

# Fabrication of Solar Based Automatic Tyre Inflation System

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**Abstract-** Tyres are the second-highest cost for the trucking industry. The on board air inflation system is used to maintain the pressure of tyres in running condition. The environmental conditions varies according to region, seasons because of this, it require maintaining the tyres pressure for better performance according to conditions. The most important application of this system is in military vehicle. At that remote place no such devices are available for maintenances of the tyres. Thus there a rises a need for automatic tyre inflation system. This can be done by employing appropriate technique. This project deals with the design and fabrication of automatic tyre inflation system.

**Index Terms-** 12 V DC Compressor, Ardiuno ckt, Battery , Rotary Joint, Solar Panel.

## I. INTRODUCTION

Automobiles have become an important and reliable companion of humans. The usage of the automobiles is increasing in a rapid manner. The various Automobile industry are now competing each other to win the hearts of humans. In order to do so, the companies are improving the safety systems in automobiles. The more reliable, the more successful the car becomes.

In ancient time, after the discovery of wheel by man, it has been used extensively for various purposes and it is vital part of human life for ages. These wheels runs human life faster and faster with new technology and one such technology is on board air inflation system used in automobiles. Tyre are the second-highest cost for the trucking industry. The on board air inflation system is used to maintain the pressure of tires in running condition. The environmental conditions varies according to region, seasons because of this, it require maintaining the tyres pressure for better performance according to conditions.

The most important application of this system is in military vehicle. For the military vehicle, the environmental condition, land conditions are continuously varying and they have to face very worst condition like heavy rainfall, snowfall, deserts. At that remote place no such devices are available for maintenances of the tyres. At some crucial times like war conditions or any flood conditions there is no time to filling the air.

It consists of compressor, which supplies air and air tank is used to stored air at constant pressure. This pressurize air can be filled into tyres through flexible ducting with the help of rotary bearing. The pressure conditions are achieved by pressure gauges. Maintaining correct inflation pressure in tyre helps to keep vehicle handling and braking at its best, as well as improving fuel efficiency and tyre life. In Addition it can prevent such events read separations and Tyre blow outs which may cause loss of control of a vehicle and severe crashes such as Roll overs.

Centralized automatic tire inflation systems monitor and continually adjust the level of pressurized air in tires, maintaining proper tire inflation automatically even while the vehicle is in motion.

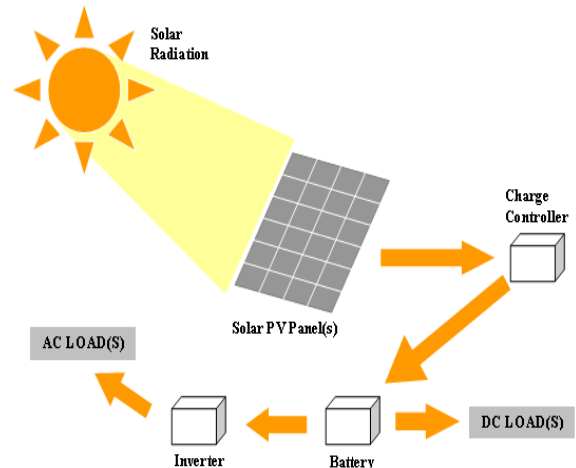


Figure 1 Working of solar panel to charge battery

Once an ATI system is installed, it should not require any special attention from the drivers. This eliminates the need to check tire pressure manually, which saves time and labor while ensuring consistent and proper tire inflation.

According to a recent report filed by the United Nation Framework Convention on Climate Change (UNFCCC) in April 2013, Carbon Dioxide (CO<sub>2</sub>) emissions from road transport have increased by 21 % between 1990 and 2011 and account for 23 % of the European Union's (EU) total CO<sub>2</sub> emissions. The EU, in its effort to meet the greenhouse gas emission targets set under the Kyoto Protocol, has pushed vehicle manufacturers to find solutions to limit the tailpipe emissions of CO<sub>2</sub>. After reviewing data on the fleet average CO<sub>2</sub> emissions from cars introduced after the year 2012, the European Commission had set the fleet average CO<sub>2</sub> emission target at 130 g/km for cars in 2015 and a projected target of 95 g/km for 2021. For the first time, these targets will be mandatory for all vehicle manufacturers within the EU. Failing to comply, will result in the vehicle manufacturer having to pay an excess emission premium for each new car registered.

The easiest way to reduce CO<sub>2</sub> emissions in a vehicle is to reduce its fuel consumption since the CO<sub>2</sub> emission is directly proportional to the amount of fuel consumed. Tyre inflation pressure plays an important role in the vehicle's fuel consumption. The results of a survey released by the US Department of Transportation's NHTSA in 2001 showed that a decrease of 0.55 bar, from the recommended inflation pressure, resulted in the reduction of fuel efficiency by 3.3%, in miles per gallon. This survey also found that one in four cars on the road had at least one tyre that was under-inflated.

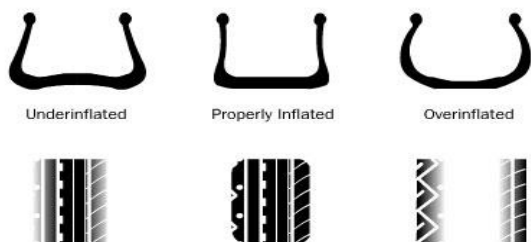


Figure 2 Tyre inflating condition

## II. PROBLEM STATEMENT

“When tyres are under-inflated, the tread wears more quickly. According to Goodyear, this equates to 15 percent fewer miles you can drive on them for every 20 percent that they're underinflated. Underinflated tyres also overheat more quickly than properly inflated tyres, which cause more tyre damage.

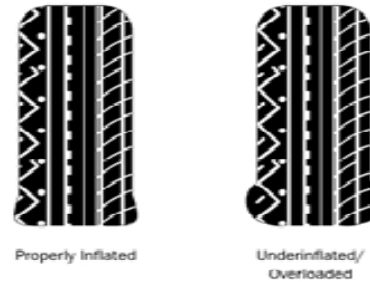


Figure 3 Properly inflated vs underinflated

You can see that the under inflated/overloaded tyre is less round than the properly inflated, properly loaded tyre. When the tyre is spinning, the contact patch must move around the tyre to stay in contact with the road. At the spot where the tyre meets the road, the rubber is bent out. It takes force to bend that tyre, and the more it has to bend, the more force it takes. The tyre is not perfectly elastic, so when it returns to its original shape, it does not return all of the force that it took to bend it. Some of that force is converted to heat in the tyre by the friction and work of bending all of the rubber and steel in the tyre. Since an under inflated or overloaded tyre needs to bend more, it takes more force to push it down the road, so it generates more heat.

To reduce this problems we are Fabricating this system. In this system we will continuously check air pressure of tyre and when low pressure is detected , air from compressor will be released and will be supplied to tyre.”

## III. OBJECTIVES

- By using Solar Based system maintaining proper tyre pressure in automobile vehicle..
- To improve Vehicle efficiency and Safety.

## IV. WORKING PRINCIPLE.

In this systemcontains a solar energy from sun stored in battery to run the compressor which is used to pass air through the rotary joint (which is fixed between wheel spindle and wheel hub at each wheel) via

hoses, providing the rotary motion of wheel assembly. Air is channeled through rotary joint without entangling the hoses. When pressure goes below the desired level it pumps air and tire inflates. The compressor gets power from the battery. This operation takes place when the vehicle is moving and there is a requirement of inflation of tire due to reduced tire pressure level.

The radiations received from sun is collected by the solar photovoltaic cell, the energy is stored in battery bank. From battery it is sent to the air compressor if the compressor is DC motor. The voltage regulator, microcontroller are used to control the fluctuation in the voltage. From batteries using inverter the energy is converted for AC motors air compressor. Once the battery is charged the energy is transfer to air compressor and starts working. The project consist of solar photovoltaic cell which generate electricity from sun rays and this energy can be stored in battery bank, for this purpose we use charged regulator which provides regulated electrical output from solar cells. This particular charged output is given as input to the air compressor motor. Air compressor is used to inflate tyre when the pressure in tyre get decreased. The buzzer get horned when pressure in any tyre get reduced by using sensors. Sensors send this signal to the microcontroller. Microcontroller send this signal to the solenoid valve which actuate the air compressor. When air pressure in the tyre get increased up to sufficient value then automatically air supply will off.

#### V. CONCLUSION

As stated in the problem statement that the system is to be developed to maintain the pressure that is required for proper inflation of tires. Our results will show that the purpose for which the design is done is achieved the system responses well to the under inflation of tires. The system is capable of succeeding a change in automotive industry.

This system clearly states that it improves:

- Reduce tire wear.
- Sustains vehicle mobility and stability

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