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An anti-lock braking system, or ABS, is designed to prevent wheel skidding during rapid braking. By rapidly applying and releasing the brakes, the system ensures a safe stop or turn without losing control of the vehicle. Without ABS, wheels can lock up when braking hard, leading to loss of control and potential accidents. ABS works by monitoring the deceleration of each wheel. When it detects an abnormal deceleration, indicating wheel locking, it releases the brake to allow the wheel to rotate freely, thereby preventing skidding. This cycle of applying and releasing brakes continues until the wheel stops safely. The ABS system consists of a master cylinder, hydraulic control unit (HCU), pump, accumulator, and solenoid valves. The master cylinder pumps brake fluid when the driver presses the pedal. The HCU receives signals from an electronic control unit (ECU) and sends brake fluid through input lines or returns it to prevent constant locking during braking. The advantages of ABS include improved safety, reduced stopping distances, and enhanced vehicle control. It is commonly used in a wide range of vehicles, including cars, trucks, motorcycles, and even airplanes. The Electronic Control Unit (ECU) plays a crucial role in controlling the brake operation when the brake pedal is pressed. It receives signals from the speed sensor and sends commands to various components such as the accumulator, solenoid valves, pump, and master cylinder to perform specific operations. The tooth wheel and speed sensor work together to provide data on wheel speed and deceleration to the ECU. When the driver presses the brake pedal, the following sequence of events occurs: 1. The piston pressurizes the brake fluid, and the ECU sends a signal to the solenoid valve and pump to initiate the flow of brake fluid towards the brake drum. 2. As the wheel locks due to braking, the speed sensor sends a signal to the ECU, which then instructs the pump and solenoid valve to stop the flow of brake fluid and release pressure on the wheel by returning the brake fluid through the return line. This process repeats rapidly until the vehicle's speed reduces or it comes to a complete stop without skidding. The Anti-lock Braking System (ABS) offers several advantages, including reduced stopping distances, improved steering control, and enhanced safety features. The ABS is used in various applications, but its primary function remains the same: to prevent wheels from locking up during hard braking, which can lead to accidents.

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