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DESIGN AND FABRICATION OF OIL SKIMMER

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Abstract -*During the recent decade, World has witnessed big oil spillage accidents into ocean and made huge impact to the environment. Apart this, sometimes Oil is getting spillage through being the results of chronic and careless habits in the use of oil industries and oil products. It is estimated that approximately 706 million gallons of waste oil enters the ocean every year; whereas more than half of that sourced from land drainage and waste disposal. Offshore drilling & production operations and spills or leaks from ships or tankers are typically contributing less than 8% of the total whereas routine maintenance of ships (nearly 20%), onshore air pollution & hydrocarbon particles (about 13%) and natural seepage from the sea floor (over 8%). This has caused ever lasting damage to aquatic life. To separate the mixed oil from the water, industries wide various type of oil skimmers are getting used. Herewith, the objective of this project is to design and conduct efficiency studies of belt type oil skimmer by using various materialed belts. The belts absorb the oil from water which can be scooped out and collect into a vessel by providing piping arrangements. The collected oil can be reused for many purposes.*

Key Words: Function of oil skimmer, Material of oil skimmer, Design of oil skimmer , Scrapper , Oil & Properties.

1. INTRODUCTION

Oil is one of the precious crude and being used in many routine application of human life. Since most of the oils are toxic so quite dangerous for alive when it comes to direct contact with them. During the years of recent decades, world has witnessed many oil spillage tragedies and subsequent damage to alive and environments. Many countries has made stringent safety norms for waste water 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 fluids; increases the life of the fluid; resulting of:

a) Reduce the machine fluid refilling cost.
b) Improves the disposal water quality.

2. METHODOLGY

Oil and grease always on the water surface. They do not mix with water. Separation of it is based on the surface tension, specific gravity and viscosity of them. The “oil and grease skimmer unit has special purpose belt, which is rotated by mechanical means such that it just touches the surface of water the oil and grease particle stick to the belt material ana travels with the belt up to scrapping arrangement where scrapping of oil and grease occurs and oil grease are collected.

This unit mainly consists of rectangular frame. In first stage of unit at the top surface of frame motor and gearbox of fitted. The ¼ H.P. induction motor is used having 40r.p.m. At the bottom of frame driven shaft is placed in the tightening arrangement. This arrangement is provided for the movement of the shaft as per the requirement.

One drum each is fitted on the two shaft with help of boss. On these drums main oil removing belt is placed. With the help of tightening arrangement the belt is sufficiently tightened so that it will not slip. And also it gives an advantages for the adjustment of unit as per the level of water flow. In same sense 2nd stage of unit is form and its upper shaft was with drum is driven by intermediate chain drive.

On one side of frame a scrapping arrangement is attached which removes the oil and grease from the surface of belt. The removed oil and grease is carried through the collector pipe to the barrel.

When the unit is switched on, motor starts, which is coupled to the gearbox. The motion of motor shaft is given to gearbox, which reduce the speed. This reduced speed is given to the driver shaft through sprocket. The upper shaft is rotated, because of these drum revolves at about at a because of these drum revolves and belt is revolves at about 15 to 16 rpm.

The belt is immersed on water oil and grease is sticked to the belt material. Which os carried with belt up to scrapping arrangement. Here scrapping of oil and grease occurs and oil and grease is collected in barrel through collector pipe. The belt after scrapping arrangement, here scrapping of oil and grease occurs and oil and grease is collected In barrel through collector pipe. The belt after scrapping again goes to the downward in water channel. This cycle is repeated continuously.

This unit mainly consists of rectangular frame. In first stage of unit at the top surface of frame motor and gear is fitted. The motor is used having 40r.p.m. which drive the shaft with the help of gear and chain arrangement. And on other side of shaft another gear and chain arrangement is provided which

are drive to the driven shaft. At the centre of shaft knurling is provided for gripping purpose so that belt move and transfer speed without slipping. For collection of mixture of fluid and water collecting tank is used , which are in rectangular shape and also it have considerable height due to this belt come in contact with the solution and remove mixture of fluid (some content of fluid)from water. This fluid is carries along with belt which has desired properties. With the help of scrapper which are located at 7 cm from bottom frame is used to remove carried oil from belt. And it is collected through pipe to reservoir

Linear Velocity of Belt

a)The individual linear velocities of the driver (motor shaft) and driven (bottom shaft).

For Driver: V1**=** ΠdN/60

For Driven: V2 = ΠdN/60

b)Velocity Ratio = V1/V2

Torque & Tension in Belt

Power is calculating through

2ΠNT/60

where, N = Motor Speed

T = Torque transmitted by Motor

Whereas, Force is calculated by,

*T=F*R*

Tension in the tight and slack sides to be calculated by,

T=(T1+T2)*R

T1/T2=e^(μθ)

Fig-1:Working Of Oil Skimmer

3. Analytical calculation

Let us assume,

T=Thickness of film on belt in mm.

W=Width of belt in m.

d=Diameter of shaft in m.

N=Speed of rotation of shaft in rpm

Volume rate of oil recover per turn when shaft is rotating at 40 rpm.

Here we assume 1mm. thickness of oil film

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

V=t×w×π×d×N

=0.001×0.05×π×0.02×40

=125.66 ml/min

4. CALCULATION

Table -1:

Recovery rate Ml/min	Belt speed RPM	Thickness Mm
125.66	40	1

Table -2:

Observation table

Oil type = Bun engine oil (Medium viscosity)

Sr. no.	Belt speed RPM	Oil spilled Ml	Collection of spilled oil	Time Min	Recovery rate ml/min	Average recovery rate
1.	40	400	380	3.06	124.18	123.41
2.	40	500	485	4.10	118.29	
3.	40	600	575	4.50	127.77	

4.Result & discussion

For high viscosity oil

- For 40 rpm speed of belt oil recovery rate = 96%
- For 40 rpm speed time taken to recover the oil from oil-water mixture = 4 min.

5. CONCLUSION

The trial taken shows that design satisfies its purpose. It is found tobe very convenient for skimming the oil for the operator. It removes about 70 to 80-lit oil per day. It is very much helpful to operators, as it avoids their tedious work of skimming the oil and grease from the wastage water.

It also helps in

a) Efficient & economical removing of oil
b) Comfort to the operator.
c) Controlling the water pollution.

6. REFERENCES

- PSG Design Data book
- V.B.Bhandari '' Design of M/C Element
  Mvgraw hill publication
- R.S. Kulkarni& J.K. Gupta ''M/C Design''
  Eurasia Publishing House
- V.D. Kodgire ''Material Science of Metallurgy