Chapter 6 Predictive Maintenance Technologies

Planning and Control of Maintenance Systems
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TPM Simplified
CAiSE 2019 International Workshops, Rome, Italy, June 3-7, 2019, Proceedings
Advanced Monitoring, Fault Diagnostics, and Predictive Maintenance
Total Productive Maintenance
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Predictive Maintenance in Smart Factories
Technology and Safety of Marine Systems
BIG DATA and Building Technology Integration
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LYRIC DEREK

Planning and Control of Maintenance Systems An Introduction to Predictive Maintenance The deteriorating condition of federal facilities poses economic, safety, operational, and environmental risks to the federal government, to the achievement of the missions of federal agencies, and to the achievement of public policy goals. Primary factors underlying this deterioration are the age of federal facilities--about half are at least 50 years old--and decades of inadequate investment for their maintenance and repair. These issues are not new and there are no quick fixes. However, the current operating environment provides both the impetus and the opportunity to place investments in federal facilities' maintenance and repair on a new, more sustainable course for the 21st Century. Despite the magnitude of investments, funding for the maintenance and repair of federal facilities has been inadequate for many years, and myriad projects have been deferred. Predicting

Outcomes of Investments in Maintenance and Repair of Federal Facilities identifies processes and practices for transforming the current portfolio of federal facilities into one that is more economically, physically, and environmentally sustainable. This report addresses ways to predict or quantify the outcomes that can be expected from a given level of maintenance and repair investments in federal facilities or facilities' systems, and what strategies, measures, and data should be in place to determine the actual outcomes of facilities maintenance and repair investments.

Enterprise Interoperability: Smart Services and Business Impact of Enterprise Interoperability John Wiley & Sons

Since the publication of the second edition in 2013, there has been an increasing interest in asset management globally, as evidenced by a series of international standards on asset management systems, to achieve excellence in asset management. This cannot be achieved without high-quality data and the tools for data interpretation. The importance of such requirements is widely recognized by industry. The

third edition of this textbook focuses on tools for physical asset management decisions that are data driven. It also uses a theoretical foundation to the tools (mathematical models) that can be used to optimize a variety of key maintenance/replacement/reliability decisions. Problem sets with answers are provided at the end of each chapter. Also available is an extensive set of PowerPoint slides and a solutions manual upon request with qualified textbook adoptions. This new edition can be used in undergraduate or post-graduate courses on physical asset management.

Proactive Maintenance for Mechanical Systems Food & Agriculture Org.

An Introduction to Predictive MaintenanceElsevier

A Simple Guide to Technology and Analytics Industrial Press Inc.

This thesis introduces a successfully designed and commissioned intelligent health monitoring system, specifically for use on any industrial robot, which is able to predict the onset of faults in the joints of the geared transmissions. However the developed embedded wireless condition monitoring system leads itself very well for applications on any power transmission equipment in

which the loads and speeds are not constant, and access is restricted. As such this provides significant scope for future development. Three significant achievements are presented in this thesis. First, the development of a condition monitoring algorithm based on vibration analysis of an industrial robot for fault detection and diagnosis. The combined use of a statistical control chart with time-domain signal analysis for detecting a fault via an arm-mounted wireless processor system represents the first stage of fault detection. Second, the design and development of a sophisticated embedded microprocesso r base station for online implementatio n of the intelligent condition monitoring algorithm, and third, the implementatio n of a discrete wavelet transform, using an artificial neural network, with statistical feature extraction for robot fault diagnosis in which the vibration signals are first decomposed into eight levels of wavelet coefficients.

Professional Housing Management Practices in Hong Kong

CRC Press

Professional housing management is of growing importance in Hong Kong and the "Hong

Kong management model" is adopted in many neighbouring high-density cities. However, there has been by far no literature on the subject of housing management practices in Hong Kong. This book is therefore crucial in understanding how housing management makes significant contributions to the safety, viability, liveability and vibrancy of our high-density and high-rise environment. Since the late 1980s, housing education in this city has developed by leaps and bounds. A recent study found that over 3,000 junior practitioners would be seeking professional training or further study for career advancement. This book is an indispensable aid to self-study or taught courses. *Infrared Methodology and Technology* Packt Publishing Ltd This book presents the outcome of the European project "SERENA", involving fourteen partners as international academics, technological companies, and industrial factories, addressing the design and development of a plug-n-play end-to-end cloud architecture, and enabling predictive maintenance of industrial equipment to be easily

exploitable by small and medium manufacturing companies with a very limited data analytics experience. Perspectives and new opportunities to address open issues on predictive maintenance conclude the book with some interesting suggestions of future research directions to continue the growth of the manufacturing intelligence.

Predicting Outcomes of Investments in Maintenance and Repair of Federal Facilities

Springer

The ‘machines’ as we see them today use certain level of technology which is contemporary to today’s standards. In garment manufacturing , activities have been mechanized over a period of time and mechatronics and electronics are added to enable better productivity, repeatability of output and consistency of quality. In the last one-and-a-half decade, the integration of computer and information technology made the machines capable of generating, storing and transmitting data automatically with added ease of diagnostics and quick repair. The future will likely see these machines support sustainable practices while becoming energyefficien t and caring for the

environment. The book traces the evolution of technology for different garment manufacturing machinery and equipment and how the gradual improvement of features has supported the users.

Artificial Intelligence-based Fault Diagnosis and Predictive Maintenance

CRC Press

It's time once again to make much of a simple concept; that two groups with different names, languages and cultures might put aside their old habits, pettiness and grudges, recognize the overwhelming alignment of their most critical self-interests, and join their complementary strengths to achieve unprecedented peace, harmony and productivity. That's the concept behind total productive maintenance (TPM), where maintenance and production personnel cooperate to define, standardize, allocate and perform the tasks needed to maximize overall equipment effectiveness (OEE), which keeps equipment producing quality product at maximum efficiency and minimum lifecycle cost.

Theory and Applications

Elsevier

Of the more than $300 billion spent on plant maintenance and operations, U.S. industry spends as much as 80

percent of this amount to correct chronic failures of machines, systems, and people. With machines and systems becoming increasingly complex, this problem can only worsen, and there is a clear and pressing need to establish comprehensiv e equi *Maintenance and Operation of Bulk Grain Stores* Apparel Resources Publication In this book, advanced methods and techniques of monitoring, fault diagnostics, and predictive maintenance for cryogenics are illustrated. In Part I on Background, mainstreams in the related research are reviewed. In Part II of Methods, for monitoring helium distribution and consumption in cryogenic systems for particle accelerators, a virtual flowmeter is presented. Then, for fault diagnostics, two methods, for fault detection on a compressor, and for distributed diagnostics based on a micro-genetic algorithm, are described. Finally, for predictive maintenance, a metaheuristic optimization scheduling algorithm is illustrated. In Part III of Application examples, several practical case studies are described for highlighting the application of the previous methods to cryogenics of particle accelerators at CERN.

TPM Simplified Elsevier Research efforts in the past decade have led to considerable advances in the concepts and methods of smart manufacturing . Smart Manufacturing : Applications and Case Studies includes information about the key applications of these new methods, as well as practitioners' accounts of real-life applications and case studies. Written by thought leaders in the field from around the world, Smart Manufacturing : Applications and Case Studies is essential reading for graduate students, researchers, process engineers and managers. It is complemente d by a companion book titled Smart Manufacturing : Concepts and Methods, which describes smart manufacturing methods in detail. Includes examples of applications of smart manufacturing in process industries Provides a thorough overview of the subject and practical examples of applications through well researched case studies Offers insights and accounts of first-hand experiences to motivate further implementatio ns of the key concepts of smart manufacturing *CAiSE 2019 International Workshops, Rome, Italy, June 3-7,*

2019, Proceedings CRC Press The effect of corrosion in the oil industry leads to the failure of parts. This failure results in shutting down the plant to clean the facility. The annual cost of corrosion to the oil and gas industry in the United States alone is estimated at $27 billion (According to NACE International) —leading some to estimate the global annual cost to the oil and gas industry as exceeding $60 billion. In addition, corrosion commonly causes serious environmental problems, such as spills and releases. An essential resource for all those who are involved in the corrosion management of oil and gas infrastructure, Corrosion Control in the Oil and Gas Industry provides engineers and designers with the tools and methods to design and implement comprehensive corrosion-management programs for oil and gas infrastructures . The book addresses all segments of the industry, including production, transmission, storage, refining and distribution. Selects cost-effective methods to control corrosion Quantitatively measures and estimates corrosion rates Treats oil and gas infrastructures as systems in order to avoid the impacts that changes to one segment if a

corrosion management program may have on others Provides a gateway to more than 1,000 industry best practices and international standards

Advanced Monitoring, Fault Diagnostics, and Predictive Maintenance McGraw Hill Professional This second edition of An Introduction to Predictive Maintenance helps plant, process, maintenance and reliability managers and engineers to develop and implement a comprehensive maintenance management program, providing proven strategies for regularly monitoring critical process equipment and systems, predicting machine failures, and scheduling maintenance accordingly. Since the publication of the first edition in 1990, there have been many changes in both technology and methodology, including financial implications, the role of a maintenance organization, predictive maintenance techniques, various analyses, and maintenance of the program itself. This revision includes a complete update of the applicable chapters from the first edition as well as six additional chapters outlining the most recent information available. Having

already been implemented and maintained successfully in hundreds of manufacturing and process plants worldwide, the practices detailed in this second edition of An Introduction to Predictive Maintenance will save plants and corporations, as well as U.S. industry as a whole, billions of dollars by minimizing unexpected equipment failures and its resultant high maintenance cost while increasing productivity. A comprehensive introduction to a system of monitoring critical industrial equipment Optimize the availability of process machinery and greatly reduce the cost of maintenance Provides the means to improve product quality, productivity and profitability of manufacturing and production plants *Total Productive Maintenance* Purdue University Press Reliability Analysis and Asset Management of Engineering Systems explains methods that can be used to evaluate reliability and availability of complex systems, including simulation-based methods. The increasing digitization of mechanical processes driven by Industry 4.0 increases the interaction between machines and monitoring and control

systems, leading to increases in system complexity. For those systems the reliability and availability analyses are increasingly challenging, as the interaction between machines has become more complex, and the analysis of the flexibility of the production systems to respond to machinery failure may require advanced simulation techniques. This book fills a gap on how to deal with such complex systems by linking the concepts of systems reliability and asset management, and then making these solutions more accessible to industry by explaining the availability analysis of complex systems based on simulation methods that emphasise Petri nets. Explains how to use a monitoring database to perform important tasks including an update of complex systems reliability Shows how to diagnose probable machinery-based causes of system performance degradation by using a monitoring database and reliability estimates in an integrated way Describes practical techniques for the application of AI and machine learning methods to fault detection and diagnosis problems *Energy and Analytics* John

Wiley & Sons Traditionally society has regulated hazardous industries by detailed references to engineering codes, standards and hardware requirements. These days a risk-based approach is adopted. Risk analysis involves identifying hazards, categorizing the risks, and providing the necessary decision support to determine the necessary arrangements and measures to reach a "safe" yet economical operating level. When adopting such an approach the abundance of techniques available to express risk levels can often prove confusing and inadequate. This highly practical guide to safety and risk analysis in Marine Systems not only adds to the current techniques available, but more importantly identifies instances where traditional techniques fall short. Uncertainties that manifest within risk analysis are highlighted and alternative solutions presented. In addition to risk analysis techniques this book addresses influencing elements including: reliability, Maintenance Decision making and Human error. The highly practical approach of this title ensures it is accessible to the widest possible audience

Applications and Case Studies Elsevier The objective of this textbook is to introduce students and professionals to fundamental principles and techniques and emerging technologies in energy informatics and the digitalization of power markets and systems. The book covers such areas as smart grids and artificial intelligence (AI) and distributed ledger technology (DLT), with a focus on information and communication technologies (ICT) deployed to modernize the electric energy infrastructure. It also provides an overview of the smart grid and its main components: smart grid applications at transmission, distribution, and customer level, network requirements with communications technologies, and standards and protocols. In addition, the book addresses emerging technologies and trends in next-generation power systems, i.e., energy informatics, such as digital green shift, energy cyber-physical-social systems (E-CPSS), energy IoT, energy blockchain, and advanced optimization. Future aspects of digitalized power markets and systems will be discussed with real-world energy informatics projects. The book is designed to

be a core text in upper-undergraduate and graduate courses such as Introduction to Smart Grids, Digitalization of Power Systems, and Advanced Power System Topics in Energy Informatics.

Guidelines for Asset Integrity Management

John Wiley & Sons

Electrical distribution and transmission systems are complex combinations of various conductive and insulating materials. When exposed to atmospheric corrosive gases, contaminants, extreme temperatures, vibrations, and other internal and external impacts, these systems deteriorate, and sooner or later their ability to function properly is destroyed. Electrical Power Transmission and Distribution: Aging and Life Extension Techniques offers practical guidance on ways to slow down the aging of these electrical systems, improve their performance, and extend their life. Recognize the Signs of Aging in Equipment—and Learn How to Slow It A reference manual for engineering, maintenance, and training personnel, this book analyzes the factors that cause materials to deteriorate and explains what you can do to reduce the impact of these factors.

In one volume, it brings together extensive information previously scattered among manufacturers ’ documentatio n, journal papers, conference proceedings, and general books on plating, lubrication, insulation, and other areas. Shows you how to identify the signs of equipment aging Helps you understand the causes of equipment deterioration	Suggests practical techniques for protecting electrical apparatus from deterioration and damage Supplies information that can be used to develop manuals on proper maintenance procedures and choice of materials Provides numerous examples from industry This book combines research and engineering material with maintenance recommendati ons given in	layperson’s terms, making it useful for readers from a range of backgrounds. In particular, it is a valuable resource for personnel responsible for the utilization, operation, and maintenance of electrical transmission and distribution equipment at power plants and industrial facilities. *Industry 4.1* John Wiley & Sons This book captures the path of digital transformation that the cement enterprises

are adopting progressively to elevate themselves to ‘Industry 4.0’ level. Digital innovations-based Internet of Things (IoT) and Artificial Intelligence (AI) are pertinent technologies for the cement enterprises as the manufacturing processes operate at very large scales with multiple inputs, outputs, and variables, resulting in the essentiality of big data management. Featuring contributions from cement industries worldwide, it covers various aspects of cement manufacturing from IoT, machine learning and data analytics perspective. It further discusses implementation of digital solutions in cement process and plants through case studies. Features: Present an up-to-date, consolidated view on modern cement manufacturing technology, applying new systems. Provides narration of complexity and variables in modern cement plants and processes. Discusses evolution of automation and computerization for the manufacturing processes. Covers application of ERP techniques to cement enterprises. Includes data-driven approaches for energy, environment, and quality management. This book aims at

researchers and industry professionals involved in cement manufacturing , cement machinery and system suppliers, chemical engineering, process engineering, industrial engineering, and chemistry.

Predictive Maintenance in Smart Factories Elsevier This book is the second volume in a set of books dealing with the evolution of technology, IT and organizational approaches and what this means for industrial equipment. The authors address this increasing complexity in two parts, focusing specifically on the field of Prognostics and Health Management (PHM). Having tackled the PHM cycle in the first volume, the purpose of this book is to tackle the other phases of PHM, including the traceability of data, information and knowledge, and the ability to make decisions accordingly. The book concludes with a summary analysis and perspectives regarding this emerging domain, since without traceability, knowledge and decision, any prediction of the health state of a system cannot be exploited.

Technology and Safety of Marine Systems BoD – Books on Demand Industrial assets (such as railway lines, roads,

pipelines) are usually huge, span long distances, and can be divided into clusters or segments that provide different levels of functionality subject to different loads, degradations and environmental conditions, and their efficient management is necessary. The aim of the book is to give comprehensive understanding about the use of autonomous vehicles (context of robotics) for the utilization of inspection and maintenance activities in industrial asset management in different accessibility and hazard levels. The usability of deploying inspection vehicles in an autonomous manner is explained with the emphasis on integrating the total process. Key Features Aims for solutions for maintenance and inspection problems provided by robotics, drones, unmanned air vehicles and unmanned ground vehicles Discusses integration of autonomous vehicles for inspection and maintenance of industrial assets Covers the industrial approach to inspection needs and presents what is needed from the infrastructure end Presents the requirements for robot designers to design an autonomous inspection and maintenance system

Includes practical case studies from industries

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