"EMERGENCY BRAKES WITH AUTOMATIC BUMPER SYSTEM"

Amol karad.[1], Yogesh Bhuse.[2], Rohan Jadhav.[3] ,Rahul Koyande. [4] Prof. Aher S.S [5]

[1] *Student, Mechanical Department, SND COLLAGE OF ENGINEERING & RESEARCH CENTER YEOLA, NASHIK-423401, Maharashtra, India*

[2] *Student, Mechanical Department, SND COLLAGE OF ENGINEERING & RESEARCH CENTER YEOLA, NASHIK-423401, Maharashtra, India*

[3] *Student, Mechanical Department, SND COLLAGE OF ENGINEERING & RESEARCH CENTER YEOLA, NASHIK-423401, Maharashtra, India*

[4] *Student, Mechanical Department, SND COLLAGE OF ENGINEERING & RESEARCH CENTER YEOLA, NASHIK-423401, Maharashtra, India*

[5]*Professor, Mechanical Department, SND COLLAGE OF ENGINEERING & RESEARCH CENTER YEOLA, NASHIK-423401, Maharashtra, India*

ABSTRACT

Now a day's vehicle accident is the major problem. This breaking system used an innovative project for the purpose of preventing accidents happens in the restricted roadways. The purpose of this system is based an intelligent electronically control with automatic bumper activation system is known as "Automatic braking with pneumatic bumper system". This concept is adopted in four wheeler vehicle. In this system consist of two mechanisms which are automatic braking system and pneumatic bumper system. Automatic braking system consist of the sensor which senses the vehicle or obstacle which comes in front of our system and due to which accidents may occures. After that through relay sensor gives feedback to engine to stop the working of engine. During this the vehicle driver also try to stop the vehicle by pressing the brake pedal. Limit switch is used to activate the pneumatic bumper and disc brake simultaneously which is placed bloe the brake pedal to reduce the damage our vehicle when both vehicles collapse on each other. This helps us to safety of our vehicle from the accidents. As well as this system helps to keep safe distance between the two vehicles. By this system we can control the speed of the vehicle. Hence we are trying to do the project on "emergency brakes with automatic bumper system."

KEYWORDS: Bumpers,brakes, Automatic Braking System.

1. INTRODUCTION

A brake is a device which reduce the motion. Clutch is its opposite component in automobile system. In braking the kinetic energy gets converted in heat due to friction. The entire effective braking depends on the system response and the drivers feel. The response time is determined as the time elapsing between the beginning of the actuation of the control pedal and the moment the pressure in the actuator reaches 75 percent of its asymptotic value. In this the configuration of the braking system has to be designed in such a manner that the response time should meet the vehicle safety standard regulations. In the designing of brake system layout of heavy commercial vehicle various vehicle parameters like Gross Vehicle Weight, wheel base, Centre of Gravity of the vehicle, number of axles etc are taken in account.

In this system the layout design is complex, it involves number of valves which have to function in a logical sequence during different stages of braking. Conventionally, the system layout design is arrived after many iterations based on field trials and experience. In this method more lead time and cost is needed to finalized the layout. Hence the modeling and analysis of the system layout using simulation helps us to predict the behavior of the layout in terms of response and the effect of the individual subsystems, valves on the system behavior and thereby optimization study can be carried out. This tool employs bond graph technique and lumped system for developing physical based modeling. The modeling of foot brake valve and predicting the dynamic response of the individual valve. We studied the robust of pneumatic brake system in commercial vehicle using Simulation which describes the modeling of system by simplifying the valves and the actuators.

In this paper we studied the braking system and bumper for the safety of vehicles. This model can be directly coupled to the vehicle models and the dynamics of the vehicle like stopping distance, stability can be studied. This model can also be used for design and optimization of brake system layouts for various heavy commercial trucks having varying wheel base and Gross Vehicle Weight.

Today India is the most important under developed country in the world. India is the largest country in the use of various type of vehicles. But the availability of resources like quality of roads are not good which causes the accidents. The number of peoples which are dead during the vehicle accidents is also very large as compared to the other causes of death. Although there are also different causes who are responsible for the accidents but proper technique of braking reduces the chances of accidents rates. So today implementation of proper braking system is for preventing the accidents and pneumatic bumper system to reduce the damage is must for vehicles. To achieve this system modification goal, we design this Emergency Brakes With Automatic Bumper System.
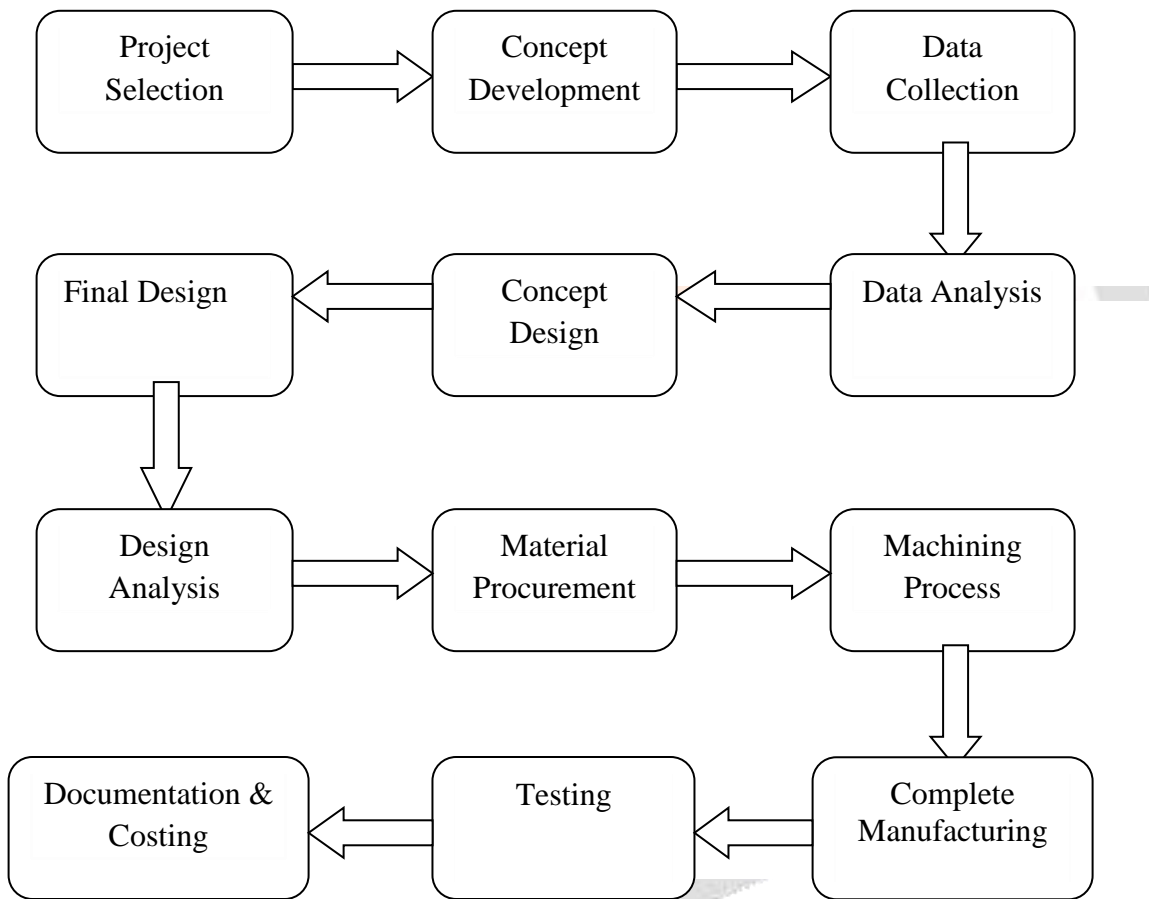
2. Objective:

To overcome these unwanted effects we have to design the Automatic Braking System with Pneumatic Bumpers which have following objectives

1) To reduce the braking effort & to increase the sureness of braking Application.
2) To reduce the response time of braking system & to maintain the accuracy in braking system.
3) To develop automation unit for braking so that, it can easily be adopted in today's automated vehicle.
4) This type of system work practically at low cost, low maintenance, low capital investment in less space.
5) To performed the most rigid operation with high speed braking.
6) To improve the pre-crash safety.
7) To avoid the percentage of passenger injury by using external vehicle safety.
8) To reduce the requirement of internal safety devices like air bags.

3. Methodology & process flow chart

The below Methodology shows the sequential operation/steps that will be performed during the project process.

```
┌──────────────┐      ┌──────────────┐      ┌──────────────┐
│   Project    │ ──▶  │   Concept    │ ──▶  │    Data      │
│  Selection   │      │ Development  │      │  Collection  │
└──────────────┘      └──────────────┘      └──────────────┘
                                                   │
                                                   ▼
┌──────────────┐      ┌──────────────┐      ┌──────────────┐
│ Final Design │ ◀──  │   Concept    │ ◀──  │ Data Analysis│
│              │      │   Design     │      │              │
└──────────────┘      └──────────────┘      └──────────────┘
      │
      ▼
┌──────────────┐      ┌──────────────┐      ┌──────────────┐
│   Design     │ ──▶  │   Material   │ ──▶  │  Machining   │
│  Analysis    │      │ Procurement  │      │   Process    │
└──────────────┘      └──────────────┘      └──────────────┘
                                                   │
                                                   ▼
┌──────────────┐      ┌──────────────┐      ┌──────────────┐
│Documentation │ ◀──  │   Testing    │ ◀──  │   Complete   │
│  & Costing   │      │              │      │Manufacturing │
└──────────────┘      └──────────────┘      └──────────────┘
```

.

4. Pneumatic systems introduction:

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.

The major components of the pneumatic systems are:

1. A compressor of appropriate capacity to meet the compressed air requirements.
2. A receiver to store the compressed air.
3. Air distribution lines to distribute the air to various components of the system.
4. Filter lubricator regulator (FLR) unit for conditioning of air and regulation of pressure.
5. Pneumatic control valves to regulate, control & monitor the air energy.
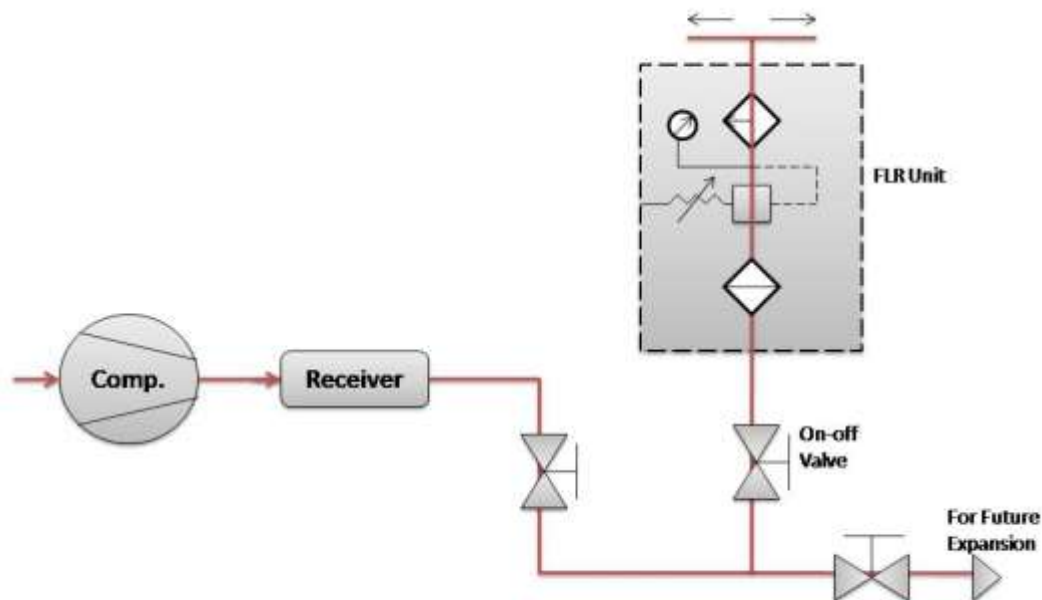6. Pneumatic actuators & Air driers.

Fig.2.1. Basic pneumatic system.

5. WORKING

As this system is used at the time of emergency during work. In normal travelling of vehicle this system is off and it never impact on the normal working. When any obstacle, humans, animals or vehicle is came in front of the vehicle then the installed infrared sensor senses that obstacle. The range of distance between the vehicle and obstacle is variable. This range is varied according to the density of vehicles or humans on road. The received signal by IR sensor is provided to the control unit. This control unit operates the relay according to the input signal. The relay operated by control unit cut off the electric power supply given to the engine so the working of engine is stop. When the engine stops the working the motion of vehicle suddenly reduces. At the same time of working of IR sensor the driver also applied the brake so braking system works by two methods.

There is some incidence when the working of automatic braking works and engine running is also stop but due to the moment of inertia on vehicle tries to forward motion of the vehicle. This inertia motion cause for accident. During such incidence the driver also uses manual braking system. In this manual braking system limit switch is also installed below the brake pedal. By receiving the foot force of driver the limit switch activates and provides the signal to the solenoid control valve. Solenoid control valve opens port going towards the bumper system and brake shoes. This pneumatic force used to forward motion of the bumper. By receiving the impact of accidental force bumper try to deflects. The flexible nature of the bumper able to sustain the force and so the impact of this force on vehicle is reduces. When the external body is kept safe then there is no chance of inner damage.
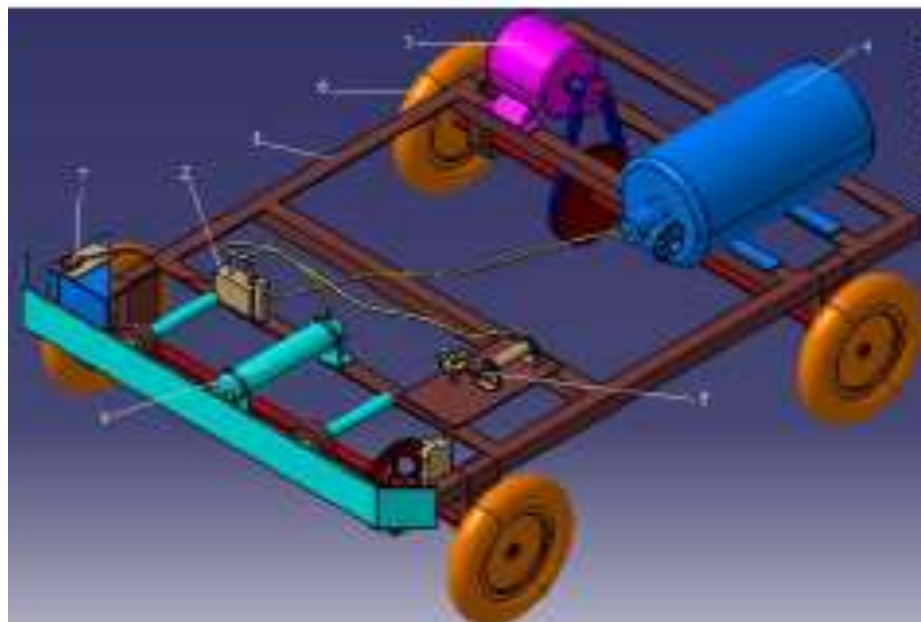

Fig. 3D model of automatic pneumatic bumper and braking system.

6. Advantages:-

1) Simple construction of the prototype vehicle.
2) It provides safety to passengers in the vehicle as well as to the vehicle body.
3) It reduces accident intensity and impact.
4) This system increases the response time of vehicle braking by keeping safe distance between two vehicles.
5) The design also increases the crashing distance by providing extra space due to extension of the bumper, decreasing the chances of injuries to commuters.

7. Applications:-

1) This system may be applicable in all types of light vehicles like cars, Rickshaws, Tempos.
2) This system also successfully installed in the heavy vehicles like buses, trucks, trailers, etc.

REFERENCES

[1]   Erik Coelingh, etal, "Collision Warning with Auto Brake", Sweden, ppn: 07-0450.
[2]   Dr. Kripal Singh, "Automobile Engineering – Vol. 1", Standard Publishers Distributors New Delhi- 110 006
[3]   S. P. Patil, "Mechanical System Design", Second Edition, JAICO Publishing House, Mumbai 400 001
[4]   Dr.Sanjiy.K.Bhatia, Dr.George.M.Lacy, "Infra- Red Sensor Simulation", Missouri,(2009)
[5]   Dr.Eung Soo Kim,"Fabrication of Auto Braking System Using Sensor", International Journal Of control And Automation, Vol-2, and no1.

[6]   IS 11852_4 "Automotive Vehicles - Brakes and Braking system", Indian Standard, 2001

[7]   Sridhar,S.,Narayanan,S.,Kumaravel,B.,"Dynamic Simulation of Brake valve in Air Brake System" SAE paper No.2009-28-0030.
[8]   Jinglai, Wu., Hongchang, Zhang., Yunqing, Zhang. and Liping, Chen., "Robust Design of a Pneumatic Brake System in Commercial Vehicles" SAE paper No.2009-01-0408
[9]   Li He, Xiaolong Wang, Yunqing Zhang, Jinglai Wu, Liping Chen" Modeling and Simulation Vehicle Air Brake System" Proceedings 8th Modelica Conference, Dresden, Germany, March 20-22, 2011
[10] Zbigniew, Kulesza., Franciszek, Siemieniako.," Modeling the air brake system equipped with the brake and relay valves" Scientific Journals, Maritime University of Szczecin Vol.24,pp 5-11,2010.
[11] Acarman, T., Ozguner, U., Hatipoglu, C., and Igusky, A., "Pneumatic Brake System Modeling for Systems Analysis," SAE Paper No.2000-01-3414.
[12] "AMESim Handbook", LMS Imagine S.A. 1995-2012
[13] Subramanian, S.C., Darbha, S. and Rajagopal, K.R., "Modeling the Pneumatic Subsystem of an S-cam Air Brake System" Journal of Dynamic Systems, Measurement and Control ASME Vol.126, pp36-46,2004
[14] Shigley, Mechanical Engineering Design (McGraw-Hill ,2008) 812-817

8.BIOGRAPHY

	Amol Ramesh Karad student of the Snd Collage of Engineering & Research Center Yeola, Nashik-423401, Maharashtra, India.in the year 2014-2017.In the mechanical Engineering. Work on the project "EMERGENCY BRAKES WITH AUTOMATIC BUMPER SYSTEM" Email id-amolkarad42@gmail.com
	Yogesh Machhindra Bhuse, student of the Snd Collage of Engineering & Research Center Yeola, Nashik-423401, Maharashtra, India.in the year 2014-2017.In the mechanical Engineering. Work on the project "EMERGENCY BRAKES WITH AUTOMATIC BUMPER SYSTEM" Email id-bhusey8@gmail.com
	Rohan Sunil Jadhav, student of the Snd Collage of Engineering & Research Center Yeola, Nashik-423401, Maharashtra, India.in the year 2014-2017.In the mechanical Engineering. Work on the project "EMERGENCY BRAKES WITH AUTOMATIC BUMPER SYSTEM" Email id:rohanjadhav857@gmail.com

	Rahul Ganpat Koyande, student of the Snd Collage of Engineering & Research Center Yeola, Nashik-423401, Maharashtra, India.in the year 2014-2017.In the mechanical Engineering. Work on the project "EMERGENCY BRAKES WITH AUTOMATIC BUMPER SYSTEM" Email id-rahulkoyande20 @gmail.com
	Prof.Aher S.S, assistant professor of the Snd Collage of Engineering & Research Center Yeola, Nashik-423401, Maharashtra, India.in the year 2014-2017.In the mechanical Engineering. Work on the project "EMERGENCY BRAKES WITH AUTOMATIC BUMPER SYSTEM" Email id-sandeep_aher2008@gmail.com