

A Circuit Device of Detecting the Bearing Deflection

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Abstract

This paper investigates the operation of the motor caused by the bearing deflection, we will design detection circuit to detect bearing deflection, the circuit includes coil, rectifier circuit and voltage measuring device. In the interior of the motor, coil has been designed in gap between the stator silicon steel, and then connect a rectifier circuit to an external motor, the rectifier circuit is connected to the voltage measurement terminal. When bearings close to stator silicon steel in the operation of the motor, the induced voltage of the coil will rise and transmit the voltage to rectifier circuit instantly. In this case, the voltage rectifier circuit will convert the DC voltage, the voltage delivered to the voltage measurement terminal, at this time, users can know the motor bearings have deflected phenomenon based on the DC voltage, and can immediately improve motor and maintenance operations.

Keywords: coil, bearing deflection, rectifier circuit, voltage measurement

1. Introduction

Motors have been widely used in conventional industries, manufacturing industries and technology industries. The inverter and AC servo drives are the fastest updating products, making it extremely competitive in performance and cost. AC drive technology is also one of the core technologies. [1] This paper aims to explore the device capable of detecting deflection of the motor bearing; The reason behind this is the deflection of the motor shaft when rotating at high speeds, [2] causing friction between the shaft and the motor that generates loud noises which lead to damaging the motors' durability and the loss of precision of the shaft, [3] further

effecting accuracy of the machine. The device to ensure orderly functions of the motor shaft after repair, and to decide if further steps are required are as shown in Fig. 1.

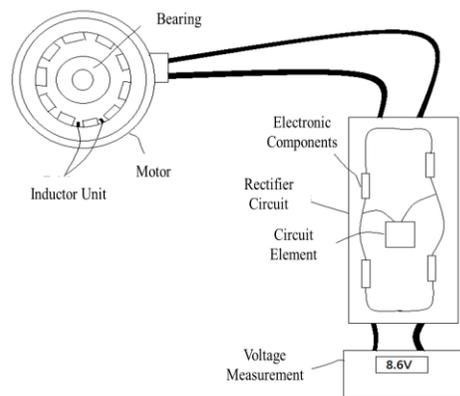


Fig. 1 Implementation of Equipment

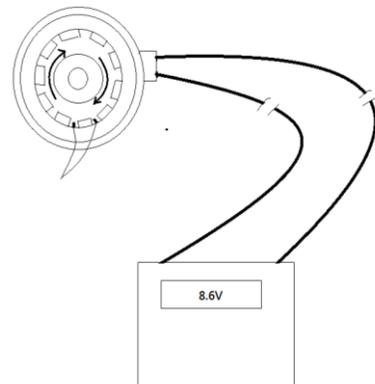


Fig. 2 Non-deflection motor shaft

Principle: When the motor shaft is rotating at high speeds (no matter forward or reverse), the shaft will be met with evident deflection. As the shaft nears the stator silicon sheet, [4] there will be a significant rise of voltage felt by the inductor, after the voltage will be sent to the rec-

tifier circuit, there it converts the AC voltage is DC voltage; the voltage is then measured for a voltage value data. This voltage value [5] is used for the measurement of the distance between the shaft and the stator silicon sheet which is proof of deflection happening to the motor shaft, and conduct immediate motor maintenance. Deflection and non-deflection are as shown in Fig. 2 and 3.

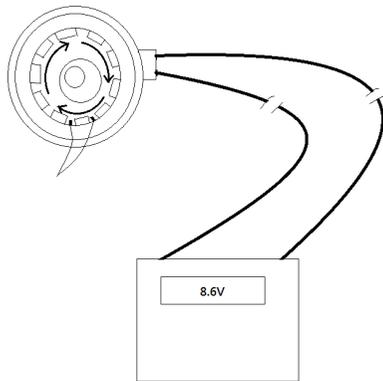


Fig. 3 Deflection of motor shaft

This paper investigates electronically linking a rectifier circuit to a monitoring device. An alarm is set to go off when the voltage value pre-set by the user in the rectifier circuit is reached, and to remind the user to repair the shaft deflection. Installation of monitoring device is in Fig. 4.

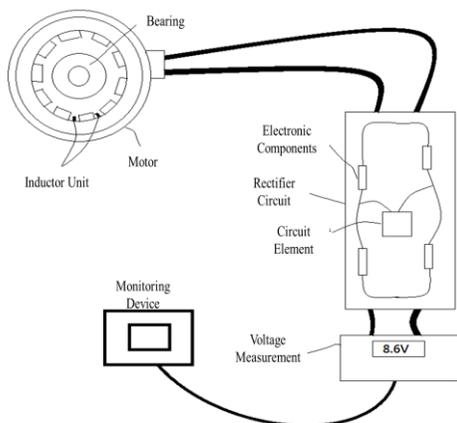


Fig. 4 Installment of monitoring device

2. Method

This design is aimed towards a device that can detect and measure shaft deflection, primarily consisting of the inductor unit, rectifier circuit and voltage measurement.

2.1. Design Requirements

- (1) Inductor unit: Placed in the gap of the stator silicon sheet inside the motor, the inductance coil. [5]
- (2) Rectifier circuit: Placed on the exterior of the motor, and electronically linked to the inductor unit. Its function is to convert AV voltage from the inductor unit into DC voltage. The rectifier circuit includes electronically linked circuit components and electronic components. Circuit components are capacitance and electronic components are diodes.
- (3) Voltage measurement: Placed on the exterior of the motor and electronically linked to the rectifier circuit. Its function is to convert the voltage into voltage value data. It is a three meter unit and is electronically linked to a monitoring device.
- (4) Monitoring device: It is electronically linked to the metering unit. The alarm to remind the user is set to go off when the pre-set voltage value is reached, it serves as a maintenance reminder for the shaft.

3. Results and Discussion

This design is based off existing motor technology, but designed for detecting shaft deflection, to create new techniques for lowering damages to the motor when running.

4. Conclusions

The motor is widely used in the manufacturing industry. Any machine that produces force is run by a motor, making the debate for this device's usage un-necessary. The advantage of applying this device is that it lowers damages upon the motor when running, predicting deflection happenings on the motor for the user to conduct immediate maintenance, and to ensure orderly functions.

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