*International Journal For Technological Research In Engineering*
*Volume 6, Issue 8, April-2019* *ISSN (Online): 2347 - 4718*

# AUTOMATIC TYRE INFLATION SYSTEM

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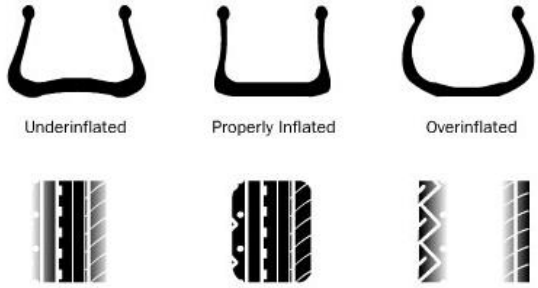
***Abstract: Since the discovery of tyres, amelioration is being done in tyres of a vehicle on a regular basis for its improved life and its role in increasing vehicular safety. As we all know that vehicle is the most important part of our life, because it helps us in traveling miles in a few minutes. The air pressure of the tyres needs to be maintained at ideal level for better running of vehicle and for its safety purposes. So, this system was introduced keeping in mind the fuel consumption, vehicular safety and comfort. It maintains the required tyre pressure of vehicle, increases fuel efficiency and reduces tyre wear thus increasing their life and reducing the tyre replacement time and cost. Significant aim of introducing this system is to maintain ideal pressure in tyres and when the pressure of tyre goes below ideal vale pressure gauge monitors it and the tyre is inflated again. This paper provides a better understanding for researchers and new learners on the working, advantages and limitations of the "Automatic tyre inflation system" used in tyres of a vehicle.***

***Key Words: Automatic tyre inflation, tyre pressure, tyre life, fuel consumption, vehicle safety.***

## I. INTRODUCTION

The use of automobiles has been increasing day-by-day. Humans are completely reliable on automobiles for transport purpose. In today'scompetitive 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. The more reliable the system is, more successful the car becomes.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. The effective use of wheels with more innovative ideas further developed with developing technologies. 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. This project work titled automatic tyre inflation system deals with the difficulty in driving the vehicles with low and high tyre pressure. The irregular and uneven tyre pressures cause difficulty in driving and even leads to the accidents. This can be implemented on the vehicles which have air braking system. The project automatic tyre inflation system is concentrated in maintaining the tyre pressures and thereby reducing the driving difficulties. This is done by mechanical means and not by using any sensors and other electronics. The air can be inflated into the tyres without stopping the vehicle. The air from the air tank is used for inflating the tyres. The air from the tank is sent to the tyres through a one-way valve. The twist made in theair hose is prevented by a joint. The design of the system is very simple and also very economical. Therefore, it can be implemented easily in the vehicles. The space requirement for the installation is also very less.Automatic tyre inflation systems can save tyre maintenance costs and improve fuel economy by nearly 1 percent, saving 100 gallons of fuel and eliminating 1 metric ton of greenhouse gas emissions per year. Properly inflated tyres also have fewer punctures and a longer life expectancy.



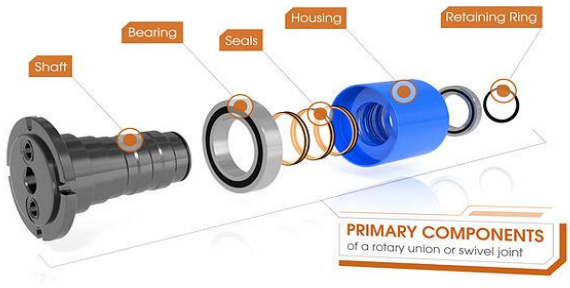

### 1.1WORKING PRINCIPLE

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 channelled 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.

## II. COMPONENTS AND THEIR WORKING

The overall system is primarily composed of the Wheel-end assembly and a control module. The wheel-end assembly comprises of a flexible hose with check valves. The check valves only permit air to flow into the tyres inspecting no leakage of air. The basic working of this system is that it has a rotary joint which sends air to nozzle which are fitted in the rim and the rotary joint allows rotary motion to wheel assembly.

ROTARY JOINT



Rotary joint or a Rotary Union is a device that provides a seal between a stationary passage and a rotating part. Stationary passage may be a pipe or tubing; whereas rotating part can be a drum, spindle or a cylinder. Thus, it permits the flow of the fluid into and/or out of the rotating part. Generally, the fluids that are used with the rotary joints and rotating unions are steam, water, thermal oil, hydraulic fluids etc.

A rotary union 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 unionfrom its source and will be held within the device during its movement.

This liquid and/or gas will leave the union when the valve openings meet during rotation and more liquid and/or gas will flow into the union again for the next rotation.

2. Pressure gauge


PRESSURE GAUGE

A pressure sensor measures pressure of gases or liquids. It generates a signal as a function of the pressure imposed; in our system such signal is electrical. Pressure sensors can also be uses to measure other variables such as fluid/gas flow, speed and water level. Pressure sensors can alternatively be called pressure transducer, pressure transmitters, pressure sensors, pressure indicators, piezometers and manometers among other names.

3. Bearing

Journal or plain bearings consist of a shaft or journal which rotates freely in a supporting metal sleeve or shell. There are no rolling elements in these bearings. Their design and construction may be relatively simple, but the theory and operation of these bearings can be complex. This article concentrates on oil- and grease-lubricated full fluid film journal bearings; but first a brief discussion of pins and bushings, dry and semi lubricated journal bearings, and tilting-pad bearings.

BEARINGS

Low-speed pins and bushings are a form of journal bearing in which the shaft or shell generally does not make a full rotation. The partial rotation at low speed, before typically reversing direction, does not allow for the formation of a full fluid film and thus metal-to-metal contact does occur within the bearing. Pins and bushings continually operate in the boundary lubrication regime.

These types of bearings are typically lubricated with an extreme pressure (EP) grease to aid in supporting the load. Solid molybdenum disulphide (moly) is included in the grease to enhance the load-carrying capability of the lubricant. Many outdoor construction and mining equipment applications incorporate pins and bushings. Consequently, shock loading and water and dirt contamination are often major factors in their lubrication.

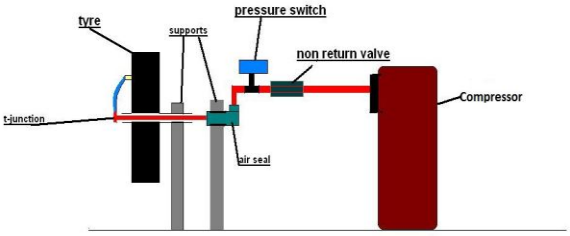
4. Compressor


AIR COMPRESSOR

The system uses compressor to get the air from atmosphere & to compress it to a required pressure. A 12V DC compressor has being used in our system. It is perfect for cars, bikes and inflators. It operates from the cigarette lighter socket of a DC- 12V.

Proper design has been set up for installing hose and cord. It is ideal for inflating all vehicle tyres and other high-pressure inflatables. The following table shows the specification of our portable compressor.

MODEL




This is the general layout of our model of the automatic inflation of tyres. It shows all the parts of the model and gives a general idea of it's working.

ADVANTAGES OF AUTOMATIC TYRE INFLATION SYSTEM-

Inclusive of the fact that it is very economical it also serves a very cardinal function i.e. safety of the passengers and vehicle itself and this type of system is not very common in passenger vehicles it can add great value to the automobile industry and can grab handsome amount of market in the industry. Except these valuable points it has some more advantages-

- Tyre wear will reduce significantly because correctly inflated tyre doesn't wear much
- Vehicle will consume less fuel
- Ideal amount of air will be supplied without consequential leakage.
- Driver's or passenger's work will reduce and there will be no wastage of time in regular checking of tyre pressure.
- Although it is costly at the time of installation, it can serve for longer span of time without changing the system and reduce air re-filling cost.
- No special requirement of technically sound person as it is user-friendly.
- Stopping distance of the vehicle would be ideal. When the tyre will be properly inflated then the coefficient of rolling resistance will be smaller resulting in proper motion and reduced heat generation in tyres resulting in stopping the vehicle at the proposed distance.

LIMITATIONS

Automatic tyre inflation system rarely has any disadvantage but there are quite a few:

- As the rotary joint continuously moves its life is limited it needs to be replaced after sometime time but with proper maintenance it can work for longer duration of time.
- Seals must be replaced regularly for optimum results.
- Pipes and tubes must be inspected from time to time.

## III. CONCLUSIONS

We can conclude that this automatic centralized compressor self-inflating tyre system ensures that all tyres are always properly inflated and thus improves the tyre life, safety, reduction of gas mileage and vehicle performance by supplying air to all tyres 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. In order to serve efficiently and increase the vehicle performance, tyre life and overall safety of the vehicle or society as a whole, it becomes essential to implement this technique. This system doesn't exist in majority of passenger vehicles till date so it will be a boom to the automobile industry. As discussed earlier it will lead to thrifty fuel consumption, better vehicle mobility due to better traction and the vehicle vibrations lessens thus ameliorating cargo safety as it is capable of retaining ideal tyre pressure by providing sufficient air flow with minimum leakage, taking care of the loads transferred on rotary joints simultaneously.

FUTURE SCOPE

In case of less pressure in tyre, there is need to fill the air in tyre for safety of driver and others. So, to fill the air with the help of microcontroller is main purpose. Pressure gauge senses pressure and according to it air is filled in tyre. During summer season, there is increase in pressure of tyre so to reduce the pressure there is pressure gauge which sense the pressure and reduce it using microcontroller. Also, pressure inside the tyre is affected during various seasons.

As previously mentioned, the main beneficiaries of this advancement in technology that will allow for tyre pressure to be adjusted for driving conditions will be the vehicle owners. Despite an initial investment in the technology, they will experience a reduction in tyre wear and an increase in fuel economy; both of which will result in saving money in the long run. It is plausible to say that society as a whole will benefit from the resulting design. The reduction in tyre disposal in landfills and decrease the rate of consumption of natural resources will truly benefit society. Also, the improvement in vehicle safety will benefit all people who drive a vehicle on the roadways.