

SOLAR BASED PORTABLE AIR COMPRESSOR FOR TYRE INFLATION

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Abstract–Solar energy is a renewable source of energy which can be used for many applications like power generation, waste heating and cooking etc. Air compressors, sometimes referred to as gas compressors, are devices or tools that reduce the volume of a gas thus creating pressure and heat in the gas or air tank. One of the presently used method is, using the compressor running on electricity. This manual or electric inflation causes following difficulties like, heavy force is required manually to push the piston along with the bearing in the head stock bore. The basic set up of a solar power air compressor is to run a compressor by means of solar energy. Here the compressor is controlled by controller and relay circuit. The pressure is controlled by the pressure Transducer for inflating the air to the required extent.

Keywords – air compressor, battery charge controller, pressure transducer, solar panel.

I.INTRODUCTION

A Lot of studies revealed the supply of fossil fuel such as natural gas and oil are limited. Researches have also identified the impacts of using fossil fuel energy on global climate change. The demand for energy is increasing as the world population grows and the economic growth in many developing countries. The energy crisis can be anticipated in the near futures. Alternative energy or renewable energy opposed to fossil fuels ought to be actively explored earlier rather than late. Renewable energy such as solar energy can provide a long term solution and minimize climate change.

Using solar energy to inflate the tires using air compressor is a practical application of sustainability. The idea is the solar based air compressor utilize the solar photovoltaic modules to convert solar energy to DC electricity.

This project consists of Microcontroller based switching circuit. Regulated output of Solar cell is connected to rechargeable battery through a unidirectional current flow circuitry. This particular charged battery output given as input to the air compressor motor, this motor will controlled by the user manually using control buttons and also automatically by micro controller by a set point along with the help of relay. This setup can automatically inflate and deflate the air according to the user requirements.

2.EXISTING SYSTEM

Some of the papers reviewed were “Dynamically self inflating tire system” as well “Automatic Tire Inflation System”. According to this system, the car tires can be inflated to the maximum extent of 50psi for cars and bikes. This system is non portable and it is fixed to the tire. This entire system is also bulkier and the supply system for running the compressor is only based on electricity. This makes the system unusable in remote areas. The controlling of pressure in air compressor is done manually. This system has more air leakage during inflation.

3. PROPOSED SYSTEM

Besides the previous system, pressure transducer is used which controls the pressure range

to required extent. Solar is used as the supply source for air compressor as solar energy will available freely all over the earth during day time. During night time the solar energy stored in the battery is used for running the compressor. In this system, the pressure range is achieved in a range of about 110 psi which is enough to fill the vehicles like bikes, cars, buses and trucks. This system can ported from one place to other place.

4. COMPONENTS WITH SPECIFICATION

4.1) Solar Panel

Solar Panels are devices that converts light into electricity. They are called as photovoltaics which means light-electricity. Set of cells are called as module. Set of modules are called as array. Set of array are called as String. 12V 50watt Polycrystalline solar panels are used. Polycrystalline solar panel have many silicon crystal in each cell. This solar panel have 36 photovoltaic cells on it.



Fig 4.1-Solar Panel

4.2) Air Compressor

An air compressor is a device that converts power into potential energy stored in pressurized air. 12V 150psi DC mini air compressor is used. This compressor don't have a tank and it is operated directly for inflation. This air compressor have a single piston having air flow of 35L/min. This compressor runs continuously for a maximum of about 15 minutes.



Fig 4.2-Air Compressor

4.3) Transducer

The basic concept of this pressure transducer is for measuring the applied force by a fluid or gas on a surface. This transducer has a rating of 5V 0-1.2MPa. It can withstand up to a maximum of 175psi till where it can control the pressure. It operates on a 5V DC supply and the output voltage range from 0.5V-4.5V. It can operate under temperature range of 0-85°C



Fig 4.3-Pressure Transducer

D) Battery

Battery is a device which is used to store energy and used for future needs. An LMF battery of rating 12V 35Ah is used. This battery is used to store the electricity which is generated from the solar panel and energy is drawn from it during the night time. The battery is charged through charge controller which helps to charge the battery constantly.

E) Controller

Controller is a device which is used to control and do some specific required operations. Arduino UNO is as a controller along with relay module. Two push buttons are used to set the required value of psi. A LCD display is also used to display the value of psi to be inflated. A switching relay is also used which protects the controller and other devices.

5.WORKING PRINCIPLE

Generally the battery used to operate the air compressor is charged by means of Solar energy. Solar energy is generated by means of solar panel. A 12V 50watt Solar panel is used which has 36 solar cells in it. The output of the solar panel will be obtained as direct current. This output is stored in the battery through a charge controller. This charge controller charges the battery at a particular rate of current flow

to the battery. Then the battery operates a 12V DC mini compressor which is interfaced with the controller and pressure transducer. The pressure sensor detects the pressure in the tyre and the required value of psi is set with the help of switches and display. After setting the psi value the arduino operates the compressor and controls the pressure transducer. The pressure transducer controls the flow of air or gas for inflation. After achieving the required psi value, the pressure transducer senses and the controller and relay circuits turn off the compressor. In case, if the actual psi value is higher than the required psi value, en compressor begins to deflate the air to the required extent.

6.SOFTWARE

A certain program is used to interface Arduino transducer and display

```
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27, 2, 1, 0, 4, 5, 6, 7, 3, POSITIVE);
const int analogPin = A0;
float inputP1;
float outputP1;
void setup()
{
  lcd.begin(20, 4);
  lcd.clear();
}
void loop()
{
  inputP1 = analogRead(A0);
  outputP1 = ((float)inputP1/1024*175);
  lcd.setCursor(0,0);
  lcd.print("P1:");
  lcd.setCursor(4,0);
  lcd.print(outputP1);
  lcd.setCursor(0,1);
  lcd.print("A0:");
  lcd.setCursor(5,1);
  lcd.print(inputP1);
  delay (500);
}
```

7.CONCLUSION

This paper deals with air compressor that can be operated by using the solar panel which is used to drive the air compressor effectively without any external supply and an output of 100psi is achieved. It interfaces the air compressor and controller through relay sections the required value is controlled. Since using the mini compressor the overall size is reduced and made as portable or it is able to fixed to a vehicle. This project can also deflate the air if the actual value is more than the required value.

8.REFERENCE

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