A Review on Development of Flat Belt Type Oil Skimmer

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Abstract:

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. So there is need of an effective way to clean this oil from the surface without actually wasting it. This paper represents the project work carried on development of flat belt type oil skimmer. We have developed a compact mechanism for collect oil from water with the help of belt in minimum period of time. Collected oil can be reused for many purposes. This oil skimmer is invented because of low cost, high compatibility, and use for rough. This set up uses the DC motor, polymer belt, pulley, supporting frame, polyurethane blade. We have made changes in the existing machine to make its application easier at reduced cost. Our main aim is reduce cost and control pollution control, attained through this Project work. 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 belt type oil skimmer is one of the majorly used.

Keywords: **oil skimmer**

I. INTRODUCTION

The basic objective of this project work is to develop oil skimmer. Oil is one of the most important energy draw material source for synthetic polymer and chemicals worldwide. As long as oil is explored, transported, stored and used their will ether risk of spillage .Oil pollution, particularly of sea and navigable water, has exited more public concerned than other water or spilt materials .Oil pollution of the sea has steadily increased with the increase in oil consumption. The bulk this in flux is due to transportation related activities spill from tanker loading and unloading operations, pipeline rupture which may be due to industrial waste as leakage from engines, incorrect operations of valves and discharge of oily wastages. Oil pollution of the shore in addition to the reduction of amenity, also affects marine, shore life and vegetation .Crude oil consists of different hydrocarbon that range from light gas to heavy solids. When oil is spilled on water, the physical and chemical properties of oil change progressively. Spilled oil has an undesirable taste and odour and causes severe environment damage on water fall, material life and affects tourism economy. The pollution increasing various sectors of the world.

II. LITERATURE REVIEW

A M Najar and et al [1] ; It is now common practice to use disc skimming systems to recover oil floating on the surface of water. However, the performance of these devices is dependent on a large number of parameters and is certainly not understood completely. This paper describes a fundamental study in which experimental techniques have been developed to enable the performance of model skimmers to be measured. This has enabled the importance of the various parameters to be examined in a more systematic and detailed way than ever before. Based upon an improved understanding of the flow behaviour inherent in the oil collection process, a number of enhanced disc skimming systems are discussed. Results are presented for these systems to show the capabilities of the new forms of disc skimmer when operated as oil recovery devices [1].

A H Hammoud et al [2] ; Oil spill recovery by means of a rotating drum skimmer was investigated experimentally for a wide range of design and operating conditions. The effect of drum diameter, drum length, rotating speed, oil _lm thickness, oil properties, and drum centre height above the oil/water interface surface were analyzed with respect to oil recovery rate of the drum skimmer. Crude, diesel, SAE 10W and SAE 140W oils were used during this investigation. It was found that oil recovery rate increases with increasing drum diameter, drum length, drum centre height above the oil/water interface, and oil slick thickness oil viscosity, and increases as oil density and surface tension decreases. The results revealed that the drum skimmer is an effective device for recovering spills

of low viscosity oil, such as light crude oil, which is the type of oil involved in most serious spills and pollutions of the sea. Furthermore, an empirical equation is proposed for predicting the oil recovery rate of the device. The equation can be applied to different oils, and gives good agreement with observed data [2].

Suraj Nair et al [3] ; 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 [3].

Tushar Pathare et al; Aim of this project is to remove the oily effluent from the waste water. Pollution has created lot of problems in industries. By removing the oil from waste water, it becomes free of oil pollutions. Oil skimmers are commonly found in three types: weir, oleophilic and non-oleophilic. Oleophilic skimmers are distinguished not by their operation but by the component used to collect the oil (rope, disk, belt or drum). It can remove even a thin floating film of oil from the water. This is mainly due to the "oleophilic material" used in the belt. 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. This can avoid water wastage and control pollution due to oil spillage. In current world scenario most of the oil from the industries goes wasted into ponds, rivers and sea. So, national and international environmental norms are getting strict day by day. It is economical to manufacture a low cost machine to meet these norms [4].

Suraj Burungale et al; 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. [5]

III. DESIGN OBJECTIVES

The basic design objectives of this project work for carrying the waste oil from the marine area to remote place where the waste oil is dropped.

[1] To simplify the complex driving mechanisms used in earlier projects and giving it simple and high working capability.
[2] To minimize the oil pollution from ocean.
[3] To separates the oil and water mixture from workshop, garage.
[4] To minimize the overall operation and production cycle time.
[5] To reduce labour cost.
[6] Another objective of the project was learning how to work the different parts of oil skimmer and achieve its optimum working.

IV. METHODOLOGY

Although designs vary, oil skimmers rely on specific gravity, surface tension and a moving medium to remove floating oil from a fluid's surface. Floating oil and grease cling to skimming media more readily than water, and water has little affinity for the media. This allows skimming media in the shape of a belt to pass through a fluid surface to pick up floating oil and grease with very little water. This oily material is subsequently removed from the media with wiper blades or pinch rollers. Oil skimmers are simple, dependable and effective tools for removing oil, grease and other hydrocarbons from water and coolants. Often, an oil skimmer by itself can achieve the desired level of water purity.

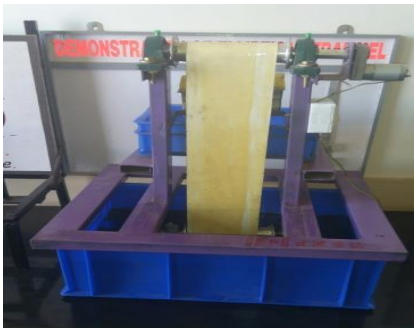

Figure 1: Oil Skimmer

V. COMPONENT FUNCTION AND SPECIFICATIONS

[1] DC Motor:

300RPM Centre Shaft Economy Series DC Motor is high quality low cost DC geared motor. It has steel gears and pinions to ensure longer life and better wear and tear properties. The gears are fixed on hardened steel spindles polished to a mirror finish. The output shaft rotates in a plastic bushing. The whole assembly is covered with a plastic ring. Gearbox is sealed and lubricated with lithium grease and require no maintenance.

Motor gives 300 RPM at 12V but motor runs smoothly from 4V to 12V and gives wide range of RPM, and torque. Tables below gives fairly good idea of the motor's performance in terms of RPM and no load current as a function of voltage and stall torque, stall current as a function of voltage.

Photograph: DC Motor

[2] Polymer Belt:

It is made up of polymer material. It is endless type which has width of 150 mm. The material is so selected to stick oil to belt. It is mounted on the aluminium pulley. Length of open belt is 1060 mm. It is immersed in liquid up to 100 mm. Belt material has good oil removal rate and it can withstand high temperature up to 180 F hence we have selected polyurethane belt. Tension to the belt is given by lower pulley with dead weight.

Photograph: Polymer Belt

[3] Pulley:

Its made up of cast iron. Its length is 150 mm. It is coated with aluminum coating. Pulley is fixed into the bearing .The motion of the pulley is very good because the torque of the pulley is safe. Main function of the pulley to hold and support the belt and give rotary motion to the belt .At the bottom dead weight is supported by the pulley.

Photograph: Pulley

[4] Supporting Frame:

It's made up of mild steel. Its length is 600mm and width is 450mm .Its supported to the pulley and belt assembles. And also motor is fixed on the frame. The frame is light weight so it's easy to transfer. It's main component in oil skimmer

Photograph: Supporting Frame

[5] Polyurethane Blade:

Its mounted on the assembly over oil receiver tank to remove oil from the belt. The length of the polyurethane blade is 150 mm. it is fitted with the help of clamp. When the oil is stick to the rotating belt then the sharp edge of polyurethane blade touches the belt. And oil is get removed with the help of sharp edge of blade.

Photograph: Polyurethane Blade

VI. PERFORMANCE SUMMARY

Advantages:

[1] Requires only a small area in the tank or sump
[2] Easy mounting
[3] High temperature capability
[4] Chip resistant powder finish
[5] Hazardous duty and food grade options

[6] Custom designs and turnkey systems available
[7] Fast cleaning with minimal maintenance
[8] Can be operated by unskilled person.
[9] It does not require high maintenance cost.

Limitations:

[1] It's not remove oil of low viscosity.
[2] Belt need to be change after some time.
[3] It's need an external power supply.

Applications:

[1] Wastewater Sumps
[2] Coolants and Cutting Fluids
[3] Heat Treating
[4] Parts Washers
[5] Food Processing Facilities
[6] Steel Mills/Scale Pits
[7] Parking Lots, Garages and Service Facilities
[8] Outdoor Ponds, Lakes, Basins, Etc.
[9] Recovery/Monitoring Wells

Future Scope:

[1] Speed of the belt cannot vary so it is to be improved by providing multispeed arrangement.
[2] Scrapper plate arrangement may be improved. Oil resisting belt can be fitted to improve life and strength of belt.
[3] Solar panel can be attached to run the DC motor.

VII. CONCLUSIONS

To conclude, we believe that the project was a successful one since we could meet most of the targeted requirements with pleasant team management. The terms stated at the beginning stage was accomplished with a rather simple design which maintain throughout the project. We hope that the experience learned from the project, including the planning in the designs and the skills in utilizing different tools could help develop our career path in the future.

The Development of oil skimmer was an important aspect of this study because a strong interaction between the different parts was needed. So we are satisfied with our project work. The basic objective of this project work is to removing oil, grease and other hydrocarbons from water and coolants. Oil skimmers are simple, dependable and effective tools.

Beside these, following objectives of project work are getting fulfilled;

[1] We successfully manufactured an oil skimmer.
[2] We simplified the complex driving mechanisms used in earlier projects and giving it simple and high working capability.
[4] We achieved process at cheaper side and eco friendly.

VIII. ACKNOWLEDGEMENTS

We take the opportunity to express our sincere thanks and gratitude to Hon. Principal, Prof. R S Narkhede and Management of MET's Institute of Technology, Nashik for providing the motivation and much support throughout our project work. We would like to gives our heartfelt thanks towards our Project guide and Head of Department-Mechanical Engineering, Prof. A P Vadnere, for his help, guidance and encouragement, during the Project. Also, we are heartily thankful to Prof P P Badgujar, Lecturer in Mechanical Engineering and the entire staff in the Mechanical Department. They supported us with technical guidance, advice and encouragement, they were always helpful and motivated and this inspired us in our work.

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