DESIGN OF MULTI-POWERED SOLAR BOAT

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ABSTRACT
Backwater Tourism is the prime attraction. Diesel engine driven boats are conventionally employed for water transport. The fumes emitted into the water results in water pollution. Incorporation of renewable energy in an electric boat can promote sustainable tourism. The goal of this paper is to design a Multi-Powered Boat for tourist transportation along the coast, rivers, and lakes. Our plan is to develop project guidelines for the construction of a zero-impact boat. Switched Reluctance Motor (SRM) due to rugged construction as well as high performance can be used in electric boats. Solar energy available in plenty can act as the driving source for this motor. Battery bank can supplement the surplus power required depending on the load requirement. So, this hybrid boat is not going to create any environmental pollution objects. As, we are using solar energy which is freely available in nature.

Introduction

Using solar energy to your own advantage is a very old concept and goes back millions of years. All life on earth depends on the sun in some way. Using sun energy to create electricity is also not such a new concept. Research on it began as early as 1839 when Alexandre

Edmond Becquerel observed a photoelectric effect when an electrode in a solution of conductive liquid became charged when in sunlight. In this project I am going to explore the possibility of making a boat that is powered solely from the sun. I will then design and make a working model. It is generally thought that solar power is limited to sunny locations. However, contrary to what most people think, solar panels still can get energy if the sky is overcast but they do not absorb as much energy. Therefore, designing a solar powered boat for the use in The Netherlands is not that farfetched. Currently, there is huge amount of research going into solar power and many new technologies are being discovered. Over the past few years new flexible and light solar panels have been invented and because of those it will be much easier to make a solar powered boat. I have absolutely no previous knowledge of solar power however I do know a fair bit about model boats. Therefore, I am hoping to build on my knowledge of model boats and learn more about using solar energy. Furthermore, by presenting my work I am also hoping to raise awareness in the school about possible alternative energies and the great potential that solar energy has.

Literature Review

These days for fishing and tourist boats, traditional boats are used. Traditional boats are either driven by manually or by using I.C.Engine. For this small purpose ships 2-stroke diesel engine is used. These engines can develop sufficient power to run the engine at heavy load. For the tourists who want to enjoy boat riding for them some paddle boats are available there. But these paddle boats required more power to drive it and not convenient for long distance.

Also, Tourists' transport along the coast, in the rivers, in the lakes, can be performed on route well-defined and carried out with boats that sail at low speed. In these days, boats are available in many shapes and sizes and are multifunctioning. But the main problem with this boat is they are operated on engines and therefore leads to the pollution of air, water and more danger to the water species and ultimately it contributes to the global warming and water pollution [1-5]. So, the solar boats are going to be the best replacement for these boats.

Problem Statement

This project is intended because of following points:

1. The increasing impact of fuel price in the global market is one of the factors that motivate people to find new alternative energy to substitute usefulness of fuel.

2. As we know, the solar panels cannot be used at night because there is no sunlight to produce it; however, this problem can be solved using rechargeable batteries that can supply current to the electric motor of solar boat at night.
3. The selection of electric motor must be exact and applicable to the boat.

Objectives

1. The project is related to store and use the freely available solar energy.
2. To reduce stress on the use of fuel by using solar energy/ any renewable energy.
3. To make sea-shore tourism more comfortable and profitable.
4. To deduct the impact of increasing fuel price on the shore tourism, lake tourism, and other water tourism businesses as well as on the businesses related to the water resources.

Methodology

- To design the solar boat, we first collected the data of boats which are in use currently like their shape size, etc.
- After taking suitable measures we designed a prototype model on CATIA software.
- Later, we analysed the model and calculated actual dimensions.
- After deciding dimensions, we started manufacturing an outer body of a ship.
- We have used the metal sheets to create an outer side of a ship body and used arc welding to join the metal angles.
- After designing an outer body, we started working on solar plates and battery arrangement and other shaft assembly.
- Later, the main problem was leakage of water in the boat, and we solved that problem by filling silicon in the boat where the water was leaking.
- Assembly of the propeller and the battery.
- Installation of steering arrangement.
- Final testing of the boat in actual water.

Performance Analysis

1. Motor- 1.5 HP (As we are using 4 panels means 900 watts & 1 HP=750 watts; so, 1.5 HP motor is sufficient)

2. Drive- Chain and Sprocket assembly (a chain and sprocket drive is a way of conveying power to the wheels of vehicle.)
3. Battery- 4 batteries of 12 volt each and 28 Ah. (As sufficient for the load
4. Charging- 1. Electric 48 v (direct charging and charge SMPS is available in market)
   2. Solar Panel 100 watts NCB solar panel
5. Max speed of boat – 20km/hr(approx.)
6. Lifetime – Min. 5 years duration
7. 4 Solar Panel used – 100 watts 12 Volt

Calculation

We know that, 1HP=750watts

Formula of *I*=w/v

*I=440*3850/440*

I=8.75A ……(v = 440 fixed v)

W=8.75*440

1.5HP=900w

Motor=1.5HP

Wattage=900watt

900w = 48v

RPM : 1.5hp=2800rmp

2800rmp to convert 900rpm

900*1/3=300rpm……...(appx.)

Amps = Watts / Volts

A=900/12v

Amps=28A

Panel measures
6.5 x 3.2=20.8
Area=20.8s.f
Power formula
P=total area*solar irradiance*conversion efficiency
$E_{panel}(kWh) = P_{panel}(kW)*Time(hour)$
P=900w
Total Capacity of Boat
T=Total weight of boat+Panel weight+external weight
T= 250+25+400
T=675kg……..(approx.)

Note: Area all requirement of small scale power plant 1kw 12sq.

Designing Work

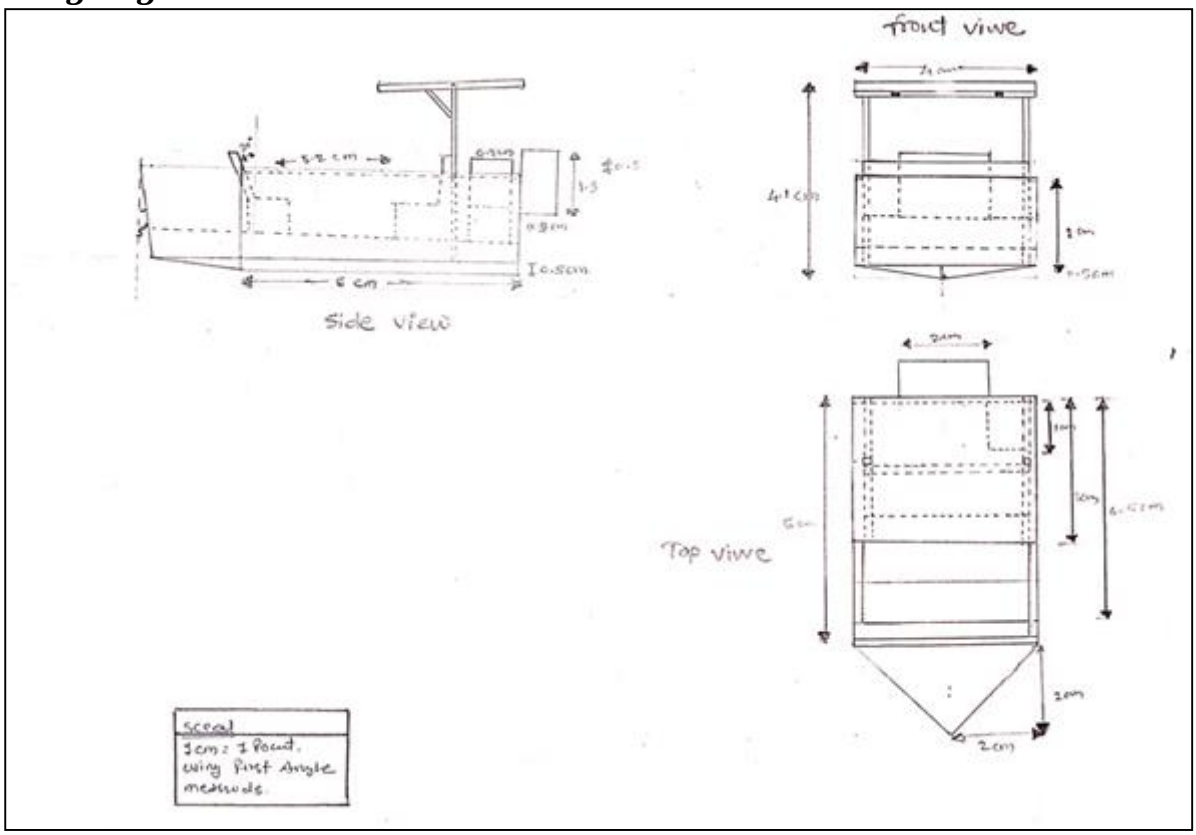

Figure 1: On Paper Graphical Design

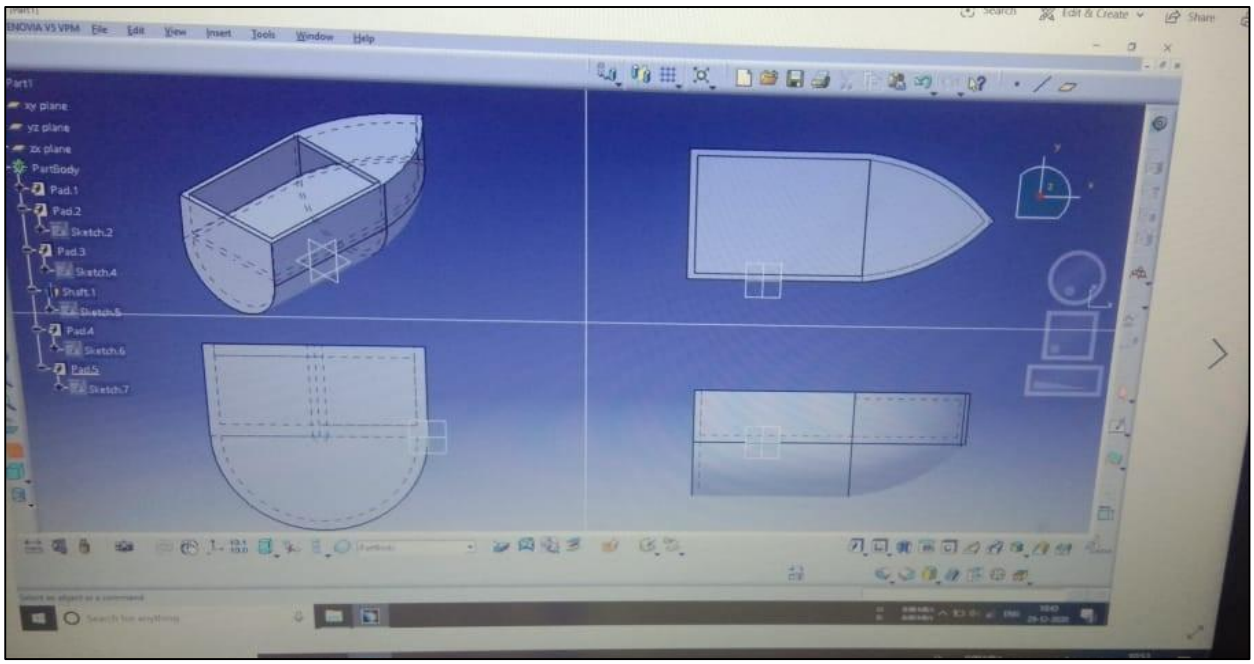

Figure 2: Design on CATIA V5 Software

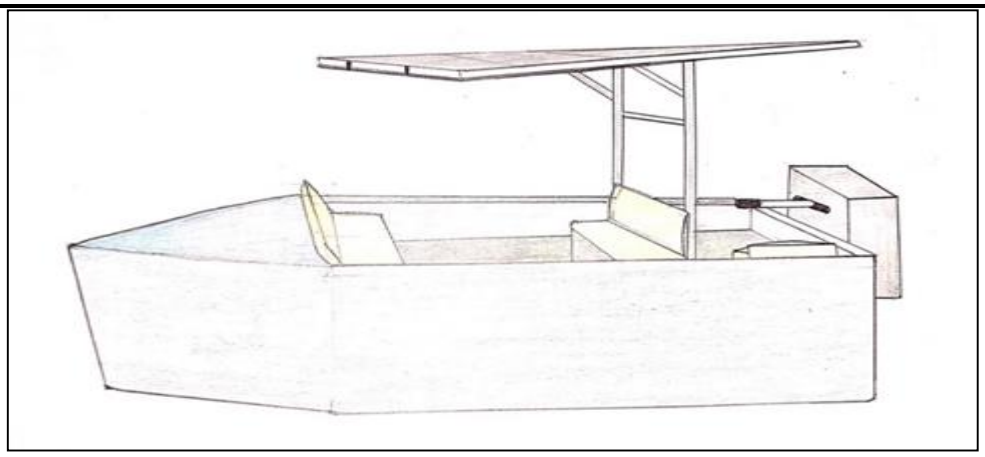

Figure 3: 3D Design on Paper

Conclusion

- This solar powered boat will put advancement in the fishing industry and also has no bad effects like global warming.
- The solar power is the most efficient in daylight and can generate full voltage depending on the capacity of solar panel used.
- Electricity produced by photovoltaic cells is safer as well as more environment friendly than that of the other conventional sources of energy production.
- This boat will make a huge change in the traditional method of boating as well as in light weight material transportation.
- Over the past few years, the need for environment preservation consciousness and awareness has been felt worldwide. Solar energy is a prodigious renewable energy source, which has enormous energy existing as heat and light, convertible into electricity.

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