“Antilock braking system”

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ME 3rd year
Introduction

• An anti-lock braking system (ABS) is a safety system on motor vehicles which prevents the wheels from locking while braking.

• The Anti-lock Braking System is designed to maintain vehicle control, directional stability and optimum deceleration under severe braking conditions on most road surfaces.

• It does so by monitoring the rotational speed of each wheel and controlling the brake line pressure to each wheel during braking. This prevents the wheels from locking up.
History

Dual-wheel braking systems in aircraft, by Graham Morris
Dunlop's Maxaret introduced system and still in use on some aircraft models

- 1960 A fully mechanical system used in the Ferguson P99 race car, the Jensen FF and the Ford Zodiac. It was further used; the system proved expensive and, in automobile use, somewhat unreliable
• 1975 Ford also introduced ABS on the Lincoln Continental Mark III and the Ford LTD station wagon, called “Sure Trak”.
• 1978 Bosch and Mercedes-Benz introduced the first completely electronic 4-wheel multi-channel ABS system in trucks and the Mercedes-Benz S-Class.
• 1988 BMW became the world’s first motorcycle manufacturer to introduce an electronic/hydraulic ABS system, this on their BMW K100.
• 1992 Honda launched its first ABS system, this on the ST1100 Pan European.
% of vehicle using 'ABS' vs year
Total Video Converter
http://effectmatrix.com
Theory

• When the car brakes (normally) wheels exert a **forward force** on the street which **less** than maximum static sliding friction.

• If the driver brakes very hard it can occur that the maximum static friction is surpassed and the wheels lose their grip and begin sliding.

• The amount of traction which can be obtained for an auto tire is determined by the **coefficient of static friction** between the tire and the road. If the wheel is locked and sliding, the force of friction is determined by the coefficient of kinetic friction.
• But in gravel, sand and deep snow, locked wheels dig in and stop the vehicle more quickly. A locked tire allows a small wedge of snow to build up ahead of it which allows it to stop in a somewhat shorter distance than a rolling tire.

• When tire does not slip, it will roll only in the direction it turns. But once it skids, regardless of the angle of the front wheels, the vehicle continues to skid in
Basic Operation

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• It does so by monitoring the rotational speed of each wheel and controlling the brake line pressure to each wheel during braking. This prevents the wheels from locking up.

• The sensors - one at each wheel - send a variable voltage signal to the control...
Components

• Wheel Speed Sensors
• Abs Control Module (ECU)
• Hydraulics Modulator
• Pump Motor &
• Accumulator
• When a wheel is about to lock up, the control unit signals the hydraulic unit to reduce hydraulic pressure (or not increase it further) at that wheel’s brake caliper. Pressure modulation is handled by electrically-operated solenoid valves.

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Wheel Speed Sensors

- The wheel speed sensor pickup has a **magnetic core surrounded by coil** consisting of a magnetic pickup and a **toothed sensor ring**.
  - As the wheel turns, teeth on the sensor ring move through the pickup magnetic field.
  - This reverses the polarity of the magnetic field and induces an alternating current.
• The number of voltage pulses per second that are induced in the pickup changes in direct proportion to wheel speed. So as speed increases, the frequency and amplitude of the wheel speed sensor goes up.
• The WSS signal is sent to the antilock brake control module, where the AC signal is converted into a digital signal.
ABS Control Module

- The ABS control module is a microprocessor and uses input from its sensors to regulate hydraulic pressure during braking to prevent wheel lockup.
- The key inputs are wheel speed sensors and brake pedal switch. The brake pedal switch is a key input.
- When ABS braking is needed, the control module kicks into action and orders the hydraulic unit to modulate brake pressure as needed.
Hydraulic Modulator

- The hydraulic modulator or actuator unit contains the ABS solenoid valves for each brake circuit.
- The exact number of valves per circuit depends on the ABS system and application.
- Some have a pair of on-off solenoid valves for each brake circuit.
**Accumulator**

- A high pressure electric pump is used in some ABS systems to generate power assist for normal braking as well as the reapplication of brake pressure during ABS braking.
- The fluid pressure that is generated by the pump is **stored** in the "accumulator."
- The accumulator on ABS systems where the hydraulic modulator is part of the master cylinder assembly consists of a
Disadvantages

- Longer stopping distances
- Reduced brake responsiveness (e.g., on loose, "soft" surfaces).
- A "false sense of security" for beginner drivers who do not understand the operation, and limitations of ABS.

- The anti-lock brakes are more sensitive on the damper condition, the influence of the worn components on the performance of the vehicle with anti-lock brakes is more significant and thus more dangerous.
Thank you
Queries?