

Sea Oil Separator

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Abstract: *This paper provides a way to extricate water from its immiscible mixture with oil which is present at the bilge, the lower compartment of a ship while retaining oil and directing it to a waste-oil tank for purification and hence reuse. In this project, we propose to separate oil and water by electronic means, by use of a microcontroller that is interfaced with an oil sensor and relays. The water obtained after separation will be free of oil and other pollutants and can be pumped out into the sea without causing any harm to the marine ecosystems. The advantages that the proposed method offers over traditional ones along with an overview of the systems currently being used for this task along are also enlisted. This project will be in conformation with International Standards such as MARPOL (Marine Pollution) and MEPC (Marine Environment Protection Committee) which forbid the ships from directly pumping out the water (containing oil) from the bilge of the ship because of its insalubrious effects on the marine life of the ocean..*

Keywords: Bilge, Electronic method, Marine ecosystems, Oil-sensors, Oil-water separators

I. INTRODUCTION

These are used to separate oil from water before the cleaned water can be discharged. Bilge water that has not been going through an oily water separator is a bad pollutant to the marine environment and may therefore never be discharged overboard [4]. When cleaning the engine room, oily water is produced. Oily water is also generated from separators and condensate from A/C units. Depending on the design and function of the ship, bilge water may also contain traces of detergents, solvents, chemicals and particles. Oil in water occurs typically in marine bilge systems and waste water from industrial processes. The discharge of oil in water is generally undesirable because it harms the environment, so regulations on contamination levels are increasingly strict [5]. In many industrial processes, detergents and high- pressure washing causes oil to mix with water. In marine bilge systems, oil is mixed with water and other materials in the bilge water tank. In the light of such occurrences, International Maritime Organization has made it mandatory for vessels to reduce the amount of oil in the bilge water of the ship to less than 15ppm, before releasing the latter into the ocean

II. SEQUENCE OF OPERATION

Basic Components of Automatic Water Pump

1. DC motor
2. Battery capacity unit
3. Solar Panel
4. Arduino Nano
5. Bluetooth receiver.
6. Fabricated body frame
7. Floating Tubes
8. Rotating Disk

III. LITERATURE REVIEW

After studying some literature about design, construction, and working of oil skimmers. Many parameters have been considered for the design, construction and working of oil skimmer such as oil recovery rate, rotor speed, material selection for a disc, shaft speed, depth of immersion.

1. We study literature By Satyam Kholgadge and Sagar Mhaskar (Design and Fabrication of Oil Skimmer with Electrolysis) in which, the skimmer utilizes a unique high efficiency belt which is driven by motor. As of chemical separation, which



aims at serving the humanity toward planet, having an ability to perform electrolysis by using carbon rods to the waste water. This generation of ions is followed by electrophoretic concentration of particles around the anode. The hydrogen gas released from the cathode interacts with the particles causing flocculation, allowing the unwanted material to rise and be removed. In the present study, we could confirm that the electrolysis process produces satisfactory results for treatment of oily wastewater, allowing its discharge into water bodies or reinjection in oil Formations. Belt type Oil Skimmer is easy, effective, economic and environmentally friendly system to tackle the global crisis of the oil spill. It can effectively clean the water surface recovering most of the oil back in usable form. The hazardous effects of oil spill and industrial waste water are thus effectively reduced and lots of human efforts are eliminated. It is judged that there would be 40% reduction in Natural Gas consumption with this hybrid system. A positive implication for an environment, working conditions and safety precautions is the additive advantage.

2. FABRICATION SOLAR OF POWERED OIL SKIMMER

ROBOT) By Nirmal Joshua Mathews, Tsebin K Varghese, Prince Zachariah, Ninos Aji Chirathalattu in which the driving mechanism is based on solar energy so problems related to its fueling can be completely omitted and is a renewable source. Use of Nano fiber belts could improve the efficiency of system. This paper has proposed the autonomous distributed system/robotic swarms as a novel concept for efficient oil spill confrontation. Instead of using a single robot, if a large no of oil skimmers are fabricated then it will have high autonomy that recover oil mechanically and are able to collect and share information with each other. The multi-unit/co-operative behavior approach provides a more environmentally friendly, efficient, versatile and fault-tolerant means for oil spill elimination. This artificial intelligence concept is generic for marine pollution elimination; for example, its application could be easily extended for port refuse collection. The swarm recovery has been integrated in a mathematical description of the dynamics of spreading and weathering of an oil spill. Simulations of this model signify the increased efficiency and the potential of the concept.

3. (Experimental Analysis of Rotating Disc Type Oil Skimmer) By Kuldip D. Chavda, Nirav Tailor, Anker A. Misty in which if the higher rotation speed being applied, the quality of recovered oil will mostly consist with water. By comparing the above two different charts we can conclude that the making the swirl motion in fluid will helps to more amount of oil will come in contact with the disc so that gradually increase in Oil recovery rate was found for various speed.

In which a systematic pro-gram of measurements has been established how the recovery rate of the skimmer system is influenced by both the characteristics of the oil film and the geometrical detail of the discs. Large improvement in recovery rate for the modify T-disk section was achieved. The main concept behind this is to anyhow to make the fluid to come in motion so that fluid at far from the disk is easily get towards the disk and oil recovery rate will be going to be affected. Such kind of action is already employed in a belt type oil skimmer as. We didn't find any data regarding such system use for the disk type oil skimmer. So, the Experimental method is developed in this research, which shows the experimental setup and the procedure to do the analysis on such kind of system.

4. (Floating Oil Skimmer with Garbage Collector) In this paper we have implemented oil skimmer system which separates oil from the water. The main causes of oil spills are carelessness of transporting authority and changing weather conditions like storm will results spilling of large tons of oil in water. This spilled oil is waste oil it destroys the coastal life around it. Oil spillage results in loss of lives and money. So, the recovery of spilled oil is very necessary. So, we have implemented oil skimmer system which can be operated using Bluetooth. The system is designed and tested and it shows that it can regain most of the oil from the water. Oil is the precious crude and it is being used in many day-to-day applications of human life. Most of the oils are toxic and are dangerous when there is direct contact with them. Many countries have made stringent safety norms for wastewater disposal contained with oils mainly typically from petrochemical and process industries so that such industries are equipped with such kind of oil skimmers to separate the oils from disposal water. The continuous removal of oil from process fluid reduces the machine.

IV. CONSTRUCTION

Oil skimmer system consists of Solar panel, DC battery, Bluetooth, three dc motors, Arduino board two propellers and the skimmer assembly. Solar panels charge the battery and supply power to the Arduino and runs the DC motors. Bluetooth is connected to the Arduino board. We can move and control oil skimmer assembly in water through Bluetooth.



Fig 1: Construction of Sea Oil Separator

Two dc motors are connected to two propellers. When propeller rotate in clockwise direction oil skimmer moves in right direction. When propeller moves in anticlockwise direction oil skimmer moves in left direction. Rotation of the propeller is controlled by dc motors. Third dc motor is connected to rod of the skimmer disc. Rotating Disc of Acrylic material attracts oil which is dumped into collecting tank. Skimmer is partially dipped in water for more contact. Disc is floating and rubber scraper is attached to the disc it collects oil in storage container.

V. MAIN ASSEMBLY

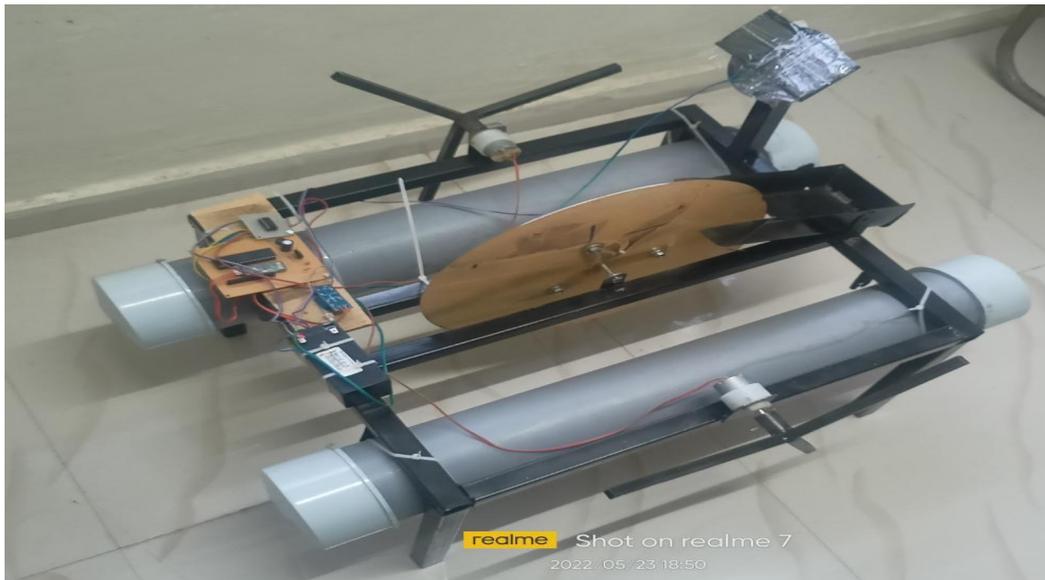


Fig 2: Actual Model

VI. RESULT AND ANALYSIS

Oil sensor testing result.

In water- 20-24mV. That is, when the water was passed through the oil sensor the output voltage was very less, in few mV. In Oil- 500-660mV. That is, when oil was passed through the sensor, the output voltage increased to hundreds of mV. So, when water passes through the sensor then the output voltage is low whereas when oil passes the output voltage is high, thus a threshold value was set to separate the oil from water.



Temperature sensor result. When the temperature sensor senses the temperature then it will display the reading on the output LCD screen at the receiver end.

Transmitter and Receiver. The transmitter effectively transmits the sensor output to the receiver which in turn displays all the results on the LCD screen. The coast guard can continuously monitor the operations at his control room without wasting his time to go and inspect the actual site.

Output accuracy. Be it dim light or full illumination, the sensor works accurately in all conditions and thus provides good separation between the oil and water. The water separated from the mixture is tested and the oil contents are found to be less than 15ppm, which is absolutely harmless for the marine ecosystems. The oil can be safely reused for lubrication purpose in the engine. Thus, the system provides an accurate and efficient way of separating oil and water and the by-products can be reused without causing any adverse effects on the system or the environment

Observation Table:

| Sr No. | Belt Speed (RPM) | Oil Spilled (ml) | CollectionOf spilledOil (ml) | Time (Min) | RecoveryRate (ml / min) | Average recoveryrate |
|--------|------------------|------------------|------------------------------|------------|-------------------------|----------------------|
| 1. | 30 | 400 | 380 | 3.06 | 124.18 | 123.41 |
| 2. | 30 | 500 | 485 | 4.10 | 118.29 | |
| 3. | 30 | 600 | 575 | 4.50 | 127.77 | |

VII. CONCLUSION

| RECOVERY RATE | RPM | OIL FILM THICKNESS |
|---------------|-----|--------------------|
| 565ml/min | 30 | 1mm |

Volume rate of oil recover per turn when shaft is rotating at 30 rpm.

Here we assume 1mm. thickness of oil film

Volume rate = Thickness of film × Width of disc × circumferential area of shaft × speed rotation of shaft

V= t × w × π × d × N

V=0.0010×0.3×π×0.02×30

=565.2ml/min

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