

Hydraulic Institute Engineering Data Book 9781880952016

The Science of Water: Concepts and Applications, Fourth Edition, contains a wealth of scientific information and is based on real-world experience. Building on the third edition, this text applies the latest data and research in the field and addresses water contamination as a growing problem. The book material covers a wide range of water contaminants and the cause of these contaminants and considers their impact on surface water and groundwater sources. It also explores sustainability and the effects of human use, misuse, and reuse of freshwater and wastewater on the overall water supply. Provides Valuable Insight for Water/Wastewater Practitioners Designed to fill a gap in the available material about water, the book examines water reserve utilization and the role of policymakers involved in the decision-making process. The book provides practical knowledge that practitioners and operators must have in order to pass licensure/certification tests and keep up with relevant changes. It also updates all previous chapters, presents numerous example math problems, and provides information not covered in earlier editions. Features: Is updated throughout and adds new problems, tables, and figures Includes new coverage on persistent chemicals in drinking water and the latest techniques in converting treated wastewater to safe drinking water Provides updated information on pertinent regulations dealing with important aspects of water supply and treatment The Science of Water: Concepts and Applications, Fourth Edition, serves a varied audience—it can be utilized by water/wastewater practitioners, as well as students, lay personnel, regulators, technical experts, attorneys, business leaders, and concerned citizens.

Front Cover; Practical Introduction to Pumping Technology; Copyright Page; Chapter 1. Parameters; Chapter 2. Pump Calculations; Chapter 3. Required Data for Specifying Pumps; Chapter 4. Pump Types; Chapter 5. Specifications; Chapter 6. Pump Curves; Chapter 7. Effects of Viscosity on Pump Performance; Chapter 8. Vibration; Chapter 9. Net Positive Suction Head (NPSH); Chapter 10. Pump Shaft Sealing; Chapter 11. Pump Bearings; Chapter 12. Metallurgy; Chapter 13. Pump Drivers; Chapter 14. Gears; Chapter 15. Couplings; Chapter 16. Pump Controls; Chapter 17. Instrumentation.

Rules of Thumb for Chemical Engineers, Fifth Edition, provides solutions, common sense techniques, shortcuts, and calculations to help chemical and process engineers deal with practical on-the-job problems. It discusses physical properties for proprietary materials, pharmaceutical and biopharmaceutical sector heuristics, and process design, along with closed-loop heat transfer systems, heat exchangers, packed columns, and structured packings. Organized into 27 chapters, the book begins with an overview of formulae and data for sizing piping systems for incompressible and compressible flow. It then moves to a discussion of design recommendations for heat exchangers, practical equations for solving fractionation problems, along with design of reactive absorption processes. It also considers different types of pumps and presents narrative as well as tabular comparisons and application notes for various types of fans, blowers, and compressors. The book also walks the reader through the general rules of thumb for vessels, how cooling towers are sized based on parameters such as return temperature and supply temperature, and specifications of refrigeration systems. Other chapters focus on pneumatic conveying, blending and agitation, energy conservation, and process modeling. Chemical engineers faced with fluid flow problems will find this book extremely useful. Rules of Thumb for Chemical Engineers brings together solutions, information and work-arounds that engineers in the process industry need to get their job done. New material in the Fifth Edition includes physical properties for proprietary materials, six new chapters, including pharmaceutical, biopharmaceutical sector heuristics, process design with simulation software, and guidelines for hazardous materials and processes Now includes SI units throughout alongside

Avoiding lengthy mathematical discussions, this reference specifically addresses issues affecting the day-to-day practices of those who design, operate, and purchase liquid pipelines in the oil, water, and process industries. Liquid Pipeline Hydraulics supplies an abundance of practical examples and applications for an in-depth understanding of liq

Hailed on first publication as a straightforward, practical, and to-the-point account of wastewater principles, practices, and operations for general readers, students, and wastewater operators in training and for all levels of operators at any level of licensure, Spellman's Standard Handbook for Wastewater Operators, Volumes I, II, and III almost

Hydraulic Institute Engineering Data BookEngineering Data BookHydraulic Institute Engineering Data BookEngineering Data BookEngineering Data BookLudwig's Applied Process Design for Chemical and Petrochemical PlantsElsevier

This book serves as a technical yet practical risk management manual for professionals working with water and wastewater organizations. It provides readers with a functional comprehension of water and wastewater operations as well as a broad understanding of industry derivations and various stakeholder interconnectivity. This knowledge is imperative, as most administrative professionals are proficient in their respective areas of expertise but sometimes lack fluency on the broader technical aspects of their organization's purpose, operations, and externalities. It also examines risk management best practices and provides an actionable review of doing the right thing, the right way, every time through a combination of core risk management principles. These include enterprise, strategic, operational, and reputational risk management, as well as risk assessments, risk/frequency matrixes, checklists, rules, and decision-making processes. Finally, the book addresses the importance of risk transfer through insurance policies and provides best practices for the prudent selection of these policies across different scenarios. Features: Provides an understanding of water and wastewater technical operations to properly implement sound risk management and insurance programs. Emphasizes the importance of building well-designed, resilient systems, such as policies, processes, procedures, protocol, rules, and checklists that are up to date and fully implemented across a business. Offers a detailed look into insurance policy terms and conditions and includes practical checklists to assist readers in structuring and negotiating their own policies. Handbook of Risk and Insurance Strategies for Certified Public Risk Officers and Other Water Professionals combines practical knowledge of technical water/wastewater operations along with the core subjects of risk management and insurance for practicing and aspiring professionals charged with handling these vital tasks for their organizations. Readers will also gain invaluable perspective and knowledge on best-in-class risk management and insurance practices in the water and wastewater industries.

Completely up-to-date coverage of water treatment facility design and operation This Second Edition of Susumu Kawamura's landmark volume offers comprehensive coverage of water treatment facility design, from the basic principles to the latest innovations. It covers a broad spectrum of water treatment process designs in detail and offers clear guidelines on how to choose the unit, process, and equipment that will maximize overall efficiency and minimize maintenance costs. This book also explores many important operational issues that affect today's plant operators and facility designers. This new edition introduces several new subjects, including value engineering, watershed management, dissolved air flotation process, filtered reservoir (clearwell) design, and electrical system design. It provides expanded and updated coverage of objectives for finished water quality, instrumentation and control, disinfection process, ozonation, disinfection by-product control, the GAC process, and the membrane filtration process. Other important features of this Second Edition include: * Practical guidance on the design of every water treatment plant component * New information on plant layout, cost estimation, sedimentation issues, and more * English and SI units throughout * Help in designing for compliance with water treatment-related government regulations Supplemented with hundreds of illustrations, charts, and tables, Integrated Design and Operation of Water Treatment Facilities, Second Edition is an indispensable, hands-on resource for civil engineers and managers, whether working on new facilities or redesigning and rebuilding existing facilities.

Rules of Thumb for Chemical Engineers, Sixth Edition, is the most complete guide for chemical and process engineers who need reliable and authoritative solutions to on-the-job problems. The text is comprehensively revised and updated with new data and formulas. The book helps solve process design problems quickly, accurately and safely, with hundreds of common sense techniques, shortcuts and calculations. Its concise sections detail the steps needed to answer critical design questions and challenges. The book discusses physical properties for proprietary materials, pharmaceutical and biopharmaceutical sector heuristics, process design, closed-loop heat transfer systems, heat exchangers, packed columns and structured packings. This book will help you: save time you no longer have to spend on theory or derivations; improve accuracy by exploiting well tested and accepted methods culled from industry experts; and save money by reducing reliance on consultants. The book brings together solutions, information and work-arounds from engineers in the process industry. Includes new chapters on biotechnology and filtration Incorporates additional tables with typical values and new calculations Features supporting data for selecting and specifying heat transfer equipment

NOTE: The Binder-ready, Loose-leaf version of this text contains the same content as the Bound, Paperback version. Fundamentals of Fluid Mechanics, 8th Edition offers comprehensive topical coverage, with varied examples and problems, application of visual component of fluid mechanics, and strong focus on effective learning. The text enables the gradual development of confidence in problem solving. The authors have designed their presentation to enable the gradual development of reader confidence in problem solving. Each important concept is introduced in easy-to-understand terms before more complicated examples are discussed. Continuing this book's tradition of extensive real-world applications, the 8th edition includes more Fluid in the News case study boxes in each chapter, new problem types, an increased number of real-world photos, and additional videos to augment the text material and help generate student interest in the topic. Example problems have been updated and numerous new photographs, figures, and graphs have been included. In addition, there are more videos designed to aid and enhance comprehension, support visualization skill building and engage students more deeply with the material and concepts.

Pipeline Planning and Construction Field Manual aims to guide engineers and technicians in the processes of planning, designing, and construction of a pipeline system, as well as to provide the necessary tools for cost estimations, specifications, and field maintenance. The text includes understandable pipeline schematics, tables, and DIY checklists. This source is a collaborative work of a team of experts with over 180 years of combined experience throughout the United States and other countries in pipeline planning and construction. Comprised of 21 chapters, the book walks readers through the steps of pipeline construction and management. The comprehensive guide that this source provides enables engineers and technicians to manage routine auditing of technical work output relative to technical input and established expectations and standards, and to assess and estimate the work, including design integrity and product requirements, from its research to completion. Design, piping, civil, mechanical, petroleum, chemical, project production and project reservoir engineers, including novices and students, will find this book invaluable for their engineering practices. Back-of-the envelope calculations Checklists for maintenance operations Checklists for environmental compliance Simulations, modeling tools and equipment design Guide for pump and pumping station placement

This book is designed to cover the standard topics in a basic fluid mechanics course in a streamlined manner that meets the learning needs of students better than the dense, encyclopedic manner of traditional texts. This approach helps students connect the math and theory to the physical world and practical applications and apply these connections to solving problems. The text lucidly presents basic analysis techniques and addresses practical concerns and applications, such as pipe flow, open-channel flow, flow measurement, and drag and lift. It offers a strong visual approach with photos, illustrations, and videos included in the text, examples and homework problems to emphasize the practical application of fluid mechanics principles

Introductory technical guidance for professional engineers, architects and construction managers interested in design of hospitals and medical clinics. Here is what is discussed: 1. ARCHITECTURAL DETAILS, 2. DRAINAGE SYSTEMS, 3. MEDICAL GAS AND VACUUM SYSTEMS, 4. HVAC SYSTEMS, 5. PLUMBING AND PIPING, 6. PLUMBING FIXTURES AND EQUIPMENT, 7. PLUMBING CRITERIA, 8. PUMBING SCHEMATICS AND SCHEDULES, 9. WATER SYSTEMS, 10. SITE PLANNING, 11. TRANSPORTATION, LOGISTICS, WAYFINDING, 12. WATER SUPPLY.

Hailed on its initial publication as a real-world, practical handbook, the second edition of Handbook of Water and Wastewater Treatment Plant Operations continues to make the same basic point: water and wastewater operators must have a basic skill set that is both wide and deep. They must be generalists, well-rounded in the sciences, cyber operations, math operations, mechanics, technical concepts, and common sense. With coverage that spans the breadth and depth of the field, the handbook explores the latest principles and technologies and provides information necessary to prepare for licensure exams. Expanded from beginning to end, this second edition provides a no-holds-barred look at current management issues and includes the latest security information for protecting public assets. It presents in-depth coverage of management aspects and security needs and a new chapter covering the basics of blueprint reading. The chapter on water and wastewater mathematics has tripled in size and now contains an additional 200 problems and 350 math system operational problems with solutions. The manual examines numerous real-world operating scenarios, such as the intake of raw sewage and the treatment of water via residual management, and each scenario includes a comprehensive problem-solving practice set. The text follows a non-traditional paradigm based on real-world experience and proven parameters. Clearly written and user friendly, this revision of a bestseller builds on the remarkable success of the first edition. This book is a thorough compilation of water science, treatment information, process control procedures, problem-solving techniques, safety and health information, and administrative and technological trends.

This expanded edition introduces new design methods and is packed with examples, design charts, tables, and performance diagrams to add to the practical understanding of how selected equipment can be expected to perform in the process situation. A major addition is the comprehensive chapter on process safety design considerations, ranging from new devices and components to updated venting requirements for low-pressure storage tanks to the latest NFPA methods for sizing rupture disks and bursting panels, and more. *Completely revised and updated throughout *The definitive guide for process engineers and designers *Covers a complete range of basic day-to-day operation topics

Engineering Fluid Mechanics guides students from theory to application, emphasizing critical thinking, problem solving, estimation, and other vital engineering skills. Clear, accessible writing puts the focus on essential concepts, while abundant illustrations, charts, diagrams, and examples illustrate complex topics and highlight the physical reality of fluid dynamics applications. Over 1,000 chapter problems provide the "deliberate practice"—with feedback—that leads to material mastery, and discussion of real-world applications provides a frame of reference that enhances student comprehension. The study of fluid mechanics pulls from chemistry, physics, statics, and calculus to describe the behavior of liquid matter; as a strong foundation in these concepts is essential across a variety of engineering fields, this text likewise pulls from civil engineering, mechanical engineering, chemical engineering, and more to provide a broadly relevant, immediately practicable knowledge base. Written by a team of educators who are also practicing engineers, this book merges effective pedagogy with professional perspective to help today's students become tomorrow's skillful engineers.

This is the first part of a two-volume work which comes at a time when oil producers are taking a close look at the economy of oilfield operation and redesign of production technology to

improve ultimate recovery. The very high cost, and risk, of the search for new oilfields demands the re-evaluation of production technology and reservoir engineering to improve the production characteristics of existing oilfields. It is the aim of this work that it will be instrumental in the improvement of the global enhancement of oil production and ultimate recovery. It is the outcome of extensive collaboration between experts in petroleum who have devoted their time to the lucid expression of the knowledge that they have acquired through experience in the evaluation and solution of field problems, and development of economic field processes. Oil production companies have been generous in their cooperation through assistance and encouragement to the authors and permission to publish data, designs and photographs. Together, the two books provide a detailed and comprehensive coverage of the subject. The physical and chemical properties of the fluids encountered by engineers in the field are clearly described. The properties, methods of separation, measurement, and transportation of these fluids (gases, condensate liquids derived from natural gas, crude oils and oilfield waters) are dealt with. Following a presentation of the fluids and their process technology, a series of chapters give a thorough discussion of every type of surface equipment that is encountered in the myriad aspects of oilfield operations, ranging from waterflooding to new enhanced oil recovery techniques. Included are all methods for pumping, water control, production logging and corrosion control. The coverage also extends to: well completion and work-over operations, methods for design and operation of underground gas storage, and a review of offshore technology. Surface Operations in Petroleum Production is therefore a comprehensive reference which will be invaluable for field production managers and engineers; as well as being an ideal text on production technology to complement the study of reservoir engineering.

Provides the definition, equations and derivations that characterize the foundation of fluid mechanics utilizing minimum mathematics required for clarity yet retaining academic integrity. The text focuses on pipe flow, flow in open channels, flow measurement methods, forces on immersed objects, and unsteady flow. It includes over 50 fully solved problems to illustrate each concept.; Three chapters of the book are reprinted from Fundamental Fluid Mechanics for the Practical Engineer by James W. Murdock.

Up to date and current with the latest technology, Spellman's Standard Handbook for Wastewater Operators: Volume II, Intermediate Level, Second Edition provides a study guide and resource in a compact format. This second of three volumes contains a compilation of wastewater treatment information, data, operational material, process control procedures and problem solving, safety and health information, new trends in wastewater treatment administration and technology, and numerous sample problem-solving practice sets, many based on actual tests. New in the Second Edition: Chapter on operator safety Reorganized table of contents Homework problems, examples, and figures While the handbook does not discuss the specific content of the examination, it reviews the job-related knowledge identified by the examination developers as essential for minimal competency. More than just a study guide, although it is immediately obvious to readers that the material presented will help them pass licensing exams, the book is designed for practical use and application. Building on the success of the first edition, the second edition contains revised and reorganized information that, if used wisely, helps readers obtain a passing score on certification exams and solve problems on the job.

Pumping Station Design, 3e is an essential reference for all professionals. From the expert city engineer to the new design officer, this book assists those who need to apply the fundamentals of various disciplines and subjects in order to produce a well-integrated pumping station that is reliable, easy to operate and maintain, and free from design mistakes. The depth of experience and expertise of the authors, contributors, and peers reviewing the content as well as the breadth of information in this book is unparalleled, making this the only book of its kind. * An award-winning reference work that has become THE standard in the field * Dispenses expert information on how to produce a well-integrated pumping station that will be reliable, easy to operate and maintain, and free from design mistakes * 60% of the material has been updated to reflect current standards and changes in practice since the book was last published in 1998 * New material added to this edition includes: the latest design information, the use of computers for pump selection, extensive references to Hydraulic Institute Standards and much more!

A must-read for any practicing engineer or student in this area There is a renaissance that is occurring in chemical and process engineering, and it is crucial for today's scientists, engineers, technicians, and operators to stay current. This book offers the most up-to-date and comprehensive coverage of the most significant and recent changes to petroleum refining, presenting the state-of-the-art to the engineer, scientist, or student. Useful as a textbook, this is also an excellent, handy go-to reference for the veteran engineer, a volume no chemical or process engineering library should be without.

The Handbook of Water and Wastewater Treatment Plant Operations is the first thorough resource manual developed exclusively for water and wastewater plant operators. Now regarded as an industry standard, this fourth edition has been updated throughout, and explains the material in easy-to-understand language. It also provides real-world case studies and operating scenarios, as well as problem-solving practice sets for each scenario. Features: Updates the material to reflect the developments in the field Includes new math operations with solutions, as well as over 250 new sample questions Adds updated coverage of energy conservation measures with applicable case studies Enables users to properly operate water and wastewater plants and suggests troubleshooting procedures for returning a plant to optimum operation levels Prepares operators for licensure exams A complete compilation of water science, treatment information, process control procedures, problem-solving techniques, safety and health information, and administrative and technological trends, this text serves as a resource for professionals working in water and wastewater operations and operators preparing for wastewater licensure exams. It can also be used as a supplemental textbook for undergraduate and graduate students studying environmental science, water science, and environmental engineering.

This handbook places emphasis on the importance of correct interpretation of pumping requirements, both by the user and the supplier. Completely reworked to incorporate the very latest in pumping technology, this practical handbook will enable you to understand the principles of pumping, hydraulics and fluids and define the various criteria necessary for pump and ancillary selection. The Pump Users Handbook will prove an invaluable aid in ordering pump equipment and in the recognition of fundamental operational problems.

Introductory technical guidance for civil engineers, mechanical engineers, environmental engineers and construction managers interested in planning, design, construction and operation of water supply systems. Here is what is discussed: 1. DOMESTIC WATER DISTRIBUTION 2. DOMESTIC WATER TREATMENT 3. PUMPING STATIONS FOR WATER SUPPLY SYSTEMS 4. TREATED WATER STORAGE 5. WATER DESALINATION 6. WATER DISTRIBUTION IN COLD REGIONS 7. WATER DISTRIBUTION SYSTEM APPURTENANCES 8. WATER SAMPLING AND TESTING 9. WATER SUPPLY SOURCES 10. WATER SUPPLY SYSTEMS OPERATION AND MAINTENANCE 11. TREATMENT AND STORAGE IN COLD REGIONS 12. PUMPS OPERATION AND MAINTENANCE.

This book covers liquid pipeline hydraulics as it applies to transportation of liquids through pipelines in a single phase steady state environment. It will serve as a practical handbook for engineers, technicians and others involved in design and operation of pipelines transporting liquids. Currently, existing books on the subject are mathematically rigorous, theoretical and lack practical applications. Using this book,

engineers can better understand and apply the principles of hydraulics to their daily work in the pipeline industry without resorting to complicated formulas and theorems. Numerous examples from the author's real life experience are included to illustrate application of pipeline hydraulics.

Introductory technical guidance for civil and environmental engineers and other professional engineers and construction managers interested in domestic water treatment and wastewater collection and treatment. Here is what is discussed: 1. ACTIVATED SLUDGE WASTEWATER TREATMENT PLANTS 2. ADVANCED WASTEWATER TREATMENT 3. AREA DRAINAGE SYSTEMS 4. DOMESTIC WASTEWATER TREATMENT 5. DOMESTIC WATER DISTRIBUTION 6. DOMESTIC WATER TREATMENT 7. HYDRAULIC DESIGN DATA FOR CULVERTS 8. HYDRAULIC DESIGN OF SEWERS 9. LOW IMPACT DEVELOPMENT 10. OILY WASTEWATER COLLECTION AND TREATMENT 11. DRAINAGE PIPE STRENGTH, COVER AND BEDDING 12. PRELIMINARY WASTEWATER TREATMENT 13. PRIMARY WASTEWATER TREATMENT 14. PUMPING STATIONS FOR WATER SUPPLY SYSTEMS 15. SLUDGE HANDLING, TREATMENT AND DISPOSAL 16. SMALL FLOW WASTE TREATMENT SYSTEMS 17. TREATED WATER STORAGE 18. WASTEWATER COLLECTION AND PUMPING.

Provides a bibliography of more than three thousand handbooks in various aspects of science and technology, from abrasives and band structures to yield strength and zero defects

A comprehensive introduction to turbomachines and their applications With up-to-date coverage of all types of turbomachinery for students and practitioners, Fundamentals of Turbomachinery covers machines from gas, steam, wind, and hydraulic turbines to simple pumps, fans, blowers, and compressors used throughout industry. After reviewing the history of turbomachinery and the fluid mechanical principles involved in their design and operation, the book focuses on the application and selection of machines for various uses, teaching basic theory as well as how to select the right machine for a specific use. With a practical emphasis on engineering applications of turbomachines, this book discusses the full range of both turbines and pumping devices. For each type, the author explains: * Basic principles * Preliminary design procedure * Ideal performance characteristics * Actual performance curves published by the manufacturers * Application and appropriate selection of the machine Throughout, worked sample problems illustrate the principles discussed and end-of-chapter problems, employing both SI and the English system of units, provide practice to help solidify the reader's grasp of the material.

This complete revision of Applied Process Design for Chemical and Petrochemical Plants, Volume 1 builds upon Ernest E. Ludwig's classic text to further enhance its use as a chemical engineering process design manual of methods and proven fundamentals. This new edition includes important supplemental mechanical and related data, nomographs and charts. Also included within are improved techniques and fundamental methodologies, to guide the engineer in designing process equipment and applying chemical processes to properly detailed equipment. All three volumes of Applied Process Design for Chemical and Petrochemical Plants serve the practicing engineer by providing organized design procedures, details on the equipment suitable for application selection, and charts in readily usable form. Process engineers, designers, and operators will find more chemical petrochemical plant design data in: Volume 2, Third Edition, which covers distillation and packed towers as well as material on azeotropes and ideal/non-ideal systems. Volume 3, Third Edition, which covers heat transfer, refrigeration systems, compression surge drums, and mechanical drivers. A. Kayode Coker, is Chairman of Chemical & Process Engineering Technology department at Jubail Industrial College in Saudi Arabia. He's both a chartered scientist and a chartered chemical engineer for more than 15 years. and an author of Fortran Programs for Chemical Process Design, Analysis and Simulation, Gulf Publishing Co., and Modeling of Chemical Kinetics and Reactor Design, Butterworth-Heinemann. Provides improved design manuals for methods and proven fundamentals of process design with related data and charts Covers a complete range of basic day-to-day petrochemical operation topics with new material on significant industry changes since 1995.

This three-volume series is designed to prepare waterworks operators for certification and licensure exams. Volume 1 is the only such volume based on the recently amended Safe Drinking Water Act and provides the tools to understand the microbiological and chemical hazards of water in light of the quality standards treatment plants must achieve. With its clear explanations of basic math, hydraulics, electricity and plant processes, it prepares the drinking water plant operator for further study of all aspects of drinking water operations, including purification and distribution. Abundant cases, problems, and a full-scale battery of examination questions enable the reader to apply the book's lessons into practice both on the job and in the classroom Volume 2 is designed to give the experienced operator the means to advance to higher levels. Its content has been selected and organized in accord with SDWA requirements for the continuing education of operators. After reviewing basic math, this volume presents information and calculations for critical areas of operator responsibility - from intake, disinfection and pumping through odor control and distribution. Self-check questions and a final examination enable the reader to monitor progress and prepare for certification and licensure testing. Volume 3 is intended for advanced operators. It represents an in-depth treatment of plant processes and operations, and stresses troubleshooting and problem solving. Questions and answers are included, plus an entire sample test suitable for self-study prior to licensure examinations.

Original edition: Munson, Young, and Okiishi in 1990.

This is the only book series devoted to explaining the full range of specialized areas required of water and wastewater plant operators. Each volume is designed to give operators the basic knowledge of a subject needed for certification, licensure, and improved job performance. Checkpoints, self-tests and a final examination with questions based on

At last, a book that covers safety procedures and standards with information that is rarely available outside of proprietary materials. A comprehensive source for basic and essential operations and procedures in use in any facility, the book offers chemical operators and first line supervisors guidance in applying appropriate practices to prevent accidents, and suggests which practices to avoid.

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