UNIVERSITI TEKNIKAL MALAYSIA MELAKA

STUDY OF VIBRATION ON MOTORCYCLE BRAKE SYSTEM

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A thesis submitted
in fulfillment of the requirements for the degree of
Bachelor of Mechanical Engineering Technology (Maintenance Technology) with Honours

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DECLARATION

I declare that this Choose an item. entitled " STUDY OF VIBRATION ON MOTORCYCLE BRAKE SYSTEM" is the result of my own research except as cited in the references. The Choose an item. has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : *IFWAT*

Name : MUHAMMAD `IFWAT WAFIUDDIN BIN JOKDIN

Date : 20/01/2023

APPROVAL

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor of Mechanical Engineering Technology (Maintenance Technology) with Honours.

Signature : *IRMAN*

Supervisor Name : TS. DR. MOHD IRMAN BIN RAMLI

Date : 20/01/2023

DEDICATION

I would like to give my dedication to my beloved family, friends and lecturers.

ABSTRACT

Disc brake is the most important component in vehicles, either smallest vehicle, bicycle have a disc brake. Inspection is important to insure disc brake in good condition. Thus, vibration of disc rake was studied in this thesis. The experiment was perform by tested disc brake in laboratory. Three speed was chooses for the experiment, 500 rpm ,1000 rpm and 1500 rpm. The vibration of normal disc brake and faulty disc brake were measure using accelerometer. The process through Data Acquisition (DAQ). Software Smart office (SO) used to analyse. All data being collected for analysis. Mat Lab software used to interpret data into graphs. All graph was analyse to understand the magnitude of the vibration on disc brake. The result obtained concludes the relation between vibration and parameter used in this experiment.

ABSTRAK

Brek cakera adalah komponen terpenting dalam kenderaan, sama ada kenderaan terkecil, basikal mempunyai brek cakera. Pemeriksaan penting untuk memastikan brek cakera dalam keadaan baik. Oleh itu, getaran cakera disk dikaji dalam tesis ini. Eksperimen dilakukan dengan brek cakera yang diuji di makmal. Tiga kelajuan dipilih untuk eksperimen, 500 rpm, 1000 rpm dan 1500 rpm. Getaran brek cakera normal dan brek cakera yang rosak diukur menggunakan akselerometer. Proses melalui Perolehan Data (DAQ). Software Smart office (SO) digunakan untuk menganalisis. Semua data dikumpulkan untuk analisis. Perisian Mat Lab yang digunakan untuk mentafsirkan data ke dalam grafik. Semua grafik dianalisis untuk memahami besarnya getaran pada brek cakera. Hasil yang diperoleh menyimpulkan hubungan antara getaran dan parameter yang digunakan dalam eksperimen ini.

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LIST OF SYMBOLS AND ABBREVIATIONS

MATLAB	-	MATrix LABoratory
rpm	-	Revolution per minutes
RMS	-	Root mean square
SO	-	Smart office
Kg	-	Kilogram
g	-	Acceleration
ISO	-	International Organization for Standardization
ASTM	-	American Society for Testing and Materials
N	-	Size of population
DAQ	-	Data acquisition systems
Σ	-	Summation
%	-	Percent
μ		Population mean

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CHAPTER 1

INTRODUCTION

1.1 Background

Brake disc system helps vehicle to slow down or stop. There are two type of most popular brake system which disc brake and drum brake. Brake disc system has been placed in vehicle since 1960s and brake disc has been used more extensively in modern vehicles. The Brake disc system have been improved year by year to increase the potential of brake disk system.

The brake system is critical to the vehicle's safety. A secondary braking system has been created to prevent accidents in the event of unexpected or partial brake failure. When the primary braking system fails, the secondary brake system is activated. In a panic situation, the driver can apply the maximum force, which is studied and used to activate the secondary braking system. The content concentrates on the design of two disc brake calliper, the supporting shaft, spring and pedal lever, and secondary brake activation. It is used to analyse the stress and deformation of braking components. The purpose of this study is to determine the stress analysis of the pedal and the actuation force of the secondary system after the primary system fails (Nilesh Totala,2015)

The primary function of a brake system is to reduce the vehicle's speed. To keep the vehicle moving during downhill operations and to keep it motionless once it has come to a complete halt. During typical Brake operation, several basic activities must be completed. During a brake system failure, and to a lesser extent, braking effectiveness (Prof. L. B. Diwakar, 2020)

The brake disc system consists of a disc, brake caliper and brake pad. The disc is the largest component in the brake system. It fixed to the wheel via the holes on the front of the hub. The brake caliper is the clamp like component that fits over the disc and the brake pad is the metal plate with a friction- based material bound the surface. Brake pad typically include of copper, steel, iron and graphite which all bonded together. A disc brake basically operates by squeezing the brake pads of rotor disc that is attached to the wheel. This will cause a friction that helps the vehicle slow down and initially stop.

This project will focusing on vibration of the brake disc system due to force of friction made by the brake.

1.2 Problem Statement

The disc brake system assists vehicles in slowing or stopping. The rotation of disc brake rotate causes vibration, which depends on the speed of rotation. The abnormal vibration may cause damage to other components.

An abnormal vibration will affected the brake disc system such as misalignment and short life span of the brake system. Also looseness one other factor of abnormal vibration happened. This probably because of bolt not suitable in size or shape for the this brake and motorcycle`s rim. Mechanical looseness results from improperly installed spinning components.

1.3 Research Objective

The main aim of this research:

a) To study the vibration on motorcycle brake disc system in different speed.

b) To compare the difference of vibration on normal motorcycle brake disc and faulty motorcycle brake disc in different speed.

c) To collect vibration data using selected software (MATLAB) base on the experiment.

1.4 Scope of Research

The experimental disc brake from a motorbike will be utilized to achieve the legitimate goal. The project's scope comprises:

- The mechanical characteristics and measurements of the specified disc brake are evaluated.
- Performing experiment on brake disc system and using software for data management.
- Comparison vibration analysis on of disc brake between different speeds.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The vehicle's braking system enables a complete stop. The braking system may be seen by many as being the most important component of a vehicle's operation. The driver can bring a car to a complete stop in the shortest amount of time due to the outstanding braking system (Thomas W. Birch, 2004).

The present-time vehicle's brake operational has been enhanced for more than a century and is now very dependable and effective. Disc brakes are used in the front and either drum or disc brakes are used in the back of a vehicle. All of these brakes are connected to the master cylinder by a network of tubes and hoses. By applying pressure to the brake pedal, the driver activates the car's braking system. Brakes slowing and stopping a moving object by converting the energy of the vehicle's speed into thermal energy. The amount of heat create is inversely related to the vehicle's speed and the driver's pressure on the brake pedal. Fast-moving, abruptly stopping vehicles produce greater heat. The braking system is made up of several components. The coordination of all braking sub-systems is necessary for stopping a vehicle.

Therefore for vehicle to stop, the whole braking system must work properly. Parking brakes, a power brake booster, and an anti-lock system are all related to the brake system. The driver or motorist applies the brake pedal to halt a wheel. The hydraulic fluid in a master cylinder is under pressure due to the pressure on the brake pedal. This hydraulic force is sent to each wheel cylinder calliper through steel lines and flexible brake lines. To

pressured friction material on the disc brake and drum brake, hydraulic pressure is delivered to each wheel cylinder or calliper. This slows down and finally stops the spinning part.

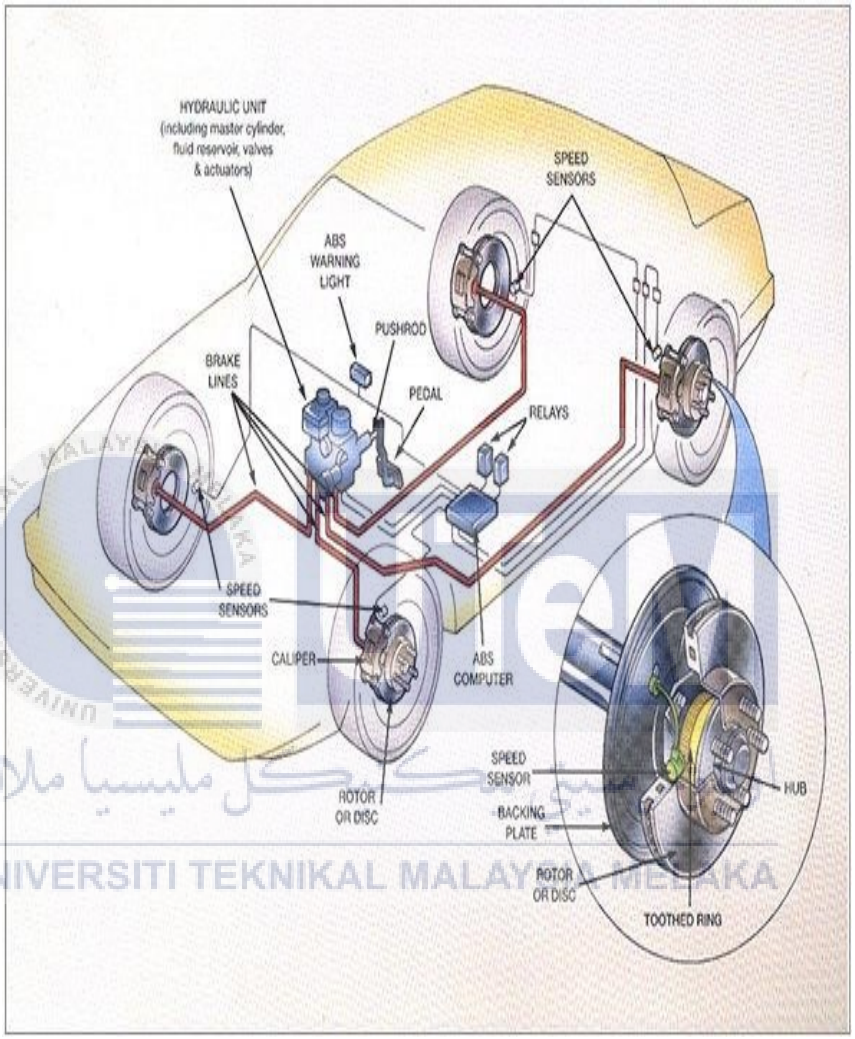

Figure 2.1:

Figure 2.1 Modern automotive brake system

Source: James D. Halderman, 2010

2.2 Brake System Categories

Brake system can be categorized into six sub-system categories based on their functions (James D. Halderman, 2010).

Type of brake system	Explanation
Apply system	Activates the braking mechanism through pushing the pedal. All of the levers, pedals, and connections required to apply a braking force are included in the apply system.
Boost system	Most automobiles employ a boost (power brake) system to lessen the amount of force the driver needs to apply to the brakes.
Hydraulic system	The pedal's force is sent to the hydraulic system, where it travels through connecting tube to the wheel brakes.
Wheel brakes	The hydraulic pressure from the hydraulic system propels the piston, which employs friction to drive material up against a revolving drum or disc. The frictions cause rotational wheel to stop.

Braking warning lights	When a hydraulic system fails, the red braking warning lamp illuminates, and an amber ABS warning lamp or dim red brake light signals an ABS self-test that may reveal an ABS system issue.

Table 2.1 Types of brake system

2.3 Disc brake

The three components of a disc braking system are typically a brake disc rotor, two brake pads, and a calliper. These elements work together to offer powerful braking with a minimal stopping distance for rotating wheels. The brake disc has a circular aperture in the middle, which is where the wheel hub is situated. It is surrounded by several holes for the wheel bolts. The wheel and the brake disc rotate in perfect lock-step. The standard load generates such in friction force at the disc-pad surface when the force is applied. As a result, a braking torque is produced at the centre of rotation of the wheel. Between the tyres and the ground, the braking force that slows the car as a result of the brake torque may be seen. Disc brakes exert pressure on two brake pads that are located on either side of a rotating rotor that is connected to the wheel hub. The disc brake pad is located in a calliper that is positioned above the rotating disc. All of the friction components of the disc brake are open to the air, which aids in cooling the brake parts and enhancing braking effectiveness during repeated hard stops from higher speeds. For a disc brake to have the same stopping power as a comparable drum brake, more hydraulic force and pressure is needed (Jack ERjavec, 2004).

Heat flux is a function of time and space variables and is determined by the contact conditions between the disc and pads. Convection, radiation, and the known temperature constitute the thermal boundary conditions outside the contact region. The frictional heat