

Design and Fabrication of Automatic Tyre Inflation and Deflation System for Four Wheeler

V. N. Loganathan¹, N. Abilash Sharma², V. Kannan³, S. Kavin⁴, V. P. Prashanth⁵

Associate Professor, Department of Mechanical Engineering¹

UG Student, Department of Mechanical Engineering^{2,3,4,5}

Nandha Engineering College (Autonomous), Erode, India

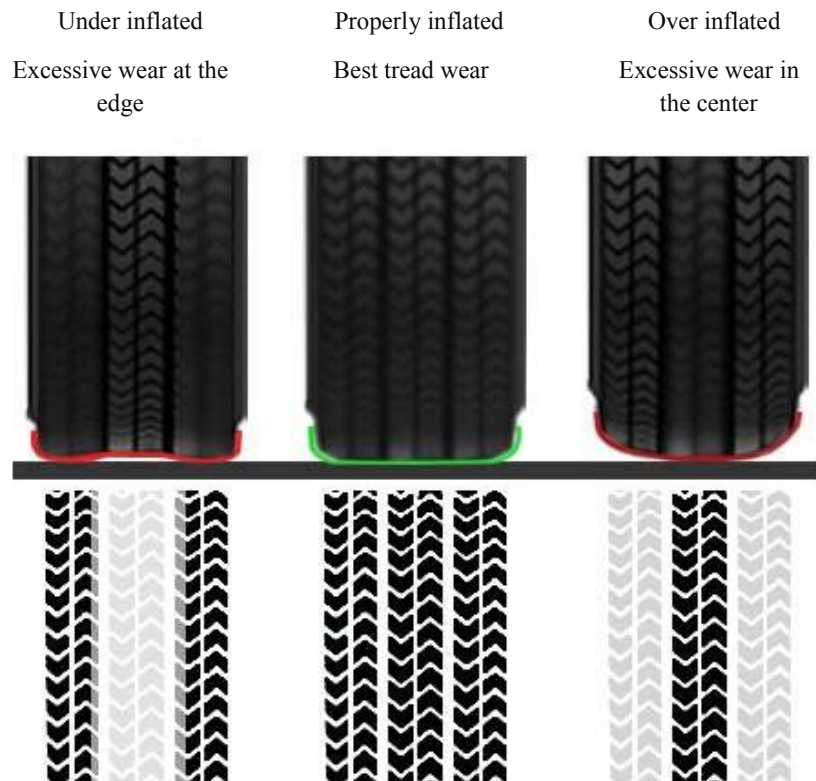
Correspondent E-Mail: vnloga@gmail.com, krishkannan434@gmail.com

Abstract: Now a days major people used four wheeler for their comfort and Sophistication. Most of the drivers didn't check the tire pressure regularly. Driven time observation that shows that a drop in tire pressure by just a few psi can result in the reduction of mileage, their life, safety, and vehicle performance. So we have designed to an automatic tire inflation and deflation system its continuously monitored air pressure inside the tire while running condition. When the air pressure will be over inflated or under inflation at that point the electronic system is activated to the solenoid valve. The solenoid valve is to be deplete or reload the exact air pressure. This paper will focuses to overcome the problems and suggested a proposed working model with expected results of exact maintenance of the pressure in the tyre.

Keywords: Pressure Sensor, Solenoid Valve, Relay, Micro Controller, Universal joint, etc.,

I. INTRODUCTION

1.1 Tyre Inflation



Survey of Inflation and Deflation Tyre Wear

The automatic tyre inflation and deflation system could be a mechanical device that is wide utilized in automobile works. The manual work increases the trouble of the person power (operator) throughout the air checking in vehicles. The air maintenance technology system developed through this project replenishes lost air and maintains optimum tyre cavity pressure whenever the tyre is rolling in commission, so up overall fuel economy by reducing the tyre's rolling resistance. These days automobile sector plays an enormous role within the political economy of all the countries within the world and lots of researches are distributed to boost the potency of Excessive wear at the edge Best tread wear Excessive wear in the centre the vehicle one the techniques to boost the potency of associate degree automobile is inflating the tire frequently. As is standard, one in all the foremost serious problems that the massive car have whether they for the transportation of traveller or payload and particularly those used for middle or long-distance travel resides the guaranteeing the proper performance of the tires. This implies ensuring that tire is inflated and keep inflated for the right amount of pressure for the load being carried and for road condition this way one will guarantee not solely the preservation of outer covering of the tires however additionally the proper operation of car with none risks. The deflation could be a method of lease air or gas out of the tires. Deflation is that the difficulty of associate degree automobile vehicle. As a result of a particular amount of your time in air reduced to the vehicle for period of time. Therefore a protracted distance cosmopolitan vehicle scar in a position thing for deflation. The air is additionally decreasing the tire. Fleet tire managers usually raise however oftentimes they must be checking tire pressure and loss such a lot of air throughout the course of the year. Osmosis of air through the tire casing will result in a loss 1to three PSI per month, depending on the particular tire build and model. The sort of compounds used in the manufacture of the tire will have an enormous impact on diffusion. The composition and gauge of the tire inner liner compound additionally play a significance in diffusion.

II. PROBLEM STATEMENT

The investigation is carried out for the following problem identification and to rectify these problems through the project,

- We are aware that maintenance of proper tyre pressure is extremely important for the enhancement of tyre life.
- Due to drop in pressure of tyre can reduce the fuel economy.
- Quickest tyre wear and discomfort ride.

2.1 Description of Equipment's

A. Air Pressure Sensor

The Smart Pressure Device (SPD) series of pressure sensors are silicon based and capsulated in modified plastic Dual In Line packages, to accommodate six pins for through-board printed circuit mounting. The sensors come in two distinct types: Gauge and absolute. The gauge type merely measures the pressure with respect to the atmospheric pressure. The absolute type contains a reference vacuum chamber, which is formed on the die during manufacturing. The output voltages of both types are proportional to the pressure that is measured. Various pressure ranges are available. On request, other ranges and encapsulations can be supplied. Please contact our sales department for more information. Because of its bridge resistance value, the SPD pressure sensor is especially suited for use in combination with the Universal Transducer Interface (UTI03), which gives an easy and very accurate interface to a digital environment.

B. Control Unit

Microcontrollers are destined to play an increasingly important role in revolutionizing various industries and influencing our day to day life more strongly than one can imagine. Since its emergence in the early 1980's the microcontroller has been recognized as a general purpose building block for intelligent digital systems. It is finding using diverse area, starting from simple children's toys to highly complex spacecraft. Because of its versatility and many advantages, the application domain has spread in all conceivable directions, making it ubiquitous. As a consequence, it has generate a great deal of interest and enthusiasm among students, teachers and practicing engineers, creating an acute education need for imparting the knowledge of microcontroller based system design and development. It identifies the vital features responsible for their tremendous impact, the acute educational need created by them and provides a glimpse of the major application area.

C. Microcontroller

A microcontroller is a complete microprocessor system built on a single IC. Microcontrollers were developed to meet a need for microprocessors to be put into low cost products. Building a complete microprocessor system on a single chip substantially reduces the cost of building simple products, which use the microprocessor's power to implement their function, because the microprocessor is a natural way to implement many products. This means the idea of using a microprocessor for low cost products comes up often. But the typical 8-bit microprocessor based system, such as one using a Z80 and 8085 is expensive. Both 8085 and Z80 system need some additional circuits to make a microprocessor system. Each part carries costs of money. Even though a product design may requires only very simple system, the parts needed to make this system as a low cost product. To solve this problem microprocessor system is implemented with a single chip microcontroller. This could be called microcomputer, as all the major parts are in the IC. Most frequently they are called microcontroller because they are used they are used to perform control functions.

The microcontroller contains full implementation of a standard microprocessor, rom, ram, i/o, clock, timers, and also serial ports. Microcontroller also called "system on a chip" or "single chip microprocessor system" or "computer on a chip". A microcontroller is a Computer-On-A-Chip, or, if you prefer, a single- chip computer. Micro suggests that the device is small, and controller tells you that the device' might be used to control objects, processes, or events. Another term to describe a microcontroller is embedded controller, because the microcontroller and its support circuits are often built into, or embedded in, the devices they control.

Today microcontrollers are very commonly used in wide variety of intelligent products. For example most personal computers keyboards and implemented with a microcontroller. It replaces Scanning, Debounce, Matrix Decoding, and Serial transmission circuits. Many low cost products, such as Toys, Electric Drills, Microwave Ovens, VCR and a host of other consumer and industrial products are based on microcontrollers.

Microcontroller is a general purpose device, which integrates a number of the components of a microprocessor system on to single chip. It has inbuilt CPU, memory and peripherals to make it as a mini computer. A microcontroller combines on to the same microchip:

- The CPU core
- Memory(both ROM and RAM)
- Some parallel digital i/o

D. Relay

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off. So relays have two switch positions and they are double throw (changeover) switches. Relays allow one circuit to switch a second circuit which can be completely separate from the first. The link is magnetic and mechanical. The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs (chips) cannot provide this current and a transistor is usually used to amplify the small IC current to the larger value required for the relay coil. Relays are usually SPDT or DPDT but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts are readily available. Most relays are designed for PCB mounting but you can solder wires directly to the pins providing you take care to avoid melting the plastic case of the relay. The animated picture shows a working relay with its coil and switch contacts. You can see a lever on the left being attracted by magnetism when the coil is switched on. This lever moves the switch contacts. There is one set of contacts (SPDT) in the foreground and another behind them, making the relay DPDT.

E. Solenoid Valve

A solenoid valve is an electro mechanical valve for use with liquid or gas controlled by running or stopping an electrical current through a solenoid, which is a coil of wire, thus changing the state of the valve. The operation of a solenoid valve is similar to that of a light switch, but typically controls the flow of air or water, whereas a light switch typically controls the flow of electricity. Solenoid valves may have two or more ports: in the case of a two-port valve the flow is switched on or off; in the case of a three-port valve, the outflow is switched between the two outlet ports. Multiple solenoid valves can be placed together on a manifold

A solenoid valve has two main parts: the solenoid and the valve. The solenoid converts electrical energy into mechanical energy which, in turn, opens or closes the valve mechanically. An excellent source of information on the different types of solenoid valve.

Solenoid valves may use metal seals or rubber seals, and may also have electrical interfaces to allow for easy control. A spring may be used to hold the valve opened or closed while the valve is not activated.

In some solenoid valves the solenoid provides the full power for the operation of the main valve. Others use a small, complete solenoid valve, known as a pilot, to operate a larger valve which provides the main output of the unit. While the second type is actually a solenoid valve combined with a pneumatically actuated valve, they are sold and packaged as a single unit which is referred to as a solenoid valve. Piloted valves require much less power to control, but they are noticeably slower.

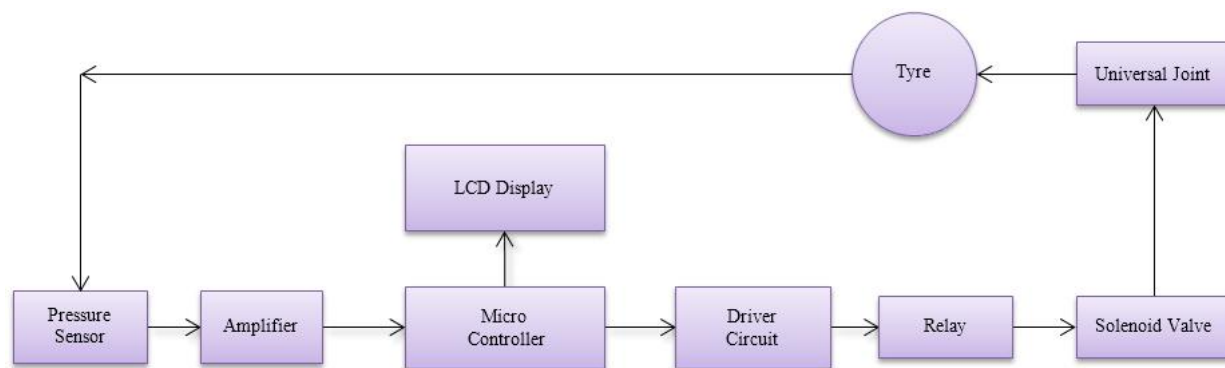
The diagram to the right shows the design of a basic valve. If we look at the top Figure we can see the valve in its closed state. The water under pressure enters at A. B is an elastic diaphragm and above it is a weak spring pushing it down. The function of this spring is irrelevant for now as the valve would stay closed even without it. The diaphragm has a pinhole through its center which allows a very small amount of water to flow through it. This water fills the cavity C on the other side of the diaphragm so that pressure is equal on both sides of the diaphragm. While the pressure is the same on both sides of the diaphragm, the force is greater on the upper side which forces the valve shut against the incoming pressure. By looking at the Figure we can see the surface being acted upon is greater on the upper side which results in greater force. On the upper side the pressure is acting on the entire surface of the diaphragm while on the lower side it is only acting on the incoming pipe. This results in the valve being securely shut to any flow and, the greater the input pressure, the greater the shutting force will be.

A common use for 2 way solenoid valves is in central heating. The solenoid valves are controlled by an electrical signal from the thermostat to regulate the flow of heated water to the heating elements within the occupied space. Such valves are particularly useful when multiple heating zones are fed by a single heat source. Commercially available solenoid valves for this purpose are often referred to as Zone valves.

F. Universal Joint

A universal joint, universal coupling, U-joint, Cardin joint, Hardy-Spicer joint, or Hooke's joint is a joint or coupling in a rigid rod that allows the rod to 'bend' in any direction, and is commonly used in shafts that transmit rotary motion. It consists of a pair of hinges located close together, oriented at 90° to each other, connected by a cross shaft.

III. BLOCK DIAGRAM OF TYRE INFLATION SYSTEM



Our project consists of solenoid valve, control unit, pressure sensor, relay and Tyre model. We are using pressure sensor to detect the pressure level in the tyre. The level of pressure is already programmed in the control unit. When the pressure level is decreased, the sensor gives signal to the control unit.

IV. DESIGN OF AUTOMATIC TYRE INFLATION AND DEFLATION SYSTEM THROUGH SOLID WORKS



4.1 Working Principle

Our project consists of solenoid valve, control unit, pressure sensor and tyre model. We are using pressure sensor to detect the pressure level in the tyre. The level of pressure is already programmed in the control unit. When the pressure level is decreased, the sensor gives signal to the control unit. After that the controller unit will open the solenoid valve for filling the air when the required pressure is obtained the control unit will turn off the solenoid valve. In case the pressure level will be more than the required level means control unit will switch on another solenoid valve for air to the atmosphere. When the required pressure is reached the operation will be stopped by the control unit.

V. RESULT

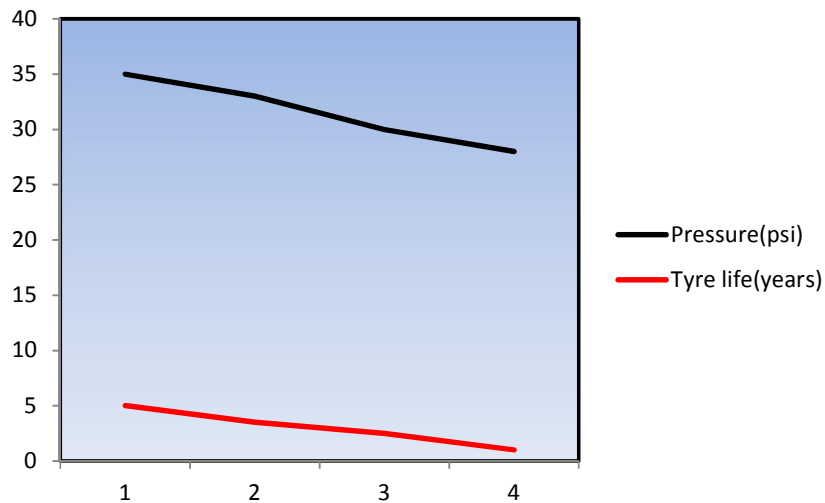


Figure: Before installation this system

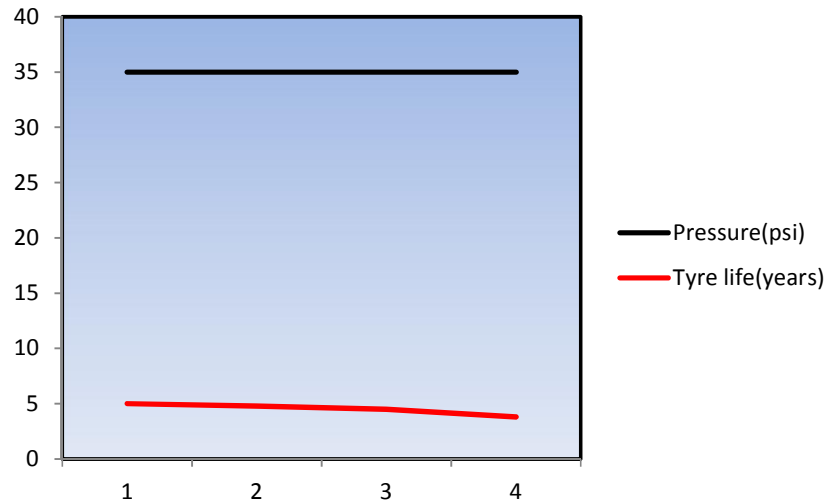


Figure: After installation this system

VI. CONCLUSION

In this project we've done the design of an "automatic tyre inflation and deflation system" by using solid works (2016) software. We can conclude the system ensures us that each and every tyre is properly inflated to proper tyre pressure throughout the journey and it also improves tyre life, reduces tyre wear, increases fuel efficiency and also increases the overall safety of the vehicle, it also monitors the tyre pressure constantly, provide us proper inflation and deflation of the tyre, and helps in providing a comfortable ride with better mileage. We ended up doing it fabrication successfully.

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