Aqua Lube Splitter

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Abstract — An Aqua Lube Splitter is a product used to separate oil and water mixtures into their separate components. There are many different types of oil-water separator. Each has different oil separation capability and are used in different industries. Oil water separators are designed and selected after consideration of oil separation performance parameters and life cycle cost considerations. "Oil" can be taken to mean crude oil, toxic chemicals and the many different hydrocarbons. This paper includes one of the solution for separating oil and water from oil water mixture during oil spill incidents. It also includes some calculations, design and a solution to cope up with these oil spill incidents.

Index Terms —Aqua Lube Splitter, crude oil, oil-water separator, oil spill incidents, gravity separation, density, costly.

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1. INTRODUCTION

The separation of oil−water mixtures has become an urgent problem to be solved in industrial production, so it is very important to design materials for effective separation of oil− water mixtures. The current methods for oil−water separation are complex, time-consuming, costly, and prone to secondary pollution.

In addition, there is no switchable wettability in these materials which limit their practical and commercial applications to some extent. Therefore, it is significant to design smart materials separation process is a method that converts a mixture or solution of chemical substances into two or more distinct product mixtures. At least one product mixture of the separation is enriched in one or more of the source density , or chemical affinity between the constituents of a mixture Processes are often classified according to the particular differences they use to achieve separation.

An Aqua Lube Splitter is a mechanism used for splitting water-oil mixture from sea water due to oil spills from bulk carrier ships.

2. WORKING

2.1 Methodology

Collect oil-water mixture from sea in first container oil

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Oil is collected in the second container

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Clean water is obtained in third container

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Thereby, with the help of gravity separation method being applied in all the containers, we get clean water in the third container

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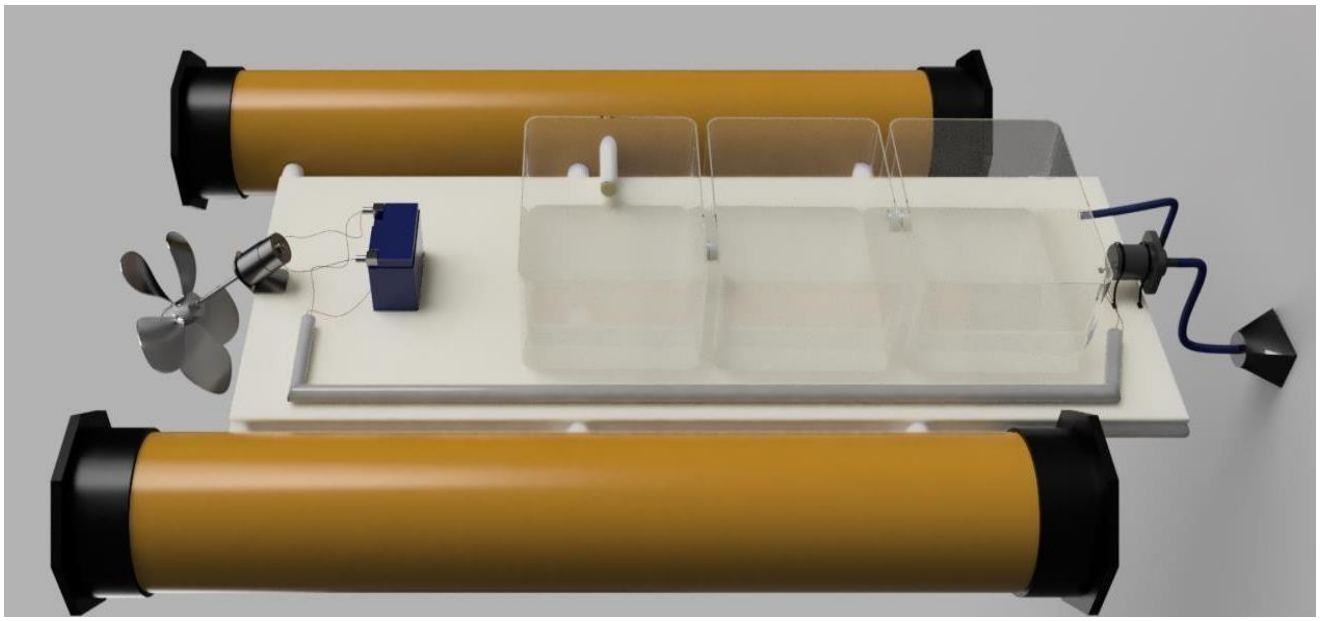
3. DESIGN



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A catamaran is a multi-hulled watercraft featuring two parallel hulls of equal size. It is a geometry-stabilized craft, deriving its stability from its wide beam, rather than from a ballasted keel as with a monohull boat. Catamarans typically have less hull volume, smaller displacement, and shallower draft (draught) than monohulls of comparable length. The two hulls combined also often have a smaller hydrodynamic resistance than comparable monohulls, requiring less propulsive power from either sails or motors. The catamaran's wider stance on the water can reduce both heeling and wave-induced motion, as compared with a monohull, and can give reduced wakes.

Cruising catamarans will typically be 25-30% faster than a cruising monohull of the same length. You basically get near racing monohull speeds, but with all the creature comforts that come with a catamarans are an entirely different deal, as they trend more toward the performance end of the spectrum, and can regularly double the sailing speed of monohulls on nearly any point of sail.

There are many aspects to safety where catamarans shine. Often overlooked is the safety margin introduced with level sailing. It is much easier to keep crew aboard in rough weather when the boat stays level and is pitching less.

3.1 Components:

1) uPVC pipe.
2) Side floaters.
3) uPVC T-joint.
4) uELBOW joint.
5) Polycarbonate plastic sheet.
6) Floaters cap.
7) 12V DC pump.
8) 12V Lithium ion battery.
9) 12V DC motor.
10) 3 plastic container.
11)Propeller

4. CALCULTIONS

Rs-775 dc 12v-24v high speed metal large torque small dc motor:

Specification:-

RPM = 6400 rpm

Current = 2.6A

Power = 16.15 W

Voltage =12V to 24V

1. Power = (To convert into HP)
= 16.15 ÷ 746
= 0.021 HP

2. Torque
P= (T) × (w) ÷ (5252)
T= (0.021) x (6400) ÷ (5252)
T= 0.0255 Nm

3. Ships / Boat Hall type = Multihull (Catamarans)
Crouch constant for catamarans = 230
C=230
Speed = √ (P/D) × c

Where, P is power,
D is displacement of boat in LBS, C is Crouch constant.

D = 9.5 kg = 9.5 X 2.2 = 20.9LBS
S = √ (0.021/20.9)×230
= 7.290 mph
= 7.290 x1.66
= 12.10 kmph
= 12.10/1.852 knots
= 6.53 knots
Speed of Boat is 6.53 knots

4. Propeller Calculation
T = π/4×D^2×p×v×ΔV
Where,
D = propeller dia (m)
V = velocity of water at propeller (m/s)
T = density of Water (kg/m³)
Density of water = 1000 kg/m3
T= π÷4 (0.18)² × (1000) × (1.666) × (6.95)
T = 293.58N

5. RESULT AND DISCUSSION

1. Aqua Lube Splitter has an efficiency of 10% for 30 micron and 90% for 150 micron oil particles.
2. Taking into consideration the capacity of each container to be 3 liters and the weight bearing capacity to be 25 kg, it takes 20 minutes for obtaining clean water.
3. Boom and skimmers cannot be used in confined areas. But this device can be used in both confined and open area.
4. According to trials taken of our prototype, we got, maximum speed of 6.53 knots.
5. Burning is also a conventional spill removing system. But it directly hampers the environment which is contradictory to the purpose of oil spill removing. But this device has no risk of environmental pollution and totally eco-friendly.

6. CONCLUSION

Different techniques are available and being used in the oil–water separation techniques for bilge water treatment. Typically, more than one unit of separators is needed to meet the minimum allowable discharge limit value set by the regulatory bodies. Gravitational and centrifugal methods are said to be the first technique before undergoing further polishing separation. Polishing treatment unit caters smaller droplet of oil, or emulsified oil, which cannot be treated by gravitational and centrifugal methods.

To conclude, oily bilge water can be treated with proper separation techniques so that the treated bilge water discharged to the sea comply with the limit and marine pollution can be minimized and prevented. Any other treatment techniques can as well be tested and introduced to enhance the oil–water separation process in treating bilge water.

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7. REFERENCES

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