JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue

JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

# AUTOMATIC TYRE INFLATION SYSTEM

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***Abstract:*** This project aims to develop and fabrication of an automatic tyre inflating system, this system ensures that tyres are properly inflated at all times. Roads are the most important modes of transport, now a days cars are integral part of it. Tyres lose air through normal driving-especially when run through pot holes and permeation. Considering today's ever increasing environmental threats; oil price hikes and energy consumption our system is most compatible and potential improvement in gas mileage and tyre wear reduction which leads to an increase in performance of tyre in diverse conditions.

Moreover temperature changes are also one of the reason due to which tyres lose air. Thus vehicles run with an under-inflated tyre which may cause accidents. Studies show that a drop in tyre pressure by just a few PSI, can result in the reduction of gas mileage, tyre life, safety, and vehicle performance. The project aims to restore the tyre pressure on vehicles so that they are kept at optimum pressure levels, thus extending their life time at the same time saving the owner from fuel costs and maintenance cost incurred with underinflated tyres.

***IndexTerms – Arduino, GUI, Android.***

## 1. INTRODUCTION

The use of automobiles has been increasing day-by-day. Humans are completely reliable on automobiles for transport purpose. In today's competitive automobile sector; various automobile industries are competing with each other in order to win hearts of human. In order to do so the companies are making the system more effective by improving the safety systems in cars. After the discovery of wheels by man, it has been used extensively for variety of purposes. Wheels have become the vital part of human lives since ages. One such upcoming technology is automatic air inflation system used in automobiles

This system is used to maintain the pressure of tyres in running condition. Military vehicles are supposed to run on various environmental conditions; where land conditions are continuously changing. Such vehicles are supposed to be operated in worst conditions such as heavy rainfall, snowfall and deserts. The vehicle can also lose one or two pascal each month in winter and even more in the summer and you can't feel if they are properly inflated just by looking at them. This is a system which is installed on the vehicle that enables the operator to adjust the inflation pressure of individual tyre of the vehicle.

### 1.1 Literature Survey

The aim of this study is to design and fabricate a system which works on automatic filling of air into a tyre that is in running condition with a low cost device. It automatically checks the pressure inside the tyre with the help of pressure gauge and ON the compressor which takes air from atmosphere, compresses it and then delivers the compressed air to tyre and ensures that tyres are always properly inflated to improve tyre life, human safety, reduction of gas mileage and vehicle performance. As the wheel is in rotating condition while filling of air into it, rotary joint is fixed between wheel spindle and wheel hub at each wheel so that there is no tangling of hoses.

Michael Alexander et,al. This paper shows that drop in tyre pressure by few psi which causes reduction in tyre life and human comfort.[1]The aim of this paper is to design, develop and fabricate automatic tyre inflation system which ensures that tyres are properly inflated at all situations. This system addresses a potential improvement in reduction of tyre wear, vehicle performance in diverse condition.[2]

Mark Reiter et,al.The under inflation of pneumatic tyre is a typical problem which seen in light duty vehicles, cars etc. which affects the vehicle handling characteristics in adverse manner. A lane change test shows that the required steering wheel angle increased up to 47.7% for front axle tyre inflation pressures at 70% of the nominal values. All tyre were inflated to 70% of the recommended tyre pressure when vehicle slip angle was up to 77.8%. [3]

Harshal Junankar et,al. The paper studies on the basis of air inflation system are used to maintain tyre pressure in running condition of vehicle.The environmental conditions changes in different seasons because of this, it is necessary to maintain tyre pressure at optimum level for better performance of the vehicles. This project deals with the design & fabrication of the automatic tyre inflation system and study of the effect of pressure variation on tyre life [4].

### 1.2 Problem Statement

To develop an automatic tyre inflation system, this recognizes and fills air in respective tyre when its pressure goes below the desired/required pressure (under inflated condition). Underinflated tyre overheat more quickly than properly inflated tyre, which cause damage to tyres.

### 1.3 Objectives

- Design and fabrication of tyre inflation system.
- Maintains the required tyre pressure: The function of the system is to maintain and
- Adjust the pressure in all the tyres of the system according to varying loading and driving conditions.
- To check the temperature using temperature sensor.

## 2. METHODOLOGY

- Designing of Model.
- Selection of Components.
- Assembly of Components
- Testing
- Fabrication
- Fabrication

## 3. MATERIAL AND COMPONENTS

### 3.1. Air Compressor:

An air compressor is a device that converts power (using an electric motor, diesel or gasoline engine, etc.) into potential energy stored in pressurized air (there is compressed air). By one of several methods, an air compressor forces more and more air into a storage tank, increasing the pressure.

Figure 1: Air compressor

Table 1: Specifications of Air Compressor

| | |
|---|---|
| Operating Pressure Range (psi) | 0-150psi |
| Voltage Supply | 12 V DC |
| Weight | 2 Kg |
| Current | 15 amp |

### 3.2. DC Motor:

A DC motor is any of a class of rotary electrical motors that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic; to periodically change the direction of current in part of the motor.

Figure 2: DC Motor

Table 2: Specifications of DC motor

| | |
|---|---|
| Volts | 12 Volt |
| Current | 1 Amps |
| Speed | 100 rpm |

### 3.3 Catia 3-D Modeling

- Catia is also known as computer aided three dimensional interactive applications. CATIA was started in 1977 by French Aircraft Manufacturer Avions Marcel Dassault System
- . It is also used in aerospace, automotive, shipbuilding, and other industries.

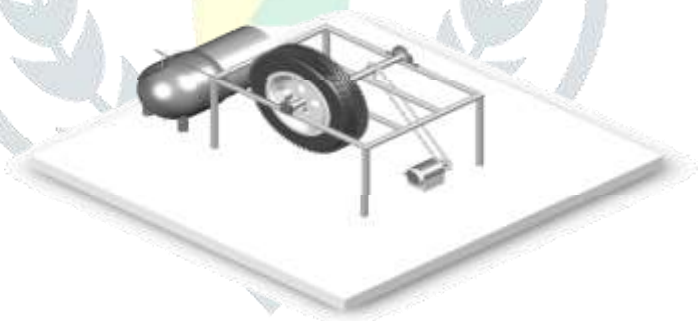

Figure 3: Design of Automatic tyre inflation system

## 4. EXPERIMENTAL WORK AND TESTING

The Automatic tyre inflation system contains a 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 tyre 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 tyre due to reduced tyre pressure level.

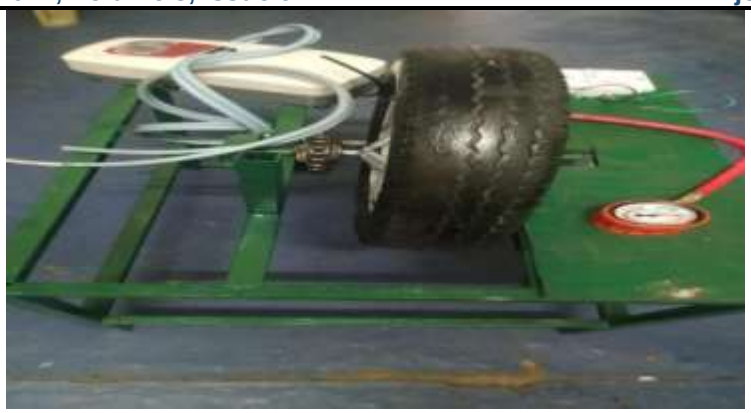

Figure 4: Fabrication of Automatic tyre inflation system

### 4.1 CALCULATION

Calculation for Mild Steel Selection:

M/I = σb/Y ……..(1)

Bending moment=force*perpendicular distance =5*9.81*450

Bending moment =22072.5Nmm

for diameter 15mm,

I=π/64*d4 ……(2)

=π/64*154 = 2483.78 mm4

Therefore, using equation no.

22072.5/5483.78=σb/7.5

σb = 8.86*7.5

σb =66.64 N/mm²

Calculation for Air Compressor Selection

For tyre pressure of 30 psi

Where, 1 psi = 0.06895 bar

Therefore,

30 psi = 30*0.06895 bar

= 2.0685 bar

= 2.1 bar (approx.)

Therefore, we are selecting 12V D.C.5.5 bar compressor for tyre pressure of 30psi

Calculation FOR DC motor Selection

Volt =12 volt

Current =1amps

Speed =100 rpm

Specifications

No of Teeth in Pinion =24

No of teeth in Gear = 60

Gear ratio = 2.5

Diameter of Gear = 10.5

Eqations:

Force required by cutting blade to shear the grass is given by;

F =T/R … ----------(1)

Where, T = Shaft torque

R = Radius of cutting blade But shaft torque is given by;

T = P/2πN … ----------(2)

Electrical Power is given by;

P = I * V … ----------(3)

Torque of motor is given by;

P= 2ΠNT / 100 … ----------(4)

T= (P*100) / (2ΠN)

## 5. RESULTS AND DISCUSSION

Proper tyre pressure thus always helps to improve the tyre life, improved ride quality, greater braking efficiency. The system will helps the driver to regulate and maintain proper pressure inside the tyres. The development of tyre pressure inflation system the users inflate their tyre more frequently at home and found to be as an easier application towards sustaining correct tyre pressure at all time and is working with satisfactory conditions.

## 6. CONCLUSION

The main focus of this project is to obtain automatic tyre inflating system. ensures that all tyre are always properly inflated and thus improves the tyre life, safety, reduction of gas mileage and vehicle performance by supplying air to all tyre via hoses and a rotary joint fixed between wheel spindle and wheel hub at each wheel whenever there is a pressure drop inside the tyre.

Reduce maintenance cost and time efficiency.

Reduce human efforts.

Increase the vehicle efficiency.

Increase the life span of tyre.

Increase fuel efficiency.

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