment, which is used in the environment pollution control from oil spillage. Oil separator helps in removing the oily from the mixing surface leaked water. By removing the oil from industry misture water, it becomes free of oil pollution. This is mainly due to acrylic material used in the oil separator. This oil separator can be used in the effluent treatment plant. This paper consists of construction, fabrication details, assembly, working and applications of oil and water separator. There is the different method to remove the oil form the water but disc type oil skimmer is mostly used.

**Keywords**— Disc , Floating Tube , Solar Panel, belt drive  
**INTRODUCTION**

Today world required speed in each field. Hence rapidness and quick working is most important. Now days for achieving rapidness, various machines and the equipment 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.

Solar based, disc type oil spill recovery system is derived from the same mechanism. The concept of using this disc type oil recovery system to tackle the crisis of oil spill is a very efficient and effective possibility. It has numerous advantages over chemical or sponge suction techniques which are used now days for cleaning the oil from water surface. Using solar energy to drive the system makes it very effective, economical and environ friendly. This practically allows us to cross the boundaries of limited service area and to reach the long distances for cleaning and recovery.

Also, the system can be fully automated which can guide itself or can be guided by remote control. Means, a single person can operate and control 100s of such system at a time. This saves lots of human efforts and hence reducing the cost of operation. The simple disc skimmer mechanism is hence could be converted in to such an effective weapon against the global crisis of the oil spill. The following paper explains the need, brief background knowledge needed for the

understanding of the concept, and the modifications in the concept.

### I. LITERATURE REVIEW

A number of publication were found in the literature survey it is express for the improvement in the industry. Therefore some information was found on the cost and benefit to the companies.

**Mr. Dhondeet. al SEA OIL SEPARATOR WITH DISC AND BELT SKIMMER**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 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. [1]

**SURAJ NAIR et. Al DESIGN& FABRICATION OF DISC TYPE OIL SKIMMER**, In the paper the disc of the material is used as a Mild Steel. The mild steel is hardened and it is easily weldable with the help of arc welding. The ultimate tensile strength as well as the compressive strength is increase with increasing the carbon content. [2]

**SUMON KHANDAKAR et.al CONSTRUCTION OF AN ECONOMIC BLANKET BELT OIL SKIMMER**The conventional spilled oil removal process is manual. So these are harmful to the human health as well as time consuming. After being concerned with the related problem with the spilled oil and the costly belt oil skimmer, a single Blanket belt economic oil skimmer construction project has performed. The replacement of the conventional belt with blanket belt radically lowers the maintenance cost and easy availability. The design and construction of the project is simple thus easy to moderate it for the several conditions as required. According to the volume of the spilled oil, the width and the

number of the belt can be re-designed easily to get more absorption. So blanket-belt oil skimmer is economic and feasible for implication.[3]

### MOHAMED AHMED MAHMOUD HYDRODYNAMIC SEPERATOR UNIT FOR REMOVAL AND RECOVERY OIL FROM WASTEWATER

The amount of oil recovered increases with decreasing the percent of water in feed flow rate. The amount of oil recovered increases with increasing the percent of oil in feed flow rate. The presence of the air circulation within the oil spill (hydrodynamic forces) enhances significantly the separation rate of oil. The amount of separated oil increases in seawater than fresh water. [4]

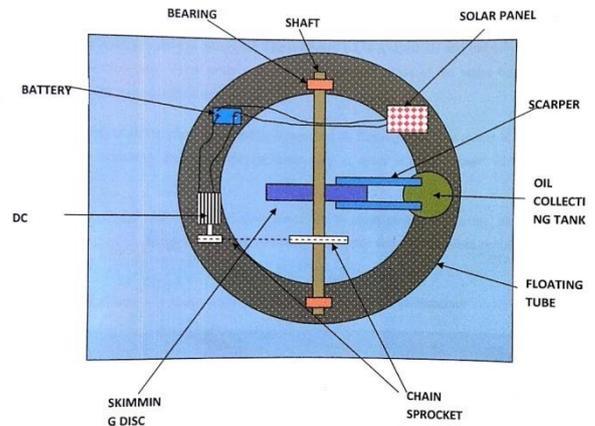
**Zhang Yindong et. Al. THE IMPROVEMENT OF OIL-WATER SEPARATION TECHNOLOGY IN OIL SPILL MECHANICAL RECOVERY 2014** The new methods of negative pressure suction and curved surface diversion are presented to improve oil-water separation in oil spill mechanical recovery. With the negative pressure suction, the oil-water mixture recovered by skimmer is inhaled into separator smoothly and bigger oil droplet is obtained. With curved surface diversion, the oil droplets in the separator obtain a base upward velocity in the flow field and rapid separation is achieved. The kinetic analysis of oil-water separation process is carried out, and according to the simulation analysis of separation process with the new methods, it can be found that the separation effect of smaller oil droplet is improved significantly and the density and viscosity of oil droplet have small influence on the separation speed. [5]

## II. CONSTRUCTION DIAGRAM & DESCRIPTION

### A. COMPONENTS

- a) **DC Gear Motor** :A DC motor is a any class of rotary electrical machine that converts direct current electrical energy into mechanical energy. The most common types rely on forces produced by magnetic fields.
- b) **Chain Drive** : Chain drive is a way of transmitting mechanical power from one place to another place. It is often to use convey power to the wheels of the vehicle, particularly bicycle and motor cycle.
- c) **Shaft** : On the shaft the wheel and the disc is mounted on the horizontal shaft.
- d) **Bearing** :Bearing is an mechanical component that separates the moving part and takes the load.
- e) **Oil Skimming Disc** :Oil skimming disc is having an material available on market is Mild Steel, PVC disc and Acrylic Disc.
- f) **Floating Tube** : It is an rubber tube. Its floating on the water surface.

- g) **Scrapper** :A tool or device used for scrapping especially for removing the dirt, paint or other unwanted matter from the surface.
- h) **Solar panel** : Solar panel refers to a panel designed to absorb the sun's rays as a source of energy for generating electricity or heating.



In this project the main component is the Oil Skimming disc. The diameter of the disc is 400mm and the thickness of the disc is 10mm. This disc is mounted on the shaft the shaft one end is connected to the DC motor 12V. The power supply for the motor is 12 V battery. The solar panel is provided to charge the battery. The frame is mounted on the floating tube the diameter of the floating tube is 900mm.

The scrapper is provided in front of the disc to remove the oil from the disc and the oil is collected to the collecting tank.

### B. SELECTION OF MATERIAL

The main objective for fabrication of the selection of the material for different component of the machine.

Selection of the material is depend on the following factor :

1. Easily available in market
2. Material properties
3. Cost of the materials
4. Mechanical properties of the material

Material of the rotating disc is acrylic because it is having a lighter in weight.

Mechanical properties of the material are oppose the mechanical forces and load.

1. **Stress** : The bending stress act on the shaft. The disc is mounted at the middle of the shaft. The maximum bending act at the middle.
2. **Strength** : The strength of the disc is good. And for sustain the bending stress the bending strength of shaft is should be more.

### C. MATERIAL USED :

#### Acrylic :

We use this material for the rotating disc because of the weight of the material is less respect to our dimension. And also it is easily available in the market.

### **Mild Steel :**

The earlier paper mild steel disc is used. But the weight of the disc is more. And the efficiency of the oil removal is less.

### **Frame :**

The material used for the frame is aluminum because the material is easily available in market and the lighter in weight.

5. Zhang Yindong, Zhang Xingming Li Wenhua The Improvement Of Oil-Water Separation Technology In Oil Spill Mechanical Recovery 2014 Research Gate

### **D. COMPOSITION OF ACRYLIC PLATE:**

Polymethyl acrylate is an acrylic resin used in an emulsified form for lacquer, textile finishes, adhesives and, when mixed with clay, to gloss paper. Another acrylic resin is Polymethyl methacrylate, which is used to make hard plastics with various light transmitting properties. Acrylic plastic refers to a family of synthetic, or man-made, plastic materials containing one or more derivatives of acrylic acid. The most common acrylic plastic is polymethyl methacrylate (PMMA)

### **III. WORKING**

The rotating disc is mounted on the shaft and the shaft one end is connected to the DC motor the motor having 45 RPM. Rotating Disc is partially dipped in the oil and water mixture. Due the adhesion property oil get stick to the disc and it get removed by the scrapper. The scrapper end collect the oil in the collecting tank.

The solar panel is to charge the battery. It is give the power to the DC motor.

### **IV. DISCUSSION**

As we have studied in the previous disc type oil skimmer there is an use the disc material is mild steel. But after using the mild steel the weight of the disc is quite high. In our project the material for the disc is Acrylic. The weight of the material is lighter than the mild steel.

### **V - FUTURE SCOPE**

As the designed of the disc type oil separator the multiple disc are attached at the shaft. It is used over the large area of oil recovery like the tunnels, small river, etc.

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