Automatic air hoses leakage prevention system

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Abstract—**Now a day, Machines are widely controlled by control system. To meet the need of exploding population economic and effective control of machines is necessary. The aim is to design and develop a control system based an electronically controlled automatic break failure indicator by using IR Sensor. Automatic break failure indicator and auxiliary braking system is consisting of IR sensor circuit, control unit and frame. The sensor is used to detect the break wire, the control signal to the alarm unit. Similarly, the auxiliary brake is fixed to the wheel frame and this can apply the brake and stop the vehicle. A pressure transducer sensor monitors the pressure in brake lining. When the primary hydraulic disc brake fails, the sensor detects the pressure loss and gives warning signal to the driver and also Activates power supply to the secondary braking unit which is a hub motors in rear wheels. This functions as a secondary braking unit and helps the driver to stop the vehicle and thus ensures safety of the passengers. The main reason is brake failure, it caused to due to poor maintenance as well as product defect, in order to safe guard the valuable human for accident the accident monitoring of brake is very important thing in automobile Vehicle safety is the avoidance of automobile accidents or the minimization of harmful effects of accidents, in particular as pertaining to human life and health. Special safety features have been built into vehicles occupants only, and some for the safety of others. We have pleasure in introducing our new project "Automatic Braking Fluid Leakage Detection with safety By-pass Braking System". This is equipped by sensors and auxiliary braking unit. It is genuine project which is fully equipped and designed for automobile vehicles.**

Index Terms—**Brakes, fluid leakage, detection, bypass secondary brakes line, safety.**

1. INTRODUCTION

A brake is mechanical devices that restrain, or prevents motion, slowing or stopping a moving object or preventing its motion. Most of the brakes generally uses friction between two surfaces pressed together to change the form of the kinetic energy of the moving object into heat, despite the fact that other methods of energy conversion may be employed for the same. For example, regenerative braking converts a large amount of the energy to electrical energy along with the heat energy, which may be stored or can be sent back to the source for later use. Some other methods convert the kinetic energy into potential energy in such stored forms as pressurized oil or pressurized air. Magnetic fields are used in Eddy current brakes to convert kinetic energy into electric current in the brake disc, fin, or rail, which is converted into heat energy. Still there are other braking methods to transform kinetic energy into different forms, for example by transferring the energy to a rotating flywheel.

Today, Machines are widely controlled by automated control system. To meet the need of growing population economic, effective and reliable control of machines as well as their control system is necessary. The main objective of this project is to continuously monitor the braking system at each and every time during the operation of the vehicle. Now a days, accidents are occurring due to lot of reasons, the one of the main reasons is brake failure, it caused to due to poor maintenance, improper use and product defect, in order to safe guard the valuable human for accident the accident monitoring of brake is very important issue in automobile. The brake failure indicator circuit is a circuit that monitors constantly of the condition of brakes and provides an audio-visual indication. When the brake is applied in order to slow down or to stop the vehicle the green LED blinks and the piezo buzzer beeps for about one second if the brake system is accurate and working properly. If brake system fails the red LED glows and the buzzer do not beep when the brakes are applied. In addition, this system prevents the fluid leakages from brake & continue the bypass in case of primary brake line failure.

1.1. Problem Statement of project:

It is generally observed that due to brake line breakage or leakage during running vehicle may cause a failure of brake in vehicle due to this accident may happened. To overcome this problem our aim to make a safety braking system which will activate secondary safety braking supply line to reduce fluid loss & to activate brake regularly without fail. The statement of project is "Air Brake Hoses Fail Detection with safety Braking System" for used in safety brakes of automobile.

1.2. Objectives:

The main objective of this project is to avoid accidents due to brake failure. The specific objectives of this project were:

1) For the protection of lively hood.
2) To reduce accidents of vehicle due to the brake failure.
3) To sense the change in hydrostatic pressure difference while brake failure.
4) In order to indicate the failure of brake.
5) It c a n operate and monitor all the brake units in the vehicle by using auxiliary brake bypass line.
6) It c a n sense the leakage of the fuel.
7) To connect the indicator with a sensor to indicate the brake failure.

1.3. Scope of project:

The brake developed by us is pneumatically operated. Thus, in old braking system it is needed to give full attention of worker to operate the brake during starting stops the vehicle in case of brake failure. This brake can be modified to fully automate pneumatic controlling brake by using automation. This automated brake with brake failure prevention system can perform specified work in minimum time, speed, reliably and with high accuracy so that it does not need any regular attention for braking in case of brake failure.

2. LITERATURE REVIEW

K. Mohan and G. Pugazhendhi, done the work on, Accidents Avoiding System Indicator Due to Brake Failure, according to his work, Brakes are implemented in cars to stop the vehicle. The increase in number of deaths and accidents is due to brake failure. Hydraulic Brake failures mainly occur due to oil leakage and results in pressure loss. The aim of our paper is to diagnose faulty braking system and application of an auxiliary secondary braking system in case of brake failures. This project helps in ensuring the safety of the passengers before the failure occurs and helps in preventing accidents. The brake failure alarming system is empowered by electronic control unit. When the primary hydraulic disc brake fails, the sensor detects the pressure loss and gives warning signal to the driver and also activates power supply to the secondary braking unit which is a hub motors in rear wheels. This functions as a secondary braking unit and helps the driver to stop the vehicle and thus ensures safety of the passengers. The project also includes the stopping of vehicle by switching off the supply of the ignition to the engine. Future scope of this project is to implement the regenerative braking system in spite of ratchet Paul mechanism in secondary braking system which gives the way for usage of brakes in efficient manner. [1]

Javed Ahmed. K, Shri Ram.K. S, Akshay Kumar.B, santosh.J, done the work on, Brake Failure Detection with Auxiliary Braking System In Cars, according to his work, Brakes are implemented in cars to stop the vehicle. The increase in number of deaths and accidents is due to brake failure. Brake failures mainly occur due to brake lining failures and results in pressure loss. The aim of our paper is to diagnose faulty braking system and application of an auxiliary secondary braking system in case of brake failures. We can achieve it by using sensors and dual braking units. A pressure transducer sensor monitors the pressure in brake lining. When the primary hydraulic disc brake fails, the sensor detects the pressure loss and gives warning signal to the driver and also activates power supply to the secondary braking unit which is a hub motors in rear wheels. This functions as a secondary braking unit and helps the driver to stop the vehicle and thus ensures safety of the passengers. The main purpose of this paper is to ensure drivers safety by using a dual braking system. A brake is a mechanical device that inhibits motion by slowing down a body or by slowing it. Brakes retard the motion of a body creating friction between two working surfaces and converts the kinetic energy of the moving body in to heat. Brakes are generally applied to moving as well as tyres. Sometimes brake failure may occur when the brake lining is cut off. And the brake fluid leaks out causing pressure loss and hence the brake shoes do not apply the required pressure on the discs. This setup reduces the accidents and prevents loss of life.

Auxiliary braking gives additional capability to the driver and to ensure prevention of damage to life and property. [2]

Dr.N. Venkatachalapathi, V. Mallikarjuna, done the work on, Automatic Brake Failure Indicator and Over Heating Alarm, according to his work, the braking system of a car is undoubtedly one of its more important features. The aim of this work is to create a better braking system with

indicator. Brake failure occurs only because of worn out of brake shoe and cut in liner. It consists of two sensors. One sensor is connected with the brake shoe. The other sensor is the brake liner. The signal from the two sensors is given to a microcontroller. When the brake shoe is worn out, the sensor senses signal to the microcontroller. Also, if the brake liner is cut, the sensor sends signal to the microcontroller. The microcontroller analyses the signal and operates the corresponding indicator. It nothing wrong, the vehicle will move and if any one critical, the vehicle will stop and the screen shows the indication of brake failure. Since this indicates the status of the brake, the user can identify the condition of the brake and thus limiting the chances of malfunction. If really persuades us to do more and more, perhaps in better way in future. Brake failure indicator is an early warning system. It constantly monitors the condition of the brake and give audio visual indication. [3]

Abhishek Chaudhary, Kapil Jariya, Mohit Kumar Sharma, Mr. Vikas Kumar, done the work on, Automatic Brake Failure Indicator, according to his work, Today, Machines are widely controlled by automated control system. To meet the need of growing population economic, effective and reliable control of machines as well as their control system is necessary. The main objective of this project is to continuously monitor the braking system at each and every time during the operation of the vehicle. Now a days, accidents are occurring due to lot of reasons, the one of the main reasons is brake failure, it caused to due to poor maintenance, improper use and product defect, in order to safe guard the valuable human for accident the accident monitoring of brake is very important issue in automobile. The brake failure indicator circuit is a circuit that monitors constantly of the condition of brakes and provides an audio-visual indication. When the brake is applied in order to slow down or to stop the vehicle the

green LED blinks and the piezo buzzer beeps for about

one second if the brake system is accurate and working properly. If brake system fails the red LED glows and the buzzer do not beep when the brakes are applied. The main purpose of this project is to provide such a device to vehicles operator so that any harmful damage and accidents cause by failure of brake switch can be easily prevented by the proper indication of working condition of brake switch. [4]

Anant W. Nemade, Samir A. Telang & Dr. Arvind L. Chel, done the work on, Vehicle Brake Failure and Road Accidents- An Investigation, according to his work, Road accidents are an outcome of the interplay of various factors, some of which are the length of road network, vehicle population, human population and adherence of road safety regulations, vehicle component failure etc. of which some parameters are difficult to control or can be controlled by external factors such as strict traffic norms, rigorous driving tests for license, traffic separation etc. But accidents due to failure of vehicle brake is a prime responsibility of vehicle manufacturer, the brakes must work properly without failure of any component in its

Assembly. Road accident causes injuries, fatalities, disabilities and hospitalization with severe socio-economic costs across the country. Consequently, road safety has become an issue of concern both at national and international level. The United Nations has rightly proclaimed 2011-20 as the Decade of Action on Road Safety. India is also signatory to Brasilia Declaration and is committed to reduce the number of road accidents and fatalities by 50 per cent by 2020. The paper investigated the various modes of failure in hydraulic braking system. The failure of brakes can be avoided, if the mechanical component of braking system works properly. The maintenance of components can avoid the accidents. This is the hardware part of the braking system. The modern invention may provide the safety from modern equipment

but if the basic parts are synchronised then the number of accidents can be reduced. [5] G. Venkata Siva, Dr.B. Chandra Mohan Reddy, done the work on, Automobile Brake Failure Indicator, according to his work, nowadays accidents may occur due to various reasons, the foremost reason is brake failure and is caused due to poor maintenance as well as product defect. In order to safe guard the valuable human life from these accidents; there is a need for monitoring of braking system in automobiles. Vehicle safety is the

avoidance of automobile accidents or the minimization of harmful effects of accidents, in particular related to human life and health. Special safety features have been built into vehicles occupants only, and some for the safety of others. This is a brake failure indicator circuit that constantly monitors the condition of the brake and gives an audio-visual indication to rider. The main purpose of this project is to provide such a device to vehicles operator so that any harmful damage and accidents caused by failure of brake can be easily prevented by the proper indication of working condition of brake. This system continuously monitors the condition of the brake wire and alerts the rider before it gets cut. The indication to the rider is given in the form of audio-visual signal. All the components are placed carefully, thus contributing to the best working of the unit. Thus, the project has been successfully designed and tested. [6]

Radhakishan Maske, Satesh Surwase, Balbhim Moharir, Vrushabh Mahajan, Vijay Kedar, Prof.Amol Adkine, done the work on, Automatic Brake Failure Indicator and Braking System, according to his work, Automatic brake failure indicator and braking system, it is genuine project which is fully equipped and designed for automobile vehicles. This forms an integral part of good quality. The one of the main reasons is brake failure, it caused to due to very poor maintenance as well as product defect, in order to safe guard the valuable human for accident the accident monitoring

of brake is very important thing in automobile Vehicle safety is the avoidance of automobile accidents or the minimization of harmful effects of accidents, in particular as concern to human life and health. Special safety features have been built into vehicles occupants only, and some for the safety of others. Automatic brake failure indicator and braking system is the most effective solution on this problem .it is the most effective and the simplest methodology used to reduce the rate of accident due to brake failure. In this system the components used are two-way relay, buzzer, battery, motor, wiring system. And finally, the braking system installed in the two-wheeler by using these components the most effective system is to be generate.

In this system, if brake failure is occurred then the buzzer gives the indication to the driver in the form of sound and simultaneously alternative braking system start their working and apply the secondary brakes by using motor fitted to the chassis, as the result of these the speed of the vehicle gets reduced and vehicle is stop in some second. The main advantage of the system is that it is compact in size, and the installation cost is very less. If this system is installing in vehicle, then accident due to brake failure get reduced, as the result of these the rate of accident due to brake failure get reduce. This setup reduces the accidents and prevents loss of life. Auxiliary braking gives additional capability to the driver and to ensure prevention of damage to life and property. The project gives more confidence that we will be able to apply in practice, whatever theoretical knowledge. If really persuade us to do more and more, perhaps in good way in our future. Brake failure indicator is an early warning system. It constantly monitors the condition of the brake and give audio visual signal. This setup reduces the accidents and prevents loss of life. Auxiliary braking gives additional capability to the driver and to ensure prevention of damage to life and property. [7]

Dhanamjayulu C, Chalamalasetti Guna Sai, Bharath Srinivas G, Hussain Basha D, Arunkumar G, Venugopal P, done the work on, Brake Failure Detection and Emergency Braking System, according to his work, now a days accidents might occur because of varied reasons, the foremost reason is equipment failure and is happened due to improper maintenance of the products. To prevent these abnormal situations and to protect one's life from these accidents, there's a necessity for watching of braking system in cars. Vehicle safety is a special term means safeguarding the automobiles or reducing the hazardous effects caused by them, specially associated with human life and health. Special safety options are engineered into vehicles occupants solely, and a few for the security of others. The method used in this work is timer operation to check the condition of brake wire periodically. This paper deals with making a circuit model, which checks the condition of brake wire in any automobile. Alerts the driver by sending an audio or visual signal. Then activates the braking system which acts as a emergency breaking as to avoid accidents. The main purpose of this project is to supply such a tool to vehicles operator in order that any harmful harm and damages accidents caused by failure of brake may be simply prevented by the correct indication of operating condition of brake. This system endlessly monitors the condition of the brake wire and alerts the rider before

it gets cut. The indication to the rider is given within the type of audio sign. All the elements area unit placed rigorously, therefore contributory to the most effective. [8]

B. Nimal Karthik & Santhanakrishnan, done the work on, Detection of Brake Failure by Automatic Indicator Using Sensors and Microcontroller, according to his work, the braking system is one of the most essential components of an automobile. The aim of this work is to create a safe braking system with brake failure indicator. Brake failure occurs

mostly because of cut in liner and worn out of brake shoe. It consists of two sensors of which one is connected with the brake shoe and the other with the brake liner. The signal from both the sensors are delivered to a microcontroller. The sensor senses signal to the microcontroller when the brake shoe is worn out and also if the brake liner is cut. The microcontroller analyses the signal and operates the corresponding indicator. It there is no defect anywhere, green indicator glows and the red indicator glows if there is a problem with brake shoe or brake liner. If the brake failure occurs while the vehicle is running, automatically an alternate brake will be operated by the microcontroller. This system plays a major role in the safety by preventing unnecessary accidents. Our project guides in indicating the status of the brake, facilitating the user to identify and limit the chances of malfunction. [9]

Prof. Pandit Biradar, Jitendra Baravkar, Komal Bhujbal, Avi Bhapkar, done the work on, Automatic Brake Failure Detection with Auxiliary Braking System, according to his work, now a day, Machines are widely controlled by control system. To meet the need of exploding population economic and effective control of machines is necessary. The aim is to design and develop a control system based an electronically controlled automatic break failure indicator by using IR Sensor. Automatic break failure indicator and auxiliary braking system is consisting of IR sensor circuit, control unit and frame. The sensor is used to detect the break wire, the control signal to the alarm unit. Similarly, the auxiliary brake is fixed to the wheel frame and this can apply the brake and stop the vehicle. A pressure transducer sensor monitors the pressure in brake lining. When the primary hydraulic disc brake fails, the sensor detects the pressure loss and gives warning signal to the driver and also Activates power supply to the secondary braking unit which is a hub

motors in rear wheels. This functions as a secondary braking unit and helps the driver to stop the vehicle and thus ensures safety of the passengers. [10]

2.1. Pneumatic systems introduction:

An incredible range of manufacturing systems use the force and power of fluids such as water, oil and air. Powered clamps open and close with the force of pressurized air or oil, large presses shape and form metal with hydraulic pressure, and assembly torque tools fasten components with pressurized air. In each example, fluid power provides the energy necessary to exert significant mechanical forces. Systems that use air are called pneumatic systems while systems that use liquids like oil or water are called hydraulic system. The pneumatic systems will be the subject of the first three sessions in the course starting from this session. Pneumatics is all about using compressed air to make a process happens. Compressed air is simply the air we breathe squeezed into a small space under pressure.

Pneumatic systems form the most primitive and distinct class of mechanical control engineering. They are classified under the term 'Fluid Power Control', which describes any process or device that converts, transmits, distributes or controls power through the use of pressurized gas or liquid. In a pneumatic system, the working fluid is a gas (mostly air) which is compressed above atmospheric pressure to impart pressure energy to the molecules. This stored pressure potential is converted to a suitable mechanical work in an appropriate controlled sequence using control valves and actuators. Pneumatic systems are well suited for the automation of a simple repetitive task. The working fluid is abundant in nature and hence the running and maintenance cost of these systems are exceptionally low. All fluids have the ability to translate and transfigure and hence pneumatic systems permit variety of power conversion with minimal mechanical hardware.

Conversion of various combinations of motions like rotary-rotary, linear-rotary and linear-linear is possible. The simplicity in

design, durability and compact size of pneumatic systems make them well suited for mobile applications. These features make them versatile and find universal applications including machines, aerospace technology, production and assembly of automotive components (power steering, chassis and engine assembly), CNC machines, food products and

packaging industry, bomb deployment units and fabrication process of plastic products. The basic layout of a pneumatic system is shown in fig. it could be observed that the basic components involved are similar to a hydraulic system. The basic differences between hydraulic and pneumatic systems are that in hydraulic system the input mechanical energy is imparted to the oil is by pump, whereas, in pneumatic systems the working fluid being air, the mechanical energy is imparted to air by a compressor. .
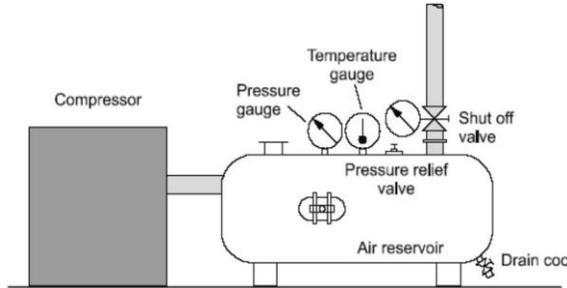

Fig.2.1. Basic pneumatic system.

It is a knowledge that any system must consist of a group of components which work together to perform a task. A pneumatic system consists of a group of pneumatic components connected together so that a signal (compressed air) is passed through the system to make something happen at the output. These group of components can be divided into five categories according to their function in the pneumatic circuit as follows:

1. Supply elements: these elements are the sources of power that drives the system which are the compressors.
2. Input elements: these elements are used to send signals to the final control elements and come in two forms; either as components that is

actuated by the operator like push buttons or sensors that determine the status of the power elements such as limit switches and proximity sensors.

3. Processing elements: these elements may perform operations on the input signals before sending the signal to the final control elements such as non-return valves, directional control valves and presser control valves.
4. Final control elements: to control the motion of actuators such as directional control valves.
5. Power elements (actuators): these are the outputs of the pneumatic system which use the stored potential energy to perform a certain task such as pneumatic cylinders and motors.

Fluid power system is a power transmission system in which the transmission of power takes place through a fluid medium. Such a system avoids the mechanical linkages such as gears, belts, ropes, chains etc. to a great extent of a conventional power transmission system. The transmission of power by fluid power system is most convenient and highly efficient. Due to this, the present conventional transmission systems are being replaced and changed over to fluid power-based systems. Prime mover supplies the mechanical energy to a pump or compressor which is used to pressurize a fluid. The mechanical energy supplied by the prime mover is converted into the pressure energy by the pump and it is stored in a fluid. The pressurized fluid is now transmitted to different parts of the system through special piping's or tubing's. The various parameters such as pressure and flow rate of the fluid can be controlled by using various control valves. At the desired places of use, the fluid energy is converted back into mechanical energy by the devices called actuators consisting of

cylinders, motors etc. Thus, the energy supplied by the prime mover has been transmitted conveniently through fluid medium to various places and at these places, the mechanical energy has been recovered back in a more convenient form. Since the power is transmitted through the fluid as a medium, therefore such a system is called as fluid power system.

2.2. Brake types:

2.2.1. Drum Brake:

On all models using drum brakes on the rear, the cable pulls the parking brake lever. The lever is attached to the secondary shoe at the top and transfers the lever action to the primary shoe through the shoe strut. When released, the brake shoe springs return the shoes to their retracted position.

2.2.2. Disc Brakes:

There are two types of rear wheel parking brake systems for disc brakes. The first uses the brake caliper assembly to mechanically apply pressure to the disc. The second type is an exclusive drum brake assembly that applies pressure to an inside drum, which is an integral part of the disc rotor. Caliper Parking Brake The parking brake is built into the caliper housing and is provided with an automatic adjusting mechanism to compensate for piston movement as the brake pads wear.

The automatic adjusting mechanism maintains the operating clearance Mechanism between the pads and

the rotor as the pads wear down with use. The primary assembly which makes this possible is the Sleeve Nut and Adjusting Bolt.

The Sleeve Nut is held by the Clutch Spring which allows it to turn in one direction only. The diameter of the Clutch Spring is slightly smaller than the diameter of the sleeve nut and allows it to turn in the unwind direction only. The clutch spring is held stationary with one end attached to the piston. When the brake pedal is depressed, hydraulic pressure forces the piston to move to the left. The movement of the Piston exerts pressure on the Thrust Plate and Thrust Bearing against the Sleeve Nut

causing it to be screwed out from the stationary Adjusting Bolt. The Sleeve Nut can be easily screwed out because the Clutch Spring unwinds and therefore does not prevent the Sleeve Nut from rotating. The distance that the Sleeve Nut screws out from the Adjusting Bolt is equal to the amount of pad wear.

2.2.3. Exclusive Parking Brake:

The exclusive parking brake is found on the Land Cruiser, Supra, Celica, Previa, Avalon and Camry. As illustrated below, a drum brake is cast into the disc rotor. The shoes and other components are similar to a conventional dual-servo drum brake system but smaller and with no wheel cylinder. Activating the parking brake is similar to applying the parking brake on conventional drum brakes. Adjustment to the exclusive parking brake is done manually at the Shoe Adjusting Screw Set (Star Wheel) and must be done periodically.

2.3. Brake Failure Indicator

A. Background:

With the passage of time, today's generation is growing up with the dreams of high-speed vehicles. The problem is that as the birth ratio is increasing, the accidents are getting in number which is one of the major problems faced in this era and it would be rapidly increasing in the coming period. So, everyone tries to avoid accidents while travelling but sometimes it is unavoidable. Accidents are happening at each nook of the streets around the world. Lakhs of life result in death as an aspect of these accidents. As the population is increasing, the number of vehicles is increasing in the same proportion. Which suggests there needs a lively hood of the brakes giving out. The condition of brakes is regularly monitored by the brake failure indicator circuit. The brake failure condition is sensed by the sensors attached to the circuit through monitoring the brake switch. So, when the brake is applied it shows the condition of brake every time.

B. Rationale:

There are several limits that must be keep in mind while driving a vehicle. The brake

failure indicator circuit contains many electrical as well as electronic equipment such as LED, sensors, piezo buzzers, ICs, transistors, etc. The brake failure indicator is used to avoid major damage. It is a main advantage of brake failure indicator, and it operate in automatic mode that make it easy to use. At present many other instruments or system can be used to warn before any accident condition but it is only use to monitor the braking system or any disturbances in electrical circuit of the braking system when the brake is applied to stop or slow down the vehicle. But this project i.e. Automatic Brake Failure Indicator uses sensors for constant monitoring of the braking switch and gives the whole condition of braking system of the vehicle. Many problem occur while using automatic braking system like some says hydraulic pipes are not connected tightly and temperature of braking system increases, it can give adverse effect on brake pad and the rotor.

3. CONSTRUCTION

It consists of mainly;

3.1. Frame:

The frame is of MS material. The frame of our machine is basically used to support the pneumatic components mounted on it. That is Piston cylinder, d.c.v, flow control valve, switches are mounted on frame.

3.2. Double acting cylinders:

Cylinders are linear actuators which convert fluid power into mechanical power. They are also known as JACKS or RAMS. Hydraulic cylinders are used at high temperature and produce large forces and precise movement. For this reason, they are constructed of strong materials such as steel and designed to withstand large forces. Because gas is an expensive substance, it is dangerous to use pneumatic cylinders at high pressures so they are limited to about

10 bar pressure. Consequently, they are constructed from lighter materials such as aluminum and brass. Because gas is a compressible substance, the motion of a pneumatic cylinder is hard to control precisely. The basic theory for hydraulic

and pneumatic cylinder is same. Parameters consider during the design of cylinder.

Fig.3.1. Double acting cylinder.

3.3. Pneumatic pipe fittings:

Pneumatic tubing is also available in a number of other materials both with and without reinforcement for use in standard applications. SMC fittings incorporate a positive tube seal while the fitting is under pressure which allows polyurethane tubing to be used. Tubing is available in sizes of 1/8", 5/32", 3/16", 1/4", 5/16", 3/8", and

1/2". Metric tubing sizes of 3.2, 4, 6, 8, 10, 12, and 16mm are available.

Tubing series:-

Polyurethane Tubing: - TAU, TCU, TFU, TIUB, TU

Nylon Tubing: - T, TAS, TIA, TISA, TRS, TS

Spark Resistance Tubing: - TRB, TRTU Coaxial Tubing: - TW

Polyolefin Tubing: - TP Moisture Control Tubing: - IDK

This can be used   for connection of pneumatic system with total drill assemble.

Fig.3.2. Pneumatic hoses and fittings.

3.4. 2/2Solinoid valve:

A valve is a device that regulates the flow of fluid (gases, liquids, fluidized solids or

slurries) by opening and closing or partially obstructing passage ways. A 2/2 way directional valve from the name itself has 2 ports equally spaced and 2 flow positions. It can be used to isolate and simultaneously bypass a passage way for the fluid which for example should retract or extend a double acting cylinder. There is variety of ways to have this valve actuated.

Fig.3.3. 2/2 solenoid valve.

3.5.   Pneumatic connectors, reducer and hose collector:

In our pneumatic system there are two types of connectors used; one is the hose connector and the other is the reducer.

Fig.3.4. Hose Collector & Connector.

3.6. Pressure switch:

The Pressure switch is generally used in much pneumatic circuit. Pressure switch carriers at pressure range setting which are widely used in pressure controlling and sense pressure receiving signals are quite easily available. The control unit activates the pneumatic braking system, so that break was applied.

Fig.3.5. Pressure transducer.

3.7. Disc brake:

A disc brake is a type of brake that uses calipers to squeeze pairs of pads against a disc in order to create friction that retards the rotation of a shaft, such as a vehicle axle, either to reduce its rotational speed or to hold it stationary.

Fig.3.6. Disc brake.

3.8. Ball bearings:

This type of bearing consists of i) a cast iron pedestal, ii) gun metal, or brass bush split into two halves called "brasses", and iii) a cast iron cap and two mild steel bolts. The detailed drawing of a pedestal bearing is shown in image below. The rotation of the bush inside the bearing housing is arrested by a snug at the bottom of the lower brass. The cap is tightened on the pedestal block by means of bolts and nuts. The detailed part drawings of another Plummer block with slightly different dimensions are also shown in image below.

are sometimes referred to colloquially as *washers*; but, while they may look similar, washers and gaskets are usually designed for different functions and made differently. Washers are also important for preventing galvanic corrosion, particularly by insulating steel screws from aluminum surfaces.

Fig.3.7. Ball bearing.

3.9. Shaft:

Shaft is a common and important machine element. It is a rotating member, in general, has a circular cross-section and is used to transmit power. The shaft may be hollow or solid. The shaft is supported on bearings and it rotates a set of gears or pulleys for the purpose of power transmission.

Material for Shafts:

The ferrous, non-ferrous materials and nonmetals are used as shaft material depending on the application.

Fig.3.8. Shaft.

Fig.3.9. Washer

3.11. Nut and Bolt

As nuts and bolts are not perfectly rigid, but stretch slightly under load, the distribution of stress on the threads is not uniform. In fact, on a theoretically infinitely long bolt, the first thread takes a third of the load, the first three threads take three-quarters of the load, and the first six threads take essentially the whole load. Beyond the first six threads, the remaining threads are under essentially no load at all. Therefore, a nut or bolt with six threads acts very much like an infinitely long nut or bolt.

3.10. Washer

A washer is a thin plate (typically disk- shaped) with a hole (typically in the middle) that is normally used to distribute the load of a threaded fastener such as a screw or nut. Other uses are as a spacer, spring (wave washer), wear pad, preload indicating device, locking device, and to reduce vibration (rubber washer). Washers usually have an outer diameter (OD) about twice the width of their inner diameter (ID). Washers are usually metal or plastic. High quality bolted joints

require hardened steel washers to prevent the loss of pre-load due to Brinelling after the torque is applied. Rubber or fiber gaskets used in taps (or faucets, or valves) to stop the flow of water

Fig. 3.10. Nut and Bolt.

3.12. Relay board:

In most of the high-end industrial application devices have relays for their effective working. Relays are simple switches which are operated both electrically and mechanically. Relays consist of a n electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet. There are also other operating principles for its working.

But they differ according to their applications. Most of the devices have the application of relays. The main operation of a relay comes in places where only a low-power signal can be used to control a circuit. It is also used in places where only one signal can be used to control a lot of circuits. There are only four main parts in a relay. They are, Electromagnet

- Movable Armature
- Switch point contacts
- Spring

It is an electro-magnetic relay with a wire coil, surrounded by an iron core. A path of very low reluctance for the magnetic flux is provided for the movable armature and also the switch point contacts. The movable armature is connected to the yoke which is mechanically connected to the switch point contacts. These parts are safely held with the help of a spring. The spring is used so as to produce an air gap in the circuit when the relay becomes de-energized. The basics for all the relays are the same. Take a look at a 4 – pin relay shown below. There are two colors shown. The green color represents the control circuit and the red color represents the load circuit. A small control coil is connected onto the control circuit. A switch is connected to the load. This switch is controlled by the coil in the control circuit.
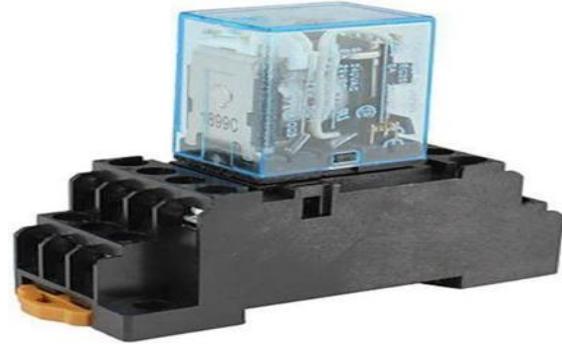

Fig.3.11. Relay switch.

4. WORKING

Automatic break failure indicator and auxiliary braking system is consisting of pressure differential sensor circuit, control unit and frame. The sensor is used to detect the brake fluid line, the control signal to the braking valve unit. Similarly, the auxiliary brake is fixed to the wheel frame and as this air leakage is prevents from primary port valve automatically secondary valve can on which can apply the brake and stop the vehicle regularly. A pressure transducer sensor monitors the pressure in brake lining. When the primary air disc brake fails, the sensor detects the pressure loss and gives warning signal to the driver and also Activates power supply to the secondary braking unit which is a hub motors in wheels.

This functions as a secondary braking unit and helps the driver to stop the vehicle and thus ensures safety of the passengers. The main reason is brake failure, it caused to due to poor maintenance as well as product defect, in order to safe guard the valuable human for accident the accident monitoring of brake is very important thing in automobile Vehicle safety is the avoidance of automobile accidents or the minimization of harmful effects of accidents, in particular as pertaining to human life and health. Special safety features have been built into vehicles occupants only, and some for the safety of others. We have pleasure in introducing our new project "Automatic Braking Fluid Leakage Detection with safety bypass Braking System". This is equipped by sensors and auxiliary braking unit. It is genuine project which is fully equipped and designed for automobile vehicles.

Concept model of Air Brake Hoses Fail Detection with safety Braking System.

5. DESIGN

Design consists of application of scientific principles, technical information and imagination for development of new or improvised machine or mechanism to perform a specific function with maximum economy and efficiency. Hence a careful design approach has to be adopted. The total design work has been split up into two parts;

System design mainly concerns with various physical constrains, deciding basic working principle, space requirements, arrangements of various components etc. Following parameters are looked upon in system design. Selection of system based on physical constraints. The mechanical design has direct norms with the system design hence system is designed such that distinctions and dimensions thus obtained in mechanical design can be well fitted in to it. Arrangement of various components made simple to utilize every possible space. Ease of maintenance and servicing achieved by means of simplified layout that enables quick decision assembly of components Scope of future improvement. In mechanical design the components are listed down and stored on the basis of their procurement in two categories. Design parts & Parts to be purchased. For designed parts detailed design is done and dimensions there obtained are compared to next dimensions which are already available in market. This simplifies the assembly as well as the post production and

maintenance work. The various tolerances on work are specified. The process charts are prepared and passed to manufacturing stage. The parts to be purchased directly are selected from various catalogues and are

specified so as to have case of procurement in mechanical designed at the first stage selection of appropriate material for the part to be designed for specific application is done.

5.1. Motor selection:

Thus, selecting a motor of the following specifications

- Single phase DC motor
- Power = 1/15hp=50 watt
- Speed= 60 rpm

Motor Torque

$$P = \frac{2\,\Pi\,N\,T}{60}$$

$$T = \frac{60 \times 50}{2\,\Pi \times 60}$$

T = 7.96N-m

Power is transmitted from the motor shaft to the input shaft by means of an open belt drive,

Motor pulley diameter = 20 mm IP

_ shaft pulley diameter = 60 mm

Reduction ratio	= 3
Speed of motor	= 60 rpm
Speed of motor pulley	= 60 rpm
Speed of shaft pulley	= 20 rpm IP

shaft speed = 60/3 = 20 rpm Torque at IP rear shaft = 3 x 7.96

= 23.88 Nm

5.2. Design of belt Drive:

Motor pulley diameter d = 20 mm

IP _ shaft pulley diameter D = 60 mm

Coefficient of friction = 0.23

Let,

Thickness of belt = 5 mm

Width of belt = 6 mm

Mass of belt per unit length is given by;

ρ= density of belt material = 950 kg/m^3 m= 0.0285 kg/m

Velocity of belt is given by;

$$V = \frac{\Pi(d+t)n}{60 \times 1000}$$

$$V = \frac{\Pi \times (20+5) \times 60}{60 \times 1000}$$

$$V = 0.078 \text{ m/s (Linear velocity)}$$

To find out tension in the belt is:-

$$P = \frac{(F1-F2)V}{1000}$$

$$50 \times 10^{-3} = \frac{(F1-F2) \times 0.078}{1000}$$

F1 − F2=636.619N -----------------------------(1)

Center distance between two pullies of motor & pullies output C=200mm.

$\alpha = \sin^{-1}\dfrac{D-d}{2\,C}$

$\alpha = \sin^{-1}\dfrac{(60-20)}{2 \times 200}$

$\alpha = 5.739^0$ (In Degrees)

$\alpha = 5.739 \times (\Pi/180)$

$\alpha = 0.10^c$ (In Radians)

θ = Angle of lap of belt.

$\theta = \Pi - 2\,\alpha$
$= \Pi - [2 \times 0.10]$

$\theta = 2.94^c$ (In Radians)

$\theta = 168.54d$ (In Degrees)

Now $\dfrac{F1}{F2} = e^{\wedge}\dfrac{\mu\Theta}{\sin\beta}$

$\dfrac{F1}{F2} = e^{\wedge}\dfrac{(0.23 \times 2.94)}{\sin 19°}$

$\dfrac{F1}{F2} = 7.97$

F1= 7.97 F2---------------------------------(2)

Put Eq. (2) in Eq. (1) F1- F2 = 636.619

7.97 F2 - F2 = 636.619

6.972 F2 = 636.619 F2 = 91.3N

Put in Eq. (3) F1 = 727.69N

Centrifugal force in belt is given by, $Fc = mV^2$

$=0.0285 \times (0.078)^2$ Fc = 1.73 N

5.3. Shaft design:

To find diameter of shaft by ASME code For commercial steel shaft, Actual shea

stress $\tau_{act} = 55N/mm^2$

$T = \Pi/16 \times \tau_{act} \times d^3$

$\tau_{act} = \dfrac{10 \times 1}{\Pi \times d^3}$

$7.76^3 = \dfrac{16 \times 55}{\Pi \times d^3}$

$d^3 = 737.089$

d=9.033mm

Select d=12mm

5.4. **Bearing selection:**

In selection of ball bearing the main governing factor is the system design of the drive i.e. the size of the ball bearing is of major importance; hence we shall first select an appropriate ball bearing. Taking into consideration convenience of mounting of ball bearing.

As shaft diameter is 12mm so we have selected a ball bearing having dia-12mm to support the shaft.

For ball bearing 6201 No.

Total radial load on ball bearing is approx. 15 kg. (Maximum)

Fh = 15 x 9.81= 147.15 N

Total radial load can be divided into two bearings so that,

$F_r = \dfrac{r\,n}{4}$

$= \dfrac{147.15}{2}$

F_r = 73.57 N Radial load on each bearing. To calculate equivalent dynamic load

$P_e = (XVF_r + YF_a)\,K_a$

K_a = load factor

P_e = equivalent dynamic load, N

F_r = radial load, N
F_a = axial load, N
X = radial factor
Y = axial factor
V = rotation factor (Assume = 1)
For bearing Axial load is zero

Equivalent dynamic load

$P_e = V.F_r.K_r$
$= 1 \times 73.57 \times 1.5$
$P_e = 110.3625$ N

Bearing life is,

$L^{10} = \dfrac{Lh10 \times 60 \times n}{10^6}$

L_{h10} from graph 4.6 PSG Design data book for 20000 rpm maximum speed of ball bearing is 31500 Hours. PSG Design data book P. No. 4.13.

$L^{10} = \dfrac{31500 \times 15 \times 60}{10^6}$

L^{10} = 28.35 millions of revolutions.

$L^{10} = (\dfrac{C}{Pe})^{(3)}$

C =(28.35)$^{(0.33)}$ X 110.3625

C = 332.78 N. ≤ 5400 N (Bearing is safe.) PSG D.D.Book.P.No.4.13.

5.5. Design of Pneumatic Cylinder:

NOTE: if we increase the pressure of air as per formula pressure is directly proportional to the force.

If, P ⇑   F ⇑

Clavarino's equation for closed end cylinder at both ends. For ductile material use to determine the thickness of cylinder.

Let,

Material of the cylinder is Aluminum.

$t = ri\left[\sqrt{\dfrac{\sigma t + (1 - 2\mu)\,P}{\sigma t - (1 + \mu)\,P}} - 1\right]$

S_{ut} = Ultimate tensile strength = 200N/mm² μ = Poisson's Ratio for the cylinder material =0.29 (std-)

d_i= Inner diameter of cylinder =25mm Consider,

Double acting cylinder Ø25X20 (Diameter X Stroke)

r_i =12.5mm

By assuming pressure in working cylinder is, P = 3 bar =0.3 N/mm²

So according to Clavarino's equation, For closed end cylinder at both ends to determine the thickness of cylinder.

Assume,

p = 3 bar = 0.3 N/mm² μ = 0.29

r_i = 12.5mm.

$$t = r_i \left[\sqrt{\frac{\sigma t + (1 - 2\mu) P}{\sigma t - (1 + \mu) P}} - 1 \right]$$

$$t = 12.5 \times \left[\sqrt{\frac{200 + 0.3\,[1 - (2 \times 0.29)]}{200 - 0.3\,(1 + 0.29)}} - 1 \right]$$

$$t = 12.5 \times \left[\sqrt{\frac{200.784}{199.808}} - 1 \right]$$

t=1.5 x0.03049 mm. =0.0457mm.

Available thickness, **t = 0.25mm**

Piston dia-   = 25mm

Stroke dia-   = 20mm Piston rod dia- = 10mm.

Let,

A= Force area of cross-section of piston.

$A = \frac{\pi}{4}(D^2)$ mm²

$A = \frac{\pi}{4}(25^2)$ mm²

A= 490.87 mm²

A_{PR}= Force area of cross-section of piston on rod side.

$A_{PR} = \frac{\pi}{4}(D^2 - d^2)$ mm²

$A_{PR} = \frac{\pi}{4}(25^2 - 10^2)$ mm²

A_{PR}= 412.334 mm²

Piston force acting during forward stroke.

$F_a = P \times \frac{\pi}{4}(D^2)$

    = 0.3 X 490.87

F_a = 147.26 N.

Piston force acting during return stroke.

$F_R = P \times \frac{\pi}{4}(D^2 - d^2)$

   = 0.3 X 412.33

F_R = 123.699 N.

5.6. Design of disc brake:

The pneumatic cylinder operates at maximum pressure 3 bar = 0.3 N/mm² Braking force P = 147.26 N.

The frictional radius Rf foruniform pressure theory,

$Rf = \frac{2}{3} \frac{(Ro^3 - Ri^3)}{(Ro^2 - Ri^2)}$

$= \frac{2}{3} \frac{(75^3 - 50^3)}{(75^2 - 50^2)}$

Rf = 63.33 mm.

The torque capacity of brake is given by, $Mt = \mu\, P\, Rf$

Mt = the torque capacity of brake N.mm

μ = Coff. Of friction of brake pad material = 0.35

P = Braking force = 147.26 N.

Mt = 0.35 x 147.26 x 63.33

Mt = 3264.26 N.mm.

The actuating force is given by, P = Avg. pressure x area of pad.

147.26 = 0.3 x area of pad.

Area of Pad A = 490.86 mm²

Angular dimensions of the pad are given by,

$A = \frac{1}{2}\theta (Ro^2 - Ri^2)$

$490.86 = \frac{1}{2}\theta\,(75^2 - 50^2)$

θ = 0.3141 Radians.

θ = 0.3141 x $\frac{180}{\pi}$

θ = 17.99⁰

6. PROCESS SHEETS

6.1. Part Name: - SUPPORTING FRAME

Part size : -600mm X 450mm X 30mm.
Part Material: - M.S.
Part Qty : - 01
Part Wt. : - 5 kg

Sr.No	Operati on	Machi ne	Tool	Tim e
1	Cutting the material as per our required size 600mm X 450mm X 300mm.	Cutting machin e	Cutter wheel	40 min
2	Welding the Frame	Weldin g machin e	Arc Weldi ng torch	80 min

6.2. Part Name: - FRONT WHEEL SUPPORT

Part size : -50mm X 50mm X 20mm.
Part Material: - M.S.
Part Qty : - 02
Part Wt. : - 0.1 kg

Sr.No	Operati on	Machi ne	Tool	Tim e
1	Cutting the material as per our required size 50mm X 50mm X 20mm.	Cutting machin e	Cutter wheel	60 min
2	Drilling four holes for bearing mountin gs.	Drillin g machin e	Drillin g bit 10 mm	45 min

3	Welding the Frame	Weldin g machin e	Arc Weldi ng torch	30 min

6.3. Part Name: - BEARING SHAFT

Part size : - Ø12mm x 500 mm
Part Qty: - 01
Part Material: - M.S.
Part WT : - 0.5 kg

Sr.No	Operati on	Machi ne	Tool	Tim e
1	Cutting the material as required size.	Cutting m/c	Cuttin g m/c Blade	15 min
2	Turning shaft to make Ø10mm. For pulley size.	Lathe m/c	Turnin g Tool	30 min
3	Facing side ends.	Lathe m/c	Facing Tool	20 min

7. ADVANTAGES

1. No need of external power supply it can be powered from the vehicle's battery itself.

2. Power consumption is comparably less.

3. Does not depend on the petrol level.

4. Operating principle is very easy

5. Installation is simplified very much

6. The safety of driver is ensured

7. The regenerative braking recovers energy and stores it in Battery.

8. Brake failure is notified to the surrounding traffic via Parking lights.

9. The cost is low.

8. APPLICATIONS

1) This system may be applicable in all types of air brake vehicles to avoid the accidents due to the brake failure & prevent fluid leakages during brake hose bursting or leakages.

Braking Point

2) This system also successfully installed in the heavy vehicles like buses, trucks, trailers, etc.

9. CONCLUSION

With all the advantages of brakes failure prevention over conventional braking, this system has been used on vehicles where the 'brake failure' problem exists. The same concept is being developed for application on hydraulic & pneumatic vehicles. The concept designed by us is just a prototype and needs to be developed more because of some limitations. These braking systems can be used as an auxiliary braking system along with the conventional braking system to avoid brake failure. The cost of modification of this brake system is cheaper. Hence the braking force produced in this is as equal & without any interpretation than the conventional brakes if can be used as a bypass or secondary or emergency braking system in the automobiles. Hence, we are satisfied with our project work.

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