

Central Air Inflation System

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Abstract: This specific need is due to the fact that transport comprises of 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 or any other industry to maintain profitable. Central tyre inflation technology offers benefits such as improved mobility and savings in road maintenance costs, but more importantly, it can reduce the two largest operational expenses on a transport vehicle namely fuel and tyres. In this project report, the basic workings of a CAIS system is explained; the various areas in which CAIS systems offer benefits are examined; and the cost benefit of implementing a CAIS system is analyzed.

Introduction

The mode of transport is one of the most important criterions these days. The vehicles safety is thus essential. Accidents are also increasing at a quick pace. There are several factors which causes these accidents. The improper inflation of tyres is one among them. Tyres lose air through normal driving (especially after hitting pot holes or curbs), permeation and seasonal changes in temperature. When tyres are under inflated, the tread wears more quickly. Underinflated tyres get damaged quickly due to overheating as compared to properly inflated tyres. The under inflation also causes a small depreciation in the mileage as well. Above all the vehicles running with under inflated tyres can cause accidents.

Thus to rectify all these defects we are using self inflating systems. The pressure monitoring systems in such systems helps in monitoring the tyre pressure constantly. The system which contains sensors feed the information to a display panel which the driver can operate manually. The electronic unit controls all the information. The source of air is taken from the vehicles air braking system or from the pneumatic systems. Thus it helps in re-inflation of the tyres to proper pressure conditions.

Problem Statement

When tyres are under-inflated, the tread wears more quickly. According to Goodyear, this equates to 15% fewer miles you can drive on them for every 20% that they're underinflated. Underinflated tyres also overheat more quickly than properly inflated tyres, which cause more tyre damage. The faded areas below indicate areas of excessive tread wear.

Because tyres are flexible, they flatten at the bottom when they roll. This contact patch rebounds to its original shape once it is no longer in contact with the ground. This rebound creates a wave of motion along with some friction. When there is less air in the tyre, that wave is larger and the friction created is greater and friction creates heat. If enough heat is generated, the rubber that holds the tyre's cords together begin to melt and the tyre fails. Because of the extra resistance an underinflated tyre has when it rolls, your car's engine has to work harder. A statistics show that tyres that are underinflated by as little as 2 psi reduce fuel efficiency by 10%. Over a year of driving, that can amount to several hundred dollars in extra gas purchases.

Methodology

This discussion covering project overview and throw out opinion that related about title and instruct to proposed a certain design and concept before go up to next step. Then start to make and decide the best idea about the title. Before that, literature review and research about title is the important point to get the best idea. Then study and make a lot of investigation about conventional air filling system. This includes a study about concept of conventional air filling system, process to fabricate, and material. These tasks have been done through study on the internet, books, and others information. After gather and collect all related information and obtain new idea and knowledge about the title, the project would continue with the design process. After that material preparation which is has been confirm initially. Purpose of this process is to determine the suitable and follow the product and design requirement. This process covering purchased material, measuring material and cutting off based on requirement. Here, this process is important because the material would determine whether our product in way to failure or otherwise. After all the drawing and material preparation done the next process is a fabrication process. This process based on dimension has been determined from drawing. During this process, all the manufacturing process which is suitable could be used such as drilling process, thread using lathe machine, welding process and cutting material using disc cutter. The evaluation is by considering the strength, portable, durability, safety and other.

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.

Literature Review

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).

Brown and Sessions (1999) summarized several of the United States Forest Services sponsored research programs to evaluate the impact of CAIS in commercial logging operations on Forest Service lands. The rough nature of logging roads forces vehicles to slow down in order to limit the vehicle vibrations which negatively impact the vehicle as well as the health of the operators. The results of their research showed that, with CAIS the overall vehicle's speed could be increased as a result of the tyres being optimally suited to the road surface conditions.

Components

1. Portable Compressor

12V Car Electric Air Compressor Tire Pump: Tire Inflator can also be used for bikes, cycles, boats, inflatable toys. No manual pumping of air is required as it is all electronic and is powered directly from car battery. It is perfect for anyone who wants to easily inflate a tire. It is time saving compared to the mechanical pump. Quick operation, very compact and easy to store in car dickey; and suitable for auto tyres, car/bike tyres, rubber rafts balls, inflatable car tyres, bicycle tyres, rafts and sports equipments such as basketball, soccer etc. It can also inflate boats, pools, air bed, balloon, etc.

2. Pressure Gauge

Pressure gauges are used for a variety of industrial and application-specific pressure monitoring applications. They can be used for visual monitoring of air and gas pressure for compressors, vacuum equipment, process lines and specialty tank applications such as medical gas cylinders and fire extinguishers. In addition to visual indication, some pressure gauges are configured to provide electrical output of indicated pressure and monitoring of other variables such as temperature.

3. Pedestal Bearing

A pillow block usually refers to a housing with an included anti-friction bearing. A pillow block refers to any mounted bearing wherein the mounted shaft is in a parallel plane to the mounting surface, and perpendicular to the center line of the mounting holes, as contrasted with various types of flange blocks or flange units. A pillow block may contain a bearing with one of several types of rolling elements, including ball, cylindrical roller, spherical roller, tapered roller, or metallic or synthetic bushing. The type of rolling element defines the type of pillow block. These differ from "plumber blocks" which are bearing housings supplied without any bearings and are usually meant for higher load ratings.

Working Principle

In the process of automatic tyre Inflation system, 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.

Compressor works on the 12V battery of the vehicle and it is reciprocating in nature that's why it is easy to obtained the desired pressure level. Rotary joint is used to rotates well as to supply compressed air simultaneously when requires.

The main working of project is as follow:

1. First, we ON the switch then 12V current supply to the motor, then the motor starts running. Motor having 3/8 gear with 12 teeth lock on the motor shaft and it gives drive to driven shaft.
2. The driven shaft is mounted on the 2 pedestal bearing and it also has a 3/8 gears, 13 teeth.
3. The shaft runs with respect to the motor. With respect to the shaft, the wheel is mounted and also rotates.
4. The rotor seal is stationary but the shaft rotates. In between the wheel and the rotor seal, there is hollow shaft used for air supply. When the 2nd switch is pressed then the compressor starts and it will fill air in the wheel. So it prevents accident on the highways.

Conclusion

The conclusion is that our project it can be fitted on future vehicles. Our project is totally based on tyre inflation system. When we see the practical model and its working, it will be better understanding for us how the tyre inflation system work. Our project work is totally on pressure gauge working. The project is for safety also. It can prevent highways accidents. When vehicle is going at very high speed and the tyre punctures then it may became dangerous for passenger. So our project works on just a simple press of a button and air is filled in the tyre, so driver gets chance to slow down the vehicle and get the vehicle on the side of the road.

Future Scope

- 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 tire 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.
- However, not everyone will benefit from this technology.
- Both tire manufacturers and the petroleum industry will be negatively affected by this resulting design.
- Tire manufacturers will be negatively affected since this product is being designed with the reduction of tire wear in mind.
- The demand for their products will decrease as tires last longer and fewer replacements are needed.

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