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Flow Analysis for Hydrocarbon Pipeline Engineering gives engineers a tool to help them determine fluid dynamics. The book describes hydrocarbon fluid transport in pipelines by presenting useful applied thermodynamic derivations specialized for

pipelines. All transport phenomena is covered, such as heat, momentum and mass transport. Moving past the fundamentals, the reference addresses the complexity of these fluids and dedicates a chapter on multiphase mixtures, including slugging, hydrates, wax and sand. Rounding out with practical case studies, this book deliv-

ers a critical reference for engineers and flow assurance experts that will help them correlate basic fluid principles with applied engineering practices. Includes discussions on sustainable operations such as CO2 transport in pipelines utilized in carbon capture and hydrocarbon recovery operations Delivers multiple case studies for

practical applications and lessons learned Describes hydrocarbon fluid transport in pipelines by presenting useful applied thermodynamic derivations specialized for pipelines

The development of oil and gas fields offshore requires specialized pipeline equipment. The structures must be strong enough to withstand the harshest environments, and ensure that production is not interrupted and remains economically feasible. However, recent events in the Gulf of Mexico have placed a new importance on maintenance and reliability. A new section; Condition Based Maintenance (CBM), introduces the subject of maintenance, written by Tian Ran Lin, Queensland University of Technology, and Yong Sun, CSIRO Earth Science and Resource Engineering. Two of the main objectives of CBM is maximizing reliability while preventing major or minor equipment malfunction and minimizing maintenance costs. In this new section, the authors deal with the multi-objective condition based maintenance optimization problem. CBM provides two major advantages: (1) an efficient approach for weighting maintenance objectives, and (2) a method for specifying phys-

ical methods for achieving those objectives. Maintenance cost and reliability objectives are calculated based on proportional hazards model and a control limit CBM replacement policy. Written primarily for engineers and management personnel working on offshore and deepwater oil and gas pipelines, this book covers the fundamentals needed to design, install, and commission pipeline projects. This new section along with a thorough update of the existing chapters represents a 30% increase in information over the previous edition. Covers offshore maintenance and maintenance support system Provides the fundamentals needed to design, install, and commission pipeline project Methods and tools to deliver cost effective maintenance cost and system reliability New section on Condition-Based Maintenance written by Tian Ran Lin, Queensland University of Technology, and Yong Sun, CSIRO Earth Science and Resource Engineering (yong.sun@csiro.au)

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 6th International Conference on Maintenance Engineering and the 2021 conference of the Efficiency and Performance Engineering Network (IncoME-VI TEPEN 2021), held in Tianjin, China on October 20-23, 2021. 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.

Fluid interfaces are promising candidates for confining different types of materials, e.g., polymers, surfactants, colloids, and even small molecules, to be used in designing new functional materials with reduced dimensionality. The development of such materials requires a deepening of the

physicochemical bases underlying the formation of layers at fluid interfaces as well as on the characterization of their structures and properties. This is of particular importance because the constraints associated with the assembly of materials at the interface lead to the emergence of equilibrium and features of dynamics in the interfacial systems, which are far removed from those conventionally found in traditional materials. This Special Issue is devoted to studies on the fundamental and applied aspects of fluid interfaces, and attempts to provide a comprehensive perspective on the current status of the research field. 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

Hydrodynamics of Pumps is a reference for pump experts and a textbook for advanced students. It examines the fluid dynamics of liquid turbomachines, particularly pumps, focusing on special problems and design issues associated with the flow of liquid through a rotating machine. There are two characteristics of a liquid that lead to problems and cause a significantly different set of concerns than those in gas turbines. These are the potential for cavitation and the high density of liquids, which enhances the possibility of damaging, unsteady flows and forces. The book begins with an introduction to the subject, including cavitation, unsteady flows and turbomachinery, basic pump design and performance principles. Chapter topics include

flow features, cavitation parameters and inception, bubble dynamics, cavitation effects on pump performance, and unsteady flows and vibration in pumps - discussed in the three final chapters. The book is richly illustrated and includes many practical examples.

This book reviews alternative and renewable energy resources in order to pave the way for a more sustainable production in the future. A multi-disciplinary team of authors provides a comprehensive overview of current technologies and future trends, including solar technologies, wind energy, hydropower, microbial electrochemical systems and various biomass sources for bio-fuel production. In addition, the book focuses on solutions for developing countries. Conventional energy sources are finite, and estimates suggest that they will be exhausted within a few decades. Finding a solution to this problem is a global challenge, and developing countries in particular are still highly dependent on fossil fuels due to their rapidly growing populations accompanied by a huge growth in primary energy consumption. Moreover, the most common conventional energy sources (coal

and petroleum) are non-sustainable since their combustion exponentially increases greenhouse gas emissions. As such, there is a pressing need for clean energy based on alternative or renewable resources, not only to ensure energy supplies at an affordable price but also to protect the environment.

Advances in Clean Energy Technologies presents the latest advanced approaches toward a cleaner and more sustainable energy environment. Editor Kalam Azad and his team of expert contributors focus on recent developments in the field of clean energy technologies, sustainable zero emission resources, energy efficiency and environmental sustainability, as well as clean energy policy and markets. This well-rounded reference includes an authoritative view on control and storage solutions specific to medium and large-scale industries, advanced approaches to modeling, and experimental investigations on clean energy technologies. Those working in and researching clean energy and sustainability will obtain detailed understanding of a variety of zero emission energy production and conversion approaches, as well as important socio-economic and environmental

considerations that can be applied to their own unique power generation settings. Presents an exclusive analysis on advanced approaches of modeling and experimental investigations of clean energy technologies, including solar, wind, ocean, and hybrid systems Includes an authoritative and cross-disciplinary view on energy policy and energy markets Helps readers develop an understanding of concepts and solutions to global issues surrounding sustainability in medium-large scale energy industries Offers detailed understanding of a variety of zero emission energy production and conversion approaches

This volume is concerned with vibration-free and quiet operation of hydraulic machines. It deals with the problems caused by mechanical and hydraulic excitations in hydraulic machinery (except for transients which are treated in a separate volume). The invited authors from five continents are internationally recognized experts in their fields. The book looks at the fundamentals for analysis of fluid structure systems, structural vibration, shaft rotordynamics and system instability; noise and diagnosis are introduced with examples from practical experience.

Designed for engineers, this work considers flow-induced vibrations. It covers topics such as body oscillators; fluid loading and response of body oscillators; fluid oscillators; vibrations due to extraneously-induced excitation; and vibrations due to instability-induced excitation.

This book is a printed edition of the Special Issue "Advanced Energy Storage Technologies and Their Applications (AESAs)" that was published in *Energies*

The idea of preparing an *Energies* Special Issue on "Structural Prognostics and Health Management in Power & Energy Systems" is to compile information on the recent advances in structural prognostics and health management (SPHM). Continued improvements on SPHM have been made possible through advanced signature analysis, performance degradation assessment, as well as accurate modeling of failure mechanisms by introducing advanced mathematical approaches/tools. Through combining deterministic and probabilistic modeling techniques, research on SPHM can provide assurance for new structures at a design stage and ensure construction integrity at a fabrication phase. Specifically, power and energy system fail-

ures occur under multiple sources of uncertainty/variability resulting from load variations in usage, material properties, geometry variations within tolerances, and other uncontrolled variations. Thus, advanced methods and applications for theoretical, numerical, and experimental contributions that address these issues on SPHM are desired and expected, which attempt to prevent overdesign and unnecessary inspection and provide tools to enable a balance between safety and economy to be achieved. This Special Issue has attracted submissions from China, USA, Portugal, and Italy. A total of 26 submissions were received and 11 articles finally published.

Particular emphasis is placed on computational methods to model, control and manage new structural solutions and material types. This integration of their design together with optimisation technologies is prevalent in all aspects of industry and research. This book contains the most significant papers presented in OPTI 2009. Following the spirit of previous editions some of them deal with the algorithmic part of this scientific discipline while other authors describe innovative design optimisation

formulations in several engineering fields or practical applications in industrial problems. Research topics included: New and enhanced algorithms; Shape optimisation; Design optimisation in materials, construction and bridge engineering; Design optimization in aircraft engineering; Optimisation in dam and soil engineering.

"Written by engineers for engineers (with over 150 International Editorial Advisory Board members), this highly lauded resource provides up-to-the-minute information on the chemical processes, methods, practices, products, and standards in the chemical, and related, industries. "

Graduate-level text synthesizes research and experience from disparate fields to form guidelines for dealing with vibration phenomena, particularly in terms of assessing sources of excitation in a flow system. 1994 edition.

In many plants, vibration and noise problems occur due to fluid flow, which can greatly disrupt smooth plant operations. These flow-related phenomena are called flow-induced vibration. This book explains how and why such vibrations happen and provides hints and tips on how to

avoid them in future plant design. The world-leading author team doesn't assume prior knowledge of mathematical methods and provides the reader with information on the basics of modeling. The book includes several practical examples and thorough explanations of the structure, the evaluation method and the mechanisms to aid understanding of flow-induced vibrations. Helps ensure smooth plant operations Explains the structure, evaluation method and mechanisms Shows how to avoid vibrations in future plant design

Flow-induced vibrations and noise continue to cause problems in a wide range of engineering applications ranging from civil engineering and marine structures to power generation and chemical processing. These proceedings bring together more than a hundred papers dealing with a variety of topics relating to flow-induced vibration and noise. The cont

This collection of papers from a prestigious IMechE conference looks at the latest innovations and techniques from experts in the field of rotating machinery from industry and academia. Reflecting latest developments in air, gas, refrigeration and related systems, these conference transactions

will be of vital importance to all those equipment manufacturers, suppliers, users, and research organizations who wish to be well informed of developments and advances in this important field of engineering. Topics covered: Scroll Compressors Refrigeration Environmental Issues Screw Compressors Reciprocating Compressors Expanders Centrifugal Compressors Novel Designs Linear Compressors Numerical Modelling Operation and Maintenance

Root Cause Failure Analysis Provides the knowledge and failure analysis skills necessary for preventing and investigating process equipment failures Process equipment and piping systems are essential for plant availability and performance. Regularly exposed to hazardous service conditions and damage mechanisms, these critical plant assets can result in major failures if not effectively monitored and assessed—potentially causing serious injuries and significant business losses. When used proactively, Root Cause Failure Analysis (RCFA) helps reliability engineers inspect the process equipment and piping system before any abnormal conditions oc-

cur. RCFA is equally important after a failure happens: it determines the impact of a failure, helps control the resultant damage, and identifies the steps for preventing future problems. Root Cause Failure Analysis: A Guide to Improve Plant Reliability offers readers clear understanding of degradation mechanisms of process equipment and the concepts needed to perform industrial RCFA investigations. This comprehensive resource describes the methodology of RCFA and provides multiple techniques and industry practices for identifying, predicting, and evaluating equipment failures. Divided into two parts, the text first introduces Root Cause Analysis, explains the failure analysis process, and discusses the management of both human and latent error. The second part focuses on failure analysis of various components such as bolted joints, mechanical seals, steam traps, gearboxes, bearings, couplings, pumps, and compressors. This authoritative volume: Illustrates how failures are associated with part integrity, a complete system, or the execution of an engineering process Describes how proper design, operation, and maintenance of the equipment help to enhance their reliability

Covers analysis techniques and industry practices including 5-Why RCFA, fault tree analysis, Pareto charts, and Ishikawa diagrams Features a detailed case study of process plant machinery and a chapter on proactive measures for avoiding failures Bridging the gap between engineering education and practical application, Root Cause Failure Analysis: A Guide to Improve Plant Reliability is an important reference and guide for industrial professionals, including process plant engineers, planning managers, operation and maintenance engineers, process designers, chemical engineers, and instrument engineers. It is also a valuable text for researchers, instructors, and students in relevant areas of engineering and science.

Pressure Systems Casebook contains a collection of papers drawn from two IMechE seminars that will be of particular interest to students and engineers who want to broaden their knowledge and learn from experience and history. The authors' backgrounds cover a range of perspectives, from representing industrial users of pressure systems to regulators, research, and engineering consultants. Complete contents: Lessons from failures of gas cylin-

ders used for dispensing beverages Experience from Health and Safety laboratory investigations Insurance aspects of pressure systems failures Failure investigation for commercial purposes - system failures leading to the collapse of storage vessels under partial vacuum Reliable technical failure investigation Failure design procedures in the new European Pressure Vessel Standard EN 13445 Causes of vibration fatigue in process pipework - a new methodology to assess the risk Avoiding vibration-induced fatigue failures in process pipework Lessons learned from pressure system failures Pressure systems contain stored energy and the threat of damaging failure is ever present. Failures of pressure systems still occur and are costly to those affected; yet the main causes, consequences, and methods of investigation are not widely known. Pre-existing defects are a major cause of failures and near-failures in pressure systems, yet many can be avoided by greater awareness of the circumstances in which they arise.

This book reports on innovative research and developments in the broad field of transportation. It covers solutions relating to intelligent vehicles and infrastructure,

energy and combustion management, vehicle dynamics and control, as well as research on human factors, logistics and security. Contributions are based on peer-reviewed papers presented at the 12th international scientific conference "Transbaltica: Transportation Science and Technology", held virtually from Vilnius Gediminas Technical University, Lithuania, on September 16-17, 2021. All in all, this book offers extensive information on modern transport systems, with a good balance of theory and practice. .

Vibration problems dealing with advanced Mathematical and Numerical Techniques have extensive application in a wide class of problems in aeronautics, aerodynamics, space science and technology, off-shore engineering and in the design of different structural components of high speed space crafts and nuclear reactors. Different classes of vibration problems dealing with complex geometries and non-linear behaviour require careful attention of scientists and engineers in pursuit of their research activities. Almost all fields of Engineering, Science and Technology, ranging from small domestic building subjected to

earthquake and cyclone to the space craft venturing towards different planets, from giant ship to human skeleton, encounter problems of vibration and dynamic loading. This being truly an interdisciplinary field, where the mathematicians, physicists and engineers could interface their innovative ideas and creative thoughts to arrive at an appropriate solution, Bengal Engineering and Science University, Shibpur, India, a premier institution for education and research in engineering, science and technology felt it appropriate to organize 8th International Conference on "Vibration Problems (ICOVP-2007)" as a part of its sesquicentenary celebration. The conference created a platform and all aspects of vibration phenomenon with the focus on the state-of-the art in theoretical, experimental and applied research areas were addressed and the scientific interaction, participated by a large gathering including eminent personalities and young research workers, generated many research areas and innovative ideas.

In many plants, vibration and noise problems occur due to fluid flow, which can greatly disrupt smooth plant operations. These flow-related phenomena are

called Flow-Induced Vibration. This book explains how and why such vibrations happen and provides hints and tips on how to avoid them in future plant design. The world-leading author team doesn't assume prior knowledge of mathematical methods and provide the reader with information on the basics of modeling. The book includes several practical examples and thorough explanations of the structure, the evaluation method and the mechanisms to aid understanding of flow induced vibration. * Helps ensure smooth plant operations * Explains the structure, evaluation method and mechanisms * Shows how to avoid vibrations in future plant design

Since the 1970's, an increasing amount of specialized research has focused on the problems created by instability of internal flow in hydroelectric power plants. However, progress in this field is hampered by the interdisciplinary nature of the subject, between fluid mechanics, structural mechanics and hydraulic transients. Flow-induced Pulsation and Vibration in Hydroelectric Machinery provides a compact guidebook explaining the many different underlying physical mechanisms and their possible effects. Typical phenomena are de-

scribed to assist in the proper diagnosis of problems and various key strategies for solution are compared and considered with support from practical experience and real-life examples. The link between state-of-the-art CFD computation and notorious practical problems is discussed and quantitative data is provided on normal levels of vibration and pulsation so realistic limits can be set for future projects. Current projects are also addressed as the possibilities and limitations of reduced-scale model tests for prediction of prototype performance are explained. Engineers and project planners struggling with the practical problems will find Flow-induced Pulsation and Vibration in Hydroelectric Machinery to be a comprehensive and convenient reference covering key topics and ideas across a range of relevant disciplines.

The first of two books concentrating on the dynamics of slender bodies within or containing axial flow, Fluid-Structure Interaction, Volume 1 covers the fundamentals and mechanisms giving rise to flow-induced vibration, with a particular focus on the challenges associated with pipes conveying fluid. This volume has been thor-

oughly updated to reference the latest developments in the field, with a continued emphasis on the understanding of dynamical behaviour and analytical methods needed to provide long-term solutions and validate the latest computational methods and codes. In this edition, Chapter 7 from Volume 2 has also been moved to Volume 1, meaning that Volume 1 now mainly treats the dynamics of systems subjected to internal flow, whereas in Volume 2 the axial flow is in most cases external to the flow or annular. Provides an in-depth review of an extensive range of fluid-structure interaction topics, with detailed real-world examples and thorough referencing throughout for additional detail Organized by structure and problem type, allowing you to dip into the sections that are relevant to the particular problem you are facing, with numerous appendices containing the equations relevant to specific problems Supports development of long-term solutions by focusing on the fundamentals and mechanisms needed to understand underlying causes and operating conditions under which apparent solutions might not prove effective

Compression Machinery for Oil and Gas is

the go-to source for all oil and gas compressors across the industry spectrum. Covering multiple topics from start to finish, this reference gives a complete guide to technology developments and their applications and implementation, including research trends. Including information on relevant standards and developments in subsea and downhole compression, this book aids engineers with a handy, single resource that will help them

stay up-to-date on the compressors needed for today's oil and gas applications. Provides an overview of the latest technology, along with a detailed discussion of engineering. Delivers on the efficiency, range and limit estimations for machines. Pulls together multiple contributors to balance content from both academics and corporate research.

Focuses on applications for offshore platforms and piping; and, wind-induced vibra-

tion of buildings, bridges, and towers. This title also focuses on acoustic and mechanical vibration of heat exchangers, power lines, and process ducting.

""Written by engineers for engineers (with over 150 International Editorial Advisory Board members), this highly lauded resource provides up-to-the-minute information on the chemical processes, methods, practices, products, and standards in the chemical, and related, industries.