Automatic Solar Air Compressor

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Abstract— With the increased urge for the vehicles in the day to day life for today's generation has led to have a continuous review over the status and working condition of the vehicles. Basically, the inflation of the tire and its wear condition. One of the presently used methods is, using the compressors running on the electricity. This manual or electric inflation causes following difficulties. Heavy force is required manually to push the piston along with the bearing in the head stock bore. Regular increase in the electric fares. Unreachable to the remote areas, where electricity is still a dream. Not safe for the user on a monetary basis. This project is to design and fabricate to minimize manual work as well as to use renewable source of energy by using a solar panel and to overcome the above difficulties. The main objective project is monitoring an air pressure level and automatic refilling of air is designed with our project. Designing and Fabrication of solar based air compressor has the following merits, Environmentally friendly. More economical, as solar energy is abundantly available. Continuous monitoring of air pressure on LCD. Easy to maintain. This process started from the literature survey. Some of the papers reviewed were "Automatic solar based air compressor". Accordingly, a PIC microcontroller is used in this project. Micro controller has the input modules like pressure sensor, control potentiometer for monitoring an air pressure and output modules are LCD display, relay. Air Compressor, solar panel, battery.

Keywords: Solar Panel, LCD, PIC Microcontroller, Air Compressor

I. INTRODUCTION

With the existing push in the direction of sustainable, clean sources of power, it is no surprise that solar power has become one of the most popular alternative energy sources. Free and available everywhere, the power of the sun can be employed to power everything like cell phones and motors. The sun's energy is usually harvested through solar panels that are made up of photovoltaic cells. These cells can convert the sun's power into electricity that can be used for a number of purposes. For private use, a handheld solar hybrid charger can be employed to recharge little device for instance a DC fan, a cell phone, or a camera. This project consists of Microcontroller based control unit that continuously monitors and controls the air pressure. This live pressure value gets display on Alpha Numeric LCD display in real time. 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 be controlled by the user manually using control buttons and also automatically by micro controller by a set point. In this project micro controller has the input modules like pressure sensor, control buttons and output modules are LCD display, compressor switching driver and buzzer to give alarm in case of high pressure.

II. RELATED WORKS

The air compressor is only monitoring the air pressure level using pressure sensor. It will only monitor the pressure level of compressor and it not self-powered.

III. PROPOSED SYSTEM

The Working of our project is self-powered with solar energy. The photons or solar energy from the sun is trapped by the photovoltaic cells present in the solar panels. Which is made to flow in a unidirectional way to the battery such that the battery does not discharge back? The battery is connected to switching circuit which finally drives the air compressor by turning it on. On the other hand, the switching circuit is made to work on the basis of the instructions given from the PIC microcontroller, which is the heart of the project. Initially the pressure sensor continuously monitored by pressure sensor. We are preprogramed normal set value of air pressure. The pressure value reach above or below set value based on this relay turned on and off to maintain air pressure level in required level and automatic refilling of air pressure is automatically performed.
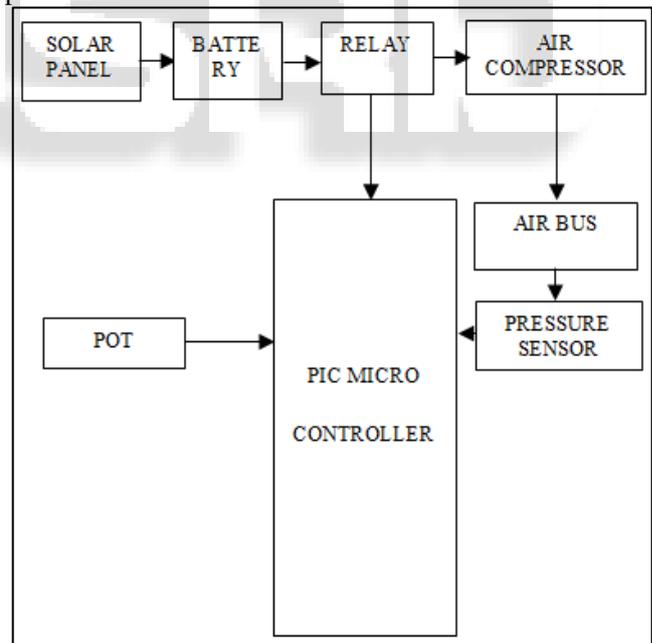

Fig. 1: Block Diagram

IV. HARDWARE COMPONENTS

A. PIC Microcontroller

Microcontroller is a general-purpose device, which integrates a number of the components of a microprocessor system on to single chip. It has inbuilt CPU, memory and peripherals to make it as a mini computer. The microcontroller that has been used for this project is from PIC series. PIC microcontrollers (Programmable Interface

Controllers), are electronic circuits that can be programmed to carry out a vast range of tasks. PIC microcontroller is the first RISC based microcontroller fabricated in CMOS (complementary metal oxide semiconductor) that uses separate bus for instruction and data allowing simultaneous access of program and data memory.

B. Solar Panel

A solar panel (photovoltaic module or photovoltaic panel) is a packaged interconnected assembly of solar cells, also known as photovoltaic cells. The solar panel is used as a component in a larger photovoltaic system to offer electricity for commercial and residential applications. solar cell or photovoltaic cell is a wide area electronic device that converts solar energy into electricity by the photovoltaic effect. Photovoltaic is the field of technology and research related to the application of solar cells as solar energy. Sometimes the term solar cell is reserved for devices intended specifically to capture energy from sunlight, while the term photovoltaic cell is used when the source is unspecified. Assemblies of cells are used to make solar modules, or photovoltaic arrays.

C. Battery

A battery is a device consisting of one or more electrochemical cells with external connections for powering electrical devices such as flashlights, mobile phones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode. The terminal marked negative is the source of electrons that will flow through an external electric circuit to the positive terminal. When a battery is connected to an external electric load, a redox reaction converts high-energy reactants to lower-energy products, and the free-energy difference is delivered to the external circuit as electrical energy. Historically the term "battery" specifically referred to a device composed of multiple cells; however, the usage has evolved to include devices composed of a single cell.

D. Relay

A relay is an electromagnetic switch operated by a relatively small electric current that can turn on or off a much larger electric current. The heart of a relay is an electromagnet (a coil of wire that becomes a temporary magnet when electricity flows through it). Relays are switching that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit. when a relay contact is normally open, there is an open contact when the relay is not energized.

E. Potentiometer

A potentiometer (colloquially known as a "pot") is a three-terminal resistor with a sliding contact that forms an adjustable voltage divider. If only two terminals are used (one side and the wiper), it acts as a variable resistor or rheostat. Potentiometers are commonly used to control electrical devices such as volume controls on audio equipment. Potentiometers operated by a mechanism can be used as position transducers. Potentiometers are rarely used to directly control significant power (more than a watt), since the power dissipated in the potentiometer would be comparable to the power in the controlled load. Instead they are used to adjust the level of analog signals (e.g. volume controls on audio equipment), and as control inputs for electronic circuits.

F. Pressure Sensor

A pressure sensor is a device for pressure measurement of gases or liquids. Pressure is an expression of the force required to stop a fluid from expanding, and is usually stated in terms of force per unit area. A pressure sensor usually acts as a transducer; it generates a signal as a function of the pressure imposed.

V. SOFTWARE SPECIFICATION

A. MPLAB IDE

MPLAB IDE is a free, integrated toolset for the development of embedded applications on Microchip's PIC and dsPIC microcontrollers. It is called an Integrated Development Environment, or IDE, because it provides a single integrated environment to develop code for embedded microcontrollers.

VI. ADVANTAGES

− Higher Efficiency
− Low Cost
− Reliable

VII. APPLICATION

This project is used for car bikes to monitor air and pressure level and Air is provided when the air pressure is low.
Used in many industries to monitor Air pressure level

VIII. PROGRAM

```
#include<pic.h>
#include"pic_lcd4.h"
#include"adc_pic.h"
//#include "pic_adc.h"
#include"pic_serial.h"
#define set RD0
#define mov RD4
#define inc RD1
#define dec RD2
#define ent RD3
#define rly RC0
#define alm RD6
void adc();
void keypad();
unsigned int in, out, va,set_out,sett,set1,set2;
unsigned char a;
bit n=0;
void interrupt timer2()
{
if(TMR2IF==1)
{
TMR2IF=0;
CCPR1L=a;
}
```

```
}
void main()
{
TRISD=0x0F;
TRISC=0x80;
TRISA=0xFF;
TRISB=0x00;
Lcd8_Init();alm=rly=0;
Lcd8_Display(0x80,"----------------",16);
Lcd8_Display(0xc0,"----------------",16);
Delay(65000);Delay(65000);
Lcd8_Command(0x01);
while(1)
{
//if(!set){Lcd8_Command(0x01);keypad();}
adc();
}
}
void adc()
{
Lcd8_Display(0x80,"PRE:",4);
in=adc_val(0);
in=in/4;
Lcd8_Decimal3(0x84,in);
Lcd8_Display(0xC0,"S.L:",4);
set1=adc_val(1);
set1=set1/4;
Lcd8_Decimal3(0xc4,set1);
Lcd8_Display(0xC8,"S.H:",4);
set2=adc_val(2);
set2=set2/4;
Lcd8_Decimal3(0xcc,set2);
if(in<set1){rly=1;Lcd8_Display(0x89,"PUMP ON",7);}
if(in>=set2){rly=0;Lcd8_Display(0x89,"PUMP OF",7);}
}
```

IX. CONCLUSION

Thus, we have seen the actual operation of an Air compressor it can be operated by using solar panel voltage stored in a rechargeable battery which is used to drive the air compressor effectively without any external supply which eliminates the usage of using conventional source of energy. In this project we are able to interface the air compressor with the help of microcontroller through relay section and programmatically we are calculating voltages which can be displayed on 16X2 LCD. Where this product is reliable and has an advantage of Easy maintenance, Compact Size, Easy to carry to remote place, Quick Inflation and it has got the application in Oil Industries, Gas Industries, House hold applications, Paint Spraying, Lubrication and in Automobile Industries.

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