Transport Phenomena Fundamentals Joel Plawsky Solutions

Catalytic Naphtha Reforming, Second Edition presents modern, crystal-clear explanations of every aspect of this critical process for generating high-octane reformate products for gasoline blending and production of benzene, toluene, and xylene (BTX) aromatics. The book details the chemistry of naphtha reforming, the preparation and characterization of catalysts, and the very latest commercial technologies and industrial applications. With more than 300 tables and figures, it addresses the development of new catalysts and revamp process improvements propelled by regulations on sulfur, benzene, and oxygenate content in gasoline and refinery pressure to maximize utilization of existing assets.

This indispensable book describes lubricant additives, their synthesis, chemistry, and mode of action. All important areas of application are covered, detailing which lubricants are needed for a particular application. Laboratory and field performance data for each application is provided and the design of cost-effective, environmentally friendly technologies is fully explored. This edition includes new chapters on chlorohydrocarbons, foaming chemistry and physics, antifoams for nonaqueous lubricants, hydrogenated styrene–diene viscosity modifiers, alkylated aromatics, and the impact of REACh and GHS on the lubricant industry.

"Covers global and domestic competition, marketing strategies, operating expenses, and environmental and safety regulations for chemical professionals at all levels. Contains up-to-date mergers and acquisitions of chemical companies."

This text offers authoritative contributions from nearly 200 leaders in the field and new methods to enhance catalytic reactions. "Catalysis of Organic Reactions" covers approaches for designing, modifying, and altering catalysts for improved function, performance, and stability, procedures to reduce by-product formation, and cost-effective alterna

The fourth edition of Transport Phenomena Fundamentals continues with its streamlined approach to the subject, based on a unified treatment of heat, mass, and momentum transport using a balance equation approach. The new edition includes more worked examples within each chapter and adds confidence-building problems at the end of each chapter. Some numerical solutions are included in an appendix for students to check their comprehension of key concepts. Additional resources online include exercises that can be practiced using a wide range of software programs available for simulating engineering problems, such as, COMSOL(R), Maple(R), Fluent, Aspen, Mathematica, Python and MATLAB(R), lecture notes, and past exams. This edition incorporates a wider range of problems to expand the utility of the text beyond chemical engineering. The text is divided into two parts, which can be used for teaching a two-term course. Part I covers the balance equation in the context of diffusive transport--momentum, energy, mass, and charge. Each chapter adds a term to the balance equation, highlighting that term's effects on the physical behavior of the system and the underlying mathematical description. Chapters familiarize students with modeling and developing mathematical expressions based on the analysis of a control volume, the derivation of the governing differential equations, and the solution to those

equations with appropriate boundary conditions. Part II builds on the diffusive transport balance equation by introducing convective transport terms, focusing on partial, rather than ordinary, differential equations. The text describes paring down the full, microscopic equations governing the phenomena to simplify the models and develop engineering solutions, and it introduces macroscopic versions of the balance equations for use where the microscopic approach is either too difficult to solve or would yield much more information that is actually required. The text discusses the momentum, Bernoulli, energy, and species continuity equations, including a brief description of how these equations are applied to heat exchangers, continuous contactors, and chemical reactors. The book introduces the three fundamental transport coefficients: the friction factor, the heat transfer coefficient, and the mass transfer coefficient in the context of boundary layer theory. Laminar flow situations are treated first followed by a discussion of turbulence. The final chapter covers the basics of radiative heat transfer, including concepts such as blackbodies, graybodies, radiation shields, and enclosures.

During the upgrading of heavy petroleum, asphaltene is the most problematic impurity since it is the main cause of catalyst deactivation and sediments formation. Exploring many aspects related to asphaltenes composition and conversion, Asphaltenes: Chemical Transformation during Hydroprocessing of Heavy Oils highlights the various changes that these heavy and complex molecules undergo during catalytic hydroprocessing. After defining and characterizing asphaltene structure, the book examines the composition of petroleum and the processes and catalysts for upgrading heavy oils. It then details the characterization of asphaltenes after hydroprocessing and the effect of reaction conditions on their structures. The authors also analyze the deactivation and characterization of spent hydroprocessing catalysts as well as the role played by asphaltenes. They cover sediments formation during hydroprocessing and the role of asphaltenes on it. The final chapters describe the hydrocracking and kinetics of asphaltenes and the fractionation of heavy crudes and asphaltenes. Due to the increasing production of heavy crude oils, asphaltene has become one of the most studied molecules. This book provides a deep understanding of how asphaltenes transform during hydroprocessing, offering insight on designing catalysts and processing for the upgrading of heavy oils.

Hydrate research has expanded substantially over the past decade, resulting in more than 4,000 hydrate-related publications. Collating this vast amount of information into one source, Clathrate Hydrates of Natural Gases, Third Edition presents a thoroughly updated, authoritative, and comprehensive description of all major aspects of natural gas cla

Although the practice of chemical engineering has broadened to encompass problems in a range of disciplines, including biology, biochemistry, and nanotechnology, one of the curriculum's foundations is built upon the subject of transport phenomena. Transport Phenomena Fundamentals, Second Edition provides a unified treatment of heat, mass, and momentum transport based on a balance equation approach. Designed for a two-term course Used in a two-term transport phenomena sequence at Rensselaer Polytechnic Institute, this text streamlines the approach to how the subject is taught. The first part of the book takes students through the balance equation in the context of diffusive transport, be it momentum, energy, mass, or charge. Each chapter adds a term to the balance equation, highlighting the effects of that addition on the

physical behavior of the system and the underlying mathematical description. The second half of the book builds upon the balance equation description of diffusive transport by introducing convective transport terms, focusing on partial rather than ordinary differential equations. The Navier–Stokes and convective transport equations are derived from balance equations in both macroscopic and microscopic forms. Includes examples and problems drawn from Comsol® software The second edition of this text is now enhanced by the use of finite element methods in the form of examples and extended homework problems. A series of example modules are associated with each chapter of the text. Some of the modules are used to produce examples in the text, and some are discussed in the homework at the end of each chapter. All of the modules are located online at an accompanying website which is designed to be a living component of the course. (available on the download tab)

Illustrating techniques in model development, signal processing, data reconciliation, process monitoring, quality assurance, intelligent real-time process supervision, and fault detection and diagnosis, Batch Fermentation offers valuable simulation and control strategies for batch fermentation applications in the food, pharmaceutical, and chemical industries. The book provides approaches for determining optimal reference trajectories and operating conditions; estimating final product quality; modifying, adjusting, and enhancing batch process operations; and designing integrated real-time intelligent knowledge-based systems for process monitoring and fault diagnosis.

Handbook of Refinery Desulfurization describes the operation of the various desulfurization process units in a petroleum refinery. It also explains the processes that produce raw materials for the petrochemical industry. It illustrates all the possible processes to lower the sulfur contents in petroleum and its fractions to decrease emissions of sulfur oxides. This book introduces you to desulfurization concepts, including biodesulfurization, as well as technology, giving guidance on how to accomplish desulfurization in various refining processes. It contains background chapters on the composition and evaluation of feedstocks and includes diagrams and tables of feedstocks and their respective produce. It also outlines how to decide which method should be employed to remove sulfur from different feedstocks. A practical and thorough discussion of the field, Handbook of Refinery Desulfurization gives you a strong grasp of the various processes involved with industrial desulfurization while giving you pointers on which procedures to use under certain conditions.

Polymer Processing Instabilities: Control and Understanding offers a practical understanding of the various flows that occur during the processing of polymer melts. The book pays particular attention to flow instabilities that affect the rate of production and the methods used to prevent and eliminate flow instabilities in order to increase production rates and enhance manufacturing efficiency. Polymer Processing Instabilities: Control and Understanding summarizes experimental observations of flow instabilities that occur in numerous processing operations such as extrusion, injection molding, fiber spinning, film casting, and film blowing for a wide range of materials, including most commodity polymers

that are processed as melts at temperatures above their melting point or as concentrated solutions at lower temperatures. The book first presents the fundamental principles in rheology and flow instabilities. It relates the operating conditions with flow curves, the critical wall shear stress for the onset of the instabilities, and new visualization techniques with numerical modeling and molecular structure. It reviews one-dimensional phenomenological relaxation/oscillation models describing the experimental pressure and flow rate oscillations, analyzes the gross melt fracture (GMF) instability, and examines how traditional and non-traditional processing aids eliminate melt fracture and improve polymer processability. It supplies a numerical approach for the investigation of the linear viscoelastic stability behavior of simplified injection molding flows and examines a newly discovered family of instabilities that occur in co-extrusion. Polymer Processing Instabilities: Control and Understanding is unique in that it fills a gap in the polymer processing literature where polymer flow instabilities are not treated in-depth in any book. It summarizes state-of-the-art developments in the field, particularly those of the last ten years, and contains significant data based on this research.

Apply an Omnibus of Knowledge from Leaders in the Field The unexpected diversity of topics presented at previous gatherings forced organizers of 2008's 22nd Conference on Catalysis of Organic Reactions to expand its format to reflect the remarkable current degree of specialization in the field. Catalysis of Organic Reactions contains a compilation of papers presented at the event, and subsequently, few books will be able to match the breadth and depth of its content. Featuring papers by respected scientists from academia, industry, and the governmental research-and-development sector, it covers various aspects of the production, sale, and use of catalysts for practical purposes. Articles concentrate on the general area of catalyzed synthesis, emphasizing the production of organic chemicals. With a focus on application rather than theory, the dominant theme is the traditionally practiced area of heterogeneous catalysis. Topics include: Hydrogenation and hydrogenolysis C-C coupling Amination and oxidation (including the precious metal, supported base metal, and sponge metal, Raney process, and homogeneous catalyst types) End uses of products, including industrial petrochemicals, fine chemicals, and pharma intermediates Those working with applied catalysis will benefit greatly from this consolidation of insights and reviews of the latest developments in the field. Each of the papers presented were edited by ORCS members, drawn from both academia and industry, and peer-reviewed by experts in related fields of study.

Used lubricating oil is a valuable resource. However, it must be re-refined mainly due to the accumulation of physical and chemical contaminants in the oil during service. Refining Used Lubricating Oils describes the properties of used lubricating oils and presents ways these materials can be re-refined and converted into useful lubricants as well as other products. It provides an up-to-date review of most of the processes for used lubricating oil refining that have

been proposed or implemented in different parts of the world, and addresses feasibility and criteria for selecting a particular process. The book begins with an overview of lubricating oil manufacturing, both petroleum-based and synthetic-based. It reviews the types and properties of lubricating oils and discusses the characteristics and potential of used lubricating oils. The authors describe the basic steps of used oil treatment including dehydration, distillation or solvent extraction, and finishing. They explore the combustion of used oil for use as fuel, covering chemistry and equipment, fuel oil properties, and combustion emissions. The book considers alternative processing options such as refinery processing and re-refining. It also reviews the major refining processes that have been suggested over the years for used oil. These include acid/clay, simple distillation, combinations of distillation and hydrogenation, solvent extraction, filtration, and coking processes. The book addresses economic, life cycle assessment, and other criteria for evaluating the attractiveness of an oil recycling project, examining various costs and presenting an economic evaluation method using an Excel spreadsheet that can be downloaded from the publisher's website. The book concludes with a chapter offering insights on how to choose the most suitable process technology.

This reference outlines the fundamental concepts and strategies for economic assessments for informed management decisions in industry. The book illustrates how to prepare capital cost and operating expense estimates, profitability analyses, and feasibility studies, and how to execute sensitivity and uncertainty assessments. From financial reports to opportunity costs and engineering trade-offs, Process Engineering Economics considers a wide range of alternatives for profitable investing and for projecting outcomes in various chemical and engineering fields. It also explains how to monitor costs, finances, and economic limitations at every stage of chemical project design, preparation, and evaluation.

Improvements in software, instrumentation, and feedback control as well as deepening linkages between fundamental aspects of process technology have vastly changed the practice of industrial process control. Newcomers to the field must have a strong understanding of the new demands and capabilities of modern process control operations. Reflecting these changes, Introduction to Process Control infuses traditional topics with industry-based practices that provide more integrated process operation, control, and information systems. The authors adopt a thoughtfully conceived approach that follows a "Continuing Problem" throughout the text, adding new concepts and strategies to the example, which culminates in a complete control design strategy. This fully realized system is implemented in MATLAB®, with software downloads available from the CRC Web site. This approach not only provides seamless continuity, but also addresses the plantwide control problem and engenders hands-on, step-by-step understanding of how the concepts apply to real processes. The book introduces data processing and reconciliation along with process monitoring as

integral components of overall control system architecture. Along with an introduction to modern architectures of industrial computer control systems, Introduction to Process Control offers unique and unparalleled coverage of the expanded role of process control in modern industry, from modeling the process to implementing a plant-wide system.

Bubbles, Drops, and Particles in Non-Newtonian Fluids, Second Edition continues to provide thorough coverage of the scientific foundations and the latest advances in particle motion in non-Newtonian media. The book demonstrates how dynamic behavior of single particles can yield useful information for modeling transport processes in complex multiphase flows. Completely revised and expanded, this second edition covers macroscopic momentum and heat/mass transfer from a single rigid or fluid particle or ensembles of particles involving strong inter-particle interactions including packed beds, fluidized beds, and porous media with different types of non-Newtonian fluids. It reflects advances made since the publication of the previous, bestselling edition with new material on topics such as extensional flow; time-independent, time-dependent and visco-elastic fluids; free settling behavior of non-spherical particles; and particle motion in visco-elastic and visco-plastic fluids, boundary layer flows, flows in porous media, and falling object rheometry. An excellent reference and handbook dealing with the technological aspects of non-Newtonian materials encountered in nature and in technology, this book highlights qualitative differences between the response of a Newtonian and non-Newtonian fluids in the complex flows encountered in processing applications.

This handbook presents the outlook for future production and consumption of MTBE and other oxygenates worldwide and studies new catalytic systems and modern methods for the synthesis and commercial production of methyl tertiary-butyl ether (MTBE) and related ethers. The scope of this sophisticated guide extends from process chemistry fundamentals and reaction kinetics to environmental remediation technologies and industry responses to conflicting calls for MTBE phase-out and higher-octane products. Well-illustrated with over 200 figures and tables, this authoritative Handbook details bioremediation, air stripping, and oxidation and adsorption processes for MTBE removal.

The chemistry of metals has traditionally been more understood than that of its oxides. As catalytic applications continue to grow in a variety of disciplines, Metal Oxides: Chemistry and Applications offers a timely account of transition-metal oxides (TMO), one of the most important classes of metal oxides, in the context of catalysis. The first part of the book examines the crystal and electronic structure, stoichiometry and composition, redox properties, acid-base character, and cation valence states, as well as new approaches to the preparation of ordered TMO with extended structure of texturally defined systems. The second part compiles some practical aspects of TMO applications in materials science, chemical sensing, analytical chemistry, solid-state chemistry, microelectronics, nanotechnology, environmental decontamination, and fuel cells. The book examines many types of reactions - such as dehydration, reduction, selective oxidations, olefin metathesis, VOC removal, photo- and electrocatalysis, and water splitting - to elucidate how chemical composition and optical, magnetic, and structural properties of oxides affect their surface reactivity in catalysis. Drawing insight from leading international experts, Metal Oxides: Chemistry and Applications is a comprehensive and interdisciplinary reference for researchers that may also be used by

newcomers as a guide to the field.

Interest in structured catalysts is steadily increasing due to the already proven, as well as potential, advantages of these catalysts. Updating the comprehensive coverage of the first edition published in 1998 with the latest science and applications, Structured Catalysts and Reactors, Second Edition gives detailed information on all aspects of structured catalysts and reactors, including: materials, mass transfer, selectivity, activity, and stability; catalyst preparation, design, and characterization; process development; modeling and optimization; reactor design; and operation costs and considerations. The book first examines how monolithic catalysts are used to clean exhaust gas from gasoline engines, treat industrial off-gases, burn fuels in commercial settings, and synthesize chemicals in two- and three-phase processes. It discusses configurations, microstructure, physical properties, and manufacture of ceramic and metallic monoliths before directing its focus to arranged catalysts and structured packings in terms of mass transfer. The book then explores catalytically active membranes and filters, featuring metallic membranes, permeation mechanisms, preparation and modeling, commercial membranes, and the latest applications, such as zeolitic membranes. Finally, several chapters present techniques for incorporating catalytic species into the structured catalyst support and controlling catalyst nanoporosity. This book conveys the scientific as well as economic advantages of using these unconventional catalytic techniques. With over 1500 references, tables, drawings, and photographs, as well as in-depth discussions and a new approach to catalytic processes, Structured Catalysts and Reactors, Second Edition is an essential reference for anyone working with or studying catalysis.

The first guide to compile current research and frontline developments in the science of process intensification (PI), Re-Engineering the Chemical Processing Plant illustrates the design, integration, and application of PI principles and structures for the development and optimization of chemical and industrial plants. This volume updates professionals on emerging PI equipment and methodologies to promote technological advances and operational efficacy in chemical, biochemical, and engineering environments and presents clear examples illustrating the implementation and application of specific process-intensifying equipment and methods in various commercial arenas.

Keeping pace with current trends in solvent production, this volume builds upon its previous edition with broader coverage of safe handling practices, health effects, physical properties, and chemical synthesis routes to some of the most important organic solvents used in the chemical and allied process industries. This handy reference features a glossary of solvent terminology and an easy-to-reference index of synonyms for chemicals and solvents. The Second Edition features new and updated chapters on the major classes of organic solvents, descriptions for general use, and the chemical formulation, thermodynamic properties, health and toxicity, and combustible characteristics of solvents.

"Second Edition expands and updates information on the technological aspects of refining heavy oils, residua, bitumen, and other high-sulfur feedstocks. Focuses on the range of next-generation refining processes."

The supply of petroleum continues to dwindle at an alarming rate, yet it is the source of a range of products- from gasoline and diesel to plastic, rubber, and synthetic fiber. Critical to the future of this commodity is that we learn to use it more judiciously and efficiently. Fundamentals of Petroleum and Petrochemical Engineering provides a holi

Advances in processing methods are not only improving the quality and yield of lubricant base stocks, they are also reducing the dependence on more expensive crude oil starting materials. Process Chemistry of Lubricant Base Stocks provides a comprehensive understanding of the chemistry behind the processes involved in petroleum base stock production from crude oil fractions. This book examines hydroprocessing technologies that, driven by the demand for higher performance in finished lubricants, have transformed processing treatments throughout

the industry. The author relates the properties of base stocks to their chemical composition and describes the process steps used in their manufacture. The book highlights catalytic processes, including hydrocracking, hydrofinishing, and catalytic dewaxing. It also covers traditional solvent-based separation methods used to remove impurities, enhance performance, and improve oxidation resistance. The final chapters discuss the production of Food Grade white oils and paraffins and the gas-to-liquids processes used to produce highly paraffinic base stocks via Fischer-Tropsch chemistry. Process Chemistry of Lubricant Base Stocks provides historical and conceptual background to the technologies used to make base stocks, thorough references, and a unique emphasis on chemical, not just engineering, aspects of lubricant processing—making this book an ideal and practical reference for scientists across a wide range of disciplines.

Reduced time to market, lower production costs, and improved flexibility are critical success factors for batch processes. Their ability to handle variations in feedstock and product specifications has made them key to the operation of multipurpose facilities, and therefore quite popular in the specialty chemical, pharmaceutical, agricultural, and

Scientists and engineers have made significant advances over the last two decades to achieve feasible, cost-efficient processes for the large-scale production of alternative, environmentally friendly sources of energy. Alcoholic Fuels describes the latest methods for producing fuels containing varying percentages of alcohol alongside the var

This reference details particle characterization, dynamics, manufacturing, handling, and processing for the employment of multiphase reactors, as well as procedures in reactor scale-up and design for applications in the chemical, mineral, petroleum, power, cement and pharmaceuticals industries. The authors discuss flow through fixed beds, elutriation and entrainment, gas distributor and plenum design in fluidized beds, effect of internal tubes and baffles, general approaches to reactor design, applications for gasifiers and combustors, dilute phase pneumatic conveying, and applications for chemical production and processing. This is a valuable guide for chemists and engineers to use in their day-to-day work.

With demand for petroleum products increasing worldwide, there is a tendency for existing refineries to seek new approaches to optimize efficiency and throughput. In addition, changes in product specifications due to environmental regulations greatly influence the development of petroleum refining technologies. These factors underlie the need for t

Chemical Process Engineering presents a systematic approach to solving design problems by listing the needed equations, calculating degrees-of-freedom, developing calculation procedures to generate process specifications- mostly pressures, temperatures, compositions, and flow rates- and sizing equipment. This illustrative reference/text tabulates numerous easy-to-follow calculation procedures as well as the relationships needed for sizing commonly used equipment.

This work highlights contemporary approaches to resource utilization and

provides comprehensive coverage of technological advances in residuum conversion. It illustrates state-of-the-art engineering methods for the refinement of heavy oils, bitumen, and other high-sulphur feedstocks.

"Analyzes health and hazard risk assessment in commercial, industrial, and refining industries. Emphasizes legal requirements, emergency planning and response, safety equipment, process implementation, and occupational and environmental protection exposure guidelines. Presents applicatoins and calculations for risk analysis of real systems, as well

The third edition of Transport Phenomena Fundamentals continues with its streamlined approach to the subject of transport phenomena, based on a unified treatment of heat, mass, and momentum transport using a balance equation approach. The new edition makes more use of modern tools for working problems, such as COMSOL®, Maple®, and MATLAB®. It introduces new problems at the end of each chapter and sorts them by topic for ease of use. It also presents new concepts to expand the utility of the text beyond chemical engineering. The text is divided into two parts, which can be used for teaching a two-term course. Part I covers the balance equation in the context of diffusive transport—momentum, energy, mass, and charge. Each chapter adds a term to the balance equation, highlighting that term's effects on the physical behavior of the system and the underlying mathematical description. Chapters familiarize students with modeling and developing mathematical expressions based on the analysis of a control volume, the derivation of the governing differential equations, and the solution to those equations with appropriate boundary conditions. Part II builds on the diffusive transport balance equation by introducing convective transport terms, focusing on partial, rather than ordinary, differential equations. The text describes paring down the microscopic equations to simplify the models and solve problems, and it introduces macroscopic versions of the balance equations for when the microscopic approach fails or is too cumbersome. The text discusses the momentum, Bournoulli, energy, and species continuity equations, including a brief description of how these equations are applied to heat exchangers, continuous contactors, and chemical reactors. The book also introduces the three fundamental transport coefficients: the friction factor, the heat transfer coefficient, and the mass transfer coefficient in the context of boundary layer theory. The final chapter covers the basics of radiative heat transfer, including concepts such as blackbodies, graybodies, radiation shields, and enclosures. The third edition incorporates many changes to the material and includes updated discussions and examples and more than 70 new homework problems.

Strong theoretical and practical knowledge of process control is essential for plant practicing engineers and operators. In addition being able to use control hardware and software appropriately, engineers must be able to select or write computer programs that interface the hardware and software required to run a plant effectively. Designed to help readers understand control software and

strategies that mimic human activities, Fundamentals of Automatic Process Control provides an integrated introduction to the hardware and software of automatic control systems. Featured Topics Basic instruments, control systems, and symbolic representations Laplacian mathematics for applications in control systems Various disturbances and their effects on uncontrolled processes Feedback control loops and traditional PID controllers Laplacian analysis of control loops Tuning methods for PID controllers Advanced control systems Virtual laboratory software (included on CD-ROM) Modern plants require operators and engineers to have thorough knowledge of instrumentation hardware as well as good operating skills. This book explores the theoretical analysis of the process dynamics and control via a large number of problems and solutions spread throughout the text. This balanced presentation, coupled with coverage of traditional and advanced systems provides an understanding of industrial realities that prepares readers for the future evolution of industrial operations.

The immediate product extracted from oil and gas wells consists of mixtures of oil, gas, and water that is difficult to transport, requiring a certain amount of field processing. This reference analyzes principles and procedures related to the processing of reservoir fluids for the separation, handling, treatment, and production of quality petroleum oil and gas products. It details strategies in equipment selection and system design, field development and operation, and process simulation and control to increase plant productivity and safety and avoid losses during purification, treatment, storage, and export. Providing guidelines for developing efficient and economical treatment systems, the book features solved design examples that demonstrate the application of developed design equations as well as review problems and exercises of key engineering concepts in petroleum field development and operation.

Highlighting the major economic and industrial changes in the lubrication industry since the first edition, Synthetics, Mineral Oils, and Bio-Based Lubricants: Chemistry and Technology, Third Edition highlights the major economic and industrial changes in the lubrication industry and outlines the state of the art in each major lubricant application area. Chapters cover the use of lubricant fluids, growth or decline of market areas and applications, potential new applications, production capacities, and regulatory issues, including biodegradability, toxicity, and food production equipment lubrication. The highly-anticipated third edition features new and updated chapters including those on automatic and continuously variable transmission fluids, fluids for food-grade applications, oil-soluble polyalkylene glycols, functional bio-based lubricant base stocks, farnesene-derived polyolefins, estolides, bio-based lubricants from soybean oil, and trends in construction equipment lubrication. Features include: Contains an index of terms, acronyms, and analytical testing methods. Presents the latest conventions for describing upgraded mineral oil base fluids. Considers all the major lubrication areas: engine oils, industrial lubricants, food-grade applications,

greases, and space-age applications Includes individual chapters on lubricant applications—such as environmentally friendly, disk drive, and magnetizable fluids—for major market areas around the globe. In a single, unique volume, Synthetics, Mineral Oils, and Bio-Based Lubricants: Chemistry and Technology, Third Edition offers property and performance information of fluids, theoretical and practical background to their current applications, and strong indicators for global market trends that will influence the industry for years to come.

The latest advances in process monitoring, data analysis, and control systems are increasingly useful for maintaining the safety, flexibility, and environmental compliance of industrial manufacturing operations. Focusing on continuous, multivariate processes, Chemical Process Performance Evaluation introduces statistical methods and modeling techniques for process monitoring, performance evaluation, and fault diagnosis. This book introduces practical multivariate statistical methods and empirical modeling development techniques, such as principal components regression, partial least squares regression, input-output modeling, state-space modeling, and modeling process signals for trend analysis. Then the authors examine fault diagnosis techniques based on episodes, hidden Markov models, contribution plots, discriminant analysis, and support vector machines. They address controller process evaluation and sensor failure detection, including methods for differentiating between sensor failures and process upset. The book concludes with an extensive discussion on the use of data analysis techniques for the special case of web and sheet processes. Case studies illustrate the implementation of methods presented throughout the book. Emphasizing the balance between practice and theory, Chemical Process Performance Evaluation is an excellent tool for comparing alternative techniques for process monitoring, signal modeling, and process diagnosis. The unique integration of process and controller monitoring and fault diagnosis facilitates the practical implementation of unified and automated monitoring and diagnosis technologies.

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Presenting efficient and effective methods for developing dynamic simulations of chemical processes, this reference illustrates the techniques and fundamentals to develop, design, and test plantwide regulatory control schemes with commercial dynamic simulation packages. It provides case studies analyzing a wide variety of systems–ranging from simple units to complex interacting unit operations. The book offers strategies to move from steady-state simulations to dynamic simulations, install and tune controllers, size control valves and equipment, and add strip-chart recorders to simulations. It also provides access to website downloads of applications in HYSYS and AspenDynamics.

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