



AUTOMATIC TIRE INFLATION SYSTEM

Jitendra Narkhede¹ | Omkar Kulkarni² | Abhijit Shelke² | Manoj Patil² | Mayur Gorane²

¹ Professor, Department of Mechanical Engineering, P.V.P.I.T, Bavdhan, Pune, India-411021.

² Student, Department of Mechanical Engineering, P.V.P.I.T, Bavdhan, Pune, India-411021.

ABSTRACT

Road transport is one of the most important mode of transport. Thus, the vehicle safety is essential. Accidents are also increasing at a quick pace. There are several factors who contribute to this problem. Improper inflation of tires is one of them. Under inflated tires results in increased rolling resistance, loss in fuel economy and increased tire wear which results in decrease in tire life. It also affects the vehicle performance and vehicle handling characteristics. Increased tire wear may result in tire bursting which may lead to fatal accidents. Studies show that majority of vehicles run with at least one underinflated tire.

This paper suggests a new technique to try to solve this problem. By providing a vehicle mounted tire pressure monitoring and pressure maintaining system with the use of a compressor. This system will keep a check on the pressure in each tire and will try to maintain the proper pressure on the fly. Thus, keeping the tires properly inflated and reducing the problems associated with the under inflation. In case of a small puncture in tire the system will use the compressor to maintain the pressure of a tire. This will allow to drive a punctured vehicle safely until the puncture can be fixed. This simple and efficient technique is explained below.

KEYWORDS: Safety, Under inflated tire, Compressor.

1. INTRODUCTION

The "Automatic tire inflation system" is a device which will be used in automobile. The Air Maintenance Technology system developed through this project replenishes lost air and maintains optimal tire cavity pressure whenever the tire is rolling in service, thus improving overall fuel economy by reducing the tire's rolling resistance.

Today automobile sector plays a big role in the economics of all the countries in the world and lots of researches have been carried out to improve the efficiency of the vehicle one of the techniques to improve the efficiency of an automobile is to inflate the tire regularly. This means making sure that tires are inflated and stay inflated for the right amount of pressure for the load being carried and for road condition this way one can ensure not only the preservation of outer covering of the tires, but also the correct operation of vehicle without any risks.

The deflation is a process of letting air out of the tires. Deflation is the problem of an automobile vehicle. Deflation occurs mainly due to increased tire temperature the air in tire expands and leaks through the air refilling valve.

2. COMPONENTS:

i. Air Source (Compressor): Automatic tire inflation systems installed on military and commercial vehicles typically use the existing onboard air systems used to actuate the brakes of the vehicle. The capacity of the air system was usually increased due to the increased volume of air required by the system. For smaller cars, a compressor will be used.



ii. Rotary Valve: A rotary valve will lock onto an input valve while rotating to meet an outlet. During this time, the liquid and/or gas will flow into the rotary valve from its source and will be held within the device during its

movement. This liquid and/or gas will leave the valve when the valve openings meet during rotation and more liquid and/or gas will flow into the valve again for the next rotation. Often functioning under high pressure and constant movement a rotary valve is designed to rotate around an axis. A rotary valve's design can be altered to change this or to increase the psi or rpm it needs to withstand.



iii. Pressure Sensor: A pressure sensor measures pressure, typically 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. For the purposes of this article, such a signal is electrical. Pressure sensors are used for control and monitoring in thousands of everyday applications. Pressure sensors can also be used to indirectly measure other variables such as fluid/gas flow, speed, water level, and altitude. Pressure sensors can alternatively be called pressure transducers, pressure transmitters, pressure senders, pressure indicators, piezometers and manometers, among other names. Pressure sensors can vary drastically in technology, design, performance, application suitability and cost. A conservative estimate would be that there may be over 50 technologies and at least 300 companies making pressure sensors worldwide.

iv. Control Unit: The control unit is a relay circuit which compares the output value generated from pressure sensor and compares it with the standard value. If the pressure value is less it will trigger the compressor the compressor will start filling air. When the pressure in tire equals the standard value the control unit will shut the compressor off.

3. EXPERIMENTAL SETUP



fig: Automatic tire inflation system

3. RESULTS:

Tire pressure monitoring and automatic air filling system is a key in reduction of accidents due under inflated tires. Tire is filled by turning on compressor only if the pressure inside the tire become less than the desired value. If the pressure in tire is equal to the standard value the compressor shuts off.

4. CONCLUSIONS:

Any tire pressure monitoring system will work effectively if and only if the right sensors are fitted into a tire. The lack in standardization of manufacturing and delivering of such sensor-fitted tires poses a big problem. By applying tire pressure monitoring and automatic air filling system properly it is easy for the driver to monitor the pressure and temperature on each tire. Tire's inflation pressure is always under check and is maintained at a standard level. Using this system gives safety of drivers and passengers become a forefront benefit, fuel efficiency is improved by having standard tire pressure and helps to avoid accidents caused with low inflated tires. It will also increase the life of tire there by reducing the cost of maintenance. The increased fuel efficiency will result in lower fuel expenses and it will reduce the environmental effect of the vehicle.

REFERENCES

- [1] A Textbook of Machine Design by R. S. Khurmi and J. K. Gupta.
- [2] A Textbook of Automobile Engineering by Kripal Singh.
- [3] A Textbook of Analog Electronics by L. K. Maheshwari and M. M. S. Anand.
- [4] Hemant Soni, Pratik Golar, Ashwin Kherde, Design of Automatic Tyre Inflation System, Industrial Science, Vol.1, Issue, 4/April 2014, ISSN: 2347-5420
- [5] Kshitij P. Gawande, Sanket A. Kulkarni, Aniket S. Kshirsagar, Automatic Tyre Pressure Control In A Vehicle, Vol. 1 Issue 6, August 2012, ISSN: 2278-0181