

A way to prevent the accidents caused by incorrect pressure in Fluid lines thereby ensuring the safety of users

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Abstract In modern days , Automobiles are a part of peoples life . Automotive engineers design the vehicles, following the notion of luxury and safety. Despite many safety applications like airbags, warning sensors, indicators, etc... and with so many cars on our roads, the rate of vehicular accident has also increased with many people died or sustained serious injuries in traffic accidents. This study reports on the brake failure and its effect on road traffic accident and a way to prevent brake defective accidents to some extent.

But, accidents which occur without the knowledge of drivers can be brought down by applying engineering techniques and fundamental sciences. This set includes accidents caused by the failing or ineffective working of brakes. This paper deals with the prevention of accidents caused by the failing or ineffective working of brakes by pre-alerting the driver before he accelerates his vehicle.

Keywords - defective brakes, incorrect pressure, failing of brakes, accidents

I. INTRODUCTION

Despite many safety applications, still there is something to add to the automobiles to ensure the safety. Many modern techniques like airbags, warning sensors, indicators came into existence ensuring the safety of customers, but nothing could serve the purpose of ineffective working or failing of brakes. So, this paper deals with a way of solving the accidents caused by failing of brakes by altering the driver at his will.

II. OBJECTIVE

This paper aims to reduce the accidents caused by failing or ineffective working of brakes thereby ensuring the safety of the customers. As of now, there are no reliable existing practices or techniques for alerting the driver when there arises any trouble in brakes. So, this paper addresses the above discussed problem and puts forth a solution , which could bring down the fatal accidents by alerting the driver at his will .

III. THESIS STATEMENT

All A way to reduce the accidents caused by ineffective working of brakes thereby ensuring the safety of the customers.

MISSION STATEMENT

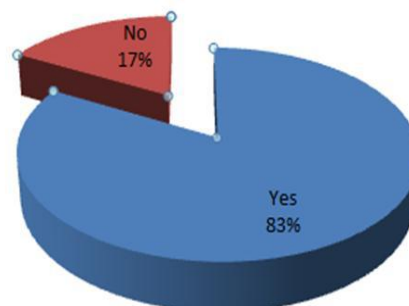
Helping the automobile drivers(at driver's will) by alerting them at the time of ineffective functioning of brakes.

IV. LITERATURE STUDY

By looking into the research papers and journals, some data was collected.

A. Probability of accidents with defective brakes

Chances of occurring accidents when one drive's the car with defective brakes



Probability of accidents when brake system fails

The above analysis shows that , out of 100 automobiles with defective brakes , 83 vehicles ends up in an accidents.

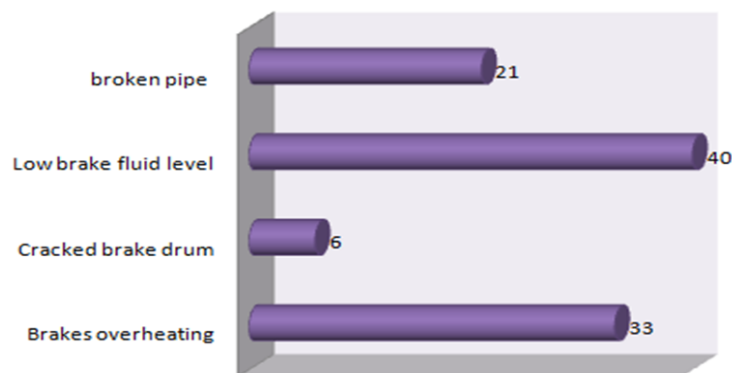
Accidents caused by defective brakes in different states in India-2015

S.No	States/UTs	Defective brakes		
		Number of Accidents	Persons Killed	Persons Injured
1	2	3	4	5
1	Andhra Pradesh	1053	455	1140
2	Arunachal Pradesh	56	21	57
3	Assam	211	72	196
4	Bihar	589	271	487
5	Chhattisgarh	1155	351	1110
6	Goa	22	1	6
7	Gujarat	1057	346	825
8	Haryana	401	170	375
9	Himachal Pradesh	1	0	2
10	Jammu & Kashmir	388	64	391
11	Jharkhand	654	372	500
12	Karnataka	908	236	1058
13	Kerala	0	0	0
14	Madhya Pradesh	6140	805	6850
15	Maharashtra	1401	459	881
16	Manipur	120	24	188
17	Meghalaya	111	21	38
18	Mizoram	0	0	0
19	Nagaland	3	2	8
20	Orissa	1058	441	1182
21	Punjab	58	39	44
22	Rajasthan	740	381	904
23	Sikkim	55	18	89
24	Tamil Nadu	2568	585	2828
25	Telangana	1108	421	1121
26	Tripura	29	8	41
27	Uttarakhand	103	76	88
28	Uttar Pradesh	2919	1543	1892
29	West Bengal	1785	950	1416
30	A & N Islands	0	0	0
31	Chandigarh	0	0	0
32	D & N Haveli	7	4	11
33	Daman & Diu	0	0	0
34	Delhi	135	14	129
35	Lakshadweep	0	0	0
36	Puducherry	24	10	21
	Total	24859	8160	23878

The above represents the statistics only in India-2015. Adding all the countries to the above list makes quite a large number. Hence, there is an urgent need to address and solve the accidents caused by defective brakes.

B. Causes of Brake Failures

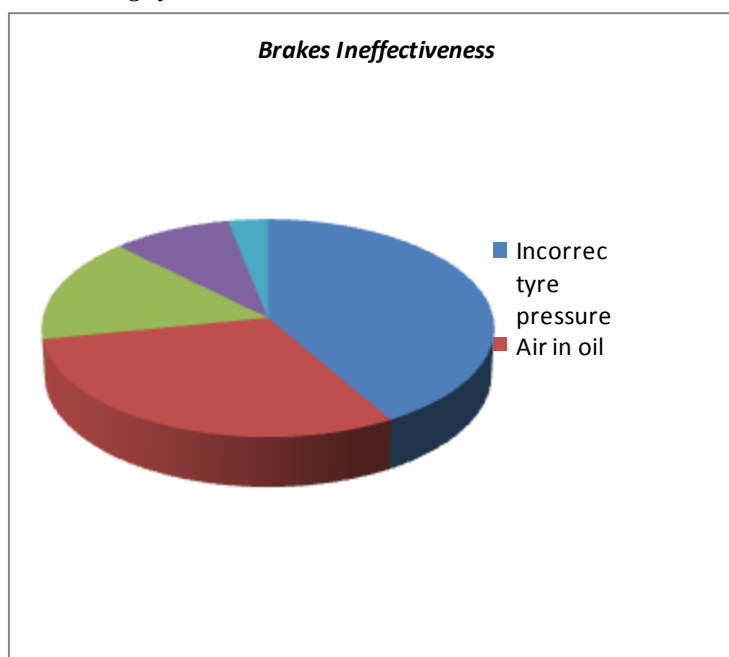
The below bar chart represents the causes of defective brakes



Causes of brake failures

C. Causes of Brakes ineffectiveness

Table showing accidents in different States (India) due to defective braking systems



From the above pie chart , the following points can be drawn :-

- a. Incorrect oil pressure contributes maximum for the brakes to be defective
- b. Air bubbles, leakage of oil, ...are the stack of issues which only adds up to the worsening of pressure.
- c. Alerting the driver when there is incorrect pressure would prevent the accidents to some extent.

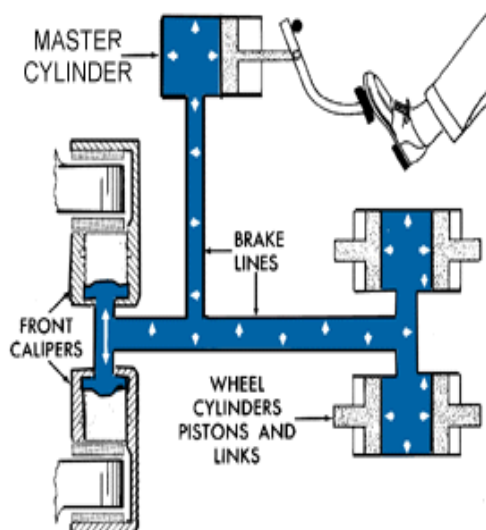
Factor that accounts to the braking defects

- a. Incorrect Pressure
- b. Air bubbles
- c. Level of oil in master cylinders
- d. wear and tear of brake pads
- e. leakage of brake fluid

V.METHODS

Level of oil in master cylinders , wear and tear of brake pads , leakage of brake fluid ,can be known with mere sense of touch and a glance at them. As soon as the above problems are detected ,they must be fixed immediately. Air bubbles in the fluid lines adds to the incorrect pressure.

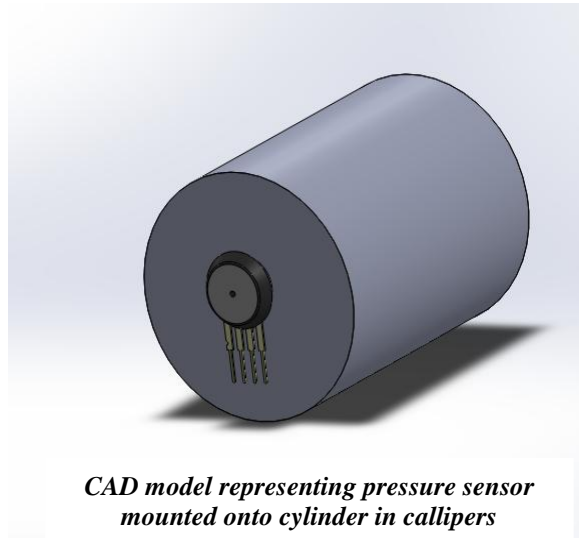
The major problem comes with the generation of correct pressure.It has to be generated at master cylinders , transmitted through the fluid lines , to the brake callipers (more precisely to the brake pads).So , Correct pressure has to be generated at master cylinders. Even though correct pressure is generated , it has to transmit all the same till brake pads



Block diagram of Braking system

So , incorporating a pressure sensor on the surface of all the cylinders in calliper which are exposed to fluid can determine the fluid pressure. In

case the fluid pressure is not correct as of the pressure given by the automotive engineers, it can indicate the driver and alert him.



CAD model representing pressure sensor mounted onto cylinder in callipers

Above is the CAD model of incorporating a pressure sensor onto the brake cylinder in callipers. When the brake pedal is pressed , the fluid reaches the calliper and then to the cylinder. On reaching this cylinder , the fluid enters into this sensor and the pressure is calculated automatically. If this pressure is less than the pressure defined by automotive engineers or Brakes head , then it notifies the driver .

But sometimes , even though the pressure generated maybe less than the designed pressure, it is sufficient to retard the vehicle. So, the driver gets only indication as Percentage of effectiveness. Taking factor of safety into considerations , the designed pressure should be equal to 92% OR 95% . The automotive engineers decides as to the lower limits of pressure sufficient to retard the vehicle and yields a percentage value for that pressure. So , the driver gets a alert , when the percentage obtained is lower than the lower bound percentage.

How does this system work????

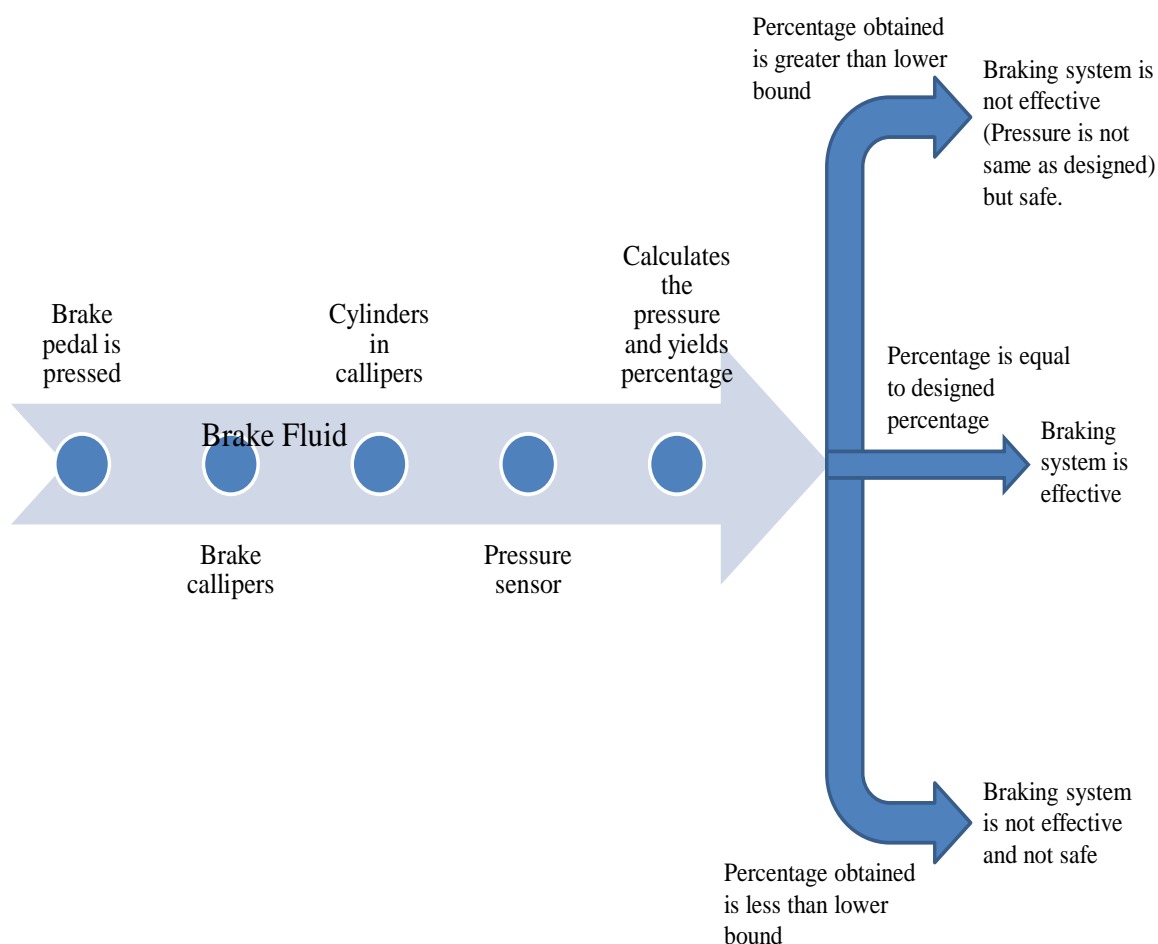
- Let us see how this works with a example
- i. Suppose the braking system is designed for a pressure of 15000 Pa.
 - ii. This 15000 Pa is assumed as 95% effective in terms of pressure. (95% because taking factor of safety into considerations).
 - iii. The automotive engineers calculate the least pressure for which the vehicle retards safely.
 - iv. Let this pressure be 12000 Pa and yields a percentage of 80%.
 - v. Whenever the driver wants to know effectiveness of brakes in terms of fluid pressure , he needs to on the pressure sensor and should press the brake pedal.

- vi. Let us suppose the pressure generated is 11000 Pa.
- vii. Fluid upon reaching the pressure sensors calculate the pressure generated as 11000 Pa and calculates percentage as 73%.
- viii. As this percentage (73%) is less than the least safe percentage(80%) , driver gets an alert that braking system is not effective and not safe.
- ix. Then the driver gets an idea that the vehicles braking system is not safe and goes for a mechanic to fix it.

VI.BLOCK DIAGRAM

The block diagram and workflow is also represented below . The above illustrated example can be compared with the below block diagram for the better understanding of the concept

Block Diagram and Workflow of the mechanism



VII.CONCLUSION

The advantages of this type of system is , it is cost effective and ensures the safety of the customers .It would bring down the count of fatal

accidents caused by defective braking system. This limits the application for only brakes and alerts the drivers at his will.

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