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# Discovery of the stator winding inter-turn insulation degradation for condition monitoring of induction motor using the non-invasive system by harmonic analysis

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## Article Info

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## ABSTRACT

Due to the requirement for a modern facility for precise control phenomena, now a day's energy-efficient motors are working everywhere. Energy-efficient motors can save energy, but not avoid fault. This paper focuses on the stator winding phenomenon of 3-phase squirrel cage induction motor inter-turn insulation degradation discovery using the non-invasive system by harmonic analysis. Here induction motors of 1.5hp, 400v, and 1400rpm are utilized. Using one of the best techniques Motor current signature analysis, where the current spectrum is analyzed with spectral analysis using Fast Fourier transform (FFT). Faulty & healthy conditions of the motor are properly discovered by suitable experimental results with theoretical analysis of stator winding inter-turn insulation degradation condition.

**KEYWORDS:** Induction motor, Condition monitoring, Motor current signature analysis, Inter-turn insulation degradation. Harmonic analysis.

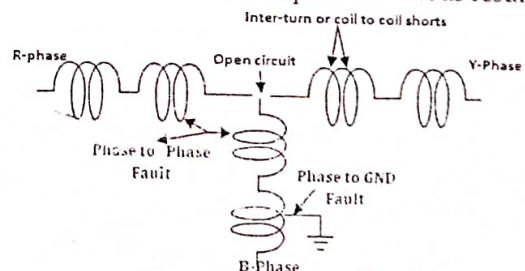
## 1. INTRODUCTION

### 1.1 BACKGROUND OF THE STUDY

Almost all industrial requirements from simple process operation to major applications depend on motors. If any unexpected shortcomings or weakness of motor due to any unobservable reasons may result to maximum loss towards other aspects like spares, maintenance, labor wages etc, [1].

These unexpected shortcomings are associated with stator, rotor, eccentricity etc.. Among this stator winding, failure mode contribution is nearby 30% of all other faults in induction motors. Thermal, vibration, electrical, and

natural environmental stresses are also important factors causing winding failures. These types of faults can occur depending on weakness in insulation material towards turn to turn, phase to ground, phase to phase fastly circulates in a coil and expand to serious results [2].



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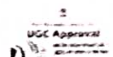
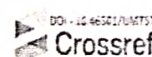
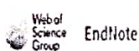
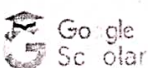
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# Important Discovery of Stator Winding Inter-Turn Insulation Degradation for Condition Monitoring of Induction Motor using Non-Invasive System by Vibration Analysis

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## ABSTRACT

*In view, of the modern control structure of present industrial needs, the induction motor has become a natural mechanical workforce in every lower to higher end process operation. It encounters several electrical and mechanical faults while improving its performance structure. This paper focuses on stator winding inter-turn insulation degradation discovery of three- phase squirrel cage induction motor for non-invasive system by vibration analysis. Motor current signature analysis (MCSA) is one of the best techniques where the current spectrum is analyzed with spectral analysis using Fast Fourier transform (FFT). Using this MCSA based online method can overcome the problems of single phasing, voltage unbalancing, etc., Due to stator winding inter-turn insulation degradation, which automatically produces rotor slot harmonics, giving rise to broken rotor bar faults and mixed eccentricity faults. Theoretical analysis and experimental results of electrical & mechanical faults are analyzed using motor current signature analysis with vibration analysis.*

**KEYWORDS:** Induction motors, Inter- turn insulation degradation, Condition monitoring, Motor current signature analysis, Vibration analysis.

## 1. INTRODUCTION

Induction motors are termed as the traditional workforce of any industry due to their less investment, rugged construction, with reliable performance. Due to its challenging and reliable nature, faults in them are

unavoidable. The most frequently introduced faults are single phasing, the unbalanced voltage on the supply side, inter-turn short circuit, and some mechanical faults of air gap eccentricity, broken rotor bar, and bearing fault on the motor side.



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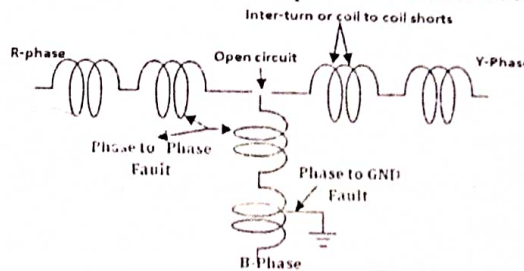
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