

# Development of Brake Failure Indicator with Emergency Brake

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**Abstract:** Accidents in cars often result from brake failure, poor maintenance, or product defects. Monitoring braking systems is crucial for safety and minimizing harmful effects on human life and health. Special safety features are designed for occupants and others to ensure a safe driving experience. Automobiles are the primary mode of transportation, and the brake failure indicator circuit monitors brake condition.

A sensor attached to the circuit monitors the brake switch and reminds the user when brakes are applied. This mechanism involves a brake wire running from the brake lever to the vehicle's braking mechanism, which is pulled when brakes are applied to stop the vehicle. The sensor detects break wires and sends a control signal to the alarm unit. An auxiliary brake is fixed to the wheel frame, applying brakes and stopping the vehicle. A microcontroller analyzes the signal, gives a warning, and activates a secondary braking unit with a disc brake and 12 volt battery. This secondary braking unit helps the driver stop the vehicle, ensuring passenger safety.

**Keywords:** brake, poor maintenance, circuit monitor, product defects, brake failure.

## I. INTRODUCTION

A brake is a mechanical device that slows down a body by creating friction between two surfaces and converting kinetic energy into heat. Brake failure can occur when the brake lining is cut-off. Common methods include regenerative braking, which converts kinetic energy into electrical energy, potential energy, eddy current brakes, and transferring energy to a rotating flywheel.

Brakes are typically applied to rotating axles or wheels, but can also be used on moving fluid surfaces. Some vehicles use a combination of braking mechanisms, such as drag racing cars with wheel brakes and parachutes or airplanes with both wheel brakes and drag flaps raised during landing. The goal is to design a braking system with an indicator, providing audio and visual alerts when a brake fails due to worn-out brake shoes and cut-in liner.

### A. *Problem Statement and Objectives of Study*

Our problem is that we don't have brake failure indication system in automobile, so to overcome the brake failure we have to do:

- To design an Automobile Brake Failure Indicator with Auxiliary Braking System for a drum brake system and test it.
- To modify mechanism of Car system to make it more safe.
- To make effective braking system.
- Increase safety at while driving vehicles.
- Conceptual design for future electric vehicles.

## II. LITERATURE SURVEY

K.Mohan<sup>1</sup> and G.Pugazhendhi Department of Mechanical Engineering, IFET College of Engineering, Villupuram, Tamilnadu, India. Article Received: 07 June 2017 Article Accepted: 27 June 2017 Article Published: 01 July 2017 had conclude that project is fully equipped and designed for safety of the automobile vehicles. Automatic brake failure indicator and braking system is the most effective solution to this problem. 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.

Dr.N.Venkatachalapathi1, V. Mallikarjuna2 Professor and Head1, Assistant Professor2 Department of Mechanical Engineering, Annamacharya Institute of Technology & Science, Rajampet, and A.P – India has founded that an Automatic Brake Failure Indicator and Over Heating Alarm 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.

G.Venkata Siva and eta Ananthapuramu, and Andhra Pradesh had been concluded that an Automobile Brake Failure Indicator The auxiliary braking unit is used as secondary braking unit when the primary hydraulic disc brake of the vehicle fails. The secondary brakes receive power from battery. The secondary braking unit is a hub motor unit present at both the wheels of the rear axle. The hub motor also called as wheel hub drive is an electric motor incorporated into the wheels of the vehicle. Hub motors have their highest torque when they start. When the relay receives positive value from comparator, it connects the power source to the hub motor .The hub motor rotates in a direction opposite to the direction of rotation of the wheels. Therefore the hub motor provides negative torque to the wheels and retards the output power of the wheels.

Vishal Pagar and eta Automatic Brake Fluid Leakage Prevention with Safety Bypass Braking System-2018 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. The purpose of this literature review is to go through the main topics of interest. The literature reviews is concerned with design of automatic control and system, breaking failure indicator, Disc brake, Pedestal bearings, Pneumatic connectors, reducer and hose collector.

### III. DESIGN AND MODELLING

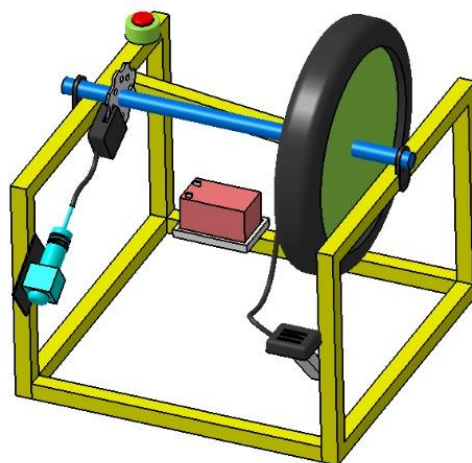


Figure 1: Design of Proposed Model

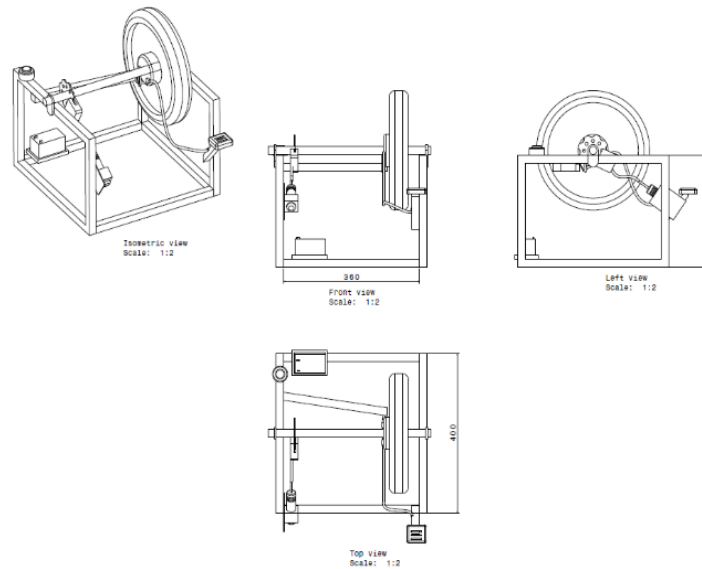


Figure 2: View of Proposed System

**B. Design Calculations**

**1. Braking force:**

$$\begin{aligned} \text{Braking force (Fb)} &= F_n * \mu \\ F_n &= \text{mass} * \text{gravity} \\ &= 144 * 9.81 \\ &= 1412.64 \text{ N} \\ \mu &= 0.8 \text{ consider max (road)} \\ F_b &= 0.8 * 1412.64 \\ F_b &= 1130.112 \text{ N} \\ \text{Pedal Force} &= 25 \text{Kg} = 245.25 \text{ N} \end{aligned}$$

**2. Braking torque**

$$\begin{aligned} \text{Braking torque (Tb)} &= F_b * R \\ T_b &= 1130.112 * 0.22 \\ T_b &= 248.62 \text{ Nm} \end{aligned}$$

Where,

- $F_n$  = Force Applied On Pedal in N
- $\mu$  = Coefficient Of Friction
- R = Radius of Wheel in M
- $F_b$  = Braking Force in N
- $T_b$  = Braking Torque in Nm

**IV. WORKING**

Working of this prototype is as simple when a vehicle is moving the brake is pressed by pedal vehicle will stop with the help of drum brakes, now

Case I: when the brake drum fails or the cable or the link join get broken then the lever of drum brake goes to Rear side and it pushes the limit switch as shown in image highlighted in red.

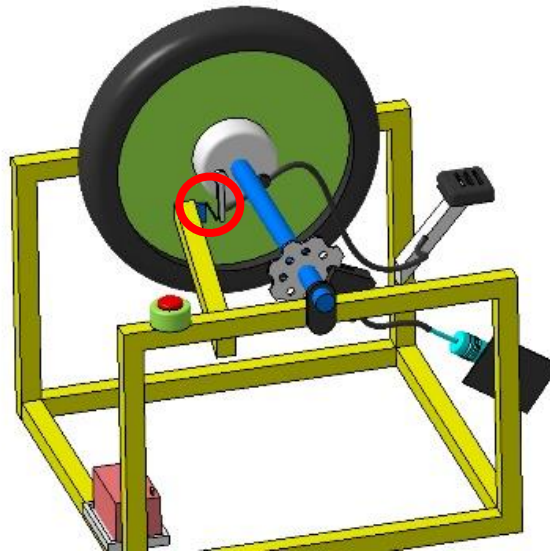


Figure 3: Working Case 1

Case II : As the topic names clear Automatic Brake Failure Indicator With Auxiliary Braking System ,in this system when the limit switch get pressed in brake fail condition, limit switch activates the solenoid gun (by connecting the solenoid gun to the battery terminal ,here limit switch acts as sensor come switch)which is connected to the disc brake , Case III: And hence once the disc is locked, the tyre shaft also gets locked & the emergency brake get applied to the system. There is no more complicated sensors involved in system.

The brake pedal, on which you apply the pressure to stop or slow down our vehicle, is connected by levers and rods to the brake booster or can be called as brake amplifier. The brake booster/amplifier multiplies and transfers the resultant force produced by stepping on the brake pedal to the master or primary cylinder. In turn, the master or primary cylinder uses that amplified force by the lever to pressure the brake fluid from its reservoir through hydraulic lines toward the front and rear brakes that are mounted on the wheels of the vehicle.

The hydraulic pressure that reaches to each wheel's brake is then used to create friction in order to slow down and to stop the vehicle. The harder you push on the pedal, more the pressure is applied to the brakes, and after a certain period locking the wheels – that is in the case your vehicle is not equipped with an Antilock Braking System (ABS). More precisely, in conventional braking system (without ABS), the hydraulic pressure is applied to the wheels through proportional valves that distribute pressure the pressure or the brake fluid accordingly to weight distribution on each wheel.

Note that brake fluid has a slippery oily feel and having no smell or odor when new. As it ages, the fluid changes into smoky brown from the water and various contaminants that collect in the system with the usage.

### C. *How does Brake Failure Works?*

The car starts and the car stops. As drivers, we need both of these features as much as we need to breathe in and out. If you've ever been in a vehicle that did not stop, you know the sheer terror that brake failure can cause. Whether your vehicle is equipped with disc or drum brakes, you expect them to work when you hit the brake pedal. Brakes can't talk - or can they? If you're not distracted with chatter or music, you might hear your brakes trying to tell you when something's wrong. Brakes have their own language; they squeal, click, squeak and grind.

The easiest way you can avoid brake failure is by maintaining the vehicle regularly and being attentive to any changes in performance. Because a vehicle's brake system involves many components along the entire length of the vehicle, any number of things can go wrong. Calipers, drums and brake pads. Let's say that despite your attentive care of the vehicle, the brakes begin to fail. What dangers might you and your passengers face, and how can you prepare for them? What will you do if you are towing a boat or trailer and experience brake failure? How can a runaway truck ramp help if your brakes stop working? In this article, we'll investigate the answers to these questions, explaining everything you need to know along the way.

## V. COMPONENTS USED

### D. Solenoid Actuator Motor Gun



Figure 4: Solenoid Actuator motor gun

### 3. Specifications:

Color: Black  
 Model: 2-wire/ 5-wire  
 Material: Plastic + Metal  
 Operating voltage: 12V/24V  
 Operating voltage range: DC 12V±3V  
 Working temperature: -30~ + 80°C  
 Life (up and down): 100,000+ times  
 Push pull force: ≥40N  
 Movement stroke: 18mm± 1mm  
 Action time: 0.2s~ 0.3s  
 Product size: 140 x 60 x 30mm/5.51 x 2.36 x 1.18"  
 Gross weight: 138g  
 Applicable models: universal  
 1 x Car Central Locking System Motor

### E. Tyre



Figure 5: Tyre

Table 1: Component Description

SR NO	PART NAME	QTY	COST
1	Frame Tube 18ft	2	3000
2	Scooty pep front tyre with drum	1 SET	2000
3	Shaft Diameter 19.75 MM	1NOS	200
4	Scooty pep front tyre with drum & Cycle Lever brake	1 NOS	1000
5	12 volt Electromagnet solenoid gun from. Scrap from Maruti 800 car	1 NOS	800
6	12 volt dc battery	1NOS	1000
7	Fixing Clamp	2	1000
8	Dc Limit switch	1	1000
9	Other Expenses	-	1000
		TOTAL	12000/-

**VI. ADVANTAGES & DISADVANTAGES****Advantages**

1. No need of external battery. Circuit can be powered from the vehicle's battery itself.
2. Power consumption is comparably less.
3. It is not depend on the petrol level.
4. Operating principle is very easy.
5. The safety of driver is ensured.
6. Brake failure is notified to the surrounding traffic via buzzer.
7. The cost is low

**Disadvantages**

1. Initial cost is high.
2. Maintenance is high.
3. Difficult to find spare parts.

**VII. CONCLUSION**

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. There are many aims of this project describe as:-

1. To indicate the proper working condition of brake switch
2. To prevent small number of accident occurs in trains and boats by the failure of brake switch
3. To gives the audio visual indication when there is a mistake in braking system.

**REFERENCES**

- [1]. B Radhakishan Maske and eta "Automatic brake failure indicator and braking system" in International Journal of Advance Research and Innovative Ideas in Education Vol-3 Issue-3 2017.
- [2]. Pandit Biradar and eta "Automatic Brake Failure Detection with Auxiliary Braking System" in International Journal for Science and Advance Research in Technology Volume 2 Issue 3 –MARCH 2016
- [3]. K.Mohan, G.Pugazhendhi "Accidents Avoiding System Indicator Due To Brake Failure" in Asian Journal of Applied Science and Technology, Volume 1, Issue 6, Pages 03-07, July 2017
- [4]. A book on "Theory of machines" by R.S KHURMI
- [5]. Mechanical engineering design, sixth edition Joseph E. Shigley , Tata Mcgraw hill ,2005.
- [6]. Khurmi R. S.,Gupta J.K., Atextbook of machine design, first edition, S. Chand Publication,1979.
- [7]. Thomas Bevan, The Theory of Machines,Third edition, CBS publishers,2005.