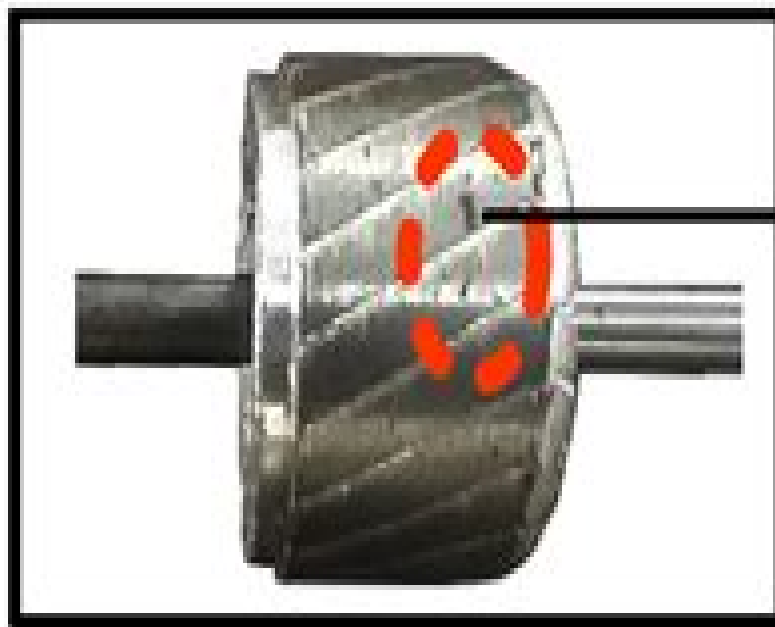




**(a) Healthy Motor**



**(b) Faulted Rotor**



**(c) Faulted bearing**

# Fault Identification Of Induction Motors

**Monia Ben Khader Bouzid, Gerard  
Champernois**



## **Fault Identification Of Induction Motors:**

Induction Motors Raúl Gregor, 2015-11-18 AC motors play a major role in modern industrial applications Squirrel cage induction motors SCIMs are probably the most frequently used when compared to other AC motors because of their low cost ruggedness and low maintenance The material presented in this book is organized into four sections covering the applications and structural properties of induction motors IMs fault detection and diagnostics control strategies and the more recently developed topology based on the multiphase more than three phases induction motors This material should be of specific interest to engineers and researchers who are engaged in the modeling design and implementation of control algorithms applied to induction motors and more generally to readers broadly interested in nonlinear control health condition monitoring and fault diagnosis

**Condition Monitoring and Faults Diagnosis of Induction Motors** Nordin Saad, Muhammad Irfan, Rosdiazli Ibrahim, 2018-07-11 The book covers various issues related to machinery condition monitoring signal processing and conditioning instrumentation and measurements faults for induction motors failures new trends in condition monitoring and the fault identification process using motor currents electrical signature analysis It aims to present a new non invasive and non intrusive condition monitoring system which has the capability to detect various defects in induction motor at incipient stages within an arbitrary noise conditions The performance of the developed system has been analyzed theoretically and experimentally under various loading conditions of the motor Covers current and new approaches applied to fault diagnosis and condition monitoring Integrates concepts and practical implementation of electrical signature analysis Utilizes LabVIEW tool for condition monitoring problems Incorporates real world case studies Paves way a technology potentially for prescriptive maintenance via IIoT

**Fault Diagnosis and Detection** Mustafa Demetgul, Muhammet Ünal, 2017-05-31 Mass production companies have become obliged to reduce their production costs and sell more products with lower profit margins in order to survive in competitive market conditions The complexity and automation level of machinery are continuously growing This development calls for some of the most critical issues that are reliability and dependability of automatic systems In the future machines will be monitored remotely and computer aided techniques will be employed to detect faults in the future and also there will be unmanned factories where machines and systems communicate to each other detect their own faults and can remotely intercept their faults The pioneer studies of such systems are fault diagnosis studies Thus we hope that this book will contribute to the literature in this regard

**Incipient Detection of Faults in Three-Phase Induction Motors Using Stator Current Spatial Angular Vector Analysis** R.A Gupta, A. K. Wadhwani, S.R Kapoor, 2009 The detection of motor faults at their incipient stage is gaining importance as it leads to increased reliability and reduced machine downtime The stator current analysis has caught the attention of researchers as a mature and simple technique for induction motor fault detection and identification In this paper angular space vector analysis of the induction motor stator current for fault identification has been investigated The tracking

of spatial angular vector profile of stator current Park's vector is used to identify the degrading health condition of induction motors. Any significant deviation in the shape of spatial angular vector is an indicator of the onset of irregularities, mechanical or electrical, in the induction motor. Three major types of induction motor faults, bearing fault, broken rotor bar fault, and unbalanced supply faults, have been experimentally investigated. The experimentation has been performed on a 3.15 kW 4 poles 1440 RPM ABB squirrel cage motor. The motor setup was mechanically loaded to operate at various loads. The TMS 320F420 DSP based dSPACE DS 1104 control card has been used to carry out the experimentation. The softwares used include MATLAB ver 2006 and dSPACE control desk. *Fault Diagnosis of Induction Motors* Jawad Faiz, Vahid

Ghorbanian, Gojko Joksimović, 2017-08-29 This book is a comprehensive structural approach to fault diagnosis strategy. The different fault types, signal processing techniques, and loss characterisation are addressed in the book. This is essential reading for work with induction motors for transportation and energy. **Fault Detection** Wei Zhang, 2010-03-01 In this

book, a number of innovative fault diagnosis algorithms in recent years are introduced. These methods can detect failures of various types of system effectively and with a relatively high significance. **Induction Motor Fault Diagnosis** Subrata

Karmakar, Surajit Chattopadhyay, Madhuchhanda Mitra, Samarjit Sengupta, 2016-04-04 This book covers the diagnosis and assessment of the various faults which can occur in a three phase induction motor, namely rotor broken bar faults, rotor mass unbalance faults, stator winding faults, single phasing faults, and crawling. Following a brief introduction, the second chapter describes the construction and operation of an induction motor, then reviews the range of known motor faults, some existing techniques for fault analysis, and some useful signal processing techniques. It includes an extensive literature survey to establish the research trends in induction motor fault analysis. Chapters three to seven describe the assessment of each of the five primary fault types. In the third chapter, the rotor broken bar fault is discussed, and then two methods of diagnosis are described: i) diagnosis of the fault through Radar analysis of stator current Concordia and ii) diagnosis through envelope analysis of motor startup current using Hilbert and Wavelet Transforms. In chapter four, rotor mass unbalance faults are assessed, and diagnosis of both transient and steady state stator current has been analyzed using different techniques. If both rotor broken bar and rotor mass unbalance faults occur simultaneously, then for identification, an algorithm is provided in this chapter. Chapter five considers stator winding faults and five different analysis techniques. Chapter six covers diagnosis of single phasing faults, and chapter seven describes crawling and its diagnosis. Finally, chapter eight focuses on fault assessment and presents a summary of the book together with a discussion of prospects for future research on fault diagnosis. **Advanced Condition Monitoring and Fault Diagnosis of Electric Machines** Irfan, Muhammad, 2018-09-14

The reliability of induction motors is a major requirement in many industrial applications. It is especially important where an unexpected breakdown might result in the interruption of critical services such as military operations, transportation, aviation, and medical applications. *Advanced Condition Monitoring and Fault Diagnosis of Electric Machines* is a collection of

innovative research on various issues related to machinery condition monitoring signal processing and conditioning instrumentation and measurements and new trends in condition monitoring It also pays special attention to the fault identification process While highlighting topics including spectral analysis electrical engineering and bearing faults this book is an ideal reference source for electrical engineers mechanical engineers researchers and graduate level students seeking current research on various methods of maintaining machinery

**Soft Computing in Condition Monitoring and Diagnostics of Electrical and Mechanical Systems** Hasmat Malik,Atif Iqbal,Amit Kumar Yadav,2020-01-17 This book addresses a range of complex issues associated with condition monitoring CM fault diagnosis and detection FDD in smart buildings wide area monitoring WAM wind energy conversion systems WECSs photovoltaic PV systems structures electrical systems mechanical systems smart grids etc The book s goal is to develop and combine all advanced nonintrusive CMFD approaches on a common platform To do so it explores the main components of various systems used for CMFD purposes The content is divided into three main parts the first of which provides a brief introduction before focusing on the state of the art and major research gaps in the area of CMFD The second part covers the step by step implementation of novel soft computing applications in CMFD for electrical and mechanical systems In the third and final part the simulation codes for each chapter are included in an extensive appendix to support newcomers to the field

**Electrical and Mechanical Fault Diagnosis in Wind Energy Conversion Systems** Monia Ben Khader Bouzid, Gerard Champenois,2023-09-01 Wind energy conversion systems are subject to many different types of faults and therefore fault detection is highly important to ensure reliability and safety Monitoring systems can help to detect faults before they result in downtime This book presents efficient methods used to detect electrical and mechanical faults based on electrical signals occurring in the different components of a wind energy conversion system For example in a small and high power synchronous generator and multi phase generator in the diode bridge rectifier the gearbox and the sensors This book also presents a method for keeping the frequency and voltage of the power grid within an allowable range while ensuring the continuity of power supply in the event of a grid fault Electrical and Mechanical Fault Diagnosis in Wind Energy Conversion Systems presents original results obtained from a variety of research It will not only be useful as a guideline for the conception of more robust wind turbines systems but also for engineers monitoring wind turbines and researchers

**Fault Detection in Three Phase Induction Motor Using Artificial Intelligence** Unida Izwani Md Dun,2010 Artificial intelligence AI techniques have proved their ability in detection of incipient faults in electrical machines In this project the fault diagnosis of three phase induction motors is studied detailed in unbalance voltage and stator inter turn fault using simulation models and neural networks have been used to train the data using Radial Basis Function Neural Network RBFNN in MATLAB with Graphical User Interface Development Environment GUIDE structured Nowadays artificial intelligence is implemented to improve traditional techniques The results can be obtained instantaneously after it analyzes the input data of the motor The increased in demand has greatly improved

the approach of fault detection in polyphase induction motor Data is taken from the experiment checking the induction motor fault and is simulated into MATLAB using RBFNN The first stage is to collect the data by experimental and simulating a Simulink model using MATLAB Three Simulink model will be created where each of the model represent the motor condition The result of the simulation will then be the data used to create an ANN The second stage creates and trains an ANN From the data obtained during the first section a target output will determine the motor condition whether the motor is in a healthy state or fault occurred In the third stage the development Graphical User Interface GUI is carried out this system The GUI is developed by using MATLAB for the purpose of evaluating and testing the ANN The purpose of this final year project the development of Fault Detection in Three Phase Induction Motor Using Artificial Intelligence is to satisfy the increased in demand to improve the approach of fault detection in polyphase induction motor Artificial intelligence is implemented to improve traditional techniques as the results can be obtained instantaneously after it analyzes the input data of the motor where it can be accomplished without an expert

**Methodologies of Using Neural Network and Fuzzy Logic Technologies for Motor Incipient Fault Detection** Mo-Yuen Chow,1997 Motor monitoring incipient fault detection and diagnosis are important and difficult topics in the engineering field These topics deal with motors ranging from small DC motors used in intensive care units to the huge motors used in nuclear power plants With proper machine monitoring and fault detection schemes improved safety and reliability can be achieved for different engineering system operations The importance of incipient fault detection can be found in the cost saving which can be obtained by detecting potential machine failures before they occur Non invasive inexpensive and reliable fault detection techniques are often preferred by many engineers A large number of techniques such as expert system approaches and vibration analysis have been developed for motor fault detection purposes Those techniques have achieved a certain degree of success However due to the complexity and importance of the systems there is a need to further improve existing fault detection techniques A major key to the success in fault detection is the ability to use appropriate technology to effectively fuse the relevant information to provide accurate and reliable results The advance in technology will provide opportunities for improving existing fault detection schemes With the maturing technology of artificial neural network and fuzzy logic the motor fault detection problem can be solved using an innovative approach based on measurements that are easily accessible without the need for rigorous mathematical models This approach can identify and aggregate the relevant information for accurate and reliable motor fault detection This book will introduce the necessary concepts of neural network and fuzzy logic describe the advantages and challenges of using these technologies to solve motor fault detection problems and discuss several design considerations and methodologies in applying these techniques to motor incipient fault detection

AC Electric Motors Control Fouad Giri,2013-03-25 The complexity of AC motor control lies in the multivariable and nonlinear nature of AC machine dynamics Recent advancements in control theory now make it possible to deal with long standing problems in AC motors control This

text expertly draws on these developments to apply a wide range of model based control design methods to a variety of AC motors Contributions from over thirty top researchers explain how modern control design methods can be used to achieve tight speed regulation optimal energetic efficiency and operation reliability and safety by considering online state variable estimation in the absence of mechanical sensors power factor correction machine flux optimization fault detection and isolation and fault tolerant control Describing the complete control approach both controller and observer designs are demonstrated using advanced nonlinear methods stability and performance are analysed using powerful techniques including implementation considerations using digital computing means Other key features Covers the main types of AC motors including triphase multiphase and doubly fed induction motors wound rotor permanent magnet and interior PM synchronous motors Illustrates the usefulness of the advanced control methods via industrial applications including electric vehicles high speed trains steel mills and more Includes special focus on sensorless nonlinear observers adaptive and robust nonlinear controllers output feedback controllers fault detection and isolation algorithms and fault tolerant controllers This comprehensive volume provides researchers and designers and R D engineers with a single source reference on AC motor system drives in the automotive and transportation industry It will also appeal to advanced students in automatic control electrical power systems mechanical engineering and robotics as well as mechatronic process and applied control system engineers

**Integrated Uncertainty in Knowledge Modelling and Decision Making** Van-Nam Huynh, Masahiro Inuiguchi, Bac Le, Bao Nguyen Le, Thierry Denoeux, 2016-11-21 This book constitutes the refereed proceedings of the 5th International Symposium on Integrated Uncertainty in Knowledge Modelling and Decision Making IUKM 2016 held in Da Nang Vietnam in November December 2016 The IUKM symposia aim to provide a forum for exchanges of research results and ideas and experience of application among researchers and practitioners involved with all aspects of uncertainty modelling and management

**Fault Diagnosis of Hybrid Dynamic and Complex Systems** Moamar Sayed-Mouchaweh, 2018-03-27 Online fault diagnosis is crucial to ensure safe operation of complex dynamic systems in spite of faults affecting the system behaviors Consequences of the occurrence of faults can be severe and result in human casualties environmentally harmful emissions high repair costs and economical losses caused by unexpected stops in production lines The majority of real systems are hybrid dynamic systems HDS In HDS the dynamical behaviors evolve continuously with time according to the discrete mode configuration in which the system is Consequently fault diagnosis approaches must take into account both discrete and continuous dynamics as well as the interactions between them in order to perform correct fault diagnosis This book presents recent and advanced approaches and techniques that address the complex problem of fault diagnosis of hybrid dynamic and complex systems using different model based and data driven approaches in different application domains inductor motors chemical process formed by tanks reactors and valves ignition engine sewer networks mobile robots planetary rover prototype etc These approaches cover the different aspects of

performing single multiple online offline parametric discrete abrupt tear and wear fault diagnosis in incremental non incremental manner using different modeling tools hybrid automata hybrid Petri nets hybrid bond graphs extended Kalman filter etc for different classes of hybrid dynamic and complex systems      Control Charts and Machine Learning for Anomaly Detection in Manufacturing Kim Phuc Tran,2021-08-29 This book introduces the latest research on advanced control charts and new machine learning approaches to detect abnormalities in the smart manufacturing process By approaching anomaly detection using both statistics and machine learning the book promotes interdisciplinary cooperation between the research communities to jointly develop new anomaly detection approaches that are more suitable for the 4 0 Industrial Revolution The book provides ready to use algorithms and parameter sheets enabling readers to design advanced control charts and machine learning based approaches for anomaly detection in manufacturing Case studies are introduced in each chapter to help practitioners easily apply these tools to real world manufacturing processes The book is of interest to researchers industrial experts and postgraduate students in the fields of industrial engineering automation statistical learning and manufacturing industries      **Intelligent Fault Diagnosis and Accommodation Control** Sunan Huang,Kok Kiong Tan,Poi Voon Er,Tong Heng Lee,2020-03-17 Control systems include many components such as transducers sensors actuators and mechanical parts These components are required to be operated under some specific conditions However due to prolonged operations or harsh operating environment the properties of these devices may degrade to an unacceptable level causing more regular fault occurrences It is therefore necessary to diagnose faults and provide the fault accommodation control which compensates for the fault of the component by substituting a configuration of redundant elements so that the system continues to operate satisfactorily In this book we present a result of several years of work in the area of fault diagnosis and fault accommodation control It aims at information estimate methods when faults occur The book uses the model built from the plant or process to detect and isolate failures in contrast to traditional hardware or statistical technologies dealing with failures It presents model based learning and design technologies for fault detection isolation and identification as well as fault tolerant control These models are also used to analyse the fault detectability and isolability conditions and discuss the stability of the closed loop system It is intended to report new technologies in the area of fault diagnosis covering fault analysis and control strategies of design for various applications The book addresses four main schemes modelling of actuator or sensor faults fault detection and isolation fault identification and fault reconfiguration accommodation control It also covers application issues in the monitoring control of actuators providing several interesting case studies for more application oriented readers      *Proceedings of the 5th International Conference on Electrical Engineering and Control Applications-Volume 1* Salim Ziani,Mohammed Chadli,Sofiane Bououden,Ivan Zelinka,2024-09-30 This book gathers papers presented during the 5th International Conference on Electrical Engineering and Control Applications ICEECA 2022 held on November 15 17 2022 Khenchela Algeria It covers new control system models troubleshooting tips and complex system



requirements such as increased speed precision and remote capabilities Additionally the book discusses not only the engineering aspects of signal processing and various practical issues in the broad field of information transmission but also novel technologies for communication networks and modern antenna design The later part of the book covers important related topics such as fault diagnosis and fault tolerant control strategies for nonlinear systems and alternative energy sources This book is intended for researchers engineers and advanced postgraduate students in the fields of control and electrical engineering computer science signal processing as well as mechanical and chemical engineering

**Signal Processing and Analysis of Electrical Circuit** Adam Glowacz,Grzegorz Królczyk,Jose Alfonso Antonino Daviu,2020-03-13 This Special Issue with 35 published articles shows the significance of the topic Signal Processing and Analysis of Electrical Circuit This topic has been gaining increasing attention in recent times The presented articles can be categorized into four different areas signal processing and analysis methods of electrical circuits electrical measurement technology applications of signal processing of electrical equipment fault diagnosis of electrical circuits It is a fact that the development of electrical systems signal processing methods and circuits has been accelerating Electronics applications related to electrical circuits and signal processing methods have gained noticeable attention in recent times The methods of signal processing and electrical circuits are widely used by engineers and scientists all over the world The constituent papers represent a significant contribution to electronics and present applications that can be used in industry Further improvements to the presented approaches are required for realizing their full potential

**Fault Detection, Supervision and Safety of Technical Processes 2006** Hong-Yue Zhang,2007-03-01 The safe and reliable operation of technical systems is of great significance for the protection of human life and health the environment and of the vested economic value The correct functioning of those systems has a profound impact also on production cost and product quality The early detection of faults is critical in avoiding performance degradation and damage to the machinery or human life Accurate diagnosis then helps to make the right decisions on emergency actions and repairs Fault detection and diagnosis FDD has developed into a major area of research at the intersection of systems and control engineering artificial intelligence applied mathematics and statistics and such application fields as chemical electrical mechanical and aerospace engineering IFAC has recognized the significance of FDD by launching a triennial symposium series dedicated to the subject The SAFEPROCESS Symposium is organized every three years since the first symposium held in Baden Baden in 1991 SAFEPROCESS 2006 the 6th IFAC Symposium on Fault Detection Supervision and Safety of Technical Processes was held in Beijing PR China The program included three plenary papers two semi plenary papers two industrial talks by internationally recognized experts and 258 regular papers which have been selected out of a total of 387 regular and invited papers submitted Discusses the developments and future challenges in all aspects of fault diagnosis and fault tolerant control 8 invited and 36 contributed sessions included with a special session on the demonstration of process monitoring and diagnostic software tools

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