

chemical process equipment selection and design

Chemical Process Equipment Selection and Design: A Comprehensive Guide

chemical process equipment selection and design is a critical aspect of chemical engineering that significantly impacts the efficiency, safety, and profitability of industrial operations. Whether you're working on a refinery, pharmaceutical plant, or food processing facility, choosing the right equipment and designing it to match your process requirements can make all the difference. This process involves a blend of technical know-how, practical experience, and a deep understanding of the chemical processes involved. In this article, we'll delve into the essentials of chemical process equipment selection and design, exploring key considerations, common challenges, and best practices to help you navigate this complex yet fascinating field.

Understanding the Importance of Equipment Selection

Selecting the appropriate chemical process equipment is more than just picking machines off a catalog. It requires a thorough evaluation of process parameters, material compatibility, operational conditions, and cost-effectiveness. The right equipment ensures smooth operation, optimal output, and minimal downtime.

Why Equipment Selection Matters

The chemical industry deals with various processes, including reaction, separation, heat transfer, and mixing. Each process demands specific equipment tailored to handle particular conditions such as temperature, pressure, corrosiveness, and flow rates. Choosing equipment unsuited to these factors can lead to operational inefficiencies, safety hazards, and increased maintenance costs.

Moreover, the lifespan of equipment and its ability to integrate with existing systems play a crucial role in long-term plant performance. Hence, equipment selection is a strategic decision that goes beyond immediate functionality.

Key Factors Influencing Chemical Process Equipment Design

Designing chemical process equipment involves translating process requirements into physical specifications that meet safety, operational, and economic factors. Here's what engineers typically consider:

Process Conditions and Operating Parameters

Understanding the chemical reactions or separations is fundamental. Parameters like temperature ranges, pressure levels, phase changes, and residence time influence the material choice and structural design of equipment. For example, high-pressure reactors require robust materials and reinforced construction to withstand operational stresses.

Material Compatibility and Corrosion Resistance

Many chemical processes involve corrosive substances or extreme pH levels. Selecting materials that resist corrosion—such as stainless steel, Hastelloy, or specialized alloys—is vital to prevent equipment degradation and contamination of products. Sometimes, linings or coatings are used for additional protection.

Capacity and Throughput Requirements

Sizing the equipment to meet production goals without overdesigning is a delicate balance. Oversized equipment can lead to unnecessary capital expenditure and inefficient operation, while undersized units may cause bottlenecks and limit scalability.

Safety and Regulatory Compliance

Chemical plants must adhere to strict safety standards and environmental regulations. Equipment design must incorporate features such as pressure relief valves, emergency shutdown systems, and containment measures to mitigate risks.

Common Types of Chemical Process Equipment and

Their Selection Criteria

There is a broad spectrum of equipment used in chemical processing, each with unique design and selection considerations.

Reactors

Reactors are vessels where chemical transformations occur. Depending on the reaction type (batch, continuous, catalytic), different reactors like stirred tank reactors, plug flow reactors, or packed bed reactors are selected. Factors such as mixing efficiency, heat transfer capability, and ease of cleaning influence the choice.

Heat Exchangers

Heat exchangers facilitate thermal energy transfer between fluids. Shell-and-tube, plate, and air-cooled heat exchangers are common types. Design considerations include temperature approach, pressure drops, fouling tendencies, and maintenance accessibility.

Distillation Columns and Separation Equipment

Separation processes like distillation require columns designed to maximize contact between vapor and liquid phases. Selection involves determining column diameter, height, tray or packing type, and reflux ratios based on feed composition and desired purity.

Pumps and Compressors

These devices move fluids and gases through the system. Their selection depends on flow rates, pressure requirements, fluid properties, and energy efficiency. Materials and sealing technology are also critical to handle aggressive chemicals.

Design Methodologies and Tools in Chemical Process Equipment

Modern chemical process equipment design leverages various methodologies and software tools to optimize performance and reduce errors.

Process Simulation and Modeling

Before actual fabrication, process simulation software like Aspen Plus, HYSYS, or CHEMCAD allows engineers to model chemical processes and predict equipment behavior under different conditions. This aids in verifying design choices and troubleshooting potential issues.

Mechanical Design and Stress Analysis

Mechanical engineers use finite element analysis (FEA) and other computational tools to ensure that equipment can endure mechanical stresses, thermal expansion, and vibrations. This ensures structural integrity and longevity.

Material Selection Software

Tools that analyze chemical compatibility and environmental factors help in choosing appropriate materials, reducing the risk of corrosion and failure.

Tips for Effective Chemical Process Equipment Selection and Design

- **Engage Multidisciplinary Teams:** Collaboration between process engineers, mechanical designers, safety experts, and operators helps align design with practical needs.
- **Consider Future Expansion:** Design with scalability in mind to accommodate process upgrades without major overhauls.
- **Prioritize Maintainability:** Equipment that is easy to clean, inspect, and repair reduces downtime and operating costs.
- **Evaluate Total Cost of Ownership:** Beyond initial purchase price, consider installation, operation, maintenance, and disposal costs.
- **Stay Updated with Industry Standards:** Compliance with ASME, API, and other standards ensures safety and reliability.

Challenges in Chemical Process Equipment Selection and How to Overcome Them

Selecting and designing chemical process equipment is not without hurdles. Some common challenges include:

Handling Complex Chemical Reactions

Unpredictable reaction kinetics or side reactions can complicate reactor design. Pilot testing and detailed kinetic studies can mitigate uncertainties.

Material Availability and Cost Constraints

Ideal materials may be expensive or hard to source. Engineers often have to balance performance with budget by exploring alternative materials or protective coatings.

Integration with Existing Systems

New equipment must fit within spatial and operational constraints of existing plants. Utilizing 3D modeling and modular design approaches can ease integration.

Environmental and Safety Regulations

Changing regulations require continuous updates to design practices. Maintaining close contact with regulatory bodies and certification agencies helps ensure compliance.

Chemical process equipment selection and design is a dynamic field that blends engineering principles with practical challenges. With thoughtful consideration of process needs, material science, and operational constraints, engineers can develop equipment that not only meets performance goals but also enhances plant safety and sustainability. Whether you are embarking on a new project or upgrading existing facilities, a strategic approach to equipment selection and design will pave the way for successful chemical processing operations.

Frequently Asked Questions

What are the key factors to consider when selecting chemical process equipment?

Key factors include the chemical compatibility of materials, operating temperature and pressure, process requirements (flow rate, capacity), safety considerations, cost, maintenance needs, and compliance with industry standards.

How does material selection impact the design of chemical process equipment?

Material selection affects corrosion resistance, mechanical strength, thermal conductivity, and overall durability of equipment. Choosing the right material ensures longevity, safety, and efficiency under specific process conditions.

What role does process simulation play in equipment design?

Process simulation helps in predicting equipment performance, optimizing design parameters, identifying potential bottlenecks, and reducing the need for costly physical prototypes, leading to more efficient and reliable equipment design.

How do safety standards influence chemical process equipment design?

Safety standards dictate design criteria such as pressure ratings, relief systems, material certifications, and emergency shutdown features to prevent accidents, ensuring the equipment operates safely under all conditions.

What are the common design challenges in scaling up chemical process equipment?

Challenges include maintaining consistent product quality, heat and mass transfer efficiency, managing increased mechanical stresses, ensuring adequate mixing, and adapting control systems to larger scales.

How is sustainability integrated into chemical process equipment selection and design?

Sustainability considerations involve selecting energy-efficient equipment, using environmentally friendly materials, minimizing waste generation, enabling easy maintenance and recycling, and designing for reduced emissions and resource consumption.

What advancements are shaping the future of chemical process equipment design?

Advancements include the use of advanced materials (e.g., composites, smart materials), digital twins for real-time monitoring, additive manufacturing for complex geometries, and AI-driven design optimization to enhance performance and reduce costs.

Additional Resources

Chemical Process Equipment Selection and Design: Navigating Complexity in Industrial Applications

chemical process equipment selection and design is a critical aspect of chemical engineering that directly influences the efficiency, safety, and economic viability of industrial processes. The choice and configuration of equipment like reactors, heat exchangers, distillation columns, and separators must align with process requirements, material characteristics, operational conditions, and regulatory standards. In the highly competitive and technically demanding landscape of chemical manufacturing, mastering the nuances of equipment selection and design is essential for optimizing process performance and minimizing downtime.

Understanding the intricate balance between process parameters and equipment capabilities forms the foundation of effective chemical process equipment selection and design. This article explores the multifaceted considerations involved in selecting appropriate equipment, the design principles that underpin their functionality, and the latest trends shaping this essential field.

Key Considerations in Equipment Selection

Selecting chemical process equipment is not merely about meeting capacity demands; it requires a thorough assessment of process conditions, material compatibility, and long-term operational goals. Several critical factors influence the decision-making process:

Process Requirements and Operational Parameters

The nature of the chemical reaction or separation process fundamentally dictates equipment choice. For instance, highly exothermic reactions necessitate reactors with robust heat removal capabilities. In contrast, processes involving sensitive compounds may demand equipment that minimizes shear or exposure to contaminants.

Operational parameters such as temperature, pressure, flow rates, and phase states (gas, liquid, solid) shape the specifications for equipment. High-pressure operations often require pressure vessels designed with stringent safety margins, while cryogenic processes demand materials and insulation suited to extremely low temperatures.

Material Compatibility and Corrosion Resistance

Chemical process equipment constantly interacts with reactive substances, making material selection a cornerstone of design. The use of stainless steel, Hastelloy, or titanium may be dictated by corrosive feedstocks or products. Failure to match materials with process fluids can lead to premature equipment degradation, safety hazards, and costly shutdowns.

Scale and Capacity Considerations

Equipment must be sized accurately to meet production targets without incurring unnecessary costs. Oversized units lead to inefficiencies and higher capital expenditure, while undersized equipment can cause bottlenecks and compromise product quality. This balance is achieved through rigorous process modeling and simulation.

Regulatory Compliance and Safety Standards

Environmental and safety regulations impose additional constraints on equipment design. Pressure relief mechanisms, containment systems, and emissions control technologies are integrated to comply with standards such as ASME, API, and OSHA. These requirements often influence both the choice of equipment and its detailed engineering.

Fundamental Design Principles in Chemical Process Equipment

The design phase translates process needs into tangible equipment specifications. It involves mechanical, thermal, and fluid dynamic considerations to ensure reliability and performance.

Reactor Design

Reactors are the heart of many chemical plants. Their design focuses on maximizing conversion and selectivity while managing heat and mass transfer effectively. Choices between batch, continuous stirred-tank, plug flow, or packed bed reactors depend on reaction kinetics and process scale.

Heat removal or supply is a critical design element; jacketed reactors and internal coils are common solutions. Computational fluid dynamics (CFD) modeling increasingly aids in optimizing mixing patterns and temperature profiles.

Heat Exchanger Design

Heat exchangers facilitate energy transfer between process streams, impacting energy efficiency profoundly. Designs vary from shell-and-tube and plate heat exchangers to more specialized forms like spiral or air-cooled units.

Design challenges include managing fouling, pressure drops, and thermal stresses. Material selection must consider thermal conductivity and corrosion resistance. Innovations such as enhanced surface geometries improve heat transfer rates, reducing equipment size and cost.

Distillation Column Design

Distillation remains a primary separation method in chemical plants. Column design involves determining the number of theoretical stages, column diameter, and tray or packing type. The choice between trays and packings hinges on factors like capacity, pressure drop, and fouling tendencies.

Advanced design tools incorporate rigorous thermodynamic models to predict vapor-liquid equilibria more accurately, leading to optimized energy consumption and product purity.

Emerging Trends and Technological Advances

The field of chemical process equipment selection and design is evolving rapidly, driven by technological innovation and sustainability imperatives.

Integration of Digital Tools and Simulation

Process simulation software such as Aspen Plus, HYSYS, and COMSOL Multiphysics play an increasingly pivotal role. These tools enable engineers to model complex interactions and predict equipment performance under varying conditions, reducing reliance on trial-and-error methods.

Digital twins and real-time monitoring facilitate predictive maintenance and operational optimization, extending equipment life and improving safety.

Sustainable and Green Design Approaches

Environmental concerns are prompting a shift toward equipment designs that minimize energy consumption and waste. Heat integration techniques, such as pinch analysis, optimize heat exchanger networks to recover waste heat.

Materials with lower environmental footprints and designs that facilitate easy disassembly and recycling are gaining traction. Moreover, modular equipment designs support flexible, scalable production with reduced resource consumption.

Advanced Materials and Manufacturing Techniques

The adoption of novel materials—like advanced composites and corrosion-resistant alloys—enables equipment to withstand harsher environments and extend service intervals. Additionally, additive manufacturing (3D printing) allows for complex geometries that improve fluid flow and heat transfer.

Such innovations open new possibilities for customizing equipment to specific process requirements, enhancing overall plant performance.

Challenges and Strategic Decision-Making

Despite technological progress, chemical process equipment selection and design remain fraught with challenges. Uncertainties in process scale-up, variability in feedstock quality, and evolving regulatory landscapes demand flexible and robust design strategies.

Decision-makers must weigh capital expenditure against operational efficiency and maintenance costs. Lifecycle analysis and risk assessment become indispensable tools to ensure that equipment investments deliver sustained value.

Collaborative approaches involving multidisciplinary teams—combining chemical engineers, mechanical designers, and safety experts—are essential to navigate the complexities inherent in modern chemical processing.

Understanding and mastering the intricacies of chemical process equipment selection and design not only enhances operational reliability but also positions enterprises to respond agilely to market and environmental demands. As industries strive for higher productivity and sustainability, the thoughtful integration of process knowledge, engineering expertise, and advanced technologies will continue to define success in this vital domain.

Chemical Process Equipment Selection And Design

chemical process equipment selection and design: Chemical Process Equipment James R. Couper, W Roy Penney, James R. Fair, Stanley M. Walas, 2005-01-20 Comprehensive and practical guide to the selection and design of a wide range of chemical process equipment. Emphasis is placed on real-world process design and performance of equipment. Provides examples of

successful applications, with numerous drawings, graphs, and tables to show the functioning and performance of the equipment. Equipment rating forms and manufacturers' questionnaires are collected to illustrate the data essential to process design. Includes a chapter on equipment cost and addresses economic concerns. - Practical guide to the selection and design of a wide range of chemical process equipment. Examples of successful, real-world applications are provided - Fully revised and updated with valuable shortcut methods, rules of thumb, and equipment rating forms and manufacturers' questionnaires have been collected to demonstrate the design process. Many line drawings, graphs, and tables illustrate performance data - Chapter 19 has been expanded to cover new information on membrane separation. Approximately 100 worked examples are included. End of chapter references also are provided

chemical process equipment selection and design: Chemical Process Equipment James R. Couper, W. Roy Penney, 2012-09-19 First published: Chemical process equipment / Stanley M. Walas. 1988.

chemical process equipment selection and design: Chemical Process Equipment - Selection and Design (Revised 2nd Edition) James R. Couper, W Roy Penney, James R. Fair PhD, 2009-08-11 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 successfully 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 equipment selection and design: Chemical Process Equipment Stanley M. Walas, 1988 Wales (chemical and petroleum engineering, U. of Kansas) presents a minimum of essential theory, with numerical examples to illustrate the more involved procedures. Emphasis is placed on short cut methods, rules of thumb and data for design by analogy; a short chapter on costs of equipment is included. The introductory chapters will provide a general background to process design, flowsheeting, and process control. Annotation copyrighted by Book News, Inc., Portland, OR

chemical process equipment selection and design: Chemical Process Equipment, 2010 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 configure plant successfully and profitably. Written by some of the most experienced and well-known chemical and process engineers in the industry today, this information-packed volume gives the chemical or process engineer or engineering student all of the guidelines for the design and selection of chemical process equipment. Comprehensive and practical, its scope and emphasis on real-world process design and performance of equipment will prove invaluable for day-to-day problem solving. 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 equipment selection and design: Chemical Process Equipment Ashish

Sharma, 2015-03 **Chemical Process Equipment** is a results-oriented reference for engineers who specify, design, maintain or run chemical and process plants. This book delivers information on the selection, sizing and operation of process equipment in a format that enables quick and accurate decision making on standard process and equipment choices, saving time, improving productivity, and building understanding. Coverage emphasizes common real-world equipment design rather than experimental or esoteric and focuses on maximizing performance. Chemical process equipment is of two kinds: custom designed and built, or proprietary off the shelf. For example, the sizes and performance of custom equipment such as distillation towers, drums, and heat exchangers are derived by the process engineer on the basis of established principles and data, although some mechanical details remain in accordance with safe practice codes and individual fabrication practices. The process design of proprietary equipment, as considered in this book, establishes its required performance and is a process of selection from the manufacturers' offerings, often with their recommendations or on the basis of individual experience.

chemical process equipment selection and design: *Chemical Process Equipment: Selection & Design* Couper, 2009-06-01

chemical process equipment selection and design: Preliminary Chemical Engineering Plant Design W.D. Baasal, 1989-11-30 This reference covers both conventional and advanced methods for automatically controlling dynamic industrial processes.

chemical process equipment selection and design: Chemical Engineering Design Project Martyn S Ray, 1998-10-01 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 process equipment selection and design: Chemical Process Design and Simulation: Aspen Plus and Aspen Hysys Applications Juma Haydary, 2019-01-23 A comprehensive and example oriented text for the study of chemical process design and simulation **Chemical Process Design and Simulation** is an accessible guide that offers information on the most important principles of chemical engineering design and includes illustrative examples of their application that uses simulation software. A comprehensive and practical resource, the text uses both Aspen Plus and Aspen Hysys simulation software. The author describes the basic methodologies for computer aided design and offers a description of the basic steps of process simulation in Aspen Plus and Aspen Hysys. The text reviews the design and simulation of individual simple unit operations that includes a mathematical model of each unit operation such as reactors, separators, and heat exchangers. The author also explores the design of new plants and simulation of existing plants where conventional chemicals and material mixtures with measurable compositions are used. In addition, to aid in comprehension, solutions to examples of real problems are included. The final section covers plant design and simulation of processes using nonconventional components. This important resource: Includes information on the application of both the Aspen Plus and Aspen Hysys software that enables a comparison of the two software systems Combines the basic theoretical principles of chemical process and design with real-world examples Covers both processes with conventional organic chemicals and processes with more complex materials such as solids, oil blends, polymers and electrolytes Presents examples that are solved using a new version of Aspen software, ASPEN One 9 Written for students and academics in the field of process design, **Chemical Process Design and Simulation** is a practical and accessible guide to the chemical process design and simulation using proven software.

chemical process equipment selection and design: Encyclopedia of Chemical Processing and Design John J. McKetta Jr, 1993-06-02 Written by engineers for engineers (with over 150 International Editorial Advisory Board members), this highly lauded resource provides up-to-the-minute information on the chemical processes, methods, practices, products, and standards in the chemical, and related, industries.

chemical process equipment selection and design: Fortran Programs for Chemical Process Design, Analysis, and Simulation A. Kayode Coker, 1995-01-25 This book gives engineers the fundamental theories, equations, and computer programs (including source codes) that provide a ready way to analyze and solve a wide range of process engineering problems.

chemical process equipment selection and design: Product-Driven Process Design Edwin Zondervan, Cristhian Almeida-Rivera, Kyle Vincent Camarda, 2020-01-20 Product-driven process design - from molecule to enterprise provides process engineers and process engineering students with access to a modern and stimulating methodology to process and product design. Throughout the book the links between product design and process design become evident while the reader is guided step-by-step through the different stages of the intertwining product and process design activities. Both molecular and enterprise-wide considerations in design are introduced and addressed in detail. Several examples and case studies in emerging areas such as bio- and food-systems, pharmaceuticals and energy are discussed and presented. This book is an excellent guide and companion for undergraduate, graduate students as well as professional practitioners.

chemical process equipment selection and design: 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.

chemical process equipment selection and design: Chemical Engineering Design Ray Sinnott, 2005-07-01 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

chemical process equipment selection and design: Chemical Process Equipment Design Richard Turton, Joseph A. Shaeiwitz, 2017 Trends such as shale-gas resource development call for a deeper understanding of chemical engineering equipment and design. Chemical Process Equipment Design complements leading texts by providing concise, focused coverage of these topics, filling a major gap in undergraduate chemical engineering education. Richard Turton and Joseph A. Shaeiwitz present relevant design equations, show how to analyze operation of existing equipment,

offer a practical methodology for designing new equipment, and introduce software programs for solving common problems. Theoretical derivations are avoided in favor of working equations, practical computational strategies, and approximately eighty realistic worked examples. The authors identify which equation applies to each situation, and show exactly how to use it to design equipment. By the time undergraduates have worked through this material, they will be able to create preliminary designs for most process equipment found in a typical chemical plant that processes gases and/or liquids. They will also learn how to evaluate the performance of that equipment, even when operating conditions differ from the design case.

chemical process equipment selection and design: Handbook of Chemical Process Equipment Design Chuk Anderson, 2012-09 This handbook traces the chemical equipment designs and defensive chemical warfare, fully covered and updated to bring the chemical engineer into the 21st century. It offers a guide to the selection and design of a wide range of chemical process equipment.

chemical process equipment selection and design: An Applied Guide to Process and Plant Design Sean Moran, 2019-06-12 An Applied Guide to Process and Plant Design, 2nd edition, is a guide to process plant design for both students and professional engineers. The book covers plant layout and the use of spreadsheet programs and key drawings produced by professional engineers as aids to design; subjects that 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. - Includes new and expanded content, including illustrative case studies and practical examples - Explains how to deliver a process design that meets both business and safety criteria - Covers plant layout and the use of spreadsheet programs and key drawings as aids to design - Includes a comprehensive set of selection tables, covering aspects of professional plant design which early-career designers find most challenging

chemical process equipment selection and design: Process Technology André B. de Haan, 2015-04-24 Process Technology provides a general overview about chemical and biochemical process technology. It focuses on the structure and development of production processes, main technological operations and the important aspects of process economics. The theoretical foundations in each chapter are supplemented by case studies and examples in a clear and instructive manner to illustrate the practical aspects. The author highlights operating principles, reasons for application and available industrial equipment of technological operations. Aim is to facilitate those without a process technology background in multi-disciplinary cooperation with (bio-) chemical engineers by providing an overview of this exciting field. The textbook is organized into seven distinct parts: Structure of the chemical industry and (bio-) chemical processes (Bio-) Chemical reaction engineering Molecular separations (distillation, extraction, absorption, adsorption) Mechanical separations (filtration, sedimentation, membranes) Particle and final product manufacturing Development, scale-up, design and safety of processes Major industrial process descriptions

chemical process equipment selection and design: Green Chemistry and Engineering Concepción Jiménez-González, David J. C. Constable, 2011-04-12 The past, present, and future of green chemistry and green engineering From college campuses to corporations, the past decade witnessed a rapidly growing interest in understanding sustainable chemistry and engineering. Green Chemistry and Engineering: A Practical Design Approach integrates the two disciplines into a single study tool for students and a practical guide for working chemists and engineers. In Green Chemistry and Engineering, the authors—each highly experienced in implementing green chemistry and engineering programs in industrial settings—provide the bottom-line thinking required to not

only bring sustainable chemistry and engineering closer together, but to also move business towards more sustainable practices and products. Detailing an integrated, systems-oriented approach that bridges both chemical syntheses and manufacturing processes, this invaluable reference covers: Green chemistry and green engineering in the movement towards sustainability Designing greener, safer chemical synthesis Designing greener, safer chemical manufacturing processes Looking beyond current processes to a lifecycle thinking perspective Trends in chemical processing that may lead to more sustainable practices The authors also provide real-world examples and exercises to promote further thought and discussion. The EPA defines green chemistry as the design of chemical products and processes that reduce or eliminate the use or generation of hazardous substances. Green engineering is described as the design, commercialization, and use of products and processes that are feasible and economical while minimizing both the generation of pollution at the source and the risk to human health and the environment. While there is no shortage of books on either discipline, Green Chemistry and Engineering is the first to truly integrate the two.

Related to chemical process equipment selection and design

Chemistry | Definition, Topics, Types, History, & Facts | Britannica Cooking, fermentation, glass making, and metallurgy are all chemical processes that date from the beginnings of civilization. Today, vinyl, Teflon, liquid crystals,

Chemical compound | Definition, Examples, & Types | Britannica 6 days ago All the matter in the universe is composed of the atoms of more than 100 different chemical elements, which are found both in pure form and combined in chemical compounds

Chemical reaction | Definition, Equations, Examples, & Types A chemical reaction is a process in which one or more substances, the reactants, are converted to one or more different substances, the products. Substances are either

Chemical element | Definition, Origins, Distribution, & Facts 5 days ago A chemical element is any substance that cannot be decomposed into simpler substances by ordinary chemical processes. Elements are the fundamental materials of which

Bismuth | Properties, Uses, Symbol, & Facts | Britannica The principal chemical application of bismuth is in the form of bismuth phosphomolybdate (BiPMo₁₂O₄₀), which is an effective catalyst for the air oxidation of

Chemical formula | Definition, Types, Examples, & Facts | Britannica Chemical formula, any of several kinds of expressions of the composition or structure of chemical compounds. The forms commonly encountered are empirical, molecular,

Chemical bonding | Definition, Types, & Examples | Britannica This article begins by describing the historical evolution of the current understanding of chemical bonding and then discusses how modern theories of the formation

Chemical energy | Definition & Facts | Britannica The chemical energy in food is converted by the body into mechanical energy and heat. The chemical energy in coal is converted into electrical energy at a power plant

Mercury | Definition, Uses, Density, & Facts | Britannica The name mercury originated in 6th-century alchemy, in which the symbol of the planet was used to represent the metal; the chemical symbol Hg derives from the Latin

Agent Orange | Definition, Effects, & Victims | Britannica The Editors of Encyclopaedia Britannica Last Updated: Article History Related Topics: chemical weapon dioxin defoliant On the Web: National Center for

Chemistry | Definition, Topics, Types, History, & Facts | Britannica Cooking, fermentation, glass making, and metallurgy are all chemical processes that date from the beginnings of civilization. Today, vinyl, Teflon, liquid crystals,

Chemical compound | Definition, Examples, & Types | Britannica 6 days ago All the matter in the universe is composed of the atoms of more than 100 different chemical elements, which are found both in pure form and combined in chemical compounds

Chemical reaction | Definition, Equations, Examples, & Types A chemical reaction is a process in which one or more substances, the reactants, are converted to one or more different substances, the products. Substances are either

Chemical element | Definition, Origins, Distribution, & Facts 5 days ago A chemical element is any substance that cannot be decomposed into simpler substances by ordinary chemical processes. Elements are the fundamental materials of which

Bismuth | Properties, Uses, Symbol, & Facts | Britannica The principal chemical application of bismuth is in the form of bismuth phosphomolybdate (BiPMo 12 O 40), which is an effective catalyst for the air oxidation of

Chemical formula | Definition, Types, Examples, & Facts | Britannica Chemical formula, any of several kinds of expressions of the composition or structure of chemical compounds. The forms commonly encountered are empirical, molecular,

Chemical bonding | Definition, Types, & Examples | Britannica This article begins by describing the historical evolution of the current understanding of chemical bonding and then discusses how modern theories of the formation

Chemical energy | Definition & Facts | Britannica The chemical energy in food is converted by the body into mechanical energy and heat. The chemical energy in coal is converted into electrical energy at a power plant

Mercury | Definition, Uses, Density, & Facts | Britannica The name mercury originated in 6th-century alchemy, in which the symbol of the planet was used to represent the metal; the chemical symbol Hg derives from the Latin

Agent Orange | Definition, Effects, & Victims | Britannica The Editors of Encyclopaedia Britannica Last Updated: Article History Related Topics: chemical weapon dioxin defoliant On the Web: National Center for

Chemistry | Definition, Topics, Types, History, & Facts | Britannica Cooking, fermentation, glass making, and metallurgy are all chemical processes that date from the beginnings of civilization. Today, vinyl, Teflon, liquid crystals,

Chemical compound | Definition, Examples, & Types | Britannica 6 days ago All the matter in the universe is composed of the atoms of more than 100 different chemical elements, which are found both in pure form and combined in chemical compounds

Chemical reaction | Definition, Equations, Examples, & Types A chemical reaction is a process in which one or more substances, the reactants, are converted to one or more different substances, the products. Substances are either

Chemical element | Definition, Origins, Distribution, & Facts 5 days ago A chemical element is any substance that cannot be decomposed into simpler substances by ordinary chemical processes. Elements are the fundamental materials of which

Bismuth | Properties, Uses, Symbol, & Facts | Britannica The principal chemical application of bismuth is in the form of bismuth phosphomolybdate (BiPMo 12 O 40), which is an effective catalyst for the air oxidation of

Chemical formula | Definition, Types, Examples, & Facts | Britannica Chemical formula, any of several kinds of expressions of the composition or structure of chemical compounds. The forms commonly encountered are empirical, molecular,

Chemical bonding | Definition, Types, & Examples | Britannica This article begins by describing the historical evolution of the current understanding of chemical bonding and then discusses how modern theories of the formation

Chemical energy | Definition & Facts | Britannica The chemical energy in food is converted by the body into mechanical energy and heat. The chemical energy in coal is converted into electrical energy at a power plant

Mercury | Definition, Uses, Density, & Facts | Britannica The name mercury originated in 6th-century alchemy, in which the symbol of the planet was used to represent the metal; the chemical symbol Hg derives from the Latin

Agent Orange | Definition, Effects, & Victims | Britannica The Editors of Encyclopaedia Britannica Last Updated: Article History Related Topics: chemical weapon dioxin defoliant On the Web: National Center for

Chemistry | Definition, Topics, Types, History, & Facts | Britannica Cooking, fermentation, glass making, and metallurgy are all chemical processes that date from the beginnings of civilization. Today, vinyl, Teflon, liquid crystals,

Chemical compound | Definition, Examples, & Types | Britannica 6 days ago All the matter in the universe is composed of the atoms of more than 100 different chemical elements, which are found both in pure form and combined in chemical compounds

Chemical reaction | Definition, Equations, Examples, & Types A chemical reaction is a process in which one or more substances, the reactants, are converted to one or more different substances, the products. Substances are either

Chemical element | Definition, Origins, Distribution, & Facts 5 days ago A chemical element is any substance that cannot be decomposed into simpler substances by ordinary chemical processes. Elements are the fundamental materials of which

Bismuth | Properties, Uses, Symbol, & Facts | Britannica The principal chemical application of bismuth is in the form of bismuth phosphomolybdate (BiPMo 12 O 40), which is an effective catalyst for the air oxidation of

Chemical formula | Definition, Types, Examples, & Facts | Britannica Chemical formula, any of several kinds of expressions of the composition or structure of chemical compounds. The forms commonly encountered are empirical, molecular,

Chemical bonding | Definition, Types, & Examples | Britannica This article begins by describing the historical evolution of the current understanding of chemical bonding and then discusses how modern theories of the formation

Chemical energy | Definition & Facts | Britannica The chemical energy in food is converted by the body into mechanical energy and heat. The chemical energy in coal is converted into electrical energy at a power plant

Mercury | Definition, Uses, Density, & Facts | Britannica The name mercury originated in 6th-century alchemy, in which the symbol of the planet was used to represent the metal; the chemical symbol Hg derives from the Latin

Agent Orange | Definition, Effects, & Victims | Britannica The Editors of Encyclopaedia Britannica Last Updated: Article History Related Topics: chemical weapon dioxin defoliant On the Web: National Center for

Chemistry | Definition, Topics, Types, History, & Facts | Britannica Cooking, fermentation, glass making, and metallurgy are all chemical processes that date from the beginnings of civilization. Today, vinyl, Teflon, liquid crystals,

Chemical compound | Definition, Examples, & Types | Britannica 6 days ago All the matter in the universe is composed of the atoms of more than 100 different chemical elements, which are found both in pure form and combined in chemical compounds

Chemical reaction | Definition, Equations, Examples, & Types A chemical reaction is a process in which one or more substances, the reactants, are converted to one or more different substances, the products. Substances are either

Chemical element | Definition, Origins, Distribution, & Facts 5 days ago A chemical element is any substance that cannot be decomposed into simpler substances by ordinary chemical processes. Elements are the fundamental materials of which

Bismuth | Properties, Uses, Symbol, & Facts | Britannica The principal chemical application of bismuth is in the form of bismuth phosphomolybdate (BiPMo 12 O 40), which is an effective catalyst for the air oxidation of

Chemical formula | Definition, Types, Examples, & Facts | Britannica Chemical formula, any of several kinds of expressions of the composition or structure of chemical compounds. The forms commonly encountered are empirical, molecular,

Chemical bonding | Definition, Types, & Examples | Britannica This article begins by describing the historical evolution of the current understanding of chemical bonding and then discusses how modern theories of the formation

Chemical energy | Definition & Facts | Britannica The chemical energy in food is converted by the body into mechanical energy and heat. The chemical energy in coal is converted into electrical energy at a power plant

Mercury | Definition, Uses, Density, & Facts | Britannica The name mercury originated in 6th-century alchemy, in which the symbol of the planet was used to represent the metal; the chemical symbol Hg derives from the Latin

Agent Orange | Definition, Effects, & Victims | Britannica The Editors of Encyclopaedia Britannica Last Updated: Article History Related Topics: chemical weapon dioxin defoliant On the Web: National Center for

Chemistry | Definition, Topics, Types, History, & Facts | Britannica Cooking, fermentation, glass making, and metallurgy are all chemical processes that date from the beginnings of civilization. Today, vinyl, Teflon, liquid crystals,

Chemical compound | Definition, Examples, & Types | Britannica 6 days ago All the matter in the universe is composed of the atoms of more than 100 different chemical elements, which are found both in pure form and combined in chemical compounds

Chemical reaction | Definition, Equations, Examples, & Types A chemical reaction is a process in which one or more substances, the reactants, are converted to one or more different substances, the products. Substances are either

Chemical element | Definition, Origins, Distribution, & Facts 5 days ago A chemical element is any substance that cannot be decomposed into simpler substances by ordinary chemical processes. Elements are the fundamental materials of which

Bismuth | Properties, Uses, Symbol, & Facts | Britannica The principal chemical application of bismuth is in the form of bismuth phosphomolybdate (BiPMo₁₂O₄₀), which is an effective catalyst for the air oxidation of

Chemical formula | Definition, Types, Examples, & Facts | Britannica Chemical formula, any of several kinds of expressions of the composition or structure of chemical compounds. The forms commonly encountered are empirical, molecular,

Chemical bonding | Definition, Types, & Examples | Britannica This article begins by describing the historical evolution of the current understanding of chemical bonding and then discusses how modern theories of the formation

Chemical energy | Definition & Facts | Britannica The chemical energy in food is converted by the body into mechanical energy and heat. The chemical energy in coal is converted into electrical energy at a power plant

Mercury | Definition, Uses, Density, & Facts | Britannica The name mercury originated in 6th-century alchemy, in which the symbol of the planet was used to represent the metal; the chemical symbol Hg derives from the Latin

Agent Orange | Definition, Effects, & Victims | Britannica The Editors of Encyclopaedia Britannica Last Updated: Article History Related Topics: chemical weapon dioxin defoliant On the Web: National Center for

Chemistry | Definition, Topics, Types, History, & Facts | Britannica Cooking, fermentation, glass making, and metallurgy are all chemical processes that date from the beginnings of civilization. Today, vinyl, Teflon, liquid crystals,

Chemical compound | Definition, Examples, & Types | Britannica 6 days ago All the matter in the universe is composed of the atoms of more than 100 different chemical elements, which are found both in pure form and combined in chemical compounds

Chemical reaction | Definition, Equations, Examples, & Types A chemical reaction is a process in which one or more substances, the reactants, are converted to one or more different substances, the products. Substances are either

Chemical element | Definition, Origins, Distribution, & Facts 5 days ago A chemical element is any substance that cannot be decomposed into simpler substances by ordinary chemical processes. Elements are the fundamental materials of which

Bismuth | Properties, Uses, Symbol, & Facts | Britannica The principal chemical application of bismuth is in the form of bismuth phosphomolybdate (BiPMo 12 O 40), which is an effective catalyst for the air oxidation of

Chemical formula | Definition, Types, Examples, & Facts | Britannica Chemical formula, any of several kinds of expressions of the composition or structure of chemical compounds. The forms commonly encountered are empirical, molecular,

Chemical bonding | Definition, Types, & Examples | Britannica This article begins by describing the historical evolution of the current understanding of chemical bonding and then discusses how modern theories of the formation

Chemical energy | Definition & Facts | Britannica The chemical energy in food is converted by the body into mechanical energy and heat. The chemical energy in coal is converted into electrical energy at a power plant

Mercury | Definition, Uses, Density, & Facts | Britannica The name mercury originated in 6th-century alchemy, in which the symbol of the planet was used to represent the metal; the chemical symbol Hg derives from the Latin

Agent Orange | Definition, Effects, & Victims | Britannica The Editors of Encyclopaedia Britannica Last Updated: Article History Related Topics: chemical weapon dioxin defoliant On the Web: National Center for

Related to chemical process equipment selection and design

CHEM_ENG 352: Chemical Engineering Design Projects (mccormick.northwestern.edu5y) Design of chemical and process plants applying the principles of unit operations, thermodynamics, reaction kinetics and economics. Mechanical design and selection of chemical process equipment

CHEM_ENG 352: Chemical Engineering Design Projects (mccormick.northwestern.edu5y) Design of chemical and process plants applying the principles of unit operations, thermodynamics, reaction kinetics and economics. Mechanical design and selection of chemical process equipment

Chemical Process Principles (Nature11mon) THESE volumes consider process problems of a physico-chemical nature and they do not contain any detailed discussion of equipment, of selection of materials for construction or of mechanical design

Chemical Process Principles (Nature11mon) THESE volumes consider process problems of a physico-chemical nature and they do not contain any detailed discussion of equipment, of selection of materials for construction or of mechanical design

Related Articles

- [dr mark hyman the blood sugar solution](#)
- [human relations strategies for success](#)
- [activity 8 7 crime scene investigation answer key](#)

[Back to Home](#)