

Design and Research of a Small Surface Oil Remover

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Abstract

Marine oil pollution, Marine crude oil or heavy oil leakage accidents occur frequently, resulting in Marine pollution, harm to Marine life, has become a major concern of the world. Oil spills into the sea quickly spread across the surface and isolate the water from the oxygen exchange in the air. Under the action of wind and waves, part of the oil can also form oil water with water. One litre of such oil and water would require 400, 000 litres of oxygen to fully oxidize, and many Marine life would die from the oxygen being looted from the water. The surface oil pollution treatment machine has the advantages of low cost, simple manufacture, convenient operation and good treatment effect for small sea oil pollution. Keywords: design; rehabilitation assistance; convenient application.

Keywords

Oil and Water Stool; Good Effect; Surface Oil Remover.

1. Introduction

Environmental protection industry is indispensable. With the rapid development of technology and economy, many people do not pay attention to this aspect of environmental protection. Now many countries in the world are actively developing the environmental protection industry. Countries are investing more and more energy and funds, and it is believed that environmental protection will be the first prerequisite for human development in the future.

At present, there is little research on small-scale oil pollution treatment machines in China, and even fewer of them are put into production and use. From the perspective of the current development of the whole industry, the overall market awareness and application of small-scale oil pollution treatment machines are basically absent. Although some large-scale oil pollution treatment machines are used, the current effect of oil pollution treatment in small sea areas is not very good.

This equipment is mainly used in ports, seaside lakes or individual businesses, and it is extremely troublesome to deal with oil spill on water surface. Our research and development not only saves expenses, but also meets the needs of the corresponding people.

2. Design Background and Significance

Oil pollution is the pollution caused by inadvertently leaking crude oil into the ocean during shipping. Every year, there are as many as 2 million tons of oil pollutants leaked into the ocean due to shipping in the world, of which about one third is caused by oil tanker accidents. When oil flows into the ocean, usually 1 liter of oil is completely oxidized to harmless level, which requires about 4×10^5 liters of seawater. The oil spill has a destructive effect on the photosynthesis, respiration and reproduction of marine plankton, fish and other marine organisms, making fish, shrimp, shellfish and seaweed stale and inedible.

No one knows how much oil has been dumped into the world waters due to accidental leakage or abandonment of ballast in an emergency. Washing empty oil drums with seawater after oil

transportation often causes pollution; In addition, a considerable amount of residual oil is pumped into the sea.

If left unattended, oil pollution will gradually spread and decompose into harmless substances, but it will seriously harm marine life before decomposition. Spraying chemical dispersing agent on oil stain can accelerate the decomposition of oil stain, but this method may cause adverse consequences. Chemical cleaning agents will destroy the natural grease on bird feathers, and seabirds can float on the water. This practice is bound to do harm to seabirds.

If there is an oil spill in the harbor, seashore or lake, the large oil suction machine will not be able to drive to absorb oil or it will not be handled cleanly, thus the demand for small-sized marine oil removal machine is reflected.

3. Design Composition and Working Principle of Oil Remover

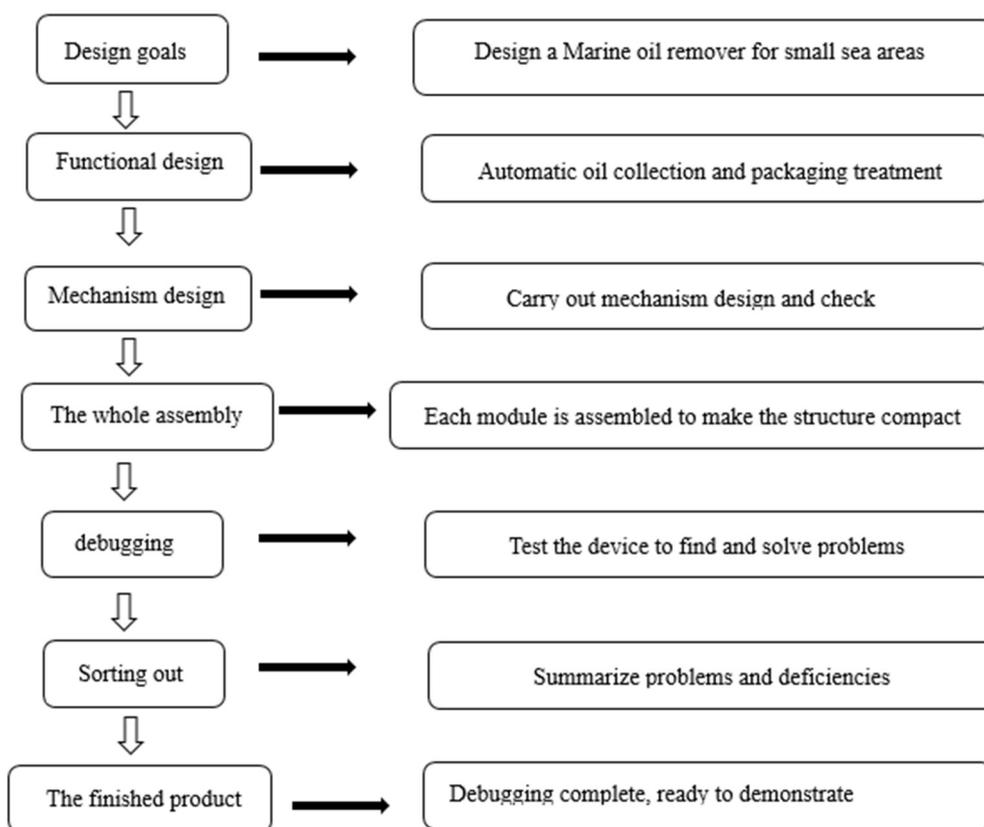


Fig. 1 design composition and working principle of Degreaser

The sea surface oil remover adopts solar energy, and three propellers are used as power devices, and the three propellers can change the driving direction at will through cooperation. The oil layer on the sea surface is absorbed by the oil absorption device: the roller plus oil absorption cotton, and stored in the collection device, and the stored oil stain is sealed by the packaging device and the machine is removed. From absorption to recovery, the oil pollution on the sea surface is effectively treated.

The control system of the sea surface oil remover is STM32F103C8T6 control board, and the Bluetooth module enables the mobile phone and other terminal devices to communicate synchronously with the serial port Bluetooth of the MCU. Bluetooth module is built in the oil remover. Through this function, when necessary, the Bluetooth program of the mobile phone will automatically send a start signal to the Bluetooth module of the oil remover. After receiving the start signal, People can freely control the moving path and direction of the oil remover by

starting the propeller, and the oil remover can pass through the oily water surface and collect the oil stains.

When the oil remover moves forward, the oil-water mixture enters from the water inlet in front of the oil remover, and the roller and oil absorbent cotton can effectively separate the oil stains. Scraper collects the oil stains absorbed into the oil storage box, at the same time, there is a bag in the oil storage box. When the oil stains accumulate to a certain position, the infrared sensor will find that the electromagnetic valve is opened and the collection bag starts to be filled with oil. The separated clean water will be discharged from the rear water outlet of the oil remover.

In order to design a machine that can automatically suck and collect oil, as the main structure of the sea surface remover, it can be enlarged according to the actual production needs to meet the needs of actual life production. The box body material is made of low-cost and light aluminum alloy, which meets the use requirements in strength and light in texture.

The main body of this work can realize the effective collection of oil stains, automatic packaging and sealing, and two functions. The interior of the box is mainly composed of three mechanical modules: oil absorption, oil storage and oil packaging. At the same time, as an intelligent product, we can automatically plan the route and complete the above operations.

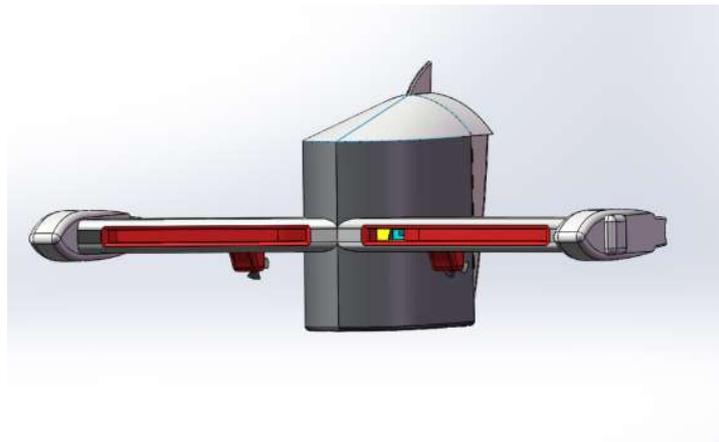


Fig. 2 Overall effect

Can automatically complete the functions of oil absorption, oil storage and packaging. The specific working principle is as follows:

(1) Power plant with changeable direction

In order to better drive on the sea surface, the propeller behind the machine is matched with the propellers on both sides, and the main control room is connected with Bluetooth module by motor. The power device is propeller, which can be easily controlled to drive in any direction, and the energy source is solar panels to absorb solar energy.

(2) Oil pollution collection device

Wrapped with oil-absorbing cotton on the roller and linked with the motor by a belt, the oil stains on the driving path are adsorbed on the roller.

(3) Collection device

Collect the oil stains on the scraper oil-absorbing cotton into the oil storage box, and at the same time, the electromagnetic valve and the liquid level sensor in the oil storage box, when the oil stains accumulate to a certain position, the infrared sensor will find and open the electromagnetic valve, and the oil stains will flow into the packaging device.

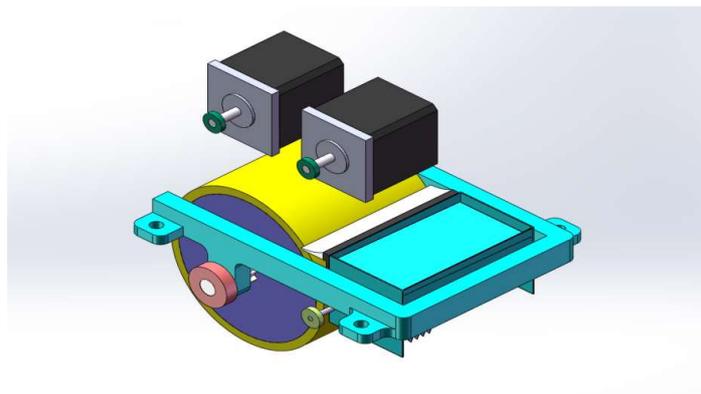


Fig. 3 Internal structure

(4) Packaging device

The oil stains flowing down through the electromagnetic valve and the liquid level sensor will enter the garbage bag which has been moved to the designated position by the screw rod in advance. After two minutes, the electromagnetic valve will be closed, the garbage bag which has been fully loaded will continue to move forward by the screw rod, and the sealing sheet of the garbage bag which has moved to a certain position will be pushed against the box wall and automatically pushed into the collecting head to form a seal. The garbage bag moving forward together with the collecting head will move outside the machine and stay on the water surface. The next collecting head will move under the electromagnetic valve and stop for two minutes, and the electromagnetic valve will open, so that the next cycle will be completed.

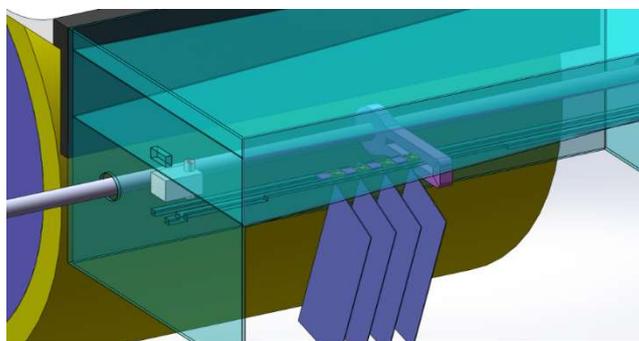


Fig. 4 Packaging device

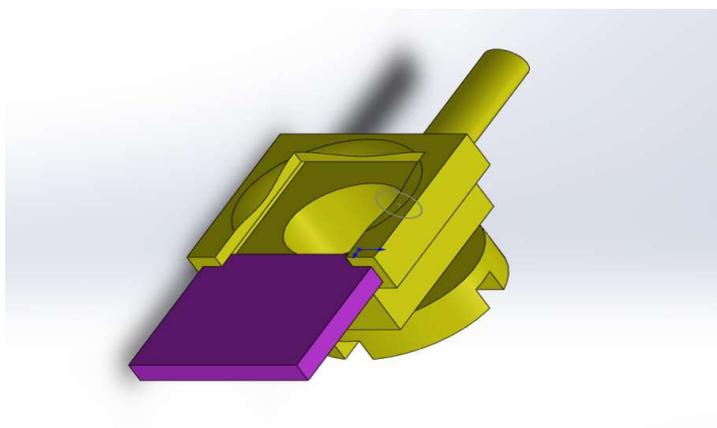


Fig. 5 Oil collecting head and sealing sheet

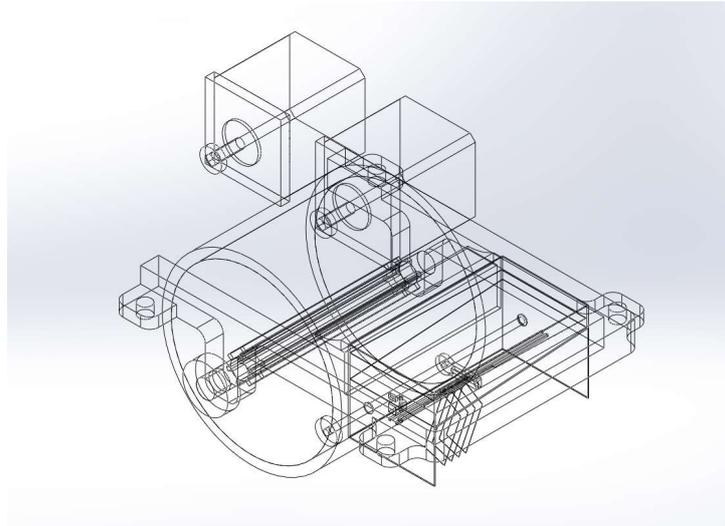


Fig. 6 Overall line drawing of offshore oil remover

4. Innovation and Application

Innovation:

- (1) The oil suction device adopts an easily detachable structure. When replacing and cleaning the oil suction device, it can be done by hand without tools, which is convenient for users to use and maintain.
- (2) Adopt unique oil storage and packaging methods, and avoid oil sticking and suspended matter blockage.
- (3) The equipment is small in size and light in weight, and people can move it, and move it wherever there is oil slick.

Work.

- (4) By issuing commands from the mobile phone, people can issue commands to the machine through the mobile phone to meet their own needs.

Application:

If there is oil spill on the seashore or lake surface of the port, the large oil suction machine will not be able to drive to absorb oil or will not be handled cleanly, thus the demand of small-scale oil remover on the sea surface will be reflected.

Acknowledgments

Fund project: This project is supported by the 2022 University of Science and Technology Liaoning University Student Innovation and Entrepreneurship Training Program Project Fund.

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