DESIGN AND FABRICATION OF SOLAR BASED BELT TYPE OIL SKIMMER

A Thesis
by

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Submitted to the

DEPARTMENT OF MECHANICAL ENGINEERING

SONARGAON UNIVERSITY

In partial fulfillment of the requirements for the award of the degree

of

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

MAY 2024

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ACKNOWLEDGEMENT

First, we started in the name of almighty Allah. This thesis is accomplished under the supervisor of **Hasan Tareq Mahin** , Lecturer, Department of Mechanical Engineering, Sonargaon University. It is a great pleasure to acknowledge our profound gratitude and respect to our supervisor for this consistent guidance, encouragement, helpful suggestion, constructive criticism and endless patience through the progress of this work. The successful completion of this thesis would not have been possible without his persistent motivation and continuous guidance.

The authors are also grateful to **Professor Md. Mostofa Hossain**, Head of the Department of Mechanical Engineering and all respect teachers of the Mechanical Engineering Department for their co-operation and significant help for completing the thesis work successfully.

ABSTRACT

Nowadays there are lots of oil accidents happening in the ocean and it makes huge impact on environment. Due to Sea accidents can further cause oil pollution. So the oil separator systems are necessary in such cases. Various oil separator systems are available currently all over. In oil separator systems belt is one of the most important components. Different types of belts are been in use in these systems. Performance and efficiency of these systems mainly depends on the type of belt & belt material use in the system. So it is necessary to study and analyze the performance of various types of belts in order to select proper belt for better performance. In this paper we are taking a review of various types of belt materials used, research work done on oil skimmers and their belt materials. In this project we use a transformer, gear motor, solar panel, battery, charge controller, pulley, bearing, load cell, conveyor belt and many things. The main purpose if this system is separate oil from water with a conveyor belt.

CHAPTER 1

INTRODUCTION

1.1 Introduction

The basic objective of this project work is to develop oil skimmer. Oil is one of the most important energy draw material sources 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 split 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 wastage. [4]

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. [5]

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. [6]

1.2 Methodology

Methodologies for the project:

- Creating an idea for design and fabrication of belt type oil skimmer. And designing a block diagram & circuit diagram to know which components we need to construct it.
- Collecting all the components and programming the micro-controller to control the whole system.
- Setting up all the components in a PCB board & then soldering. Lastly, assembling all the blocks in a board and to run the system & for checking purposes.

1.3 Organization of The Project

This project book consists of Six chapter. The first chapter contains the statement of the introduction, our background study for the project, Literature Review, objectives of the study in the project, Methodology and the project organization. Chapter two contains System design and simulation. Here we describe the design of this project, block diagram and circuit diagram, working principle, background and real project, details of component and instrument details of the whole project. Chapter three contains the Hardware implementation. Chapter four deals with the experiment result,calculation advantages and application of this project. In the final chapter, we discuss about future scope and conclusion of our project.

CHAPTER 2

LITERATURE REVIEW

2.1 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.[1] 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 behavior 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 [2].

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 center 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 center 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 pollution's 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 [3].

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 [4]; 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 [5]; 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]

Philip C. Lewan et al [1992] [6] had studied apparatus for removing oil from the surface of a liquid using an endless belt partially submerged in the liquid, the belt passes over a primary roller having a vertical axis and pressure rollers squeeze the belt on the primary roller removing oil from the belt which allows by gravity to a collection receptacle mounted upon a frame supporting the primary roller and its drive structure. The belt twists whereby its lower portion submerged in the liquid denes a reversing loop whose configurations maintained by a weight roller having a horizontal axis of rotation.

Mamta Patel [2015] [7] had studied the function of oil skimmer, its various design aspects and performance. All the results of experimental studies indicate that slight design improvement of typical oil skimmers towards to include additional belt shaft and use of belt with steel material instead of rope; significantly improve the oil recovery efficiency and also its structure became simpler. As practical overview of different oil spillage cleanup method, this paper has illustrated several limitations of these methods and current oil spill technology. Further extensive research & testing can improve the existing techniques and equipment to have better control for oil recovery exercise.

Prof. P.A. Patil et al [2017] [8] had concluded that the separation of oil is based on surface tension, specific gravity and viscosity. He studied the operation of oil skimmer on various positions of the belt like inclined, vertical, horizontal. Spills may occur from refined petroleum products. Off and on from there by products, and heavier fuels used by large water vessels such as bunker fuel, or the spill of any oily refuse or waste oil. Cleaning and full recovery of spilled oil is challenging and may takes weeks or months. Sometimes even years required to clean up.

CHAPTER 3

HARDWARE IMPLEMENTATION

3.1 Software

- Easy EDA

Hardware

- Transformer
- Gear Motor
- Solar Panel
- Battery
- Charge Controller
- Variable Resistor
- Conveyor Belt
- Transformer
- Pulley Timing Belt
- Bearing
- Pulley
- Switch

3.2 Solar Cell

These panels are designed with solar cells composed of semiconductor materials. The main function of Solar panels is to convert solar energy into DC electrical energy generally of 12V, which is further used for the rest of the circuit.



Figure 3.1: Picture of solar sell system.

The number of cells required and their size depends on the rating of the load. The collection of solar cells can produce maximum electricity. But the solar panel must place exactly at right angles to the sun rays.

Certain materials can be made to produce electricity when light falls on them; this is called the photovoltaic effect. Solar panels use this effect to convert energy from sunlight into direct current (DC) electrical energy. An inverter unit then changes this into alternating current (AC) for your home's electrical circuits. Any excess energy can be fed back to the electricity grid, for which you may be paid an agreed feed-in tariff, or it could be fed into a battery storage system so you can use the stored power later (at night, for instance).

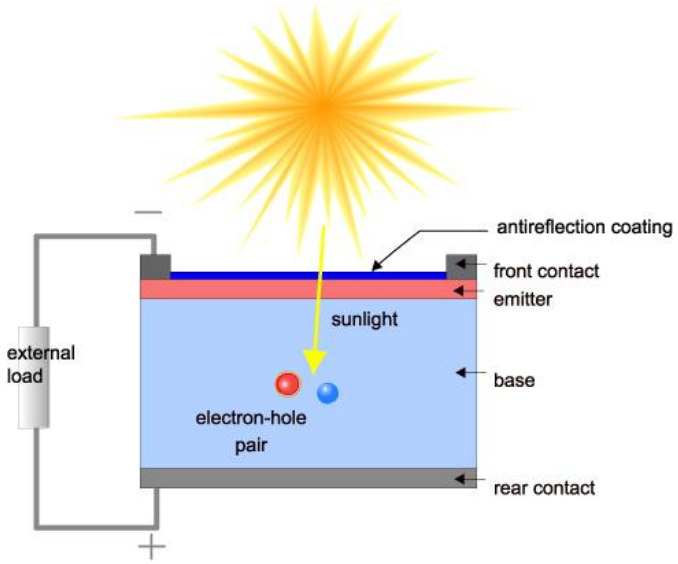


Figure 3.2: Solar sell system Curve.

Solar panels work best when they're north facing, pointed directly at the sun, at an optimal angle and not blocked by trees or shading. The effectiveness of solar panels also depends on where you live and the weather. A solar cell is a solid-state electrical device (p-n junction) that converts the energy of light directly into electricity (DC) using the photovoltaic effect. The process of conversion first requires a material which absorbs the solar energy (photon), and then raises an electron to a higher energy state, and then the flow of this high-energy electron to an external circuit. Silicon is one such material that uses such process.

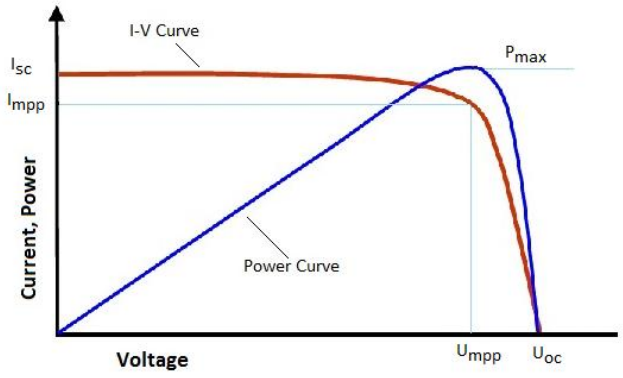


Figure 3.3: Solar sell system Curve.

3.3 Solar Charger Controller

Here is a solar charger circuit that is used to charge Lead Acid or Ni-Cd batteries using the solar energy power. The circuit harvests solar energy to charge a 6-volt 4.5 Ah rechargeable battery for various applications. The charger has voltage and current regulation and over voltage cut-off facilities.

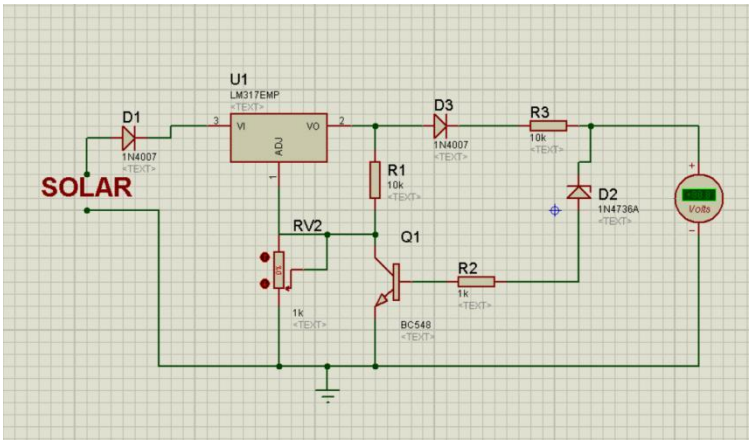


Figure 3.4: Solar Charger Controller Circuit.

The circuit uses a 12-volt solar panel and a variable voltage regulator IC LM 317. The solar panel consists of solar cells each rated at 1.2 volts. 12-volt DC is available from the panel to charge the battery. Charging current passes through D1 to the voltage regulator IC LM 317. By adjusting its Adjust pin, output voltage and current can be regulated. VR is placed between the adjust pin and ground to provide an output voltage of 9 volts to the battery. Resistor R3 Restrict the charging current and diode D2 prevents discharge of current from the battery. Transistor T1 and Zener diode ZD act as a cut off switch when the battery is full. Normally T1 is off and battery gets charging current. When the terminal voltage of the battery rises above 6.8 volts, Zener conducts and provides base current to T1. It then turns on grounding the output of LM317 to stop charging.

3.4 Transistor:

BC 547 NPN transistor Specifications:

- Bipolar Transistor, NPN, 45V, TO-92
- Transistor Polarity: NPN
- Collector Emitter Voltage V(br)ceo: 45V
- Transition Frequency Typ ft: 300MHz
- Power Dissipation Pd: 625mW
- DC Collector Current: 100mA
- DC Current Gain hFE: 150

The invention of the bipolar transistor in 1948 ushered in a revolution in electronics. Technical feats previously requiring relatively large, mechanically fragile, power-hungry vacuum tubes were suddenly achievable with tiny, mechanically rugged, power-thrifty specks of crystalline silicon. This revolution made possible the design and manufacture of lightweight, inexpensive electronic devices that we now take for granted. Understanding how transistors function is of paramount importance to anyone interested in understanding modern electronics.

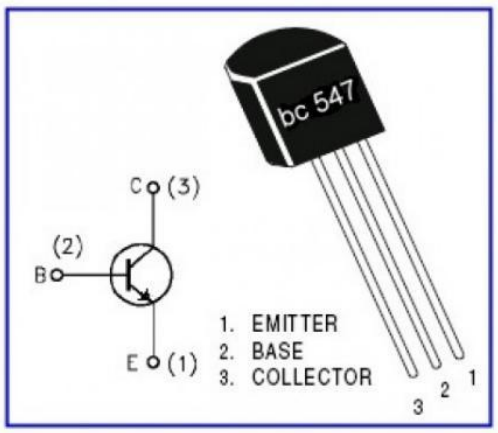


Figure 3.5: Transistor BC 547.

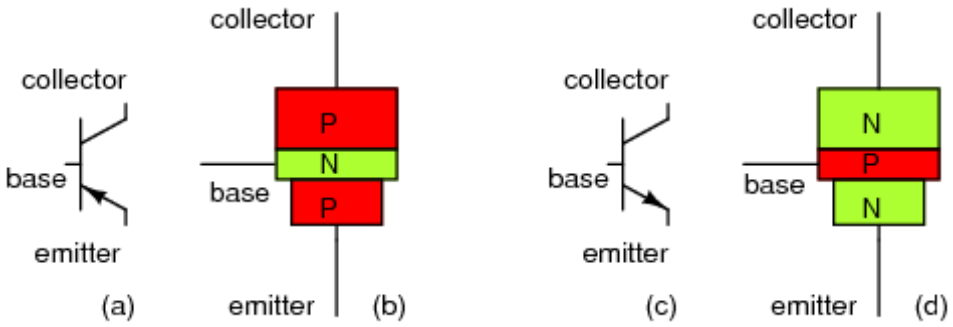


Figure 3.6: Transistor Symbol.

My intent here is to focus as exclusively as possible on the practical function and application of bipolar transistors, rather than to explore the quantum world of semiconductor theory. Discussions of holes and electrons are better left to another chapter in my opinion. Here I want to explore how to use these components, not analyze their intimate internal details. I don't mean to downplay the importance of understanding semiconductor physics, but sometimes an intense focus on solid-state physics detracts from understanding these devices' functions on a component level. In taking this approach, however, I assume that the reader possesses a certain minimum knowledge of semiconductors: the difference between "P" and "N" doped semiconductors, the functional characteristics of a PN (diode) junction, and the meanings of the terms "reverse biased" and "forward biased." If these concepts are unclear to you, it is best to refer to earlier chapters in this book before proceeding with this one.

A bipolar transistor consists of a three-layer “sandwich” of doped (extrinsic) semiconductor materials, either P-N-P in Figure below a(b) or N-P-N at (d). Each layer

forming the transistor has a specific name, and each layer is provided with a wire contact for connection to a circuit.

BJT transistor:

(a) PNP schematic symbol,

(b) physical layout

(c) NPN symbol,

(d) layout.

The functional difference between a PNP transistor and an NPN transistor is the proper biasing (polarity) of the junctions when operating. For any given state of operation, the current directions and voltage polarities for each kind of transistor are exactly opposite each other.

Bipolar transistors work as current-controlled current regulators. In other words, transistors restrict the amount of current passed according to a smaller, controlling current. The main current that is controlled goes from collector to emitter, or from emitter to collector, depending on the type of transistor it is (PNP or NPN, respectively). The small current that controls the main current goes from base to emitter, or from emitter to base, once again depending on the kind of transistor it is (PNP or NPN, respectively). According to the standards of semiconductor symbology, the arrow always points against the direction of electron flow. (Figure below)

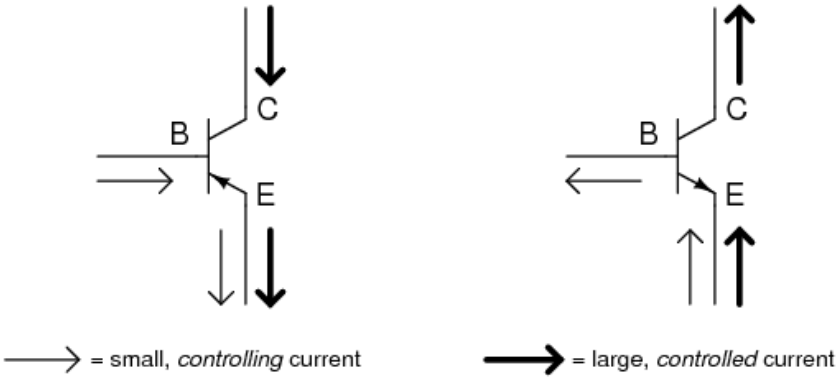


Figure 3.7: NPN & PNP Transistor Symbol.

Small Base-Emitter current controls large Collector-Emitter current flowing against emitter arrow. Bipolar transistors are called bipolar because the main flow of electrons through them takes place in two types of semiconductor material: P and N, as the main current go from emitter to collector (or vice versa). In other words, two types of charge carriers—electrons and holes—comprise this main current through the transistor.

As you can see, the controlling current and the controlled current always mesh together through the emitter wire, and their electrons always flow against the direction of the transistor's arrow. This is the first and foremost rule in the use of transistors: all currents must be going in the proper directions for the device to work as a current regulator. The small, controlling current is usually referred to simply as the base current because it is the only current that goes through the base wire of the transistor.

Conversely, the large, controlled current is referred to as the collector current because it is the only current that goes through the collector wire. The emitter current is the sum of the base and collector currents, in compliance with Kirchhoff's Current Law.No current through the base of the transistor, shuts it off like an open switch and prevents current through the collector. A base current, turns the transistor on like a closed switch and allows a proportional amount of current through the collector. Collector current is primarily limited by the base current, regardless of the amount of voltage available to push it.

3.5 Transformer

A transformer is an electrical device used to change the value of an alternating voltage. Transformers are widely used in electrical work. They are encountered daily, in industrial, commercial and domestic situations. They vary in size from miniature units used in electronics to huge units used in power stations. The efficient transmission and distribution of electricity throughout the country would be impossible without the use of power transformers.

Transformers are also used for safety reasons on construction sites when using power tools and in domestic bathroom situations in shaver units. They are used in doorbell operation and also to power electronic equipment, battery chargers, televisions,

computers, alarm systems, etc. Transformers vary considerably in construction, size and shape depending on their application.

All transformers rely on the principle of mutual inductance for their operation. Mutual inductance was discussed in detail in Unit Magnetism, Electromagnetism and Electromagnetic Induction.

Transformer Symbols:

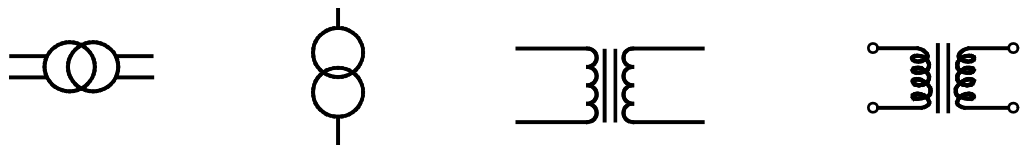


Figure 3.8: Transformer Symbols

Transformer Construction:

A transformer consists of two coils of wire called windings, which are wound onto a common iron core. The wire used in the two windings, primary and secondary, is coated with an insulating varnish. Both coils are wound onto, but insulated from the iron core.

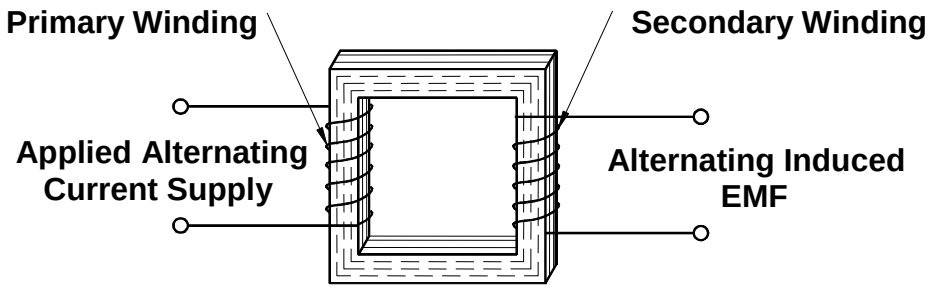


Figure 3.9: Transformer Construction.

The Transformer Principle

When a conductor or coil is moved in a stationary magnetic field it cuts the lines of magnetic flux and an EMF is induced in the conductor or coil. This same principle also applies when a conductor is held stationary and the magnetic flux is made to change or vary.

Now consider an alternating current applied to a stationary coil. A magnetic field will build up and collapse in the coil, continually rising and falling in harmony with the applied AC .

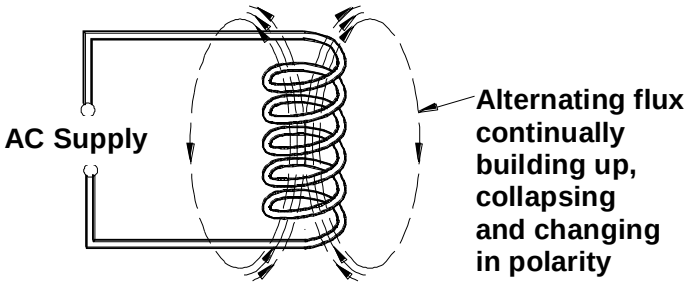


Figure 3.10: Transformer Primary Coil.

If a second coil (coil 2) is placed close to the first coil (coil 1) the alternating magnetic flux in coil 1 links with coil 2. This results in an EMF being induced in coil 2. This is a process known as mutual induction.

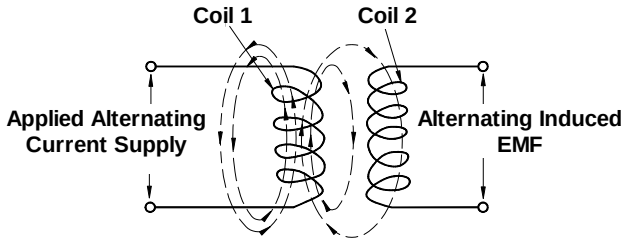


Figure 3.11: Transformer Primary & secondary Coil.

If coil 1 and coil 2 are mounted on an iron core the magnetic flux around both coils will be concentrated. This arrangement of coils and an iron core form the complete device known as a transformer.

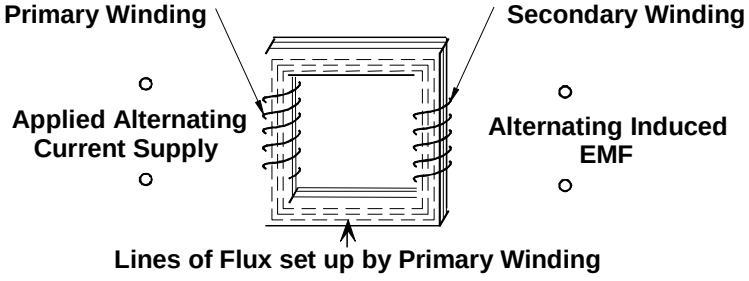


Figure 3.12 Lines Of Flux set up by primary Winding

The input coil of a transformer is fed from the AC supply and is called the primary winding. The output coil, to which the load is connected, is called the secondary winding.

It is important to remember that there is no electrical connection between the primary winding and the secondary winding of a transformer. The only common link between the two winding is the magnetic field.

3.6 The Full Wave Rectifier:

The first building block in the dc power supply is the full wave rectifier. The purpose of the full wave rectifier (FWR) is to create a rectified ac output from a sinusoidal ac input signal. It does this by using the nonlinear conductivity characteristics of diodes to direct the path of the current.

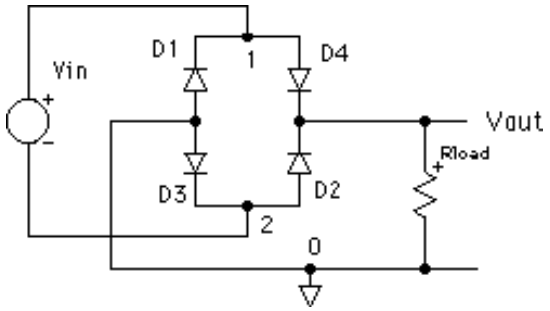


Figure 3.13: Common four-diode bridge configuration for the FWR.

Filtered Full Wave Rectifier

The filtered full wave rectifier is created from the FWR by adding a capacitor across the output.

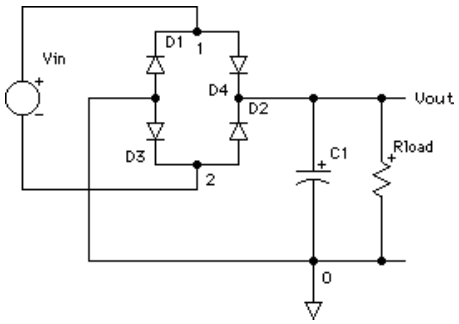


Figure 3.14: Filtered full wave rectifier

The result of the addition of a capacitor is a smoothing of the FWR output. The output is now a pulsating dc, with a peak-to-peak variation called ripple. The magnitude of the ripple depends on the input voltage magnitude and frequency, the filter capacitance, and the load resistance.

To describe the source of the voltage ripple, consider the performance of the filtered full wave rectifier above. The input to the rectifier is a sine wave of frequency f. Let Vi

be the full wave rectified signal input to the filter stage of the rectifier and Vo be the output. Vi can be approximated as the absolute value of the rectifier input, with frequency 2f.

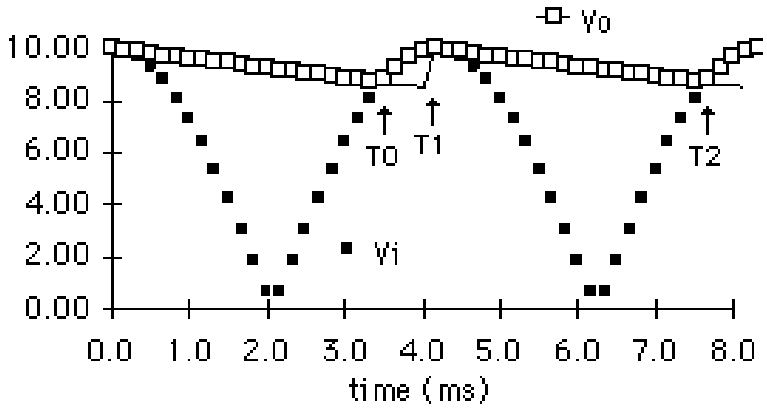


Figure 3.15: Output (Vi) and input (Vo) of a filtered full wave rectifier

In the time period from T0 to T1, the diode D1 (or D3, depending on the phase of the signal) is forward biased since Vi > VC1 (approximate the forward biased diode as a short circuit). The capacitor C1 charges and the voltage across the load R increases. From T1 to T2, the diodes D1 and D2 are reverse biased (open circuit) because Vcap > Vi, and the capacitor discharges through the load R with a time constant of RC seconds.

3.7 12v Battery

A twelve-volt battery has six single cells in series producing a fully charged output voltage of 12.6 volts. A battery cell consists of two lead plates a positive plate covered with a paste of lead dioxide and a negative made of sponge lead, with an insulating material (separator) in between.

Quick Details

- Brand Name: DOUBLE TECH (rechargeable 12v dc battery pack)
- Model Number: DBG12-200(12V 200AH)
- Nominal Capacity: 200AH
- Place of Origin: Fujian, China
- Weight: 5.7kgs
- Certification: ISO9001 CE,MSDS

- rechargeable 12v dc battery pack: 1PCS/CTN(according to the actual situation)
- Production Capacity: rechargeable 12v dc battery pack:50000PCS/Month



Figure 3.16: 12V Battery

3.8 DC Gear Motor

Description:

A DC motor is any motor within a class of electrical machines whereby direct current electrical power is converted into mechanical power. A 12v DC motor is small and inexpensive, yet powerful enough to be used for many applications.

Specification:

- Voltage:12V DC
- Gear ratio: 1/31
- No-load speed: 200RPM
- Rated Speed: 140RPM
- Rated torque: 10kg.cm
- Rated current: 2.5Amp
- Length of Motor(including spindle): 106mm/4.17″
- Diameter: 37mm/1.45″
- Shaft length: 21mm/0.82″
- Shaft diameter: 6mm/0.24″



Figure 3.17: DC Gear Motor

3.9 Conveyor Belt

A conveyor belt is the carrying medium of a belt conveyor system (often shortened to belt conveyor). A belt conveyor system is one of many types of conveyor systems. A belt conveyor system consists of two or more pulleys (sometimes referred to as drums), with a closed loop of carrying medium—the conveyor belt—that rotates about them. One or both of the pulleys are powered, moving the belt and the material on the belt forward. The powered pulley is called the drive pulley while the powered pulley is called the idler pulley.

Description

Conveyors are durable and reliable components used in automated distribution and warehousing, as well as manufacturing and production facilities. In combination with computer-controlled pallet handling equipment this allows for more efficient retail, wholesale, and manufacturing distribution. It is considered a labor-saving system that allows large volumes to move rapidly through a process, allowing companies to ship or receive higher volumes with smaller storage space and with less labor expense.

Belt conveyors are the most commonly used powered conveyors because they are the most versatile and the least expensive. Products are conveyed directly on the belt so both regular and irregular shaped objects, large or small, light and heavy, can be transported successfully. Belt conveyors are also manufactured with curved sections

that use tapered rollers and curved belting to convey products around a corner. These conveyor systems are commonly used in postal sorting offices and airport baggage handling systems.

Applications

Now a days there are different types of conveyor belts that have been created for conveying different kinds of material available in PVC and rubber materials. Material flowing over the belt may be weighed in transit using a belt weigher. Belts with regularly spaced partitions, known as elevator belts, are used for transporting loose materials up steep inclines. Belt Conveyors are used in self-unloading bulk freighters and in live bottom trucks. Belt conveyor technology is also used in conveyor transport such as moving sidewalks or escalators, as well as on many manufacturing assembly lines. Stores often have conveyor belts at the check-out counter to move shopping items, and may use checkout dividers in this process. Ski areas also use conveyor belts to transport skiers up the hill. Industrial and manufacturing applications for belt conveyors include package handling, trough belt conveyors, trash handling, bag handling, coding conveyors, and more. Integration of Human-Machine Interface(HMI) to operate the conveyor system is in the developing stages and will prove to be an efficient innovation.

Types of Conveyor Belt

“There are three different types of conveyor belts: raxine belt and fabric belt. A basic belt conveyor consists of two or more pulleys that hold one continuous length of material. These types of belts can be motorized or require manual effort.



Figure 3.18: Conveyor Belt

3.10 Pulley

A pulley is a wheel on an axle or shaft that is designed to support movement and change of direction of a taut cable or belt, or transfer of power between the shaft and cable or belt. In the case of a pulley supported by a frame or shell that does not transfer power to a shaft, but is used to guide the cable or exert a force, the supporting shell is called a block, and the pulley may be called a sheave.A pulley may have a groove or grooves between flanges around its circumference to locate the cable or belt. The drive element of a pulley system can be a rope, cable, belt, or chain.

Table: 01: Pulley Specification

Product Type	**Motor Pulley**
Size	5mm,
Height	25mm
Outer diameter	12.2mm/0.48
Pitch Diameter	12.7mm/0.5



Figure 3.19: Pulley

3.11 Easy EDA Software

Easy EDA is a web-based EDA tool suite that enables hardware engineers to design, simulate, share - publicly and privately - and discuss schematics, simulations and printed circuit boards. Other features include the creation of a bill of materials, Gerber files and pick and place files and documentary outputs in PDF, PNG and SVG formats. Easy EDA allows the creation and editing of schematic diagrams, SPICE simulation of mixed analogue and digital circuits and the creation and editing of printed circuit board layouts and, optionally, the manufacture of printed circuit boards.

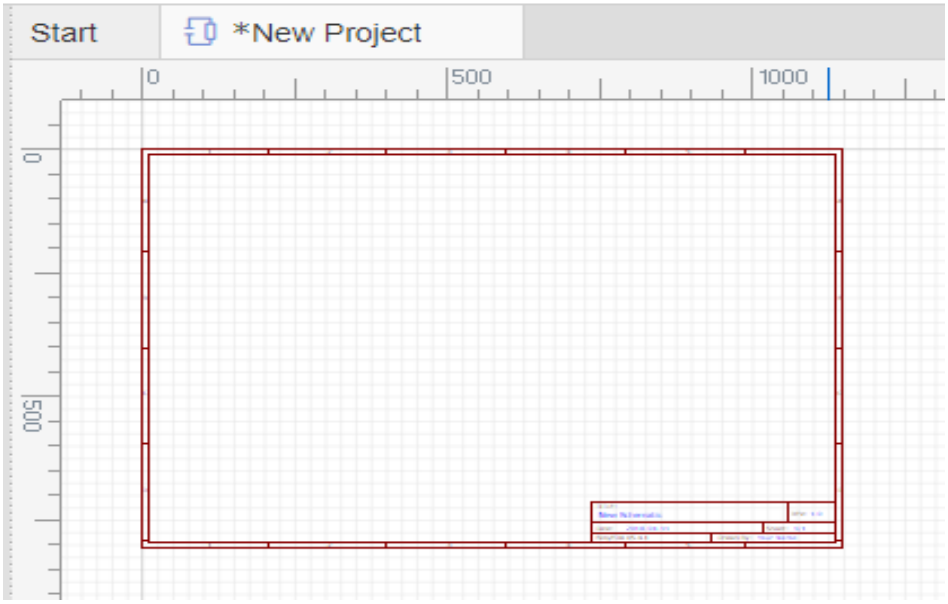


Figure 3.20: Easy EDA Software Interface

Subscription-free membership is offered for public plus a limited number of private projects. The number of private projects can be increased by contributing high quality public projects, schematic symbols, and PCB footprints and/or by paying a monthly subscription.Registered users can download Gerber files from the tool free of charge; but for a fee, Easy EDA offers a PCB fabrication service. This service is also able to accept Gerber file inputs from third party tools.

CHAPTER 4

SYSTEM DESIGN AND SIMULATION

4.1 Block Diagram

In our project we have set up a Fabrication of Belt Type Oil Skimmer. Here, in this system, we are use AC source and DC (Battery) Source for operate. Here we also use a transformer, gear motor, solar panel, battery, load cell, LCD Display, charge controller, pulley etc.

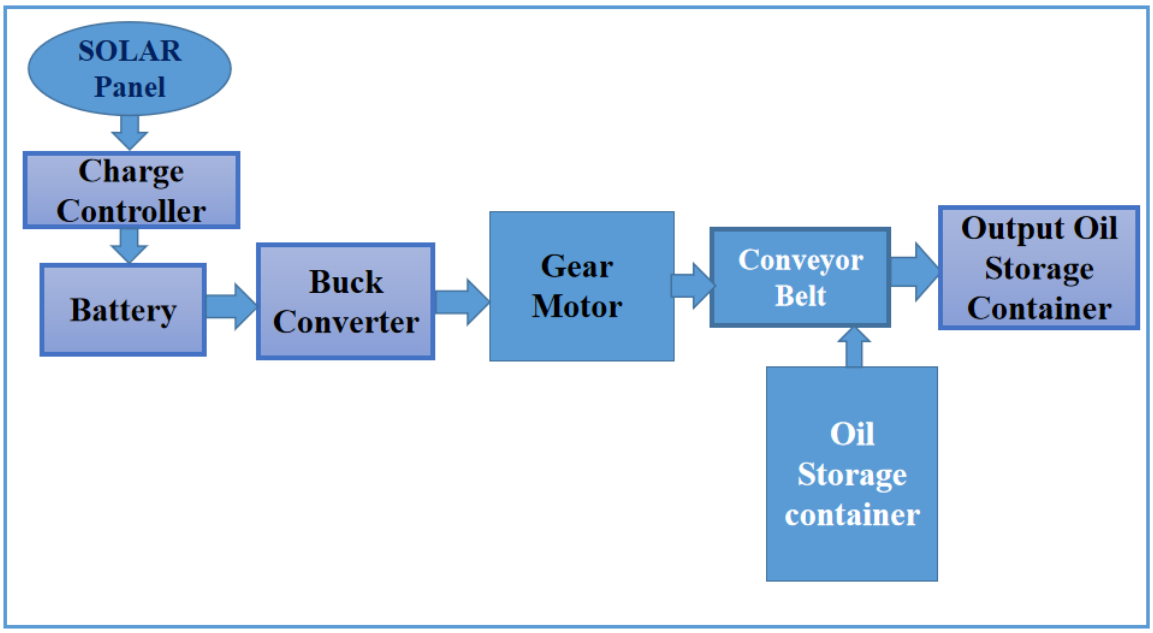


Figure 4.1: Block Diagram of Belt Type Oil Skimmer System.

4.2 Circuit Diagram of proposed Model

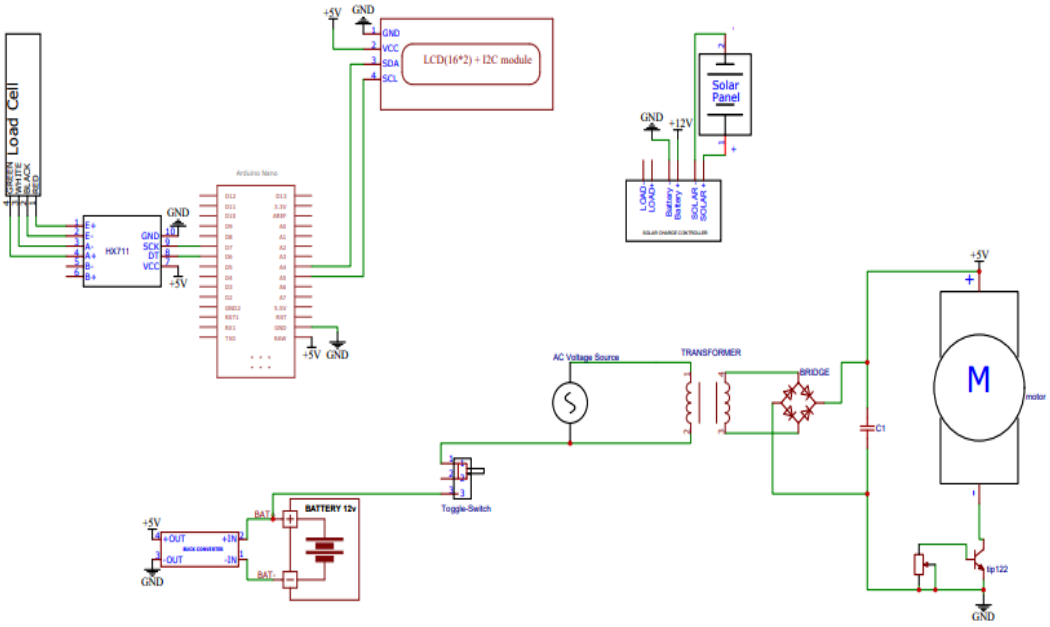


Figure 4.2: Circuit Design of Belt Type Oil Skimmer System.

4.3 Components Rating and Cost Analysis

Table 02: Component's Name and Price

Sl. No	Components Name	Specification	Qty	Unit Price	Total Price
01	Transformer	12V, 3Amp	1	280	280
02	Gear Motor	12V, 100 RPM	1	880	880
03	Solar Panel	12V. 6 Watt	1	950	950
04	Battery	12V, 4.7Amp	1	1250	1250
05	Solar Charge Controller	12V	1	350	350
06	Metallic Structure		1	1350	1350
07	Others				1550
Total					6,610/=

4.4 Working Principle

Here we use a solar panel for power generating elements and restore it in a battery for battery charge controller. In this project Solar takes sunlight and produces some energy and stores it battery with the help of a charge controller system. We are use some equipment's like , Load Cell, Gear Motor, Battery, solar Charge Controller. This solar cell is controlled by the Micro-controller. When the power up of this system then the system able to work. Then if we start the system then transformer rectifier the AC current and rotate the gear motor. This gear motor is able to control its speed. When we need to oil skimming then just place the system on this water and start our project. Our System will be separate oil from the water easily and load cell measure the amount of oil. This is the main procedure of our system.

4.5 Basic Design of the System

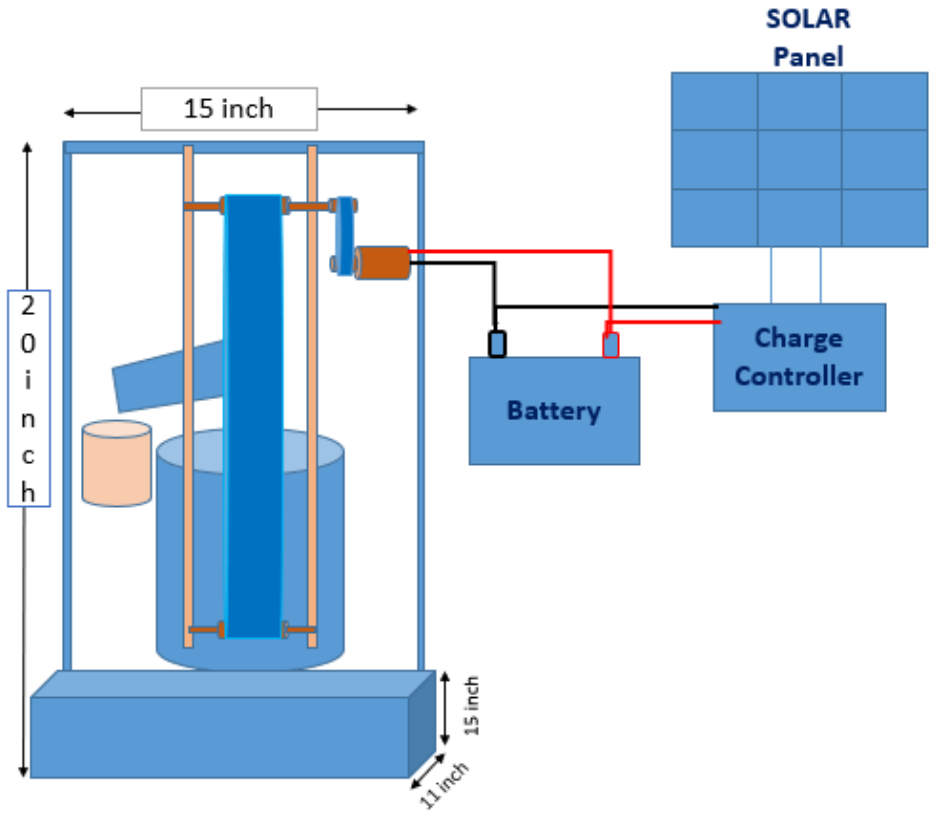


Figure 4.3: Basic Design of this System

4.6 Schematic Views of the project



FRONT VIEW



TOP VIEW



ISOMETRIC VIEW



SIDE VIEW

Figure 4.4: Different Views of the project

4.7 PCB Design:

The PCB Layout module is automatically given connectivity information in the form of a net list from the schematic capture module. It applies this information, together with the user specified design rules and various design automation tools, to assist with error free board design. PCB's of up to 16 copper layers can be produced with design size limited by product configuration.

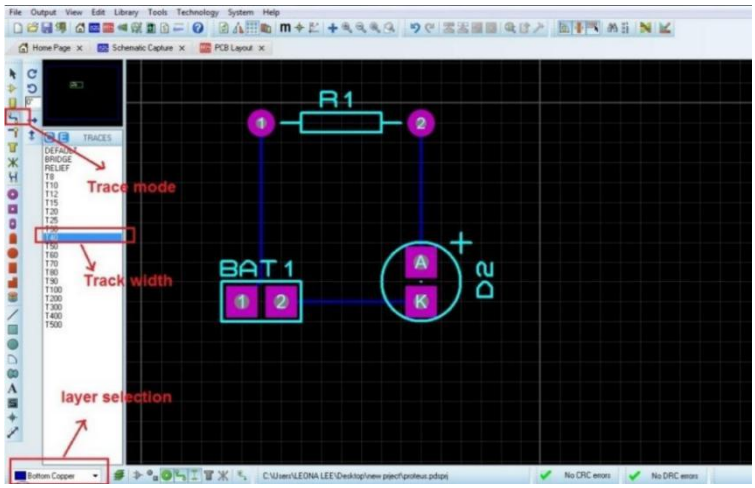


Figure 4.5: PCB Design

The 3D Viewer module allows the board under development to be viewed in 3D together with a semi-transparent height plane that represents the board's enclosure. STEP output can then be used to transfer to mechanical CAD software such as Solid works or Auto desk for accurate mounting and positioning of the board.

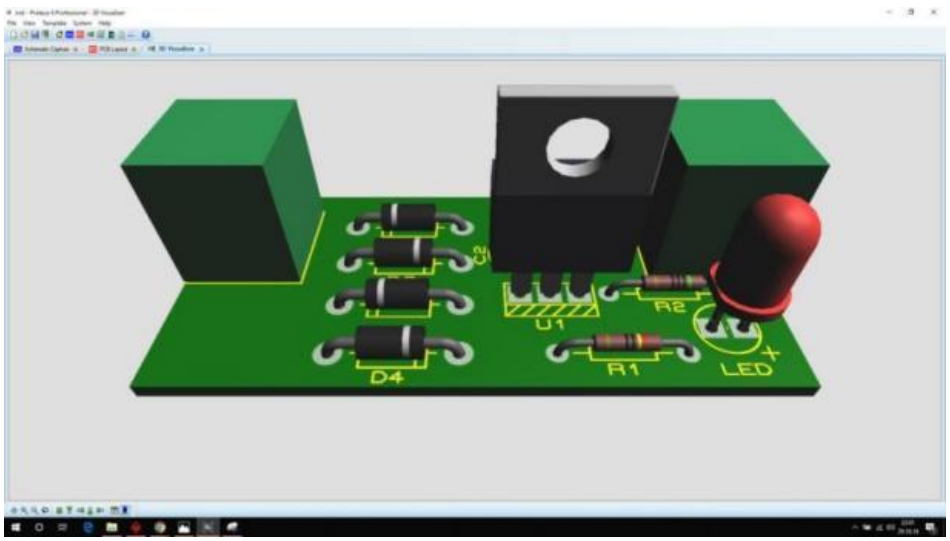


Figure 4.6: 3D Viewer

CHAPTER 5

RESULTS AND DISCUSSIONS

5.1 Results

After making the project we observe it very careful. It works as we desire. The project give output perfectly and all equipment are work perfectly. We check how much it works and we get perfect output from this project.

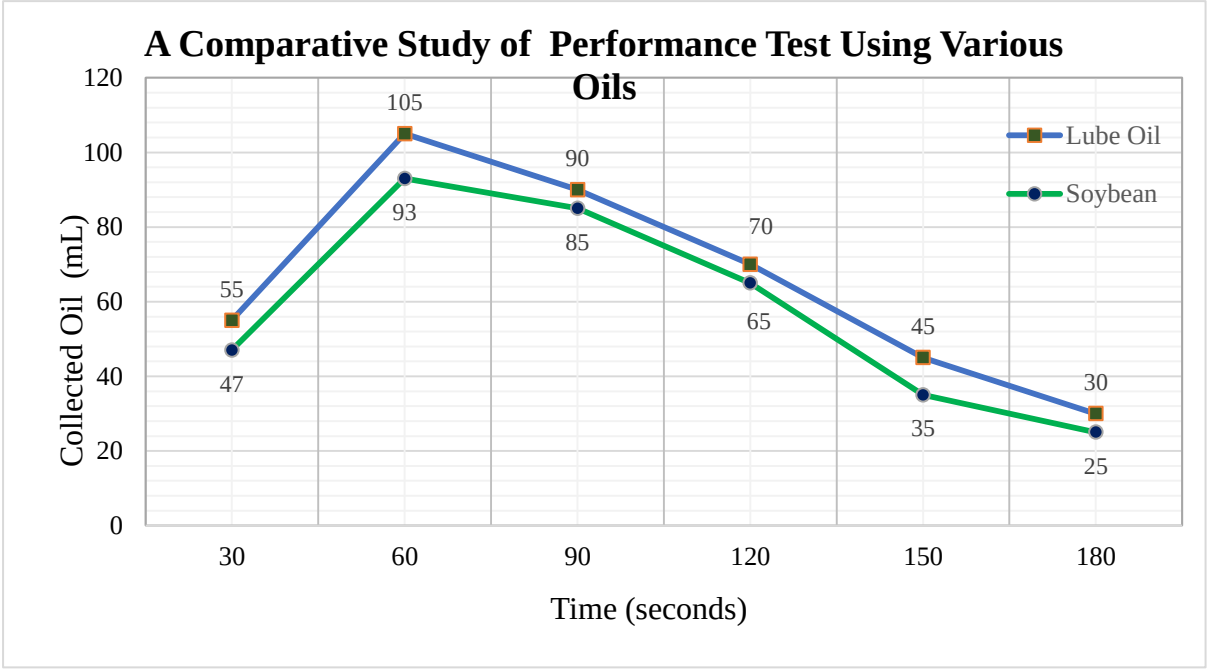
- Finally, we have complete the project successfully & check our project its run accurately according to our objective.
- At first, start the system.
- At first, we connect the battery source.
- Then we start the switch then motor will be rotate .
- Then belt will separate the oil from water.
- Then oil will be store in a jar.

Table 03: Rexine belt performance test using lube oil

Type of Belt	Materials of Belt	Quantity of Water (ml)	Quantity of Lube Oil (ml)	Time (Sec)	Collected Oil (ml)
Rexine Belt	Synthetic Leather	2000	400	0-30	55
				31-60	105
				61-90	90
				91-120	70
				121-150	45
				151-180	30

Table 04: Rexine belt performance test using Soybean oil

Type of Belt	Materials of Belt	Quantity of Water (ml)	Quantity of Soybean Oil (ml)	Time (Sec)	Collected Oil (ml)
Rexine Belt	Synthetic Leather	2000	400	0-30	47
				31-60	93
				61-90	85
				91-120	65
				121-150	35
				151-180	25



labelled "Lub Oil"and "Soybean". The line labelled "Lub Oil" appears to show that the most oil was collected at the 60 second mark, and the least was collected at the 180 second mark. The line labelled "Soybean" appears to show that the most oil was collected at the 60 second mark, and the least was collected at the 180 second mark . The amount of oil separation will decrease with time.

Table 05: Fabric belt performance test using lub oil

Type of Belt	Materials of Belt	Quantity of Water (ml)	Quantity of Lube Oil (ml)	Time (Sec)	Collected Oil (ml)
Fabric Belt	Polyster	2000	400	0-30	43
				31-60	87
				61-90	77
				91-120	66
				121-150	50
				151-180	33

Table 06: Fabric belt performance test using Soybean Oil

Type of Belt	Materials of Belt	Quantity of Water (ml)	Quantity of Soybean Oil (ml)	Time (Sec)	Collected Oil (ml)
Fabric Belt	Polyster	2000	400	0-30	37
				31-60	53
				61-90	70
				91-120	59
				121-150	40
				151-180	28

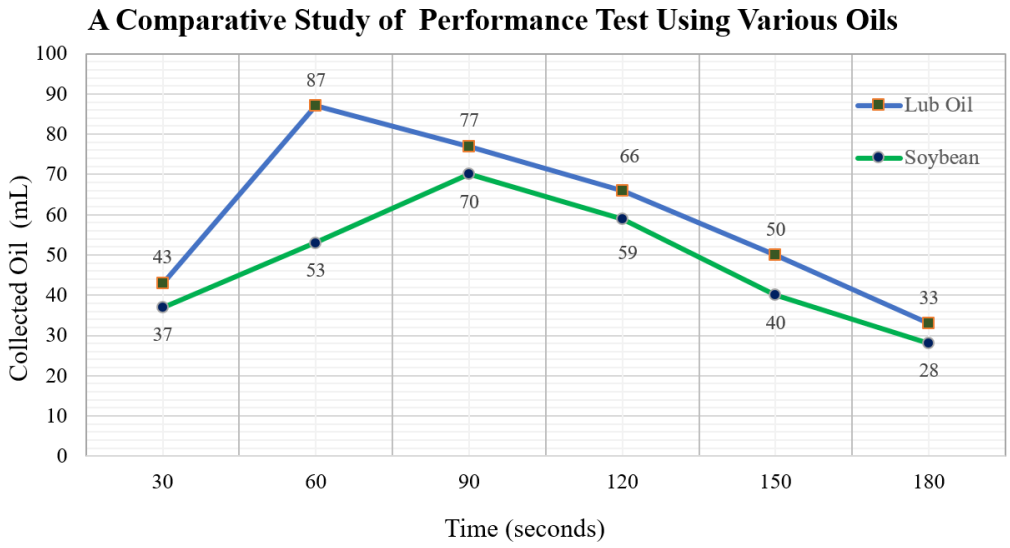


Figure 5.2: Performance Test Fabric Belt Using Various Oil

This performance test was conducted using Fabric belt. The graph showing the results of a performance test using various oils. The horizontal axis of the graph is labelled "Time (seconds)" and goes from 0 to 180 seconds. The vertical axis is labelled "Collected Oil (mL)" and goes from 0 to 120 mL. There are two lines on the graph, labelled "Lub Oil"and "Soybean". The line labelled "Lub Oil" appears to show that the most oil was collected at the 60 second mark, and the least was collected at the 180 second mark. The line labelled "Soybean" appears to show that the most oil was collected at the 90 second mark, and the least was collected at the 180 second mark .The amount of oil separation will decrease with time

5.2 Advantages

There are many advantages of our project because of its accuracy. Some of the advantages are pointed out below:

- An oil skimmer helps reduce that threat by removing the oil.
- It's an automated process.
- The cost of an outside contractor to haul away oil is greatly reduced with the installation of an oil skimmer.
- Time saving machine for industrial work.
- Very effectively work for oil skimming.

- Reduce energy waste.
- Less skill technicians is sufficient to operate.
- Less time and more profit.
- Ease of operation

5.3 Discussion

While working on the project, Face some difficulties as it is a very complex system but the end results, Finally came up with were quite satisfactory. Put the whole system through several tasks to validate our work and also have taken necessary notes for future improvements. Some future recommendations that have involves improvement in system design and wiring, adding features for more efficient.

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

6.1 Applications

The application areas for this project in this modern and practical world are huge and some of these are given below:

- It can be implemented in sea.
- Industry
- On Ship
- Factory

6.2 Future Work and Modification

We are thinking about adding many features to our project in the future to get more desirable out comes. Some of the steps that we are thinking about taking are given below:

- In future we will add some sensor to measure oil quantity in container.
- In future we will add IoT System to operate in fully automatically.
- In future we will add protection equipment to protect this system from any kind of hazard.

6.3 Conclusion

In this project, we enforced to highlight the function of oil skimmer, its various design aspects and performance. The project successfully separate oil from water surface. All the results of experimental studies indicate that slight design improvement of typical oil skimmers towards to include additional belt shaft and use of belt with steel material instead of rope; significantly improve the oil recovery efficiency and also its structure became simpler. Further extensive research & testing can improve the existing techniques and equipment to have better control for oil recovery exercise.

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[13] https://www.google.com/search?q=transistor&tbm=isch&ved

[14] https://www.google.com/search?q=transformer&tbm=isch&ved

[15] https://www.google.com/search?q=battery+12+volt&tbm=isch&ved

[16] https://www.google.com/search?q=dc+gear+motor&tbm=isch&ved

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