

PRELIMINARY STUDY ON BRAKE SQUEAL NOISE FOR THE
DEVELOPMENT OF FAULTY PARTS INDICATOR

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THE DEVELOPMENT OF FAULTY PARTS INDICATOR

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“I have read this literature work and that in my opinion it is fully adequate,
in scope and quality, as a masterpiece for the degree of
Bachelor of Mechanical Engineering (Automotive)”

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Date : 27th MARCH 2008

“I hereby declare that all information in this document has been obtained and presented
accordance with academic rules and ethical conduct. I have fully cited and referenced
all materials and results that are not original to this work”

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Date : 27th MARCH 2008

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ABSTRACT

Noise of faulty part in car will occur when the part is nearly damage. Usually this noise occurs after a long term usage. This annoying noise will disturb driver's concentration while driving. Generally typical driver with limited technical knowledge of car maintenance cannot determine the location of the noise in car. This report presents a study of brake squeal noise for the development of faulty part indicator. Brake squeal noise usually cause of faulty condition of component of brake system that near faulty. The measurement of the brake squeal noise was carried out and will be analysed to know the characteristic of the brake squeal noise. It is expected that this project will continue to do the development of the faulty indicator.

ABSTRAK

Bunyi bising bahagian-bahagian dalam kereta akan berlaku apabila bahagian tersebut hampir rosak. Biasanya bunyi hingar ini terjadi setelah melepasi satu jangkamasa panjang penggunaannya. Bunyi bising menjengkelkan ini akan mengganggu tumpuan pemandu ketika memandu. Pemandu umum yang biasanya mempunyai pengetahuan teknikal yang terhad mengenai penyelenggaraan kereta tidak dapat menentukan lokasi bunyi bising tersebut dalam kereta. Laporan ini adalah mengenai satu kajian bunyi bising jeritan pada brek untuk pembangunan penunjuk bahagian rosak di dalam kereta. Bunyi bising jeritan pada brek biasanya disebabkan oleh keadaan yang hampir rosak pada sistem brek tersebut. Pengukuran jeritan bunyi bising pada brek telah dijalankan dan akan dianalisis untuk mengetahui ciri jeritan bunyi bising pada brek. Projek ini dijangka akan diteruskan dengan pembangunan penunjuk kerosakan pada bahagian-bahagian kereta.

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CHAPTER 1

INTRODUCTION

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INTRODUCTION

1.1 Introduction

Recently, visual alarm mechanism or indicators in car have been improved in this new era of technology. This indicator is used to warn the driver about their vehicle condition and safety driving precautions likes parking brake and safety belt. It is important that drivers have to know each component of the indicator in their vehicle. Usually this indicator is used to indicate fuel level, door switch, temperature level and many more. But not all indicators will show vehicle condition. Sometime, when a car has a faulty part problem it will make a noise. This problem will not be shown through the present car indicator.

Noise in car is a serious problem because it will disturb driving concentration of the driver. It is because the driver will be confused that where the noise come from and give a bad feeling about their car condition. A new indicator that located the faulty part noise is needed to solve this problem. It will help the driver to know their car condition and exact location of the near faulty part problem. In other hand it also helps the driver to communicate and tell the mechanic their car problem and make the mechanic easy to search and repair the problem.

1.2 Objectives

The objective of this project is to determine and analyze the brake squeal noise criteria for faulty condition of brake system for the development of faulty part indicator. Brake is one of the important parts in handling characteristic of vehicle and for safety of the car to slowing down and stop to static condition. Usually this noise will be heard after a long usage of vehicle. The purpose of this project is to measure sound pressure of the squeal noise inside car interior for the development of the faulty part indicator. The data will be analyse to know the characteristic of the squeal noise produce by faulty brake condition. Then the data will be considered to use for the development of faulty part indicator.

1.3 Scope

This project is to carry out several tests using Proton Satria 1.6 SE and acquire data on the noise inside car interior, contributed by faulty brake condition in car. Then the data will be analyse to know the characteristic of the noise. The sound pressure level (SPL) of brake squeal noise is to be measured inside the car interior and analyse by using the Sound Level Meter (SLM). The sound pressure level is analyse to know the characteristic of the squeal noise inside car interior contributed by faulty brake condition.

1.4 Problem Statement

In brake system, there is several noise problem occurs for different type of faulty condition. This condition is effect from several part in the brake system which is rotor, brake pad, brake caliper and brake booster.

1.4.1 Vibration of Brake Rotor

There are several parts that can be faulty in the brake system of the car. One of the parts is the brake rotor. Brakes rotor is one of the important part of the brake system that attach to the drive shaft and tire and responsible for stopping the moving vehicle when hydraulic force is applied at brake caliper. Brake system performs work by using friction to convert the mechanical energy motion, called kinetic energy, into heat energy. Brake function when forcing the friction surface against the drum or rotors to stop the car.

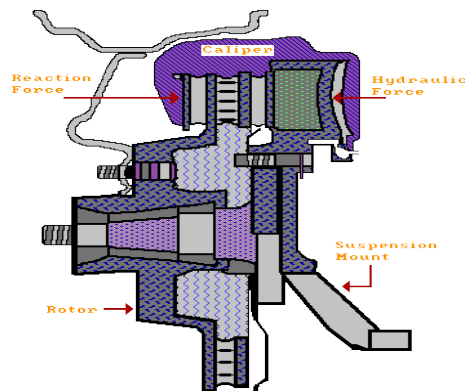


Figure 1: Disc brake function and damage (“Disc Brake Drag” www.dnr.louisiana.gov)

Usually brake noise is a common complaint from customers [1]. Vibration is the leading cause of disc brake noise. During brake application, the lining sticks to the rotor momentarily before slipping and then sticking again. This causes the high frequency vibration that result in annoying squeaks and squeal. A sensor should be placed at the rotor to detect the vibration that produced the noise and an indicator should be design to warn the driver about this faulty condition.

1.4.2 Excessive Wear and Material of Brake Pad

Noise during a stop can include squeaks, metal-to-metal sounds from excessive wear, rattles due to loose parts, and rubbing from a distorted backing plate. A very common cause of brake noise occurs when the metal brake pad back vibrates against the metal caliper piston. Harder lining materials have a tendency to make noise, especially when cold, but they last longer and provide better hot stopping than softer linings. Many newer vehicles come from the factory with semi metallic linings that are more prone to low-frequency vibration and noise. Some consider a small amount of noise from these linings to be normal [1].



Figure 2: Faulty of the brake pads (“Disc Brake Drag” www.dnr.louisiana.gov)

Base on some driver experiences, squeal noise that come from brake always disturb their driving concentration. The squeal noise usually came from the faulty of the brake pads. Although the brake work perfectly and the shoe are in good order but the sound is so loud and difficult to judge if it is one or both brakes that are responsible. Sometime, in another driver experience, the brakes make squealing noise when brake a little hard especially when stopped the vehicle. Base on this case, it is hard for some driver to know where the squealing noises come from. To overcome this problem an indicators that can detect that typical of noise have to be design and develop [2].

Beside that sometime brake also can make sound of grinding noise when braking [3]. This is because the brake pads are worn out and it have to be change. To solve this problem indicator of the brake pad wear and tear should be design that detects the type of noise that generated from the brake pad.

1.4.3 Brake Booster

Brake booster is designed to create better braking force from minimal pedal effort, using a difference in atmospheric pressure and engine manifold vacuum. Based on this function, this booster needs an airtight pressure to make a well-functioning brake system. Sometime when this booster has been used for long usage, the airtight seal is worn out. This makes the booster leak.

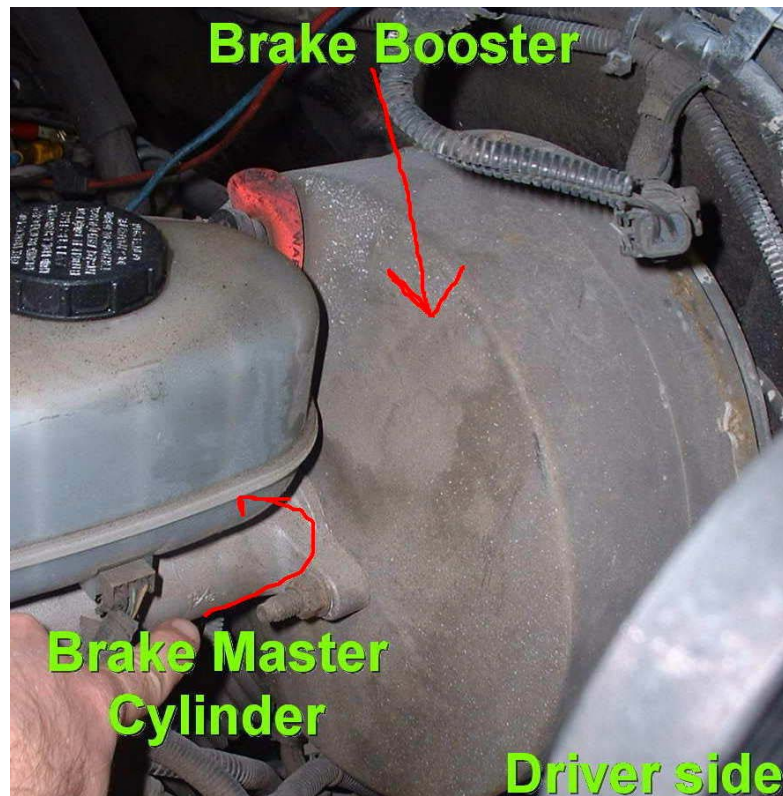


Figure 3: Faulty condition of brake booster (www.tech1autorepair.com)

Another noise problem that is experienced by the driver is the sound of hisses. This problem could be due to an air leak at the brake booster [3]. In this problem, a sound sensor and indicator for the booster have to be designed to solve it.

1.4.4 LOOSEN BRAKE CALIPER

Brake caliper is also called cylinder body. This caliper function transfer hydraulic pressure to press the brake pad to grip the rotor. Brake caliper is the most important part of the brake system. Usually this caliper is hard to have a problem regarding the noise. It usually has a problem with the hydraulic leakage. But there is a problem that complains by customer that has an experience of clacking noise when pushing the brake pedal [3]. It probably sound of loosen of brake caliper cause of loose bolt. Base on this problem an indicator have to develop to detect this type noise for the faulty condition of the brake caliper.



EXPLODED VIEW OF
BRAKE CALIPER ASSEMBLY

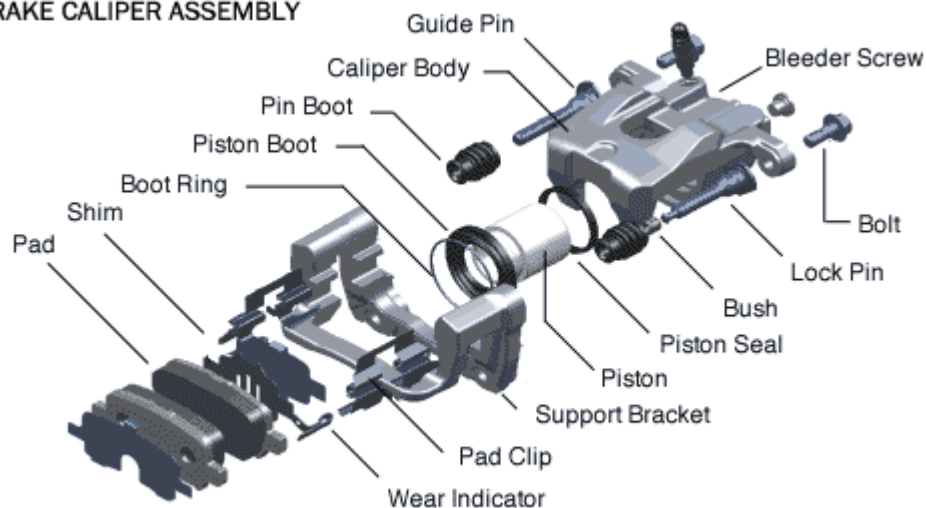


Figure 4: Faulty Brake Caliper and Exploded View (www.akebonobrake.com).