

Fault Detection in Three Phase Induction Motor

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ABSTRACT: Induction motor faults can be detected in an initial stage in order to prevent the complete failure of an induction motor and unexpected production costs. Accordingly, this project presents three methods to detect induction motor faults. The first method is a motor fault diagnostic method that identifies the faults like inter-turn short circuits in stator windings, broken rotor bars that helps in identifying the motor fault's severity and air gap eccentricity. These types of faults represent 40 to 50% of all reported faults. In motor fault monitoring method that classifies the operating condition of an induction motor as healthy or faulty.

KEYWORDS: Stator winding fault, rotor cage failure, air-gap irregularities.

I. INTRODUCTION

Several alternatives have been used in industry to prevent severe damage to induction motors from the above mentioned faults and to avoid unexpected production shutdowns. Schedule of frequent maintenance is implemented to verify the integrity of the motors, as well as to verify abnormal vibration, lubrication problems, bearings conditions, and stator windings and rotor cage integrity. Most maintenance must be performed with the induction motor turned off, which also implies production shutdown.

Usually, large companies prefer yearly maintenance in which the production is stopped for full maintenance procedures. Redundancy is another way to prevent production shutdowns, but not induction motor failure. Employing redundancy requires two sets of equipment, including induction motors. The first set of equipment operates unless there is a failure, in which case the second set takes over. This solution is not feasible in many industrial applications due to high equipment cost and physical space limitations. Thus, in this thesis an alternative to these approaches is proposed.

Specifically, this thesis addresses electrically detectable faults that occur in the stator windings and rotor cage, namely inter-turn short circuits in stator windings and broken rotor bars. The methods developed in this thesis detect motor faults without the necessity of invasive tests or process shutdowns. Moreover, the presented methods monitor the operating induction motor continuously, so that human inspection is not required to detect motor faults.

II. STATOR WINDING FAULT

Inter-turn short circuits in stator windings constitute a category of faults that is most common in induction motors. Typically, short circuits in stator windings occur between turns of one phase, or between turns of two phases, or between turns of all phases. Moreover, short circuits between winding conductors and the stator core also occur. The different types of winding faults are summarized below as follows

Fault Detection And Protection Of Three Phase Induction Motor

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Fault Detection and Protection of Three Phase Induction Motor Maruti R. Jadhav, 2013 Induction motors are widely used in industries some electric faults may cause malfunctioning of it so protection of it against these incipient faults is very necessary This monograph refers to an approach of protection of motor using micro controller It emphasizes on PIC 18F4431 family controller to detect the faults and protect them some simulink modelling and simulations are done to find the tolerable limit values

Power System Protection in Smart Grid Environment Ramesh Bansal, 2019-01-15 With distributed generation interconnection power flow becoming bidirectional culminating in network problems smart grids aid in electricity generation transmission substations distribution and consumption to achieve a system that is clean safe protected secure reliable efficient and sustainable This book illustrates fault analysis fuses circuit breakers instrument transformers relay technology transmission lines protection setting using DIGsILENT Power Factory Intended audience is senior undergraduate and graduate students and researchers in power systems transmission and distribution protection system broadly under electrical engineering

Fault Detection Wei Zhang, 2010-03-01 In this book a number of innovative fault diagnosis algorithms in recently years are introduced These methods can detect failures of various types of system effectively and with a relatively high significance

International Conference on Innovative Computing and Communications Ashish Khanna, Deepak Gupta, Siddhartha Bhattacharyya, Aboul Ella Hassanien, Sameer Anand, Ajay Jaiswal, 2021-08-28 This book includes high quality research papers presented at the Fourth International Conference on Innovative Computing and Communication ICICC 2021 which is held at the Shaheed Sukhdev College of Business Studies University of Delhi Delhi India on February 20 21 2021 Introducing the innovative works of scientists professors research scholars students and industrial experts in the field of computing and communication the book promotes the transformation of fundamental research into institutional and industrialized research and the conversion of applied exploration into real time applications

Fault diagnosis of induction motor fed by frequency converter. The signal signature analysis technique Hussain Mahdi, 2016-08-12 Thesis M A from the year 2013 in the subject Electrotechnology Warsaw University of Technology Electrical Engineering language English abstract 3 Phase induction motors are widely used as a source of mechanical power for effective operation and low costs The abnormalities have to be detected in advance to avoid the motor breakdown and the cost associated restrain of plant production This work discusses current and flux leakage spectral analysis techniques for the diagnosis of broken rotor bars and shortcircuited turns in induction motor fed from different AC sources In spite of recent development of various types of models toward motor faults diagnosis and examining different problems associated with 3 phase induction motors the signal spectral analysis is considered as one of most important approaches Most of the models from simple equivalent circuit to more complex d q and a b c models and lastly developed hybrid models are provided for the integration of different forms of current and or voltage unbalance Generally techniques that relate to asymmetry identify

asymmetrical motor faults Frequency converters in many applications feed induction motors Such applications which play a major role in industry are growing at a high rate allow to use 3 phase induction motor as variable speed applications This paper proposes application of spectral signature analysis for the detection and diagnosis of abnormal electrical and mechanical conditions which indicates chosen faults in induction motor fed by frequency converter **Soft Computing**

Techniques and Applications Samarjeet Borah,Ratika Pradhan,Nilanjan Dey,Phalguni Gupta,2020-11-27 Focusing on soft computing techniques and application in various engineering research domains this book presents the state of the art outcomes from ongoing research works being conducted in various research laboratories and educational institutions The included research works deal with estimated models and give resolutions to complex real life issues In the field of evolutionary computing and other domains of applications such as data mining and fuzzy logic soft computing techniques play an incomparable role where it successfully handles contemporary computationally intensive and complex problems that have usually appeared to be inflexible to traditional mathematical methods Comprising the concepts and applications of soft computing with other emerging research domains this book cherishes varieties of modern applications in the fields of natural language processing image processing biomedical engineering communication control systems circuit design etc **Smart Computing and Informatics** Suresh Chandra Satapathy,Vikrant Bhateja,Swagatam Das,2017-12-20 This volume contains 74 papers presented at SCI 2016 First International Conference on Smart Computing and Informatics The conference was held during 3 4 March 2017 Visakhapatnam India and organized communally by ANITS Visakhapatnam and supported technically by CSI Division V Education and Research and PRF Vizag This volume contains papers mainly focused on applications of advanced intelligent techniques to video processing medical imaging machine learning sensor technologies and network security The proceedings of the 16th Annual Conference of China Electrotechnical Society Qingxin Yang,Xidong

Liang,Yaohua Li,Jinghan He,2022-04-17 This book gathers outstanding papers presented at the 16th Annual Conference of China Electrotechnical Society organized by China Electrotechnical Society CES held in Beijing China from September 24 to 26 2021 It covers topics such as electrical technology power systems electromagnetic emission technology and electrical equipment It introduces the innovative solutions that combine ideas from multiple disciplines The book is very much helpful and useful for the researchers engineers practitioners research students and interested readers 2024-25 CTET/TET Class 1 to V Mathematics Solved Papers YCT Expert Team , 2024 25 CTET TET Class 1 to V Mathematics Solved Papers 864 1495 E This book contains 173 sets of the previous year s papers and 5190 objective questions **Mechatronic Systems and Materials** Nin Bizys,Andrejus Henrikas Marcinkevičius,2006-06-15 Collection of Papers from the 1st International Conference Mechatronic Systems and Materials MSM 2005 Vilnius Lithuania 20 23 October 2005 *Proceedings of the ...*

Annual International Motorcon ... Conference ,1983 *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 **IECON '98** IEEE Industrial Electronics Society.

Conference,1998 *Condition Monitoring, Fault Diagnosis and Applications of Induction Motors* Lindy Ladner,2023-09-19 An induction motor refers to an alternate current electric motor for which the electric current is required to produce torque in the rotor through electromagnetic induction from the magnetic field of the stator winding Three phase induction motors play an important role in various industries because of their benefits over other electrical motors As a result there is a high demand for their dependable and secure operation Any breakdowns or faults in the motor might result in longer downtime and can cause significant maintenance and revenue losses requiring early fault detection for motor protection Condition monitoring of induction motor is a new technology for detecting potential faults online It entails taking measurements on a machine while it is in operating condition for detecting faults The goal of online condition monitoring is to lower maintenance costs and unexpected failure This book outlines the applications of induction motors as well as their condition monitoring and fault diagnosis It will serve as a valuable source of reference for graduate and post graduate students International Conference on Power Electronics, Machines and Drives, 16-18 April 2002 : Venue, University of Bath, UK, ,2002 This conference provided a forum for delegates to have the opportunity to discuss debate and learn about recent developments and future trends in the areas of electrical machines drives solid state motion control and power conversion It was also an opportunity for users to identify short comings in existing designs and equipment and make equipment manufacturers and

installers more aware of their potential markets The conference was the premier UK technical event for Power Electronic Machines and Drive specialists ICEMS'2001 Fengxiang Wang, Renyuan Tang, 2001 Fault Detection in Three Phase Induction Motor Using Artificial Intelligence Ahmad Farid Abu Bakar, 2009 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 *British Journal of Non-destructive Testing*, 1986 Journal of the Indian Institute of Science Indian Institute of Science, Bangalore, 1999 **Standard Handbook for Electrical Engineers Sixteenth Edition** H. Wayne Beaty, Donald Fink, 2012-08-30 THE MOST COMPLETE AND CURRENT GUIDE TO ELECTRICAL ENGINEERING For more than a century the Standard Handbook for Electrical Engineers has served as the definitive source for all the pertinent electrical engineering data essential to both engineering students and practicing engineers It offers comprehensive information on the generation transmission distribution control operation and application of electric power Completely revised throughout to address the latest codes and standards the 16th Edition of this renowned reference offers new coverage of green technologies such as smart grids smart meters renewable energy and cogeneration plants Modern computer applications and methods for securing computer network infrastructures that control power grids are also discussed Featuring hundreds of detailed illustrations and contributions from more than 75 global experts this state of the art volume is an essential tool for every electrical engineer Standard Handbook for Electrical Engineers 16th Edition covers Units symbols constants definitions and conversion factors Electric and magnetic circuits Measurements and instruments Properties of materials Generation Prime movers Alternating current generators Direct current generators Hydroelectric power generation Power system components Alternate sources of power Electric power system economics Project economics Transmission systems High voltage direct current power transmission Power system operations Substations Power distribution Wiring design for commercial and industrial buildings Motors and drives Industrial and commercial applications of electric power Power electronics Power quality and reliability Grounding systems Computer applications in the electric power industry Illumination Lightning and overvoltage protection Standards in electrotechnology telecommunications and information technology

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