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ABSTRACT

The primary aim of this project was to design a device that can be use for bicycle wheel truer. The project systems allow a wheel's current state to be measure and analyzed. The project was using strain gauges to detect the wobble and eccentricity on the bicycle wheel. The strain gauges will produce small voltage value from it detection, thus amplifier design need to be implement to boost the signal level to increase measurement resolution. The systems also need a gadget that will help to hold the bicycle wheel properly, while the wheel being test with the strain gauges. The test result from the systems will inform about how big wobbles and eccentricities that occur in the wheel.

INTRODUCTION

Wheel stability in bicycle is very important for safety and comfort in riding a bike. For that reason, the project aim is to make a system that can test the stability of wheel or to help 'true' a bicycle wheel. The project involved the measurement of eccentricity and wobble that may have produce by the bicycle wheel.



The directions to be sensed

For that purposes the project requires:

1. Sensors to detect wobble and eccentricity on the wheel

The wobble or eccentricity produce by the bicycle wheel usually is in very small distances. Thus, sensors to fulfill the requirement have to be able detect those small changes. Strain gauges were chosen because it has the ability to measure very small changes in the length of a piece material, usually strain gauge used for detect stress in structures.



Figure 1 Strain gauge

The strain gauge consists of a very fine wire or metallic foil arranged in a grid pattern. The grid pattern maximizes the amount of metallic wire or foil subject to strain in the parallel direction. In the application, Strain gauges are glued to the side of a piece of metal or strain bar and when the strain bar is placed under stress, its resistance changes.



Figure 2. Strain gauges use for Eccentricity strain gauges use for Side wobbles
As a result of attaching strain gauges to strain bar, it will be applicable to use for the eccentricity and for the side wobble. Therefore it can be placed for the side and the top of the wheel.

2. Gadget for the bicycle wheel

We need to build a gadget for placing the strain gauges so it can be held properly when we conduct a test with the wheel. Bicycles have variant sizes of wheels; thus to make a gadget that is able to be placed on the bicycle frame and able to be used on different sizes of wheels, it needs advanced calculation for the design and also needs to be machined for construction. However, the students do not have the facility and enough skill to do it. The design for the gadget was chosen to be more simple but able to adopt different sizes of wheels.

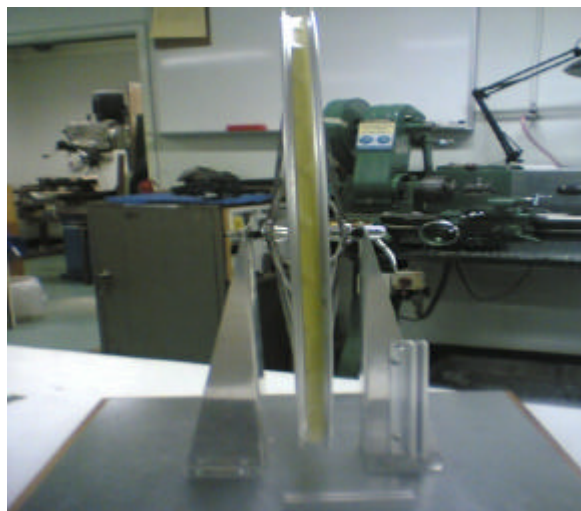


Figure 4. Gadget for holding the bicycle wheel

The picture above shows that a bicycle wheel placed on towers made by aluminum. The gadget make any size of wheel can be test with strain gauges, which placed on the towers and the table.

THE DESIGN

2.1 Strain Gauge

2.1.1 Theory

'The constant demand for improvement in the design of machine and structural parts has led to the development of various experimental techniques for determining stress distributions. However, since stress cannot be measure directly, there is approach through some type of strain measurement' (Murray & Miller, 1992). Strain gauge is sensor that can be implemented to respond this situation. The strain gauge in used to sense bending, torque, force, pressure or some other quantity related to strain (Murray & Miller, 1992).

In 1983, Lord Kelvin reported his observation that metallic conductors subjected to strain reveal a change in their electrical resistance. The use of strain gauges is based on the fact that the resistance of a conductor changes when the conductor is subjected to strain

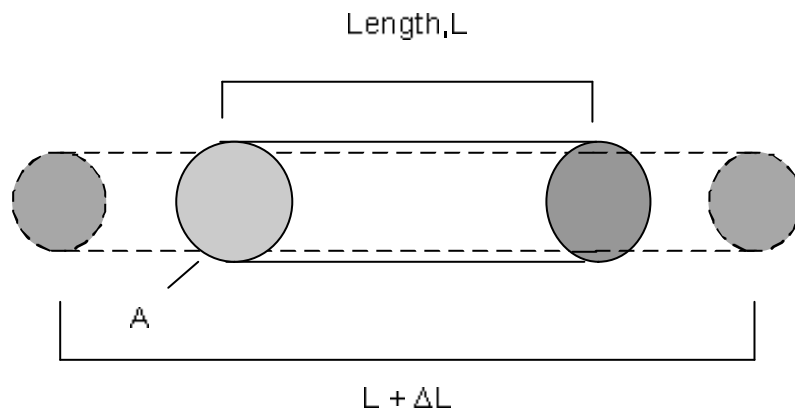


Figure 5. Strained conductor

The electrical resistance of a conductor is given by: