

Anti Stoppie Braking System for Track Bikes

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ABSTRACT: Nowadays we concentrate on speed and performance when it comes to bikes or superbike. It is the responsibility of automobile sectors to assure it along with proper safety. Usually, the brakes contribute much for the driver safety. The anti stoppie braking system is coined exclusively for superbike. Here the anti stoppie is actuated through a proximity sensor. The development of this new technology involves the knowledge of intricate braking mechanisms. Thus ASBS will be accepted beyond ABS exclusively by track bikers. The reason behind is the ASBS will not affect drifting as like ABS while cornering.

KEYWORDS: braking mechanism, superbikes, proximity sensor, anti stoppie

I. INTRODUCTION TO BRAKING MECHANISMS

When a car has been set in motion, the driver naturally is concerned that he or she is able to bring the vehicle safely to rest. This is the function of the braking system. The standard for braking was "9 metre from 32 kilometres per hour." To understand what this means requires a bit of calculus and basic dynamics. Recall that the definitions of velocity and acceleration are

$$V = \frac{ds}{dt} \quad \text{and} \quad a = \frac{dV}{dt}$$

These equations can be "solved for dt and set equal to each other to give

$$ads = VdV$$

Integrating Eq. 9.1 yields (Note: 32 kmph = 30 ft= 29.33 fps)

$$\int_0^{9m} ads = \int_{32kmph}^0 VdV \Rightarrow a = 4.37 \frac{m}{s}$$

Thus, the specification actually defines a required deceleration. Modern braking requirements and testing procedures are spelled out in the SAE Handbook. The procedures define many specific tests, and they measure parameters including sustained deceleration, stopping distance, average and maximum torque, average and maximum pressure, and final rotor/drum temperature, among others. Without going into the details of every test, the maximum sustained deceleration required by the specifications is 0.65g. This test corresponds to a "panic" stop from 97 kmph. "Normal" stopping tests specify a deceleration of 0.3 g. One might ask why the required deceleration is not much higher. The answer is simply that it is unwise to require decelerations that would cause people or objects to be thrown into the front windshield.

For example, consider a Dodge Viper (1705 kg) traveling at 129 kmph (35.76 ds). The car is to be stopped with the maximum sustained deceleration. The force required to bring the car to a stop is

$$F_b = 1705 \times 0.65 \times 9.81 = \underline{10.87 \text{ kW}}$$

The average power absorbed by the brakes is given by

$$P_{avg} = F_b * V / 2 = (10.87 \times 35.76) / 2 = \underline{194 \text{ KW}}$$

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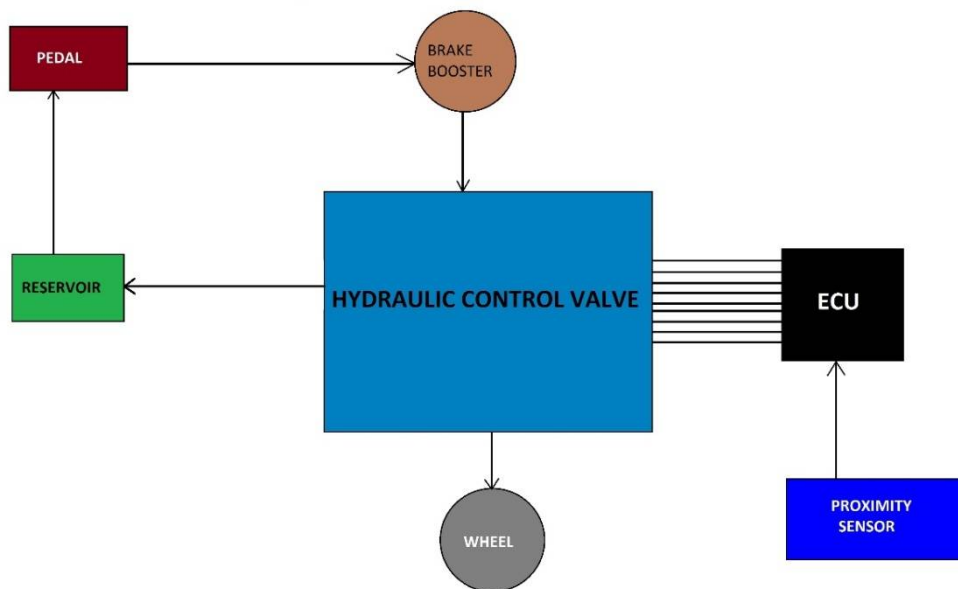
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The power at the onset of braking is twice this value, or 388 kW! Because the brakes basically convert kinetic energy to heat, this rate of energy dissipation naturally should raise concerns about heat dissipation from the system.

II. ASBS LAYOUT



The complete layout of ASBS is shown. The electrical circuit is also extremely simple compared to ABS

The brake pedal is in the control of the driver. The pedal is directly connected to the brake booster. The brake oil is supplied to the pedal from the reservoir. The flow is regulated by the hydraulic unit. The booster increase the brake application pressure. The ECU is connected to Hydraulic control valve. The proximity sensor is connected to ECU.

III. WORKING PRINCIPLE

A stoppie, is a vehicular maneuver that involves raising the rear wheel (or wheels) above the level of the rider relative to the vehicle in question, while keeping the front wheel on the ground. You're most likely to see riders perform stoppies with motorcycles or bikes. A wheelie is considered to be a daredevil stunt for obvious reasons. However, like a lot of other audacious stunts, wheelies are also based on two very common physical concepts: **angular momentum and torque**. In the most basic terms, the angular momentum of an object is the product of its moment of inertia and angular velocity. On the other hand, torque is a measure of the twisting force that causes an object to rotate.

Now that you have a fair idea about angular momentum and torque, let's see how these physical forces help raise the wheels of a motorcycle. When a motorcycle moves on a level surface, the force of gravity is exerted on the center of mass of the motorcycle, and the normal forces (acting in the opposite direction of gravity) are exerted by the ground on the front and rear wheels. Hence, equilibrium is established between these forces and the motorcycle moves normally. In order to lift the rear wheel off the ground, you need to disturb this equilibrium between these two opposing forces. More specifically, you need to unbalance the torques acting on the front wheel. This is achieved by accelerating the motorcycle until the load borne by the rear axle is decreased to zero, thereby increasing the torque that's applied

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around the front axle – and therefore the front wheels. Note that the normal force on the front wheel does not apply any torque on the front wheel. Only gravity and the engine of the motorcycle do. Therefore, all the engine has to do is supply more torque (through the drive train) to the front wheel than the gravitational torque, and behold.



The picture shows the physics behind the occurrence of stoppie

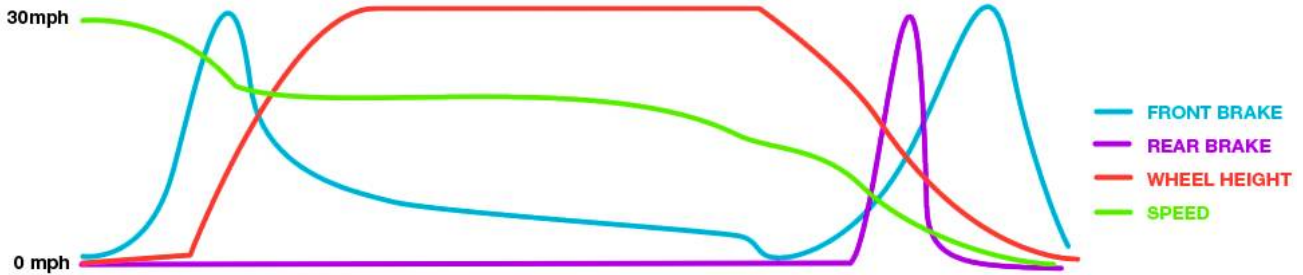
The Technology developed is as Follows: During cornering at high speeds, if the driver applies front brake suddenly the rear wheel tends to rise from the ground level. When the wheel rises more than 300 mm from the ground level, the proximity sensor triggers an electric signal to the ECU. The ECU transfers the signal to Hydraulic circuit. The Hydraulic Circuit finally regulates the flow of brake fluid to the front wheel. The flow regulation is maintained by it according to the signals from ECU. Here we use ultrasonic proximity sensors. This type of proximity sensor has the maximum range of detection.

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During stoppie the behavior of each parameter is shown in the graph

IV. ELECTRONIC SYSTEM IN ASBS

This ASBS constitutes of two vital electronic systems. They are the Electronic Control Unit (ECU), the Proximity Sensor and the actuators. The system is actuated by the combined operation of these components along with other mechanical components. The function and role of each of these components are discussed separately in detail in as this is the basis for the ASBS activation.

ECU

In automobile industry an electronic control unit is an embedded electronic device, basically a digital computer, which reads signals coming from sensors placed at various parts and in different components of the car and depending on this information controls various important units. The ECU uses closed loop control, a control scheme that monitors outputs of a system to control the inputs to a system managing the emissions and fuel economy of the system. Gathering the data from the different sensors, the ECU performs millions of calculations each second, including looking up values in tables, calculating the results of long equations to decide on the exact hydraulic fluid supply timing or determining how long the hydraulic circuit is open. In ASBS the electronic control unit receives signal from the various signals. A switch at the brake provides the brake operating signal. Another in the ignition system signals the engine is operating. This step of the automatic check that ASBS conducts the every time when the engine starts. Another input is from the proximity sensors. These signals are used to control the hydraulic control unit and anticipate wheel from stoppie. If a stoppie continues to sustain to a distance of above 300mm from the ground, the ECU operates the solenoid valve to reduce the hydraulic pressure appropriately.

ACTUATORS

Actuators are devices used to produce action or motion. The input signals of actuators may be an electric signal or fluids. The output of actuators can be position or rate i.e. a linear displacement or velocity. There are three types of actuators in general. They are pneumatic, hydraulic, electrical/electronic. Here we use a hydraulic type. Its a drive or transmission system that uses pressurised hydraulic fluid to actuate the brakes. The hydraulic actuator is controlled by a hydraulic pump.

PROXIMITY SENSOR

An ultrasonic proximity sensor uses a piezoelectric transducer to send and detect sound waves. Transducer generate high frequency sound waves and evaluate the echo by the detector which is received back after reflecting off the target. Sensors calculate the time interval between sending the signal and receiving the echo to determine the distance to the target. When the target enters the operating range the output switches. The ultrasonic proximity switches are equipped with temperature sensors and a compensation circuit, in order to be able to compensate for changes in operating distance caused by temperature fluctuations. The ultrasonic sensor can work in diffuse, reflex or thru-beam mode. For ASBS we use diffuse reflective mode. In this case the emitter and detector are put in the single package in such a way

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that their field of view cross. Here the emitter continuously emits the light. When the target comes within the operating range of the sensor the light from the emitter is reflected off the target and detected by the detector.



The construction and working principle of ultrasonic proximity sensor is shown

V. SCOPE OF ASBS

This technology enables high speed cornering. It also helps the race bikers during drifting. Thus this technology will find its fullest value and application when it is implemented in superbikes/ sporsbikes. This technology ensures safety for riders. Due to the absence of ABS here, the drifting of wheel is prevented and the risk of your vehicle overthrown is blown off from this technology.

VI. CONCLUSION

The further development of this new technology will be a great hike among the track riders and super bike lovers. The performance of the individuals in races will greatly improve due to this technology. The further scope of this technology is to achieve the combined effect of both Antilock Braking System (ABS) and Anti Stoppie Braking System (ASBS)

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