

FOURTH EDITION

A WORKING GUIDE TO *Process Equipment*



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Norman P. Lieberman
Elizabeth T. Lieberman

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A Working Guide To Process Equipment:

Working Guide to Process Equipment, Third Edition Norman Lieberman, Elizabeth Lieberman, 2008-05-18 Diagnose and Troubleshoot Problems in Chemical Process Equipment with This Updated Classic Chemical engineers and plant operators can rely on the Third Edition of A Working Guide to Process Equipment for the latest diagnostic tips practical examples and detailed illustrations for pinpointing trouble and correcting problems in chemical process equipment This updated classic contains new chapters on Control Valves Cooling Towers Waste Heat Boilers Catalytic Effects Fundamental Concepts of Process Equipment and Process Safety Filled with worked out calculations the book examines everything from trays reboilers instruments air coolers and steam turbines to fired heaters refrigeration systems centrifugal pumps separators and compressors The authors simplify complex issues and explain the technical issues needed to solve all kinds of equipment problems Comprehensive and clear the Third Edition of A Working Guide to Process Equipment features Guidance on diagnosing and troubleshooting process equipment problems Explanations of how theory applies to real world equipment operations Many useful tips examples illustrations and worked out calculations New to this edition Control Valves Cooling Towers Waste Heat Boilers Catalytic Effects and Process Safety Inside this Renowned Guide to Solving Process Equipment Problems Trays Tower Pressure Distillation Towers Reboilers Instruments Packed Towers Steam and Condensate Systems Bubble Point and Dew Point Steam Strippers Draw Off Nozzle Hydraulics Pumparounds and Tower Heat Flows Condensers and Tower Pressure Control Air Coolers Deaerators and Steam Systems Vacuum Systems Steam Turbines Surface Condensers Shell and Tube Heat Exchangers Fire Heaters Refrigeration Systems Centrifugal Pumps Separators Compressors Safety Corrosion Fluid Flow Computer Modeling and Control Field Troubleshooting Process Problems *A Working Guide to Process Equipment* Norman P. Lieberman, Elizabeth T. Lieberman, 1997 This guide offers explanations of the inner workings of equipment in petroleum refineries chemical and pharmaceutical plants fertilizer plants and other continuous process facilities **Working Guide to Process Equipment** ,2008 **A Working Guide to Process Equipment, Fifth Edition** Norman P. Lieberman, 2021-03-08 The latest methods for troubleshooting and maintaining process equipment While directed particularly at chemical and petroleum refining process equipment the new edition of A Working Guide to Process Equipment revised and fully up dated throughout remains applicable to a broad range of technicians and industries and explains how to diagnose troubleshoot and correct problems without complex equations and computer simulations without ever losing sight of the importance of direct field measurements and observations Nine new chapters cover Determining the Causes of Wet Steam Distillation Process Engineering Design Errors Technical Adventures from the Past Setting Pressure Relief Valves Applying Process Engineering Technology to Natural Gas Production Reduction of Flare Losses Suppressing CO2 Emissions and Energy Conservation A Final Word The Earth s Oxygen Content Evaluating Distillation Tray Capacity Filled with examples and illustrations the new edition of this practical resource continues to demonstrate how theory applies

to solving real world plant operation problems Selected hand calculation methods are also provided You ll gain insights from decades of work from the two authors solving process problems and carrying out test runs in the field revamping equipment for better efficiency and the questions and answers explored in the Lieberman s Process Equipment Troubleshooting Seminars conducted

A Working Guide to Process Equipment, Fourth Edition Norman P. Lieberman, Elizabeth T. Lieberman, 2014-03-14 The latest methods for troubleshooting and maintaining process equipment Applicable to a broad range of technicians and industries and fully updated throughout A Working Guide to Process Equipment Fourth Edition explains how to diagnose troubleshoot and correct problems with chemical and petroleum refining process equipment Nine new chapters cover Tray design details Shell and tube heat exchanger design details Relief valve system design Vapor lock and exchanger flooding in steam systems Steam generation operating and design details Wastewater strippers Thermodynamics how it applies to process equipment Centrifugal pumps reducing seal and bearing failures Hand calculations for distillation towers Vapor liquid equilibrium absorption and stripping calculations Filled with examples and illustrations this practical resource demonstrates how theory applies to solving real world plant operation problems Selected hand calculation methods are also provided Comprehensive coverage includes Distillation Tower Trays Tower Pressure Control Distillation Towers Reboilers Tower Internals Instruments Packed Towers Steam and Condensate Systems Bubble Point and Dew Point Steam Strippers Draw Off Nozzle Hydraulics Pumparounds and Tower Heat Flows Condensers and Tower Pressure Control Air Coolers Deaerators and Steam Systems Steam Generation Wastewater Strippers Vacuum Systems Steam Turbines Surface Condensers Shell and Tube Heat Exchangers Fired Heaters Refrigeration Systems Cooling Water Systems Catalytic Effects Centrifugal Pumps Control Valves Separators Centrifugal Compressors and Surge Reciprocating Compressors Corrosion Fluid Flow in Pipes Super Fractionation Stage Computer Control Field Troubleshooting

A Working Guide to Process Equipment Meenakshi Awasthi, 2015-03 This book includes the latest diagnostic tips practical examples and detailed illustrations for pinpointing trouble and correcting problems in chemical process equipment This updated classic contains new chapters on Control Valves Cooling Towers Waste Heat Boilers Catalytic Effects Fundamental Concepts of Process Equipment and Process Safety Filled with worked out calculations the book examines everything from trays reboilers instruments air coolers and steam turbines to fired heaters refrigeration systems centrifugal pumps separators and compressors

Working Guide to Process Equipment, Third Edition Norman P. Lieberman, 2008 Filled with worked out calculations chemical engineers and plant operators can rely on this updated classic for diagnostic tips practical examples and detailed illustrations for pinpointing trouble and correcting problems in chemical process equipment

Working Guide to Process Equipment Norman P. Lieberman, Elizabeth T. Lieberman, 2003 Working Guide to Process Equipment 2nd Ed carefully and clearly explains all the basic technical issues that you need to know to trouble shoot most process equipment problems This guide contains a wealth of useful diagnostic tips

worked out calculations practical examples and informative illustrations to help you quickly pinpoint trouble and repair typical malfunctions in Trayed and packed distillation towers Natural and forced reboilers Partial and total condensers Steam systems and deaerators Vacuum systems Fired heaters Shell and tube heat exchangers Centrifugal compressors Gas turbines and reciprocating engines Centrifugal pumps and motor drivers In no time at all this essential problem solving manual will become your most trusted on the job tool for dealing effectively with costly equipment malfunctions

Troubleshooting Vacuum Systems Norman P. Lieberman, 2012-12-03 Vacuum systems are in wide spread use in the petrochemical plants petroleum refineries and power generation plants The existing texts on this subject are theoretical in nature and only deal with how the equipment functions when in good mechanical conditions from the viewpoint of the equipment vendor Also the existing texts fail to consider the interaction of the vacuum system with the process equipment it serves and the variability of the motive steam conditions change in cooling water temperature condenser fouling and erosion of the ejectors Here are some of the many questions answered in this groundbreaking volume Why does my first stage jet make a surging sound during hot weather Why does the vacuum suddenly break I've seen moisture condensing on the jet's body What's causing that Why do I have to steam out the drain legs from our condensers Superheated steam is making our vacuum worse Is this normal How can I locate and measure air leaks Reducing the steam pressure to my jets improves vacuum But why I can't pull the pre condenser bundle The shell side is fouling What should I do We're not getting our normal horsepower from our steam turbine Could this be a jet problem Raising the seal drum level improves vacuum Is there an explanation for this Our turbine exhaust steam pressure to our surface condenser has doubled in the last two years What should we do Restricting cooling water flow from our elevated condensers improves vacuum Is this possible What's a converging diverging ejector all about What's the difference between a barometric condenser and a surface condenser Which is better

Petroleum Refining Design and Applications Handbook, Volume 1 A. Kayode Coker, 2018-09-05 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 With so many changes over the last few decades in equipment and processes petroleum refining is almost a living document constantly needing updating With no new refineries being built companies are spending their capital re tooling and adding on to existing plants Refineries are like small cities today as they grow bigger and bigger and more and more complex A huge percentage of a refinery can be changed literally from year to year to account for the type of crude being refined or to integrate new equipment or processes This book is 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 Written by one of the world's foremost authorities this book sets the standard for the industry and is an integral part of the petroleum refining renaissance It is truly a must

have for any practicing engineer or student in this area

Troubleshooting Process Plant Control Norman P.

Lieberman, 2017-04-03 Examines real life problems and solutions for operators and engineers running process controls Expands on the first book with the addition of five new chapters as well as new troubleshooting examples Written for the working operator and engineer with straightforward instruction not hinged on complex math Includes real life examples of control problems that commonly arise and how to fix them Emphasizes single and well established process engineering principles that will help working engineers and operators switch manual control loops to automatic control *Process Engineering and Plant Design* Siddhartha Mukherjee, 2021-12-28 The book provides the whole horizon of process engineering and plant design from concept phase through the execution to commissioning of the plant in the real practice Providing a complete industrial perspective the book Covers the guidelines and standards followed in the industry and how engineering documents are generated using these standards Describes Hazardous Area Classification Relief System Design Revamp Engineering Interaction with Other Disciplines and Pre commissioning and Commissioning Contains several illustrated practical examples which clarify the fundamentals to a raw chemical engineer Includes description of a complete chemical project from concept to commissioning Treating the topic from the perspective of an industrial employee with extensive experience in process engineering and plant design it aims to aid chemical and plant engineers to deal with decision making processes on strategic level management tasks and leading functions beside the technical know how **Process**

Engineering Norman P. Lieberman, 2017-04-10 This is not your average technical book Using a humorous and easy to understand approach to solving common process engineering problems this unique volume is the go to guide for any veteran or novice engineer in the plant office or classroom Textbooks are often too theoretical to help the average process engineer solve everyday problems in the plant and generic handbooks are often out of date and not comprehensive This guide focuses on the most common problems that every engineer faces and how to solve them The characters walk the reader through every problem and solution step by step through dialogues that literally occur every day in process plants around the world With over half a century of experience and many books videos and seminars to his credit Norm Lieberman is well known all over the world and has helped countless companies and engineers through issues with equipment processes and training This is the first time that this knowledge has appeared in a format like this quite unlike anything ever published before in books on process engineering This is a must have for any engineer working in process engineering **Managing CO2**

Emissions in the Chemical Industry Hans-Joachim Leimkühler, 2010-11-29 This unrivaled reference and handbook on this hot topic covers the technical and administrative aspects of CO₂ emissions with special reference to the chemical and petrochemical industry It also discusses energy efficient design cultural aspects and future developments answering such questions along the way as How can I measure and demonstrate the CO₂ emissions linked to my production How can I benefit from CO₂ neutral investments using the UNFCCC frame How can I reduce or avoid CO₂ emissions by technical

measures and new processes If CO₂ emissions cannot be avoided how is the capture and storage of CO₂ technically and economically feasible What are the upcoming technical developments regarding CO₂ reduction A highly useful practical and essential information source on one of the most pressing environmental topics of our times *Process Engineering* Michael Kleiber, 2023-11-20 Reading the book you can feel the long practical experience of the author The text is easy to read even where concepts can be complex The strong theoretical background of the author is well known from other publications In this book however the topics are presented on a level that every engineer and scientist in the chemical industry and process industry should know and can understand This book would have been very helpful at the beginning of my career to close the addressed gap Therefore I can strongly recommend it not only to all students close to their degree but also to engineers and scientists just starting their industrial career in the related industrial sectors that are subsumed under the term process industry chemical or petrochemical industry pharmaceutical industry food industry biochemical industry environmental technology etc The book is like an investment Doing a better job and getting a better job evaluation might pay for the book Prof Dr Ing Claus Fleischer Frankfurt University of Applied Sciences Process Engineering is based on almost 30 years of practical experience of the author in process simulation design and development The book is a missing link between students and practitioners The author has coached many graduates in their first months and knows what the typical questions are Coming from the university graduates often do not know which relevance their knowledge has and how to apply it in real life whereas established practitioners often stick to the narrow way of their experience forgetting that science continuously makes progress There is a gap to be bridged From his own professional experience the author covers many topics of the process engineering business but three guest contributions are a valuable supplement to the content of the third edition Already in the 2nd edition Verena Haas from BASF SE wrote an excellent chapter on dynamic process simulation For the new 3rd edition G kce Adali and Michael Benje added two chapters on digitalization and patents respectively Preparing the reader for the everyday business **Chemical Process Engineering Volume 1** Rahmat Sotudeh-Gharebagh, A. Kayode

Coker, 2022-05-03 Written by two of the most prolific and respected chemical engineers in the world this groundbreaking two volume set is the new standard in the industry offering engineers and students alike the most up to date comprehensive and state of the art coverage of processes and best practices in the field today This first new volume in a two volume set explores and describes integrating new tools for engineering education and practice for better utilization of the existing knowledge on process design Useful not only for students professors scientists and practitioners especially process chemical mechanical and metallurgical engineers it is also a valuable reference for other engineers consultants technicians and scientists concerned about various aspects of industrial design The text can be considered as a complementary text to process design for senior and graduate students as well as a hands on reference work or refresher for engineers at entry level The contents of the book can also be taught in intensive workshops in the oil gas petrochemical biochemical and process industries The

book provides a detailed description and hands on experience on process design in chemical engineering and it is an integrated text that focuses on practical design with new tools such as Excel spreadsheets and UniSim simulation software. Written by two industry and university's most trustworthy and well known authors, this book is the new standard in chemical, biochemical, pharmaceutical, petrochemical, and petroleum refining. Covering design, analysis, simulation, integration, and perhaps most importantly, the practical application of Microsoft Excel and UniSim software, this is the most comprehensive and up to date coverage of all of the latest developments in the industry. It is a must have for any engineer or student's library.

Ludwig's Applied Process Design for Chemical and Petrochemical Plants Incorporating Process Safety

Incidents A. Kayode Coker, 2024-07-10 Ludwig's Applied Process Design for Chemical and Petrochemical Plants Incorporating Process Safety. Incidents is ever evolving, starting with the first edition some 60 years ago. The volumes in this fifth edition provide improved techniques and fundamental design methodologies to guide the practicing engineer in designing process equipment and applying chemical processes to the properly detailed hardware. As indicative of the new title, process safety incidents are incorporated in many of the chapters, reviewing the root causes and how these could be mitigated in the future. Like its predecessor, this new edition continues to present updated information for achieving optimum operational and process conditions and to avoid problems caused by inadequate sizing and lack of internally detailed hardware. The volumes provide both fundamental theories where applicable and direct application of these theories to applied equations essential in the design effort. This approach in presenting design information is essential for troubleshooting process equipment and in executing system performance analysis. Volume 1B continues to cover mixing of liquids, process safety, and pressure relieving devices, metallurgy, and corrosion, and process optimization. It 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 new content on three phase separation, mixing of liquids, ejectors, and mechanical vacuum systems, process safety, and pressure relieving devices, metallurgy, and corrosion, and optimization of chemical process blending. Some chapters review pressure relieving devices and provide case studies for process safety incidents which are well illustrated from US Chemical Safety Hazard Investigation Board (www.csb.gov). Finally, this book contains a glossary of Petroleum and Petrochemical Terminologies and Physical and Chemical Characteristics of Major Hydrocarbons. Provides improved design manual for methods and proven fundamentals of process design with related data and charts. Covers complete range of basic day to day petrochemical operation topics. Extensively revised with new material added on three phase separation, metallurgy, and corrosion. Process safety management, HAZOP, and hazard analyses, and optimization of chemical process blending. Presents many examples using Honeywell UniSim Design software, developed and executable computer programs, and Excel spreadsheet programs. Includes case studies of process safety incidents, guidance for troubleshooting, and checklists. Includes Software of Conversion Table and 30 process data sheets in excel format.

Rules of Thumb for Chemical Engineers Stephen M Hall, 2012-07-27 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 Online calculation tools Excel workbooks guidelines for hazardous materials and processes and a searchable Rules of Thumb library are included 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 imperial and now accompanied by online calculation tools and a searchable Rules of Thumb library

Transfer and Stockpiling Operations in the Crude Oil Refining Industry Marcio Wagner da Silva, 2025-05-29 Transfer and Stockpiling Operations in the Crude Oil Refining Industry provides an overview of crude oil refining processes highlighting stockpiling operations which unfortunately tend to be underestimated in comparison with processing units operations like FCC and hydrotreating The book presents a deep analysis of the current context and challenges imposed on players in the downstream industry and how the stockpiling operations can help the refiners achieve flexibility and better competitive positioning How stockpiling managers can use their knowledge to call attention to stockpiling assets and manage process safety and performance adequately is described This book Offers a simplified approach to crude oil refining processes Discusses economic information related to the downstream business and the role of stockpiling operations in the refining business Introduces newer trends in the industry such as synergy between FCC and hydrocracking technologies as a strategy to maximize profitability and modern naphtha alkylation technologies as a safety route to achieve high quality and low sulfur gasoline Presents challenges related to adequate process safety and asset management in stockpiling operations Describes the main interfaces between the stockpiling operations of a crude oil refinery and relevant areas like midstream companies and how to

manage this relation Offering a contemporary view of current challenges and opportunities in the downstream oil and gas business this practical book is aimed at readers working in the fields of petroleum and chemical engineering calling attention to the relevance of stockpiling operations to the global results of the refineries **The Science of Economic Development and Growth: The Theory of Factor Proportions** C.C. Onyemelukwe, 2016-07-08 A theoretical framework aiming to facilitate study of development economics The author presents his theory in three sections how advanced nations developed a proposed third dimension in addition to labour and capital and why capital accumulation is unnecessary even potentially harmful

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