

FOURTH EDITION

A WORKING GUIDE TO *Process Equipment*



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Norman P. Lieberman
Elizabeth T. Lieberman

A Working Guide To Process Equipment

Norman P. Lieberman



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** 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 *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 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 **Rules of Thumb for Chemical Engineers** Stephen Hall, 2017-10-30 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 **Role of Chemical Engineering in Processing of Minerals and Materials**, 2003 *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 alkylolation 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

Sustainability Engineering for Enhanced Process Design and Manufacturing Profitability Jeffery P. Perl, 2024-03-11 Now in an expanded and revised second edition this book explores sustainability engineering through the lens of the manufacturing and chemical process industries to explain the safe and economical implementation of process designs to transform raw materials into valuable finished products The author applies the principles of sustainability science to engineering methodology for residential commercial and industrial applications that support the perpetual availability of raw materials through recycling reuse and repurposing to incorporate inexhaustible supplies and encompasses the management and conservation of these resources in a manner that minimizes negative environmental impacts New sections include Coverage of electric power opportunities and challenges solar wind and cogeneration Efficiency improvement as an energy supply extender Recycling as a material extender The book examines relevant energy policies driving and affecting commercial industrial and residential energy utilization and includes new industrial case studies Anyone involved in the design or manufacture of chemicals or the upgrade of existing manufacturing processes will benefit from this book's suggestions for identifying improvement options while adding the pivotal aspect of sustainability to the usual cost and safety equation optimization elements

Upstream, Midstream, Downstream Process simulation and Design Editoiu Mihail (author), 2021-07-01 The ebook shall drive you in a Simulation World from Upstream Midstream and Downstream Sectors Step by step simulation procedure including key technical parameters and neutral layout to be implemented in any available flowsheet simulator thermo package recommendation and design tips specific for each type of presented Unit Process ALL necessary information to build a professional simulation are included Starting from Upstream processes like FPSO GOSP then passing to Midstream with Mercury Removal Amine Unit Glycol Molecular Sieve Dehydration NGL Recovery and complete Fractionation Train then arriving Downstream to Refinery where Crude Vacuum Condensate Distillation Units are touch various Strippers like NHT

Distillate VGO Reformate Splitter and Stripper are presented FCC Hydrocracking Separation Sections Saturated Gas Plant Sour Water Stripping Unit plus Sulfur Recovery TGT and finally to Petrochemical sector where PP Splitter with heat pump BT Fractionation and Aromatic Separation are give out Also four special chapters are part of the ebook MDMT rigorous calculation including tensile stress of wall expose to fire with practical examples one vessel and multiple equipment protected by the same depressurization valve HIPPS implementation for FPSO and Toluene Separation dynamic simulation layout with integrator settings and various scenarios CPA validation against experimental data with extensive graphs showing equilibrium for various literatures available experimental data and Divided Wall Column DWC Opex Capex quick tips and simulation optimization tricks The above four special chapters are a must considering that in Upstream MDMT rigorous calculation is vital CPA validation against experimental data used to compute necessary flow rate of hydrate inhibitor MeOH Mercury distribution between vapor liquid and water phases are essential HIPPS to minimize flare loads with Upstream Downstream applications and the last one but important the DWC which gain more and more in all sectors At the end of each chapter the reader shall find Take Away section with useful technical information to be discovered 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 *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.

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 retooling 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 in 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, 2024-09-11. A practical and engaging guide to running process controls in petrochemical plants and refineries. Process control is an area of study dealing with controlling variables that emerge in process plants such as chemical plants, wastewater purification plants or refineries. Existing guides to process control are numerous but they tend to be associated with control engineering which is more mathematical and theoretical. There is an urgent need for a more straightforward and concrete guide for practical use in petrochemical plants and refineries. Troubleshooting Process Plant

Control meets this need with a work dedicated to real life solutions and problem solving Rooted in real world examples and the career experience of the author it largely avoids complex mathematics in favor of practical well established process engineering principles Now fully updated to reflect the latest best practices and developments in the field it is indispensable for process controllers in active plants of all kinds Readers of the third edition will also find New chapters on alarm disabling spectrometer use and reducing CO₂ emissions Additional novel examples throughout Guidelines for using spectrometers to directly control reflux rates and steam flow to reboilers Troubleshooting Process Plant Control is ideal for practicing engineers and other technical professionals working in process facilities as well as advanced students taking professional training courses in these fields

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

Process Equipment Malfunctions: Techniques to Identify and Correct Plant Problems
Norman Lieberman, 2011-07-12 A PRACTICAL GUIDE TO TROUBLESHOOTING PROCESS EQUIPMENT MALFUNCTIONS Process Equipment Malfunctions offers proven techniques for finding and fixing process plant problems and contains details on failure identification Diagnostic tips examples and illustrations help to pinpoint and correct faults in chemical process and petroleum refining equipment Complex math has been omitted An essential resource for plant operators and process engineers this book is based on the author's long career in field troubleshooting process problems COVERAGE INCLUDES Distillation tray malfunctions Packed tower problems Distillation tower pressure and composition control Fractionator product stripping Pumparounds Reboiled and steam side strippers Inspecting tower internals Process reboilers thermosyphon circulation Heat exchangers Condenser limitations Air coolers Cooling water systems Steam condensate collection systems Steam quality problems Level control problems Process plant corrosion and fouling Vapor liquid separation vessels Hydrocarbon water separation and desalters Fired heaters draft and excess O₂ Disabling safety systems Vacuum systems and steam jets Vacuum surface condensers Centrifugal pump limitations Steam turbine drivers Centrifugal compressors Reciprocating compressors

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