Motor Current Signature Analysis And Its Applications In

Find the Fault in the Machines Drawing on the author’s more than two decades of experience with machinery condition monitoring and consulting for industries in India and abroad, Machinery Condition Monitoring: Principles and Practices introduces the practicing engineer to the techniques used to effectively detect and diagnose faults in machines. Providing the working principle behind the instruments, the important elements of machines as well as the technique to understand their conditions, this text presents every available method of machine fault detection occurring in machines in general, and rotating machines in particular. A Single-Source Solution for Practice Machinery Conditioning Monitoring Since vibration is one of the most widely used fault detection techniques, the book offers an assessment of vibration analysis and rotor-dynamics. It also covers the techniques of wear and debris analysis, and motor current signature analysis to detect faults in rotating mechanical systems as well as thermography, the nondestructive test NDT techniques (ultrasonics and radiography), and additional methods. The author includes relevant case studies from his own experience spanning over the past 20 years, and detailing practical fault diagnosis exercises involving various industries ranging from steel and cement plants to gas turbine driven frigates. While mathematics is kept to a minimum, he also provides worked examples and MATLAB® codes. This book contains 15 chapters and provides topical information that includes: A brief overview of the maintenance techniques Fundamentals of machinery vibration and rotor dynamics Basics of signal processing and instrumentation, which are essential for monitoring the health of machines Requirements of vibration monitoring and noise monitoring Electrical machinery faults Thermography for condition monitoring Techniques of wear debris analysis and some of the nondestructive test (NDT) techniques for condition monitoring like ultrasonics and radiography Machine tool condition monitoring Engineering failure analysis Several case studies, mostly on failure analysis, from the author’s consulting experience Machinery Condition Monitoring: Principles and Practices presents the latest techniques in fault diagnosis and prognosis, provides many real-life practical examples, and empowers you to diagnose the faults in machines all on your own.

The Model Rules of Professional Conduct provides an up-to-date resource for information on legal ethics. Federal, state and local courts in all jurisdictions look to the Rules for guidance in solving lawyer malpractice cases, disciplinary actions, disqualification issues, sanctions questions and much more. In this volume, black-letter Rules of Professional Conduct are followed by numbered Comments that explain each Rule's purpose and provide suggestions for its practical application. The Rules will help you identify proper conduct in a variety of given situations, review those instances where discretionary action is possible, and define the nature of the relationship between you and your clients, colleagues and the courts.

This book shows how condition monitoring can be applied to detect internal degradation in pumps so that appropriate maintenance can be decided upon based on actual condition rather than arbitrary time scales. The book focuses on the main condition monitoring techniques particularly relevant to pumps (vibration analysis, performance analysis). The philosophy of condition monitoring is briefly summarised and field examples show how condition monitoring is applied to detect internal degration in pumps. * The first book devoted to condition monitoring and predictive maintenance in pumps. * Explains how to minimise energy costs, limit overhauls and reduce maintenance expenditure. * Includes material not found anywhere else.

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.

Proceeding of International Conference on Intelligent Communication, Control and Devices

Induction Motor Current Signature Analysis for Speed Detection Using Spectral Estimation Techniques

Proceedings of the 27th International Conference on Systems Engineering, ICSEng 2020

Advances in Emerging Trends and Technologies

Industrial Application and Case Histories

Real-time DSP Implementation of Motor Current Signature Analysis for Induction Motor Speed Estimation and Control

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.

Motor current signature analysis (MCSA) is a powerful monitoring tool for motor-driven equipment that provides a nonintrusive means for detecting the presence of mechanical and electrical abnormalities in the motor and the driven equipment, including altered conditions in the process ''downstream'' of the motor-driven equipment. It was developed at the Oak Ridge National Laboratory as a means for determining the effects of aging and service wear systems, but it is applicable to a broad range of machinery. MCSA is based on the recognition that an electric motor (ac or dc) driving a mechanical load acts as an efficient and permanently available transducer by sensing mechanical load

variations, large and small, long-term and rapid, and converting them into variations in the induced current generated in the motor windings. These motor current variations are carried by the electrical cables processes as desired. Motor current signatures, obtained in both time and over time to provide early indication of degradation. Successful applications of MCSA technology (patent applied for) include not only motor-operated valves but also pumps of various designs, blowers, and air conditioning systems. Examples are presented briefly, and speculation regarding the applicability of MCSA to a broader range of equipment monitoring and production line testing is also given. 1 ref., 13 figs.
Muthireddy, Rajesh. M. S. The University of Memphis. May/2010. Condition Monitoring of electric motors using Motor Current Signature Analysis and Acoustic Emission. Gary Qi. Electric motors are critical components in industrial processes and rolling element bearings are an essential part of them. Studies show that most of the motors fail due to the failure of bearings inside them. The bearings are by nature subjected to various kinds of loads including eccentric forces due to the attachment of power transmission units such as gears, pulleys and fans, and as such bearing life depends on the load type, magnitude and operating conditions. Monitoring the bearing condition can greatly reduce manufacturing down-time and improve maintenance costs. In this thesis, I compare two non-invasive, online condition monitoring techniques for electric motors independently subjected to eccentric loading, bearing contamination and elevated temperatures. A test rig was built for the study. Results indicate that early electric motor bearing failure detection is best captured by Acoustic Emission (AE) where as Motor Current Signature Analysis (MCSA) can be used to assess and interpret the overall electrical condition of the motor.
This book is a collection of research articles and critical review articles, describing the overall approach to energy management. The book emphasizes the technical issues that drive energy efficiency in context of power systems. This book contains case studies with and without solutions on modelling, simulation and optimization techniques. It covers some innovative topics such as medium voltage (MV) back-to-back (BTB) system, cost optimization of a ring frame unit in textile industry, rectenna for radio frequency (RF) energy harvesting, ecology and energy dimension in infrastructural designs, 2.4 kW three-phase inverter for aircraft application, study of automatic generation control (AGC) in a two area hydrothermal power system, energy-efficient and reliable depth-based routing protocol for underwater wireless sensor network, and power line communication using LabVIEW. This book is primarily targeted at researchers and senior graduate students, but is also highly useful for the industry professional and scientists.

Motor Current Signature Analysis for Determining Operational Readiness of Motor-operated Valves (MOVs).
Permanent Magnet Synchronous Machines
Detection of Induction Motor Stator Abnormalities Using Motor Current Signature Analysis
Condition Monitoring, Plant Maintenance and Reliability
Condition Monitoring of Machinery Using Motor Current Signature Analysis
Predictive Maintenance of Pumps Using Condition Monitoring

Interest in permanent magnet synchronous machines (PMSMs) is continuously increasing worldwide, especially with the increased use of renewable energy and the electrification of transports. This book contains the successful submissions of fifteen papers to a Special Issue of Energies on the subject area of “Permanent Magnet Synchronous Machines”. The focus is on permanent magnet synchronous machines and the electrical systems they are connected to. The presented work represents a wide range of areas. Studies of control systems, both for permanent magnet synchronous machines and for brushless DC motors, are presented and experimentally verified. Design studies of generators for wind power, wave power and hydro power are presented. Finite element method simulations and analytical design methods are used. The presented studies represent several of the different research fields on permanent magnet machines and electric drives.
Engineering Asset Management discusses state-of-the-art trends and developments in the emerging field of engineering asset management as presented at the Fourth World Congress on Engineering Asset Management (WCEAM). It is an excellent reference for practitioners, researchers and students in the multidisciplinary field of asset management, covering such topics as asset condition monitoring and intelligent maintenance; asset data warehousing, data mining and fusion; asset performance and level-of-service models; design and life-cycle integrity of physical assets; deterioration and preservation models for assets; education and training in asset management; engineering standards in asset management; fault diagnosis and prognostics; financial analysis methods for physical assets; human dimensions in integrated asset management; information quality management; information systems and knowledge management; intelligent sensors and devices; maintenance strategies in asset management; optimisation decisions in asset management; risk management in asset management; strategic asset management; and sustainability in asset management.
This volume gathers the latest advances, innovations and applications in the field of condition monitoring, plant maintenance and reliability, as presented by leading international researchers and engineers at the 5th International Conference on Maintenance Engineering and the 2020 Annual Conference of the Centre for Efficiency and Performance Engineering Network (IncoME-V & CEPE Net-2020), held in Zhuhai, China on October 23-25, 2020. Topics include vibro-acoustics monitoring, condition-based maintenance, sensing and instrumentation, machine health monitoring, maintenance auditing and organization, non-destructive testing,

reliability, asset management, condition monitoring, life-cycle cost optimisation, prognostics and health management, maintenance performance measurement, manufacturing process monitoring, and robot-based monitoring and diagnostics. The contributions, which were selected through a rigorous international peer-review process, share exciting ideas that will spur novel research directions and foster new multidisciplinary collaborations.

Generously illustrated with over 1600 dispaly equations and more than 145 drawings, diagrams and photographs, this book is a handy, single-source reference suited to readers with a wide span of educational backgrounds and technical experience. Comprehensive in both scope and depth this manual covers all significant aspects of the field, such as Amperes Law and Faraday's Law, emphasing basic explanations of motor behaviour, derives all important equations and relationships required to analyze, design and apply polyphase induction motors, uses worldwide SI units or international MKS system of units as well as practical units used in the US and shows how to apply working equations to real-life situations with numerical examples... and more.

Induction Motor Fault Diagnosis

Improved Speed Observer Performance Using Motor Current Signature Analysis

Volume 2

Analysis and Torque Control

Condition Monitoring Of Electric Motors Using Motor Current Signature Analysis And Acoustic Emission

Approach through Current Signature Analysis

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.

With countless electric motors being used in daily life, in everything from transportation and medical treatment to military operation and communication, unexpected failures can lead to the loss of valuable human life or a costly standstill in industry. To prevent this, it is important to precisely detect or continuously monitor the working condition of a motor. Electric Machines: Modeling, Condition Monitoring, and Fault Diagnosis reviews diagnosis technologies and provides an application guide for readers who want to research, develop, and implement a more effective fault diagnosis and condition monitoring scheme—thus improving safety and reliability in electric motor operation. It also supplies a solid foundation in the fundamentals of fault cause and effect. Combines Theoretical Analysis and Practical Application Written by experts in electrical engineering, the book approaches the fault diagnosis of electrical motors through the process of theoretical analysis and practical application. It begins by explaining how to analyze the fundamentals of machine failure using the winding functions method, the magnetic equivalent circuit method, and finite element analysis. It then examines how to implement fault diagnosis using techniques such as the motor current signature analysis (MCSA) method, frequency domain method, model-based techniques, and a pattern recognition scheme. Emphasizing the MCSA implementation method, the authors discuss robust signal processing techniques and the implementation of reference-frame-theory-based fault diagnosis for hybrid vehicles. Fault Modeling, Diagnosis, and Implementation in One Volume Based on years of research and development at the Electrical Machines & Power Electronics (EMPE) Laboratory at Texas A&M University, this book describes practical analysis and implementation strategies that readers can use in their work. It brings together, in one volume, the fundamentals of motor fault conditions, advanced fault modeling theory, fault diagnosis techniques, and low-cost DSP-based fault diagnosis implementation strategies.

The special anniversary edition of The Little Engine That Could™ contains the entire text and original artwork. Young readers, as well as parents and grandparents, will treasure the story of the blue locomotive who exemplifies the power of positive thinking.

The book contains six chapters. The use of the progressive regressive strategy for biometrical authentication through the use of human gait and face images was investigated. A new lossy image compression technique that uses singular value decomposition and wavelet difference reduction technique was proposed. The best wavelet packet based selection algorithm and its application in image denoising was discussed. The scaling factor threshold estimator in different color models using a discrete wavelet transform for steganographic algorithms was presented. The extraction of features appearing in current signal using wavelet analysis when there is rotor fault of eccentricity and broken rotor bar was debated. The application of the empirical wavelet transform for seismic anomalies detection in ultralow-frequency geomagnetic signals was illustrated.

Condition Monitoring of Motors and Motor Operated Values Using Voltage and Current Signature Analysis

ICICCD 2016

Modeling, Condition Monitoring, and Fault Diagnosis

ETAEERE-2016

Advanced Condition Monitoring and Fault Diagnosis of Electric Machines

Electrical Systems 2

Developed for electricians, mechanics, students, academia, and reliability/maintenance managers, Electrical Motor Diagnostics provides the information, case studies, and materials necessary to interpret motor circuit analysis, motor current signature analysis, electrical signature analysis, and other standard testing technologies for AC/DC electric motors, transformers, machine tool motors, synchronous motors, and generators including pass/fail values. Information on the development of a motor management program and the SUCCESS by DESIGN Time to Failure Estimation methodology for any technology are covered in detail.

This book provides a thorough approach for mastering the behavior and operation of induction motors, an essential device in the modern industrial world. Its way of presentation renders this book suitable for selfteaching by students, engineers, and researchers in the field of electrical engineering. It covers the modern theory of induction motor applications and control methods. The transient analysis of both three-phase and single-phase induction motors as well as that of the double-cage motors are developed. The principles of such modern control methods as Fiel-Oriented Control, Direct Torque Control and Computed Charges Acceleration Method are clearly treated in this monograph. Numerous equations, simulations, and figures are presented.

Methods of diagnosis and prognosis play a key role in the reliability and safety of industrial systems. Failure diagnosis requires the use of suitable sensors, which provide signals that are processed to monitor features (health

indicators) for defects. These features are required to distinguish between operating states, in order to inform the operator of the severity level, or even the type, of a failure. Prognosis is defined as the estimation of a system's lifespan, including how long remains and how long has passed. It also encompasses the prediction of impending failures. This is a challenge that many researchers are currently trying to address. Electrical Systems, a book in two volumes, informs readers of the theoretical solutions to this problem, and the results obtained in several laboratories in France, Spain and further afield. To this end, many researchers from the scientific community have contributed to this book to share their research results.

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.

Instrumentation for Motor-current Signature Analysis Using Synchronous Sampling

From Diagnosis to Prognosis

Electrical Signature Analysis

Induction Motors

Motor Current Signature Analysis Method for Diagnosing Motor-operated Devices

Design, and Application

A motor current noise signature analysis method for remotely monitoring the operating characteristics of an electric motor-operated device such as a motor-operated valve. Frequency domain signal analysis techniques are applied to a conditioned motor current signal to distinctly identify various operating parameters of the motor driven device from the motor current signature. The signature may be recorded and compared with subsequent signatures to detect operating abnormalities and degradation of the device. This diagnostic method does not require special equipment to be installed on the motor-operated device, and the current sensing may be performed at remote control locations, e.g., where the motor-operated devices are used in inaccessible or hostile environments. 6 figs.

Machinery Vibration Analysis and Predictive Maintenance provides a detailed examination of the detection, location and diagnosis of faults in rotating and reciprocating machinery using vibration analysis. The basics and underlying physics of vibration signals are first examined. The acquisition and processing of signals is then reviewed followed by a discussion of machinery fault diagnosis using vibration analysis. Hereafter the important issue of rectifying faults that have been identified using vibration analysis is covered. The book also covers the other techniques of predictive maintenance such as oil and particle analysis, ultrasound and infrared thermography. The latest approaches and equipment used together with the latest techniques in vibration analysis emerging from current research are also highlighted. Understand the basics of vibration measurement Apply vibration analysis for different machinery faults Diagnose machinery-related problems with vibration analysis techniques

Current Signature Analysis for Condition Monitoring of Cage Induction MotorsIndustrial Application and Case HistoriesJohn Wiley & Sons

Provides coverage of Motor Current Signature Analysis (MCSA) for cage induction motors This book is primarily for industrial engineers. It has 13 chapters and contains a unique data base of 50 industrial case histories on the application of MCSA to diagnose broken rotor bars or unacceptable levels of airgap eccentricity in cage induction motors with ratings from 127 kW (170 H.P.) up to 10,160 kW (13,620 H.P.). There are also unsuccessful case histories, which is another unique feature of the book. The case studies also illustrate the effects of mechanical load dynamics downstream of the motor on the interpretation of current signatures. A number of cases are presented where abnormal operation of the driven load was diagnosed. Chapter 13 presents a critical appraisal of MCSA including successes, failures and lessons learned via industrial case histories. The case histories are presented in a step by step format, with predictions and outcomes supported by current spectra and photographic evidence to confirm a correct or incorrect diagnosis The case histories are presented in detail so readers fully understand the diagnosis The authors have 108 years of combined experience in the installation, maintenance, repair, design, manufacture, operation and condition monitoring of SCIMs There are 10 questions at the end of chapters 1 to 12 and answers can be obtained via the publisher Current Signature Analysis for Condition Monitoring of Cage Induction Motors serves as a reference for professional engineers, head electricians and technicians working with induction motors. To obtain the solutions manual for this book, please send an email to pressbooks@ieee.org. William T. Thomson is Director and Consultant with EM Diagnostics Ltd, in Scotland. Prof. Thomson received a BSc (Hons) in Electrical Engineering in 1973 and an MSc in 1977 from the University of Strathclyde. He has published 72 papers on condition monitoring of induction motors in a variety of engineering journals such as IEEE Transactions (USA), IEE Proceedings (UK), and also at numerous International IEEE and IEE conferences. He is a senior member of the IEEE, a fellow of the IEE (IET) in the UK and a Chartered Professional Engineer registered in the UK. Ian Culbert was a Rotating Machines Specialist at Iris Power Qualitrol since April 2002 until his very

untimely death on 8th September, 2015. At this company he provided consulting services to customers, assisted in product development, trained sales and field service staff and reviewed stator winding partial discharge reports. He has co-authored two books on electrical machine insulation design, evaluation, aging, testing and repair and was principal author of a number of Electric Power Research Institute reports on motor repair. Ian was a Registered Professional Engineer in the Province of Ontario, Canada and a Senior Member of IEEE.

Practical Machinery Vibration Analysis and Predictive Maintenance

Electric Machines

Fault Diagnosis of Induction Motors

Motor Current Signature Analysis of Incipient Broken Rotor Bar of Squirrel Cage Induction Motor

High-vibration Detection Using Motor Current Signature Analysis

Principles and Practices

Personnel in the Instrumentation and Controls Division at Oak Ridge National Laboratory, in association with the United States Enrichment Corporation, the U.S. Navy, and various Department of Energy sponsors, have been involved in the development and application of motor-current signature analysis for several years. In that time, innovation in the field has resulted in major improvements in signal processing, analysis, and system performance and capabilities. Recent work has concentrated on industrial implementation of one of the most promising new techniques. This report describes the developed method and the instrumentation package that is being used to investigate and develop potential applications.

Motor current signature analysis (CSA) has been used for several years as a diagnostic tool for electrical problems in ac, induction motors. Personnel at Oak Ridge National Laboratory have found that CSA can also provide information about system vibrations and imbalances similar to the information provided by an accelerometer. As a result, CSA techniques for monitoring the status of the equipment, such as pumps and compressors, driven by induction motors have been developed and used in dedicated monitoring systems. In this work, researchers have found that CSA responds proportionately to imbalances in rotating equipment and can be used to detect the In high-vibration conditions that can result. This report describes how vibration monitoring with CSA can be implemented and presents test data to support that use.

The book presents high-quality research papers presented at the first international conference, ICICCD 2016, organised by the Department of Electronics, Instrumentation and Control Engineering of University of Petroleum and Energy Studies, Dehradun on 2nd and 3rd April, 2016. The book is broadly divided into three sections: Intelligent Communication, Intelligent Control and Intelligent Devices. The areas covered under these sections are wireless communication and radio technologies, optical communication, communication hardware evolution, machine-to-machine communication networks, routing techniques, network analytics, network applications and services, satellite and space communications, technologies for e-communication, wireless Ad-Hoc and sensor networks, communications and information security, signal processing for communications, communication software, microwave informatics, robotics and automation, optimization techniques and algorithms, intelligent transport, mechatronics system, guidance and navigation, algorithms, linear/non-linear control, home automation, sensors, smart cities, control systems, high performance computing, cognition control, adaptive control, distributed control, prediction models, hybrid control system, control applications, power system, manufacturing, agriculture cyber physical system, network control system, genetic control based, wearable devices, nano devices, MEMS, bio-inspired computing, embedded and real-time software, VLSI and embedded systems, FPGA, digital system and logic design, image and video processing, machine vision, medical imaging, and reconfigurable computing systems.

This book covers topics such as AeroSpace Systems, Intelligent Systems, Machine Learning and Analytics, Internet of Things, Applied Media Informatics and Technology, Adaptive Control Systems, Software Engineering and Cyber-Physical Systems. Research in the discipline of Systems Engineering is an important concept in the advancement of engineering and information sciences. Systems Engineering attempts to integrate many of the traditional engineering disciplines to solve large complex functioning engineering systems, dependent on components from all the disciplines. The research papers contained in these proceedings reflect the state of the art in Systems Engineering from all over the world and serve as vital references to researchers to follow. This book is a very good resource for graduate students, researchers and scholars who want to learn about the most recent development in the fields.

Proceedings of the Fourth World Congress on Engineering Asset Management (WCEAM) 2009

Engineering Asset Management

Condition Monitoring and Faults Diagnosis of Induction Motors

Model Rules of Professional Conduct
Wavelet Transform and Some of Its Real-World Applications
Approach Through Current Signature Analysis

Induction motors are considered to be the work horse in all types of today's industries. In all mechanical applications, using an induction motor is considered to be the preferable, if not the optimum selection. Their failures, on the other hand, cause an interruption equal to their volume of dependency in any plant. This has initiated different maintenance programs that can extend equipment's life time and reduce sudden equipment failure. The down time that is mandated by conventional maintenance methods is no longer acceptable with tight industrial competition. Condition Monitoring using Motor Current Signature Analysis (MCSA) is the demanding methods that can significantly reduce unscheduled downtime and enable extended motor life. The potential of this method is very high especially for mechanical failure. The frequencies of components that reveal existence of any bearing or rotor-bars related faults are well defined. For other fault sources (e.g. Windings, Insulation) the analysis findings are not yet mature enough and there are uncertainties that make it less attractive. The research of this thesis looks at MCSA as a means to detect failure in stator windings of squirrel-cage induction machines. The approach in this thesis is to run the motors under various stator abnormality conditions and study the behavior of the frequency spectrum to correlate the changes that will appear due to specific faults. Different faults were simulated on two different motors (5 hp, 100 hp). The two machines were operated at normal operating condition and the indicator of stator abnormalities in the current spectrum was identified. The effect of loading on those components is one of the new aspects that are rarely mentioned in previous researches in the field of motor diagnostics.

Motor current signature analysis (MCSA) is a novel diagnostic process for condition monitoring of electric-motor-driven mechanical equipment (e.g., pumps, motor-operated valves, compressors, and processing machinery). The MCSA process identifies, characterizes, and trends over time the instantaneous load variations of mechanical equipment in order to diagnose changes in the condition of the equipment (e.g., due to degradation or service wear), which, if allowed to continue, may lead to failure. It monitors the instantaneous variations (noise content) in the electric current flowing through the power leads to the electric motor that drives the equipment. The motor itself thereby acts as a transducer, sensing both large and small, long-term and rapid, mechanical load variations and converting them to variations in the induced current generated in the motor windings. This motor current noise signature is detected, amplified, and further processed as needed to examine its time domain and frequency domain (spectral) characteristics. The operational principles of MCSA and the nonintrusive data collection apparatus and procedure used with MOVs will be described. Data collected from MOVs in both laboratory and in-plant environments will also be shown to illustrate the ability of MCSA to "see" the detailed inner workings of the valve and operator and thus to detect degraded performance at an incipient stage. (Set of 18 vugraphs).

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 designmethods 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.

This book constitutes the proceedings of the 1st International Conference on Advances in Emerging Trends and Technologies (ICAETT 2019), held in Quito, Ecuador, on 29 – 31 May 2019, jointly organized by Universidad Tecnol ó gica Israel, Universidad T é cnica del Norte, and Instituto Tecnol ó gico Superior Rumi ñ ahui, and supported by SNOTRA. ICAETT 2019 brought together top researchers and practitioners working in different domains of computer science to share their expertise and to discuss future developments and potential collaborations. Presenting high-quality, peer-reviewed papers, the book discusses the following topics: Technology Trends Electronics Intelligent Systems Machine Vision Communication Security e-Learning e-Business e-Government and e-Participation

Current Signature Analysis for Condition Monitoring of Cage Induction Motors
Advances in Power Systems and Energy Management
AC Electric Motors Control
Method and Apparatus for Embedded Multi-Regime Motor Current Signature Analysis
Machinery Condition Monitoring
A Thesis