بسم الله الرحمن الرحيم

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تم رفع هذه الرسالة بواسطة / منى مغربي أحمد

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

ملاحظات: لا يوجد

Cairo University

PROPOSED PROTECTION SCHEMES FOR DETECTING AND DIAGNOSIS INCIPIENT BROKEN BARS AND BEARING FAULTS IN INDUCTION MOTORS

By

Mohamed Esam El-dine Atta Abd El-Halim

A Thesis Submitted to the
Faculty of Engineering at Cairo University
In Partial Fulfillment of the
Requirements for the Degree of

DOCTOR OF PHILOSOPHY

In

Electrical Power and Machines Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Title of Thesis:

PROPOSED PROTECTION SCHEMES FOR DETECTING AND DIAGNOSIS INCIPIENT BROKEN BARS AND BEARING FAULTS IN INDUCTION MOTORS

Key Words:
Bearing Faults, Broken Bar Faults, Detecting and diagnosis, Induction Motors, Variable load.

Summary:

With the increased dependence on induction motors (IMs) in the modern industry, the detection of incipient motor faults becomes an imperative requirement to reduce maintenance costs and avoid unscheduled shutdowns. Broken bar faults (BBFs) and bearing faults are around 60% of motor faults. These faults are developed from high thermal stresses, excessive forces, environmental stresses and high currents that occur in the motor cage. This thesis proposes three protection schemes to detect and diagnose BBFs and bearing faults.

The first scheme is introduced to detect BBFs and estimate fault severity in IMs under start-up conditions. It includes three main stages, applying a powerful optimized S-transform to the current signal, extracting the LSH from the (*t-f*) domain using a proposed adaptive (*t-f*) filter, and estimating a proposed fault severity index based on the energy of RLSH.

The second scheme provides a novel adaptive scheme to detect and diagnosis BBFs in IMs during steady-state conditions. It can detect BBFs in their incipient phases including non-adjacent faults under variable inertia, variable loading conditions, and in a noisy environment. The main idea is to monitor continuously the variation in phase angle of the main sideband frequency components by applying Fast Fourier Transform for only one phase of stator current.

The third scheme is introduced for bearing faults detection and diagnosis under fixed and time-varying speed conditions. It utilizes the persistence spectrum for monitoring bearing health condition, as it provides some features related to bearing health and fault conditions. In addition, a multi-scale structural similarity index is used as a robust basis for bearing faults detection and classification without the need for training process or expert knowledge

The proposed schemes are extensively validated using simulation tests and/or experimental data that proved their effectiveness to detect and diagnose BBFs and bearing faults.

DISCLAIMER

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references sections.

Name: Mohamed Esam El-dine Atta Abd El-Halim

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Signature:

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