

Analysis Paper on ABS, Electronic Brake Power Distribution (EBD), Traction Control Device (TCS) & Electronic Stability Control (ESC)

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ABSTRACT: *Rapidly growing injuries are one of the key threads of any living person travelling across a road car. According to a study reported in a well-known magazine, there is one death every 4 minutes due to a road accident in India. And speeding is one of the key factors for these incidents. 'ABS' evolves to avoid crashes due to brake failure & power loss engineers (Anti-lock Braking System). Prevents the locking of the wheels during the panic break to prevent the skidding of the wheels. In addition to ABS, other protection mechanisms such as the Traction Control System (TCS), the Electronic Stability Control (ESC) and the Electronic Brake Power Distribution System (EBFD) or (EBD) have since been developed to mitigate the no. Injuries occur due to skidding and lack of control under every state of the track.*

KEYWORDS: *Braking, ABS system, Wheels, Electronic arrangement, Skidding problem, Friction, Automotive.*

INTRODUCTION

"India is, unfortunately, at the top with the highest number of fatalities, accounting for about 11 per cent of the world," said Nitin Gadkari, Minister of Road Transport and Highways. As road vehicles are on the increase, the number of crashes, fatalities and injuries is growing and is of concern to any human being travelling on Indian Roads. According to reports released in September 2019 by the Indian Government Ministry of Road, Transport and Highways. 4,67,044 incidents occurred on Indian highways, of which 1,51,417 people were killed and 4,69,418 people were seriously injured.

It is further noted in this study that more than 35 per cent of fatalities, i.e. 1,64,313 accidents, are caused by two-wheeler vehicles alone and 47,560 people lost their lives out of the total deaths, which is again more than 30 per cent of the total deaths. Tamil Nadu, Madhya Pradesh, Uttar Pradesh, Karnataka & Kerala are the top five cities with more than 50 percent of overall incidents, i.e. 2,39,783 accidents [1]. An accident can happen for so many reasons; drivers' fault, over-speeding, drunk driving, jumping red light, and many more. But out of all these causes, speeding is one of the key reasons that leads to more than 3,000,000 lakh incidents and 98,000 lakh fatalities. Brake loss and sudden as per records

1.1 Brakes: a mechanical mechanism that opposes the rolling of a vehicle by applying external forces or by consuming the energy of a moving body [2]. Brakes functions on the theory of Newton's first rule of motion, "An object in motion shall remain in motion until some external force acts on it."

Brakes are grouped into following categories:

- i. Mechanical braking
- ii. Hydraulic braking
- iii. Pneumatic pedals
- iv. Air brake compressed
- v. Vacuum brake
- vi. Electro-dynamic brakes

Mechanical and hydraulic brakes are commonly used for 2 and 4 wheeled vehicles.

Mechanical braking or brakes for friction: Similar like all brakes, these brakes often act under the principle of mechanical friction. This brake consists of two semi-circular shoes called brake pads or brake shoes, with a friction rubber pivoted to a fixed fulcrum within the revolving drum, when the driver is retaining the brakes because of the force applied, the brakes are extended to apply the friction force to the rotating drum to stop the acceleration [3].

Hydraulic Breaks: This brakes use the law of the Pascal ('the pressure applied to the incompressible fluid is equal in both directions.') to translate the force applied by the driver to the pressure. Hydraulic friction is used in these brakes to apply the brakes. Pressure produced is used to squeeze a pair of brake pads using pistons within the brake calipers to add force to the rotation of the rotor/disk connected to the wheel that contributes to the full locking of the wheel. This is ideal for emergency braking, but it also improves slippage and injuries due to panic braking [4].

In order to address the issue of crashes leading to emergency braking, panic braking or often sudden locking of wheels engineers create a device known as 'ABS' (Anti-lock Braking System). If known from the name itself, ABS avoids the complete locking of the wheels during a rapid or panic break to stop the skidding of the wheels. In the same way, with the aid of multiple sensors and ECU, the ABS system works at a much higher speed and power than humans can handle. ABS also increases the longevity of the tyres by reducing friction between the road and the wheel [5]. ABS Includes a range of devices and controls, such as speed sensors, EBD, ECU and HCU.

LITERATURE REVIEW

The Antilock Braking System (ABS) is one of the most critical safety features offered by the automotive industry using an electronics motor. The ABS system helps minimize the vehicle's stopping distance, boosts tyre performance and preserves vehicle stability [6].

ECU is a computerized device that processes signals from a single sensor impacting various parts and segments of the vehicle. It functions like an industrial mind with an inserted structure consisting of both machinery and programming [7]. Microcontroller is a primary computer that assumes an integral aspect of it. ECU has feedback pins connected with sensors and actuators.

DISCUSSION

ABS is a car safety mechanism that allows the wheel in the vehicle to keep traction contact with the ground surface while stopping, keeping the wheels from being stuck to avoid skidding or uncontrolled skidding. This system is based on the concepts of threshold braking and cadence braking practiced by trained drivers in the previous braking system. Cadence braking is a strategy that helps the driver to steer and brake on slippery surfaces by pumping the brake pad very rapidly (figure 1).

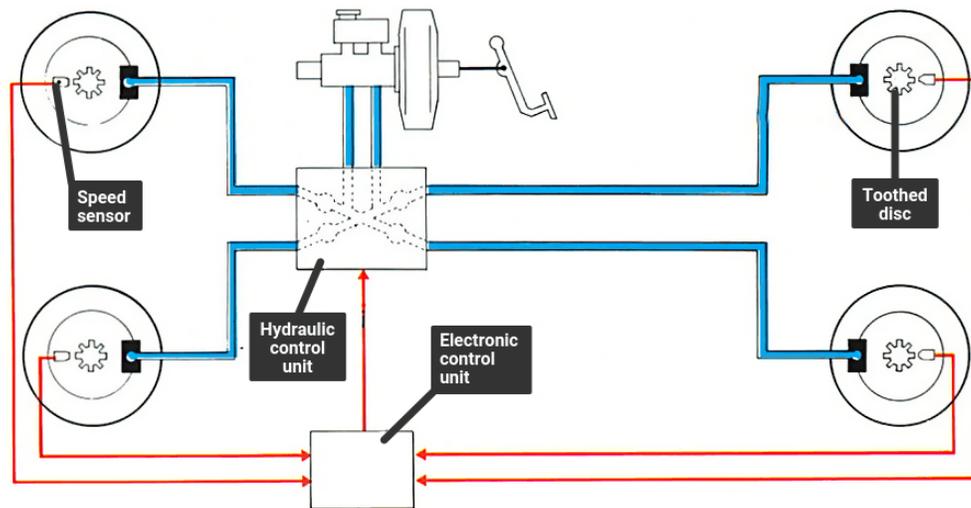


Figure 1: Working of ABS system

ECU is a computerized device that processes signals from a single sensor impacting various parts and segments of the vehicle. It functions like an industrial mind with an inserted structure consisting of both machinery and [7] programming. Microcontroller is a primary computer that assumes an integral aspect of it. ECU has feedback pins connected with sensors and actuators. Electronic brake force distribution (EBFD) is designed to make braking effective. As a special feature of the ABS, the EBFD guarantees that the amount of braking force applied to the wheel is equal to the load of the wheel at that moment. Locking wheels are really dangerous and you're losing all of your steering control. Locked-up rear wheels not only increase the chance of skidding, they also cause the front wheels to do all the work that can result in spinning and loss of balance. EBD eliminates these risks by balancing the applied braking force according to the total weight distribution of the car [8].

CONCLUSION

The automobile industry is rising towards an electric engine. With the aid of an electric engine, the manufacturer will deliver a lot of equipment to consumers. The Antilock Braking System (ABS) is one of the most critical safety features offered by the automotive industry using an electronics motor. The ABS system helps minimize the vehicle's stopping distance, boosts tyre performance and preserves vehicle stability. However, there are certain drawbacks such as its performance in unfavorable road conditions, so to address this automotive industry has made new developments in the ABS system known as Electronic Brake-Force Delivery (EBFD). EBFD allows the car more stability in unfavorable road conditions.

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