

Automatic Tyre Inflation System

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Abstract- *The Driven by studies, if there is a drop in tyre pressure by a few PSI can result in the reduction of gas mileage, tyre life, safety, and vehicle performance. We have developed an automatic tyre inflation system that ensures the tyres are properly inflated constantly. Our design proposes and successfully implements the use of a compressor which is centralized and will supply air to all four tyres through hoses and a rotary joint which is fixed between the wheel spindle and wheel hub at each wheel. The rotary joints effectively allow air to the tyres without the tangling the hoses. With the recent oil price hikes and growing concern of environmental issues, this system addresses a potential improvement in gas mileage; tyre wear reduction; and an increase in handling and tyre performance in diverse conditions*

Keywords- Automatic Tyre Inflation System

I. INTRODUCTION

Improperly inflated tyres are quite common problems on passenger vehicles. In fact, 80% of passenger vehicles on the road have at least one under-inflated tyre and 37% of passenger cars have at least one tyre that is 20 percent or more under-inflated. Often pressure loss in tyres is a result of natural permeation of the gas through the unpredictable rubber, road conditions (such as potholes), and seasonal changes in. Most vehicle owners are unaware of the fact that their tyres are not at the exact pressures because it is difficult to determine the tyre pressure visually; a tyre that is properly inflated to the accurate pressure looks very similar to one that is either over-inflated or under- inflated. Thus, from the lookout of passenger vehicle owners, they are losing money due to increased tyre wear and decreased fuel efficiency, and a clarification needs to be found to correct this issue. From the perspective of the designers, however, the root cause of improperly- inflated tyres is due to vehicle owners not knowing appropriate tyre pressures for certain conditions, trouble finding an air pump, lack of pressure calculating device, and a general lack of concern. Thus, the combination of the user and expert perspectives will be used to make decisions in the design process of this product.

II. PROBLEM STATEMENT

The aim of this study is to design and fabricate a system in which there is proper inflation in the tyre at all times

which produce fuel savings of 1-4% and increase tyre life by up to 10%. A trial was done in this case paper involving two cement tankers in NSW Australia operated over a period of 12 weeks in 2013. For first 6 weeks central inflation system was turned ON in both tankers and for another 6 weeks central inflation system was turned OFF in the both and graphs are prepared showing trucks with central inflated system is good in conditions like average vehicle idle time, average vehicle time spent using power take off, average vehicle GHG emissions, average vehicle fuel consumption across the trial period.

III. OBJECTIVES

- To study of the tyre inflation system
- Describe the construction and working of various parts of our project
- Development of the working model of the our project

IV. LITERATURE REVIEW

Bezuidenh out in discuss The South African Sugar cane industry has identified central tyre inflation (CTI) as a technology that could improve vehicle performance and reduce costs. This specific need is due to the fact that transport comprises up to 20 % of a cane grower's production costs because of poor vehicle utilization. Consequently it is important that transport costs should be reduced in order for the sugarcane industry to maintain profitability.

Central tyre inflation technology offers benefits such as improved mobility and savings in road maintenance costs, but more importantly can also reduce the two largest operational expenses on a transport vehicle namely fuel and tyres as per Oberholzer. As per Kaczmarek during World War II the mobility requirements in the former Soviet Union and Warsaw pact countries were extremely demanding due to poor road and highway quality. Consequently, a considerable effort was made by these countries to develop systems to improve mobility, including primary suspensions and central tyre inflation systems.

Kaczmarek (1984) stated that "One of the most effective and well proven systems that have been adapted to wheeled tactical vehicles to improve the overall vehicle mobility is CTI." However, after World War II no serious

consideration of the benefits of CTI occurred until the early 1980's, where after most of the military tactical vehicles produced in the United States were equipped with CTI discuss by Adams. Sturos *et al.* Say's Tyre deflection is the key to understanding the use of CTI technology. Tyre deflection is defined as the change in tyre section height from the freestanding height to the loaded the height. The percentage deflection is the ratio of that change to the freestanding section height. At the lowered inflation pressures (increased tyre deflection), the Tyre's imprint or contact the area is greatly increased and the load is applied over a substantially larger area. Foltz and Elliot discuss that A CTI system permits a vehicle operator to optimize tyre and vehicle performance by varying inflation pressures in response to changing operating conditions (load, road and vehicle speed) while the vehicle is moving. In this study, the air pressure of tyre is maintained by using automatic tyre inflation system.

V. CONSTRUCTION AND WORKING

A conclusion section is not required. Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions.

A) Methodology

- The horizontal and vertical component are fixed on a wooden plank through nut and bolts.
- Now the wheel hub or wheel assembly is attached to the vertical component which allows the free rotation of the wheel.
- The wheel nozzle is permanently fixed by a hollow tube going through it and which is then further attached to the rotary joint end.4. Now the rotary joint is attached to tube which goes to the nozzle of the wheel.
- The rear nozzle coming out of the nozzle is attached to compressor mouth from where the compressed air is to be supplied.
- The compressor is fixed on the wooden board and is attached to the available power source.

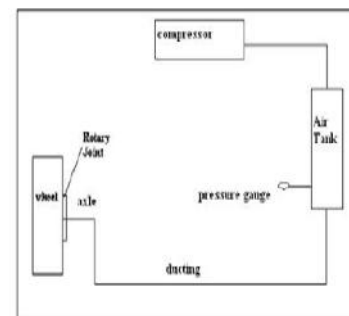


Figure 1: Diagram of the project

This mechanism works on the principle that the compressor supplies air to the tyre when the vehicle is running. The air from the compressor is supplied to the rotary joint, from where the air is supplied to the tyre which is under-inflated because of the implementation of rotary joint the air is easily supplied to the tyre without tangling the hoses. An automatic compact air compressor, shutdown automatically when the required tyre pressure is reached. In the process of automatic tyre inflation system as shown in fig.(c), the compressor is used to compress the air. The air is taken from the atmosphere and compressed it at required pressure. There is ducting which is used connect to the compressor outlet port and one end of the rotary joint. The compressed air is supplied to the rotary joint through the ducting. Two Pedestal bearings are used to support the axle of the assembly. Bearings are fixed to the rigid supports via nuts and bolts. The axle is rotate on which wheel or rim is mounted on one end. One end of coupler is connected to axle and other end is connected to rotary joint. There are electronic sensors are used to detect the tyre pressure with the help of pressure gauge. When the pressure in the tyre reduced below the required level then the sensors senses the pressure level and send 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 it's easy to obtain the desired pressure level. Rotary joint is used to rotate well as to supply compressed air simultaneously when required.

Parts used in the project

- Rotary Union (Housing, Shaft, Bearing,)
- Pressure Switch
- Solenoid Valve
- Portable Compressor
- Mechanical seal
- Compressor
- Wheel Hub
- Other components :- nuts, bolts, clamps ,nozzles for air supply etc. has been used as per the need

Working of the project

When the pressure reduces below the lower limit in the tyre during its rotation, pressure sensor senses the air drop and starts the compressor and solenoid valve automatically for filling of air into the tyre with the help of control circuit.

ADVANTAGES

The Tyre Inflation System can be introduced as a new product in the automobile industry. It addresses the needs of the consumers and maintains appropriate Tyre pressure conditions.

- There will be reduction in the Tyre wears due uniform pressure in the Tyres.
- Increase in fuel economy.
- Increased overall vehicle safety of the vehicle and passengers.
- As this device is not used in majority of vehicles, the market condition would be favorable for the introduction of a Tyre inflation system.
- It will provide sufficient airflow to the Tyre with minimum leakage
- The main beneficiaries from this device will be the vehicles owners.
- Despite an initial investment, there will be reduction in cost due to reduced Tyre wear and an increase in the fuel economy.
- With an increase in fuel economy for passenger vehicles and the demand for petroleum fuel will reduce.

VI. CONCLUSION

- Tyre Inflation Systems have several benefits for the transportation industry and for the for the vehicle owners.
- These benefits include, improved vehicle mobility due to improved traction, improved ride quality and cargo
- safety due to the reduction in vehicle vibrations when the correct Tyre pressure is used, reduction in road maintenance, increased fuel efficiency and a considerable increase in the Tyre life of vehicles. Thus Tyre Inflation
- System should be used in vehicles for the betterment of automobile industry, vehicle owners, passengers and society as a whole.

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