

# A WORKING GUIDE TO PROCESS EQUIPMENT

F I F T H E D I T I O N

**Norman P. Lieberman**  
**Elizabeth T. Lieberman**

**Mc  
Graw  
Hill**



# A Working Guide To Process Equipment

**RJ Alexander**



## **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 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 **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 CO<sub>2</sub> 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** Elizabeth T. Lieberman, Norman P.

Lieberman, 2014-05-28 Publisher's Note Products purchased from Third Party sellers are not guaranteed by the publisher for quality authenticity or access to any online entitlements included with the product 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

**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, 2018-08-09 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,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 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 Separation Process Technology Jimmy L. Humphrey, George E. Keller, 1997 Separation Process Technology is a comprehensive guide to the fundamentals selection applications and installation methods of innovative separation technologies A Working Guide to Shell-and-tube Heat Exchangers Stanley Yokell, 1990 Distillation Troubleshooting Henry Z. Kister, 2006-04-07 THE FIRST BOOK OF ITS KIND ON DISTILLATION TECHNOLOGY The last half century of research on distillation has tremendously improved our understanding and design of industrial distillation equipment and systems High speed computers have taken over the design control and operation of towers Invention and innovation in tower internals have greatly enhanced tower capacity and efficiency With all these advances one would expect the failure rate in distillation towers to be on the decline In fact the opposite is the case the tower failure rate is on the rise and accelerating Distillation Troubleshooting collects invaluable hands on experiences acquired in dealing with distillation and absorption malfunctions making them readily accessible for those engaged in solving today s problems and avoiding tomorrow s The first book of its kind on the distillation industry the practical lessons it offers are a must for those seeking the elusive path to trouble free distillation Distillation Troubleshooting covers over 1 200 case histories of problems diagnoses solutions and key lessons Coverage includes Successful and unsuccessful struggles with plugging fouling and coking Histories and prevention of tray packing and internals damage Lessons taught by incidents and accidents during shutdowns commissioning and abnormal operation Troubleshooting distillation simulations to match the real world Making packing liquid distributors work Plant bottlenecks from intermediate draws chimney trays and feed points Histories of and key lessons from explosions and fires in distillation towers Prevention of flaws that impair reboiler and condenser performance Destabilization of tower control systems and how to correct it Discoveries from shutdown inspections Suppression of foam and accumulation incidents A unique resource for improving the foremost industrial separation process Distillation Troubleshooting transforms decades of hands on experiences into a handy reference for professionals and students involved in the operation design study improvement and management of large scale distillation **Chemical Engineering**, 2005 Marinas, a Working Guide to Their Development and Design Donald W. Adie, 1984 **Subject Guide to Books in Print**, 1997 Beginner's Guide to Processing and Printing Clyde Reynolds, 1981 **The ASQ Pocket Guide to Failure Mode and Effect Analysis (FMEA)** D.H. Stamatis, 2014-08-21 The recognition that all well managed companies are interested in preventing or at least minimizing risk in their operations is the concept of risk management analysis This pocket guide explores the process of evaluation of risk by utilizing one of the core methodologies available the failure mode and effect analysis FMEA The intent in this Pocket FMEA is to provide the reader with a booklet that makes the FMEA concept easy to understand and provide some guidelines as to why FMEA is used in so many industries with positive results The booklet is not a complete reference on FMEA but rather a summary guide for anyone who wants some fast

information regarding failures and how to deal with them It covers risk reliability and FMEA prerequisites of FMEA what an FMEA is robustness the FMEA form and rankings types of FMEA and much more **The British National Bibliography**  
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