

# Chemical Engineering Plant Cost Index Cepci 2012

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Experimental Methods and Instrumentation for Chemical Engineers  
Guide to Capital Cost Estimating  
Chemical Engineering Design  
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Plant Design and Economics for Chemical Engineers  
Chemical Engineering Design  
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Process Plant Layout  
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Preliminary Chemical Engineering Plant Design  
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Introduction to Chemical Engineering  
Estimating Costs of Air Pollution Control  
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Preliminary Chemical Engineering Plant Design

## Chemical Process Safety

The proposed book will be divided into three parts. The chapters in Part I provide an overview of certain aspect of process retrofitting. The focus of Part II is on computational techniques for solving process retrofit problems. Finally, Part III addresses retrofit applications from diverse process industries. Some chapters in the book are contributed by practitioners whereas others are from academia. Hence, the book includes both new developments from research and also practical considerations. Many chapters include examples with realistic data. All these feature make the book useful to industrial engineers, researchers and students.

## Experimental Methods and Instrumentation for Chemical Engineers

Part I: Process design -- Introduction to design -- Process flowsheet development -- Utilities and energy efficient design -- Process simulation -- Instrumentation and process control -- Materials of construction -- Capital cost estimating -- Estimating revenues and production costs -- Economic evaluation of projects -- Safety and loss prevention -- General site considerations -- Optimization in design -- Part II: Plant design -- Equipment selection, specification and design -- Design of pressure vessels -- Design of reactors and mixers -- Separation of fluids -- Separation

columns (distillation, absorption and extraction) -- Specification and design of solids-handling equipment -- Heat transfer equipment -- Transport and storage of fluids.

## **Guide to Capital Cost Estimating**

In these pages is all the information that you-manager, engineer, or other technical professional-would need to select, size, and estimate "budget/study" level capital and annual costs for a variety of air pollution control equipment. This equipment includes wet scrubbers, carbon adsorbers, and other "add-on" devices. This book also deals with such nonstack controls as wet dust suppression systems and flue gas desulfurization systems. The costs are current (1988 or 1989 dollars) and are mainly presented in equational form for ease of computerization and updating. Clear, comprehensive equipment sizing procedures are also detailed. Finally, several detailed example problems are included to illustrate the sizing and costing procedures. This book is not just for technical personnel, however. The material is easy to grasp and use. Anyone with an air pollution control background can follow and apply the procedures and data herein. Using this book, air pollution control professionals can now develop sound, defensible (within  $\pm 30\%$ ) cost estimates with a minimum of time and effort.

## **Chemical Engineering Design Project**

Chemical Projects Scale Up: How to Go from Laboratory to Commercial covers the chemical engineering steps necessary for taking a laboratory development into the commercial world. The book includes the problems associated with scale up, equipment sizing considerations, thermal characteristics associated with scale up, safety areas to consider, recycling considerations, operability reviews and economic viability. In addition to the process design aspects of commercializing the laboratory development, consideration is given to the utilization of a development in an existing plant. Explains how heat removal for exothermic reactions can be scaled up Outlines how a reactor can be sized from batch kinetic data Discusses how the plant performance of a new catalyst can be evaluated Presents how the economics of a new product/process can be developed Discusses the necessary evaluation of recycling in commercial plants

## **Plant Design and Economics for Chemical Engineers**

### **Chemical Engineering Design**

The fifth edition of Plant Design and Economics for Chemical Engineers is a major revision of the popular fourth edition. There are new chapters on process synthesis, computer-aided design, and design of chemical reactors. A traditionally strong feature of the text, economic analysis, has been revamped and updated. Another strength, equipment sizing and cost estimation, is updated and expanded as well. These improvements also reflect changes in equipment availability. The numerous real examples throughout the book include computer or hand solutions, and often both. There is a new increased emphasis on computer use in design,

economic evaluation, and optimization. Concepts, strategies, and approaches to computer use are featured. These concepts are not tied to particular software programs and therefore apply to wide a range of applications software, of both current and future release. This widely used text is now more useful than ever, providing a "one-stop" guide to chemical process design and evaluation.

## **Profit Maximization Techniques for Operating Chemical Plants**

### **Means Building Construction Cost Data**

### **Ludwig's Applied Process Design for Chemical and Petrochemical Plants**

Known as the Blue Book this fourth edition continues with the endorsement from the Association of Cost Engineers. The guide is designed to be an aid for student engineers in the design activities undertaken during their course and help young engineers in industry to compile their own set of cost data. With much of the material in the third edition retained, the major changes are: new cost data; updated cost index information (which has been donated by industrialists); and short-cut estimating techniques up-dated.

### **An Applied Guide to Process and Plant Design**

This new edition follows the original format, which combines a detailed case study - the production of phthalic anhydride - with practical advice and comprehensive background information. Guiding the reader through all major aspects of a chemical engineering design, the text includes both the initial technical and economic feasibility study as well as the detailed design stages. Each aspect of the design is illustrated with material from an award-winning student design project. The book embodies the "learning by doing" approach to design. The student is directed to appropriate information sources and is encouraged to make decisions at each stage of the design process rather than simply following a design method. Thoroughly revised, updated, and expanded, the accompanying text includes developments in important areas and many new references.

### **Chemical Projects Scale Up**

### **Process Plants**

After the shearer removes the winter coat from the sheep, the spinner, weaver, and knitter, each in turn, do their part to produce the wool sweater.

### **Chemical Engineering**

This complete revision of Applied Process Design for Chemical and Petrochemical Plants, Volume 1 builds upon Ernest E. Ludwig's classic text to further enhance its

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

## **Chemical Engineering Economics**

Engineers often find themselves tasked with the difficult challenge of developing a design that is both technically and economically feasible. A sharply focused, how-to book, Engineering Economics and Economic Design for Process Engineers provides the tools and methods to resolve design and economic issues. It helps you integrate technical and economic decision making, creating more profit and growth for your organization. The book puts methods that are simple, fast, and inexpensive within easy reach. Author Thane Brown sets the stage by explaining the engineer's role in the creation of economically feasible projects. He discusses the basic economics of projects — how they are funded, what kinds of investments they require, how revenues, expenses, profits, and risks are interrelated, and how cash flows into and out of a company. In the engineering economics section of the book, Brown covers topics such as present and future values, annuities, interest rates, inflation, and inflation indices. He details how to create order-of-magnitude and study grade estimates for the investments in a project and how to make study grade production cost estimates. Against this backdrop, Brown explores a unique scheme for producing an Economic Design. He demonstrates how using the Economic Design Model brings increased economic thinking and rigor into the early parts of design, the time in a project's life when its cost structure is being set and when the engineer's impact on profit is greatest. The model emphasizes three powerful new tools that help you create a comprehensive design option list. When the model is used early in a project, it can drastically lower both capital and production costs. The book's uniquely industrial focus presents topics as they would happen in a real work situation. It shows you how to combine technical and economic decision making to create economically optimum designs and increase your impact on profit and growth, and, therefore, your importance to your

organization. Using these time-tested techniques, you can design processes that cost less to build and operate, and improve your company's profit.

## **Ludwig's Applied Process Design for Chemical and Petrochemical Plants**

The field of chemical engineering is undergoing a global "renaissance," with new processes, equipment, and sources changing literally every day. It is a dynamic, important area of study and the basis for some of the most lucrative and integral fields of science. Introduction to Chemical Engineering offers a comprehensive overview of the concept, principles and applications of chemical engineering. It explains the distinct chemical engineering knowledge which gave rise to a general-purpose technology and broadest engineering field. The book serves as a conduit between college education and the real-world chemical engineering practice. It answers many questions students and young engineers often ask which include: How is what I studied in the classroom being applied in the industrial setting? What steps do I need to take to become a professional chemical engineer? What are the career diversities in chemical engineering and the engineering knowledge required? How is chemical engineering design done in real-world? What are the chemical engineering computer tools and their applications? What are the prospects, present and future challenges of chemical engineering? And so on. It also provides the information new chemical engineering hires would need to excel and cross the critical novice engineer stage of their career. It is expected that this book will enhance students understanding and performance in the field and the development of the profession worldwide. Whether a new-hire engineer or a veteran in the field, this is a must—have volume for any chemical engineer's library.

## **Food Plant Design**

With flair and an originality of approach, Crundwell brings his considerable experience to bear on this crucial topic. Uniquely, this book discusses the technical and financial aspects of decision-making in engineering and demonstrates these through case studies. It's a hugely important matter as, of course, engineering solutions and financial decisions are intimately tied together. The best engineers combine the technical and financial cases in determining new solutions to opportunities, challenges and problems. To get your project approved, no matter the size of it, the financial case must be clear and compelling. This book provides a framework for engineers and scientists to undertake financial evaluations and assessments of engineering or production projects.

## **Chemical Process Design and Integration**

Chemical Engineering Design is one of the best-known and widely adopted texts available for students of chemical engineering. It deals with the application of chemical engineering principles to the design of chemical processes and equipment. Revised throughout, the fourth edition covers the latest aspects of process design, operations, safety, loss prevention and equipment selection, among others. Comprehensive and detailed, the book is supported by problems

and selected solutions. In addition the book is widely used by professionals as a day-to-day reference. Best selling chemical engineering text Revised to keep pace with the latest chemical industry changes; designed to see students through from undergraduate study to professional practice End of chapter exercises and solutions

## **Membrane Technology and Engineering for Water Purification**

An immense treasure trove containing hundreds of equipment symptoms, arranged so as to allow swift identification and elimination of the causes. These rules of thumb are the result of preserving and structuring the immense knowledge of experienced engineers collected and compiled by the author - an experienced engineer himself - into an invaluable book that helps younger engineers find their way from symptoms to causes. This sourcebook is unrivalled in its depth and breadth of coverage, listing five important aspects for each piece of equipment: \* area of application \* sizing guidelines \* capital cost including difficult-to-find installation factors \* principles of good practice, and \* good approaches to troubleshooting. Extensive cross-referencing takes into account that some items of equipment are used for many different purposes, and covers not only the most familiar types, but special care has been taken to also include less common ones. Consistent terminology and SI units are used throughout the book, while a detailed index quickly and reliably directs readers, thus aiding engineers in their everyday work at chemical plants: from keywords to solutions in a matter of minutes.

## **Life Cycle Costing**

A systematic approach to profit optimization utilizing strategic solutions and methodologies for the chemical process industry In the ongoing battle to reduce the cost of production and increase profit margin within the chemical process industry, leaders are searching for new ways to deploy profit optimization strategies. Profit Maximization Techniques For Operating Chemical Plants defines strategic planning and implementation techniques for managers, senior executives, and technical service consultants to help increase profit margins. The book provides in-depth insight and practical tools to help readers find new and unique opportunities to implement profit optimization strategies. From identifying where the large profit improvement projects are to increasing plant capacity and pushing plant operations towards multiple constraints while maintaining continuous improvements—there is a plethora of information to help keep plant operations on budget. The book also includes information on: ● Take away methods and techniques for identifying and exploiting potential areas to improve profit within the plant ● Focus on latest Artificial Intelligence based modeling, knowledge discovery and optimization strategies to maximize profit in running plant. ● Describes procedure to develop advance process monitoring and fault diagnosis in running plant ● Thoughts on engineering design , best practices and monitoring to sustain profit improvements ● Step-by-step guides to identifying, building, and deploying improvement applications For leaders and technologists in the industry who want to maximize profit margins, this text provides basic concepts, guidelines, and step-by-step guides specifically for the chemical plant sector.

## **Introduction to Process Engineering and Design**

A facility is only as efficient and profitable as the equipment that is in it: this highly influential book is a powerful resource for chemical, process, or plant engineers who need to select, design or configures plant sucessfully and profitably. It includes updated information on design methods for all standard equipment, with an emphasis on real-world process design and performance. The comprehensive and influential guide to the selection and design of a wide range of chemical process equipment, used by engineers globally • Copious examples of successful applications, with supporting schematics and data to illustrate the functioning and performance of equipment Revised edition, new material includes updated equipment cost data, liquid-solid and solid systems, and the latest information on membrane separation technology Provides equipment rating forms and manufacturers' data, worked examples, valuable shortcut methods, rules of thumb, and equipment rating forms to demonstrate and support the design process Heavily illustrated with many line drawings and schematics to aid understanding, graphs and tables to illustrate performance data

## **Chemical Process Retrofitting and Revamping**

A compilation of the calculation procedures needed every day on the job by chemical engineers. Tables of Contents: Physical and Chemical Properties; Stoichiometry; Phase Equilibrium; Chemical-Reaction Equilibrium; Reaction Kinetics and Reactor Design; Flow of Fluids and Solids; Heat Transfer; Distillation; Extraction and Leaching; Crystallization; Filtration; Liquid Agitation; Size Reduction; Drying; Evaporation; Environmental Engineering in the Plant. Illustrations. Index.

## **Chemical Engineering Process Simulation**

## **Integrated Design and Simulation of Chemical Processes**

Introduction to Process Engineering and Design covers basic principles to design alternate systems, develop process diagrams and select the best alternative to be adopted. Multiple industrial examples provided in the book will enhance the skills of the readers for innovative designs. Salient Features: • Focuses on process design of chemical plants and equipment • State-of-the-art technique of supercritical extraction, reactive distillation, short path distillation discussed • Process Flow-charts are provided throughout the book

## **Preliminary Chemical Engineering Plant Design**

Combines academic theory with practical industry experience Updated to include the latest regulations and references Covers hazard identification, risk assessment, and inherent safety Case studies and problem sets enhance learning Long-awaited revision of the industry best seller. This fully revised second edition of Chemical Process Safety: Fundamentals with Applications combines rigorous academic methods with real-life industrial experience to create a unique resource for students and professionals alike. The primary focus on technical fundamentals of

chemical process safety provides a solid groundwork for understanding, with full coverage of both prevention and mitigation measures. Subjects include: Toxicology and industrial hygiene Vapor and liquid releases and dispersion modeling Flammability characterization Relief and explosion venting In addition to an overview of government regulations, the book introduces the resources of the AIChE Center for Chemical Process Safety library. Guidelines are offered for hazard identification and risk assessment. The book concludes with case histories drawn directly from the authors' experience in the field. A perfect reference for industry professionals, *Chemical Process Safety: Fundamentals with Applications, Second Edition* is also ideal for teaching at the graduate and senior undergraduate levels. Each chapter includes 30 problems, and a solutions manual is now available for instructors.

## **Engineering Economics and Economic Design for Process Engineers**

*Process Plant Layout, Second Edition*, explains the methodologies used by professional designers to layout process equipment and pipework, plots, plants, sites, and their corresponding environmental features in a safe, economical way. It is supported with tables of separation distances, rules of thumb, and codes of practice and standards. The book includes more than seventy-five case studies on what can go wrong when layout is not properly considered. Sean Moran has thoroughly rewritten and re-illustrated this book to reflect advances in technology and best practices, for example, changes in how designers balance layout density with cost, operability, and safety considerations. The content covers the 'why' underlying process design company guidelines, providing a firm foundation for career growth for process design engineers. It is ideal for process plant designers in contracting, consultancy, and for operating companies at all stages of their careers, and is also of importance for operations and maintenance staff involved with a new build, guiding them through plot plan reviews. Based on interviews with over 200 professional process plant designers Explains multiple plant layout methodologies used by professional process engineers, piping engineers, and process architects Includes advice on how to choose and use the latest CAD tools for plant layout Ensures that all methodologies integrate to comply with worldwide risk management legislation

## **Rules of Thumb for Chemical Engineers**

This complete revision of *Applied Process Design for Chemical and Petrochemical Plants, Volume 1* builds upon Ernest E. Ludwig's classic text to further enhance its use as a chemical engineering process design manual of methods and proven fundamentals. This new edition includes important supplemental mechanical and related data, nomographs and charts. Also included within are improved techniques and fundamental methodologies, to guide the engineer in designing process equipment and applying chemical processes to properly detailed equipment. All three volumes of *Applied Process Design for Chemical and Petrochemical Plants* serve the practicing engineer by providing organized design procedures, details on the equipment suitable for application selection, and charts in readily usable form. Process engineers, designers, and operators will find more



chemical petrochemical plant design data in: Volume 2, Third Edition, which covers distillation and packed towers as well as material on azeotropes and ideal/non-ideal systems. Volume 3, Third Edition, which covers heat transfer, refrigeration systems, compression surge drums, and mechanical drivers. A. Kayode Coker, is Chairman of Chemical & Process Engineering Technology department at Jubail Industrial College in Saudi Arabia. He's both a chartered scientist and a chartered chemical engineer for more than 15 years. and an author of Fortran Programs for Chemical Process Design, Analysis and Simulation, Gulf Publishing Co., and Modeling of Chemical Kinetics and Reactor Design, Butterworth-Heinemann. Provides improved design manuals for methods and proven fundamentals of process design with related data and charts Covers a complete range of basic day-to-day petrochemical operation topics with new material on significant industry changes since 1995.

## **Resources and Pollution Control**

How far will an ounce of prevention really go? While the answer to that question may never be truly known, Process Plants: A Handbook for Inherently Safer Design, Second Edition takes us several steps closer. The book demonstrates not just the importance of prevention, but the importance of designing with prevention in mind. It emphasizes the role

## **Finance for Engineers**

A revision of the classic text-reference for the chemical engineering "design" course usually offered to all Chemical Engineers at the junior/senior level. This new edition contains the latest cost data as well as new emphasis on safety and H42OPS and a new chapter on Computer-Aided Design. The book nicely balances both economics (cost estimating and cost data) and process equipment design in one text.

## **Chemical Engineering Design**

Product acquisition involves an examination of the support cost of major equipment over its total life years. Depending on the type of equipment, support costs may range from 10 to 100 times the cost of acquisition. "Life Cycle Costing: Techniques, Models and Applications" offers a comprehensive approach to the entire field, and treats it in such a way that the reader requires no previous knowledge to understand the contents. It covers all advances and recent progress in life cycle costing from its history and definitions to current approaches. It is fully referenced for deeper study in any specific area (there are over 1150 references with an appendix) and contains more than 50 examples with their solutions. Subjects covered include reliability improvement warranty, computer hardware and software costing, vehicles life cycle costing, reliability engineering, life cycle costing in the aircraft industry, and processing systems costing. This work is intended for all engineers and senior students of engineering or business administration, administrators, cost analysts, researchers, academics, and anyone involved with equipment procurement.

## **Chemical Process Equipment - Selection and Design (Revised 2nd Edition)**

An Applied Guide to Process and Plant Design is a guide to process plant design for both students and professional engineers. The book covers plant layout and the use of spreadsheet programmes and key drawings produced by professional engineers as aids to design; subjects which are usually learned on the job rather than in education. You will learn how to produce smarter plant design through the use of computer tools, including Excel and AutoCAD, "What If Analysis", statistical tools, and Visual Basic for more complex problems. The book also includes a wealth of selection tables, covering the key aspects of professional plant design which engineering students and early-career engineers tend to find most challenging. Professor Moran draws on over 20 years' experience in process design to create an essential foundational book ideal for those who are new to process design, compliant with both professional practice and the IChemE degree accreditation guidelines. Explains how to deliver a process design that meets both business and safety criteria Covers plant layout and the use of spreadsheet programmes and key drawings as aids to design Includes a comprehensive set of selection tables, covering those aspects of professional plant design which early-career designers find most challenging

## **Analysis, Synthesis and Design of Chemical Processes**

Written by a highly regarded author with industrial and academic experience, this new edition of an established bestselling book provides practical guidance for students, researchers, and those in chemical engineering. The book includes a new section on sustainable energy, with sections on carbon capture and sequestration, as a result of increasing environmental awareness; and a companion website that includes problems, worked solutions, and Excel spreadsheets to enable students to carry out complex calculations.

## **Process Plant Layout**

In biotechnology and bioengineering, small molecules can be used to increase the efficiency reduce the cost and damage to the environment of certain bioprocesses. This book introduces readers to the important field of chemically promoted biotechnology and bioengineering and presents the theory behind the biotechnology of enzymatic reactions and how they can be chemically enhanced. The book covers chemical modulators for enzymatic reactions, chemically promoted biotechnology in plant cell cultures, chemically promoted biotechnology for plant protection and future prospects for the field. Knowledge gained allows both chemists to make use of biotechnology to solve chemical problems in an environmentally-friendly way, and biologists to make use of chemistry to increase biotechnological efficiency. This book is useful for scientists in a broad range of disciplines, including agricultural chemistry, pesticide science, medicinal chemistry, biochemistry, bio-organic chemistry, cell and molecular biology. Students and researchers in both academia and industry will find it a useful handbook.

## **Handbook of Chemical Engineering Calculations**

Although chemical engineering and food technology are subject areas closely related to food processing systems and food plant design, coverage of the design of food plants is often sporadic and inadequately addressed in food technology and engineering books. Some books have attempted to treat food engineering from this dual point of view but, most have not achieved balanced coverage of the two. Focusing on food processing, rather than chemical plants, Food Plant Design presents precise design details with photos and drawings of different types of food processing plants, including food processing systems, refrigeration and steam systems, conveying systems, and buildings. The authors discuss the subject in an ordered format that gives you the tools to produce food products with minimum cost. Including modeling procedures for food processing systems and auxiliary systems, they elucidate synthesis techniques and procedures. Using a clear structure for different levels of information and data on different food processing alternatives, the book outlines solutions to plant design problems in the context of overall optimization of an agro-industrial system and corresponding food chain. It provides the work procedures and techniques for solving the design problems of a food processing plant and in making a defined food product.

## **Rules of Thumb in Engineering Practice**

Membrane Technology and Engineering for Water Purification, Second Edition is written in a practical style with emphasis on: process description; key unit operations; systems design and costs; plant equipment description; equipment installation; safety and maintenance; process control; plant start-up; and operation and troubleshooting. It is supplemented by case studies and engineering rules-of-thumb. The author is a chemical engineer with extensive experience in the field, and his technical knowledge and practical know-how in the water purification industry are summarized succinctly in this new edition. This book will inform you which membranes to use in water purification and why, where and when to use them. It will help you to troubleshoot and improve performance and provides case studies to assist understanding through real-life examples. Membrane Technology section updated to include forward osmosis, electrodialysis, and diffusion dialysis Hybrid Membrane Systems expanded to cover zero liquid discharge, salt recovery and removal of trace contaminants Includes a new section on plant design, energy, and economics

## **Preliminary Chemical Engineering Plant Design**

least, the author wishes to thank his constantly helpful wife Maggie and his secretary Pat Weimer; the former for her patience, encouragement, and for acting as a sounding-board, and the latter who toiled endlessly, cheerfully, and most competently on the book's preparation. CONTENTS Preface / iii 1. INTRODUCTION / 1 Frequently Used Economic Studies / 2 Basic Economic Subjects / 3 Priorities / 3 Problems / 6 Appendixes / 6 References / 6 2. EQUIPMENT COST ESTIMATING / 8 Manufacturers' Quotations / 8 Estimating Charts / 10 Size Factoring Exponents / 11 Inflation Cost Indexes / 13 Installation Factor / 16 Module Factor / 18 Estimating Accuracy / 19 Estimating Example / 19 References / 21 3. PLANT COST ESTIMATES /

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## **Plant Design and Economics for Chemical Engineers**

The Leading Integrated Chemical Process Design Guide: Now with New Problems, New Projects, and More More than ever, effective design is the focal point of sound chemical engineering. Analysis, Synthesis, and Design of Chemical Processes, Third Edition, presents design as a creative process that integrates both the big picture and the small details—and knows which to stress when, and why. Realistic from start to finish, this book moves readers beyond classroom exercises into open-ended, real-world process problem solving. The authors introduce integrated techniques for every facet of the discipline, from finance to operations, new plant design to existing process optimization. This fully updated Third Edition presents entirely new problems at the end of every chapter. It also adds extensive coverage of batch process design, including realistic examples of equipment sizing for batch sequencing; batch scheduling for multi-product plants; improving production via intermediate storage and parallel equipment; and new optimization techniques specifically for batch processes. Coverage includes Conceptualizing and analyzing chemical processes: flow diagrams, tracing, process conditions, and more Chemical process economics: analyzing capital and manufacturing costs, and predicting or assessing profitability Synthesizing and optimizing chemical processing: experience-based principles, BFD/PFD, simulations, and more Analyzing process performance via I/O models, performance curves, and other tools Process troubleshooting and “debottlenecking” Chemical engineering design and society: ethics, professionalism, health, safety, and new “green engineering” techniques Participating successfully in chemical engineering design teams Analysis, Synthesis, and Design of Chemical Processes, Third Edition, draws on nearly 35 years of innovative chemical engineering instruction at West Virginia University. It includes suggested curricula for both single-semester and year-long design courses; case studies and design projects with practical applications; and appendixes with current equipment cost data and preliminary design information for eleven chemical processes—including seven brand new to this edition.

## **Introduction to Chemical Engineering**

Experimental Methods and Instrumentation for Chemical Engineers, Second Edition, touches many aspects of engineering practice, research, and statistics. The principles of unit operations, transport phenomena, and plant design constitute the focus of chemical engineering in the latter years of the curricula. Experimental methods and instrumentation is the precursor to these subjects. This resource integrates these concepts with statistics and uncertainty analysis to

define what is necessary to measure and to control, how precisely and how often. The completely updated second edition is divided into several themes related to data: metrology, notions of statistics, and design of experiments. The book then covers basic principles of sensing devices, with a brand new chapter covering force and mass, followed by pressure, temperature, flow rate, and physico-chemical properties. It continues with chapters that describe how to measure gas and liquid concentrations, how to characterize solids, and finally a new chapter on spectroscopic techniques such as UV/Vis, IR, XRD, XPS, NMR, and XAS. Throughout the book, the author integrates the concepts of uncertainty, along with a historical context and practical examples. A problem solutions manual is available from the author upon request. Includes the basics for 1st and 2nd year chemical engineers, providing a foundation for unit operations and transport phenomena Features many practical examples Offers exercises for students at the end of each chapter Includes up-to-date detailed drawings and photos of equipment

## **Estimating Costs of Air Pollution Control**

Chemical Engineering Process Simulation is ideal for students, early career researchers, and practitioners, as it guides you through chemical processes and unit operations using the main simulation softwares that are used in the industrial sector. This book will help you predict the characteristics of a process using mathematical models and computer-aided process simulation tools, as well as model and simulate process performance before detailed process design takes place. Content coverage includes steady and dynamic simulations, the similarities and differences between process simulators, an introduction to operating units, and convergence tips and tricks. You will also learn about the use of simulation for risk studies to enhance process resilience, fault finding in abnormal situations, and for training operators to control the process in difficult situations. This experienced author team combines industry knowledge with effective teaching methods to make an accessible and clear comprehensive guide to process simulation. Ideal for students, early career researchers, and practitioners, as it guides you through chemical processes and unit operations using the main simulation softwares that are used in the industrial sector. Covers the fundamentals of process simulation, theory, and advanced applications Includes case studies of various difficulty levels to practice and apply the developed skills Features step-by-step guides to using Aspen Plus and HYSYS for process simulations available on companion site Helps readers predict the characteristics of a process using mathematical models and computer-aided process simulation tools

## **Chemical Biotechnology and Bioengineering**

The most complete guide of its kind, this is the standard handbook for chemical and process engineers. All new material on fluid flow, long pipe, fractionators, separators and accumulators, cooling towers, gas treating, blending, troubleshooting field cases, gas solubility, and density of irregular solids. This substantial addition of material will also include conversion tables and a new appendix, "Shortcut Equipment Design Methods." This convenient volume helps solve field engineering problems with its hundreds of common sense techniques, shortcuts, and calculations. Here, in a compact, easy-to-use format, are practical tips, handy formulas, correlations, curves, charts, tables, and shortcut methods

that will save engineers valuable time and effort. Hundreds of common sense techniques and calculations help users quickly and accurately solve day-to-day design, operations, and equipment problems.

## **Preliminary Chemical Engineering Plant Design**

This comprehensive work shows how to design and develop innovative, optimal and sustainable chemical processes by applying the principles of process systems engineering, leading to integrated sustainable processes with 'green' attributes. Generic systematic methods are employed, supported by intensive use of computer simulation as a powerful tool for mastering the complexity of physical models. New to the second edition are chapters on product design and batch processes with applications in specialty chemicals, process intensification methods for designing compact equipment with high energetic efficiency, plantwide control for managing the key factors affecting the plant dynamics and operation, health, safety and environment issues, as well as sustainability analysis for achieving high environmental performance. All chapters are completely rewritten or have been revised. This new edition is suitable as teaching material for Chemical Process and Product Design courses for graduate MSc students, being compatible with academic requirements world-wide. The inclusion of the newest design methods will be of great value to professional chemical engineers. Systematic approach to developing innovative and sustainable chemical processes Presents generic principles of process simulation for analysis, creation and assessment Emphasis on sustainable development for the future of process industries

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