

“TYRE PRESSURE MANAGEMENT SYSTEM BY AUTOMATIC AIR FILLING MACHINE ON 4-WHEELER: A REVIEW”

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ABSTRACT: Tyre is the important part of any vehicle because whole body part exert on the tyre . A drop in tire pressure by just a few pounds per square inch (PSI) can result in the reduction of gas mileage, tire life, safety, and vehicle performance .Tyre pressure monitoring system is a primary need for safety concern of any vehicle .Tyre pressure management system (TPMS) gives instruction about pressure in the tyre and help for safety . The driving force behind the tire pressure management system (TPMS) was to solve the incorrect tire pressure situation. Several key objectives were set forth in order to design a product which satisfies the problem and customer's needs. TPMS needed to have preset pressure settings for different operating conditions. For pulling a heavy load out of an incline at slow speeds, crawling out of soft dirt, or maneuvering through challenging terrain, a lower tire pressure is desired in order to maximize traction.

Keywords: Air compressor, Distribution box, Pressure gauge, Control valve

1. INTRODUCTION

The majority of automobile drivers do not adequately maintain their tire pressure, even though they lose approximately one to two pounds per square inch (PSI) of air pressure a month. Underinflated tires cause a greater contact surface area with the road, resulting in higher friction between the road and tire. This significantly decreases tire life and fuel economy. According to Doran Manufacturing, when tires are 20% underinflated, tire life and fuel economy can be reduced by 30% and 3% respectively . Vehicle handling characteristics are also adversely affected due to low tire pressures. Stopping distances increase and the driver experiences a loss of steering precision and cornering stability. With all these undesirable effects, proper tire pressure should be of greater concern. The National Highway Traffic Safety Administration (NHTSA) statistics show that 660 fatalities and 33,000 injuries occur every year as a result of low-tire pressure-related crashes . The main reasons for incorrectly inflated tires include vehicle owners not knowing proper tire pressures for certain conditions, difficulty finding an air pump, lack of a pressure measuring device, and a general lack of concern. The Rubber Manufacturers Association has estimated that only about 19 percent of drivers properly check their tire pressure. These facts show that a system is needed to maintain proper tire pressure for optimal performance in a variety of driving

conditions. This report will discuss the design of a system that makes pressure adjustments to the front and rear tires separately through the use of a user control interface. The system consists of a centralized air compressor, a reservoir storage tank, and solenoid valves to control the direction of air flow. An MSP430, a microcontroller from Texas Instruments, is used to control the system. The designed system also provides several preset pressure settings. This allows the user to adjust pressures based on driving conditions. The pressure in any single tire or in each tire in any combination of tires, up to a total of four tires, should not fall to 25 percent or more below the vehicle manufacturer's recommended cold inflation pressure for the tires.

2. LITERATURE REVIEW

A tire pressure monitoring system is not a new idea. In fact, the first monitoring system was installed in select production cars in the mid 1980's. Such additions were limited to hi-end vehicles and remain absent in today's production cars. However, on March 1, 2005, the National Highway Traffic Safety Administration (NHTSA) and Department of Transportation (DOT) created a final rule which forces car manufacturers to include a tire pressure monitoring system in every vehicle under 10,000 pounds . This system "must warn the driver when the pressure in any single tire or in each tire in

any combination of tires, up to a total of four tires, has fallen to 25 percent or more below the vehicle manufacturer's recommended cold inflation pressure for the tires". This bill, named Transportation Recall Enhancement, Accountability, and Documentation (TREAD) Act, was pushed into effect by former President Bill Clinton after the Firestone tire recall. Firestone tires were responsible for over one-hundred deaths due to tire blowouts in sport utility vehicles (SUVs) and received much attention from the general public as well as Congress. Although a monitoring system will alert a driver to any underinflated tire, the driver must manually fill each tire to the recommended level using an outside air source. Commercial and military trucks have been using systems which automatically inflate the tires using an onboard air source. "As early as 1984, GM offered the central tire inflation systems (CTIS) on Commercial Utility Cargo Vehicle (CUCV) Blazers and pickups. CUCV's are essentially full-size Chevrolet Blazers and pick-ups that have special equipment added for military applications. These types of trucks have been used by the U.S. military since the mid-1980s. Although systems exist for monitoring the pressure in tires, few systems exist which allow automatic inflation and deflation for vehicles in the public market. Systems currently in development include a peristaltic pump, as well as others which are in the prototype stage.

3. COMPONENTS

a) Flow Control Valve

Its is used to control the flow of air into distribution chamber.

¼ INCH*8mm



b) Distribution Block

Its is used to distribute the air in different wheel and maintain constant pressure in each wheel with the help of flow control valve. **150*150*30 mm**



C) Bearing

Its is used to rotate two component at a time . And reduce friction between two component.

Bearing 6203-2z



d)Rotating Coupling

Its is used in between tyre and connecting shaft . In which both end are free to rotate



e)Compressor Tank

Its is used to store a air and utilize when its is require.

Dia 130mm,length 150mm



4. WORKING

In these process of automatic air filling in four wheeler vehicle .The air compressor is used to compress the air from atmosphere at required pressure. The Pressure relief valve is used to maintain the pressure of tyre. The Flow control valve is connected to the compressor and supplies air to the distribution chamber. Four tubing of the distribution block is connected to the tyre and in these four tubing flow control valve is individually attached and control air supply .Distribution block is connected to the tyre with the help of tubing and supplies required air to the tyre.

The tyre pressure is measured with the help of pressure gauge. When the pressure in the tyre reduced below the required level then then it sends feedback signal to compressor for maintaining pressure level of the air in the tyre.

Compressor works on the 12V battery of the vehicle and it is reciprocating in nature that's why its easy to obtained the

desired pressure level. Rotary joint is used to rotate well as to supply compressed air simultaneously when requires.

5. CONCLUSION

An automated system was developed that will help the need for maintaining tire pressure. The system comes with several pre-defined tire pressure settings and allows the user to enter their own pressure setting if needed. This system will take the maintenance out of proper tire pressure resulting in increased tire life, fuel efficiency, vehicle safety and performance.

With an automobile manufacturer's resources, the axles would be engineered to incorporate the rotary seal to their drive assembly and the electronics would be integrated with the vehicles current design. Because of mass quantity orders, a carbon faced seal would be recommended for a better sealing surface and improved life cycle. Electronically, the user interface could be incorporated into existing display systems in the dash. Through this configuration, the keypad could be eliminated and replaced by an existing touch screen. By incorporating the user interface into current dash arrangements, the user will be able to view the pressures on a much larger screen than this prototype, making it much more user friendly. The analysis showed clearly that my system improved the life time of the tire and also provided a smooth ride. It also increased the fuel efficiency. The prototype was able to tackle various conditions. It also proved vital in warning about the puncture. My future implementation is to device a more compact version of my prototype.

6. RESULT

It will increase the life of tire .After fabrication of automatic tyre inflation system, the result obtained that if the system utilization will be executed in proper by taking and concerning all the relevant according to the project demand the process time, cost and human efforts can be reduce in a great manner .

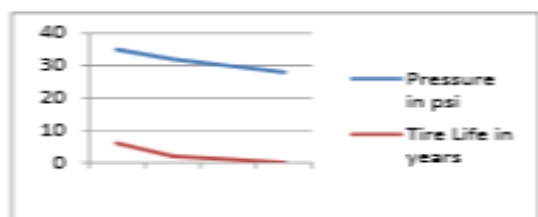


Figure 9- Before System

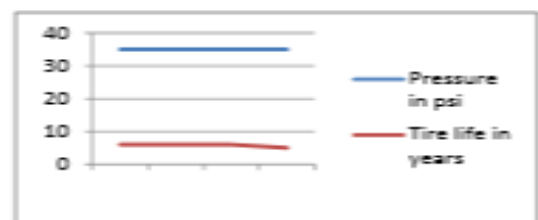


Figure 10- After System

The two graphs show a comparison between the pressure level in tire and the life time of the tire before and after using the system. The manufactures say that the maximum life time of a tire is mostly around 6 years.

Figure 1- Before using the system, the pressure level is not maintained properly. Due to this improper maintenance of the tire, the life time of the tire falls rapidly. This causes the early replacement of tire. The under inflation also causes more wear and tear of the tire. This under inflation allows punctures to occur easily.

Figure 2- After using the system, the pressure level is maintained properly. The tire is filled with optimum air. Thus the life time of the tire is maintained properly. As it is filled with optimal air the probability of puncture is greatly reduced

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