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Broken Rotor Bars Detection Using Zero-Setting Analysis Protection

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ABSTRACT: Induction motors are widely used in industries. Maximum industries are acquitted with 3-ph induction motors, so to improvise their protection is must. To detect fault at early stage is important to avoid massive damage to the motor. For this purpose we can use Zero-setting Analysis to capture faults at early stage. Through this analysis we can find faults without interrupting motors operation. In this system we fetch data of motor to matlab by microcontroller and it work on Fourier Transform and Wavelet transform Algorithm.

KEYWORDS: Broken Bars, Protection, Zero-Setting Analysis

I. INTRODUCTION

Induction motors are widely used in industries as there are several advantages of these motors over the other motors. AC induction motors are used throughout the world to perform work by converting electricity into mechanical power. IM's range from very small fractional horsepower to the very large of thousands of horsepower. Induction Motors are used under severe and hazardous conditions and are expected to perform with high reliability. They are used in several applications from domestic to large industries. Induction motor has advantages over other motors like they are robust in construction and having low cost. They are self-start motors.

There are several faults occur in Induction Motor like Electrical, mechanical and Environmental. The Electrical faults are categorised as under or over voltage, under or over current, negative phase sequence, single phasing, inter turn short circuit. The Mechanical faults consists mass unbalance, broken rotor bars, damage regarding bearing, stator and rotor winding failure.

In rotor broken bar fault under mechanical faults, they are not occurs frequently but they are more severe so to detect those at early stage or at initial stage is important. If rotor bars gets break they will be reason to damage stator and stator winding cause breakage of rotor bars cause a high rise in current in stator winding which leads to complete damage of motor.

This minimizes the risks of uncalculated failures and indirect plant outages. The failure of motors can cause high vibrations so to analyse this is the predominant and most widely used method to determine equipment condition, and to predict failures. Through this system we detect two faults broken rotor bars and vibration fault. To minimize damage and increase productivity it is necessary to detect faults at early stages. There are 5 per cent of motor failures occurs across rotor cage according to survey by Electric Power Research Institute (EPRI) and IEEE [1].

II. RELATED WORK

Broken rotor bars in induction motors can be dependably detected by analysing the current signatures under sufficient motor load conditions. Detection becomes less dependable under light motor load conditions. There are also cases in which tolerable motor operating conditions generate current signatures similar to those of motors with broken rotor bars,[1].

Induction motors are widely used in industrial drives because they are rugged, reliable and economical. They became an industry workhorse and play a pivotal role in industry for conversion of electrical into mechanical energy. Motor Current Signature Analysis (MCSA) is a condition monitoring technique used to diagnose problems in induction motors,[2].

The vibration of the motor is measured and monitored. The measured vibration data is analysed using spectrum analysis software and a MATLAB program. The overall vibration level is monitored; the vibration severity is compared with the standard severity table and is used to determine the condition of the motor. The specific natural frequency corresponds with which kind of fault or failure mode is identified. This information provide insight on the condition of the machine,[4].

III. METHODOLOGY

The zero setting Analysis consists of Motor Current Signature Analysis. This analysis is wider we can do Voltage signature Analysis, Power Analysis. So here we are using Motor Current signature Analysis to detect faults. Under that we are using Fourier and Wavelet transform algorithms. It is used to ensure completely safe and reliable operation of induction motor online. Through this we can detect the fault and which is most important. The reliability of operation can be increased by timely maintenance. There are so many protections schemes are available still failure of system is happening which leads to decreased lifespan of machines.

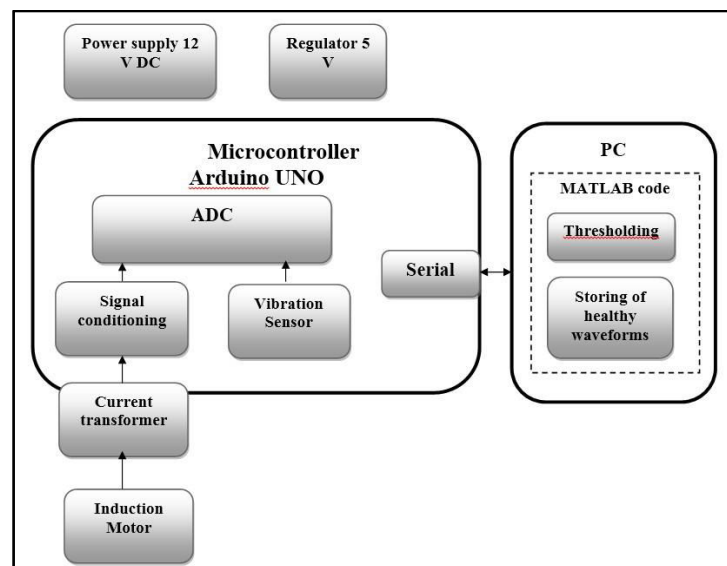


Fig.1 Block diagram of methodology

Many methods required expensive sensors and monitoring system but in this zero setting analysis we does not required any extra sensors. Current monitoring of induction motor is the base of the Motor zero setting analysis technique; hence it is not very overpriced. For locating fault frequencies the current spectrum of the machine is used in zero setting analysis. Whenever the fault appears, the frequency spectrum of the current grows into different from the healthy motor.

MCSA is an effective route used to control the operating condition of IM without breaking its operation. Motor current signature analysis notices of an electrical signal that possesses current components. MCSA encounters the faults at an early stage and protects from the complete failure and damage to the motor. Detailed analysis of fault is possible with the help of MCSA.

IV. EXPERIMENTAL RESULTS

The fig. 2 shows that variations in Current signals in frequency spectrum as well as vibrations analysis. So through this comparison show the fault across the motor.

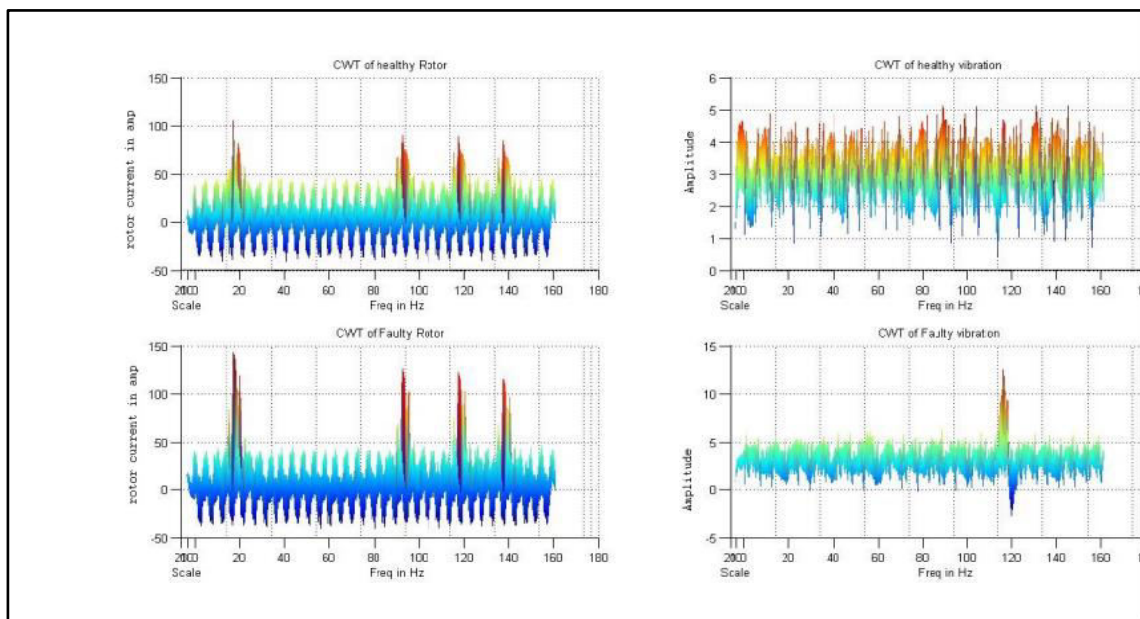


Fig. 2 Result analysis of Wavelet Transform

V. CONCLUSION

This method provides detection of rotor broken bars at early stage and the analysis is done by continuous time without interrupting motors operation. It is cost effective method of protection. So we can say that it is most effective way to protect motors at early stage and it is cost effective.

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