

MECHATRONICS BOOK SERIES

CONTROL AND INTELLIGENT SYSTEMS

Momoh Jimoh E. Salami
Abiodun Musa Aibinu
Yasir Mohd Mustafah



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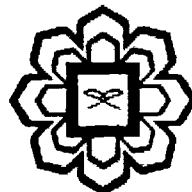
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EDITOR

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Anti Skid Control System, A Tutorial

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7.1 Introduction

Antiskid Braking System (ABS) refers to devices designed for preventing wheel lock during hard and panic braking conditions. These systems have gained attention in the recent time. In Malaysia, most Malaysian's cars are equipped with an ABS. It is a known fact that four wheel systems provide more security, steerability and stability. ABS systems are designed using system hydraulics, sensors and control electronics.

The antiskid braking system is basically an actuator used in controlling the valve and brake pressure fluid use for stopping cars. The main idea is to control the brake force not to exceed the wheel threshold limit where slip can occur. The vehicle speed and wheel speed play important role in making the car stop in safe way thus avoiding skidding. As long as the driver steps on the brake pedal, antiskid braking system will play its important action to prevent skidding.

Most modern ABS comprises of: Hydraulic brakes for wheels of the vehicle; Actuators provided for respective brake groups each including at least one of the brakes, for controlling a braking pressure or pressures of the brake or brakes of the corresponding groups; Speed sensors, at least one of which is provided corresponding to each actuator, for detecting speeds of the wheels.

A moving vehicle is affected by weight force, air resistance and voluble resistance of tire above all. The force actuating for tire is consist include: Circumferential force, which is descended from driving mechanism; Side force, which is descended from vehicle control; Normal force, which is descended from vehicle weight.

The forces efficiency depends from road status, tire status and atmospheric conditions. The transferred force intensity between road and tire at accelerating or decelerating are determined by the friction forces. Car safety systems need maximum uses instantaneous value of the friction forces, which is determined by the adhesive force. If there is a high friction force, then more driving force of engine will gives the car more acceleration. If the value of friction force is small enough, the wheel will start to skid. In this case, the Antiskid Braking System (ABS) must reduce the engine driving force to some level if any wheel is skidding. In other words, the braking forces must be reduced so the vehicle stops from skidding.

The most important parameter processed in ABS is slip. The slip is non dimensional parameter designated as λ . This parameter determines the skid rate during braking. General equation of slip is:-