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CHEMICAL ENGINEERING DESIGN

PRINCIPLES, PRACTICE AND ECONOMICS OF PLANT AND PROCESS DESIGN

Elsevier *Chemical Engineering Design, Second Edition*, deals with the application of chemical engineering principles to the design of chemical processes and equipment. Revised throughout, this edition has been specifically developed for the U.S. market. It provides the latest US codes and standards, including API, ASME and ISA design codes and ANSI standards. It contains new discussions of conceptual plant design, flowsheet development, and revamp design; extended coverage of capital cost estimation, process costing, and economics; and new chapters on equipment selection, reactor design, and solids handling processes. A rigorous pedagogy assists learning, with detailed worked examples, end of chapter exercises, plus supporting data, and Excel spreadsheet calculations, plus over 150 Patent References for downloading from the companion website. Extensive instructor resources, including 1170 lecture slides and a fully worked solutions manual are available to adopting instructors. This text is designed for chemical and biochemical engineering students (senior undergraduate year, plus appropriate for capstone design courses where taken, plus graduates) and lecturers/tutors, and professionals in industry (chemical process, biochemical, pharmaceutical, petrochemical sectors). New to this edition: Revised organization into Part I: Process Design, and Part II: Plant Design. The broad themes of Part I are flowsheet development, economic analysis, safety and environmental impact and optimization. Part II contains chapters on equipment design and selection that can be used as supplements to a lecture course or as essential references for students or practicing engineers working on design projects. New discussion of conceptual plant design, flowsheet development and revamp design Significantly increased coverage of capital cost estimation, process costing and economics New chapters on equipment selection, reactor design and solids handling processes New sections on fermentation, adsorption, membrane separations, ion exchange and chromatography Increased coverage of batch processing, food, pharmaceutical and biological processes All equipment chapters in Part II revised and updated with current information Updated throughout for latest US codes and standards, including API, ASME and ISA design codes and ANSI standards Additional worked examples and homework problems The most complete and up to date coverage of equipment selection 108 realistic commercial design projects from diverse industries A rigorous pedagogy assists learning, with detailed worked examples, end of chapter exercises, plus supporting data and Excel spreadsheet calculations plus over 150 Patent References, for downloading from the companion website Extensive instructor resources: 1170 lecture slides plus fully worked solutions manual available to adopting instructors

ENGINEERING ECONOMICS AND ECONOMIC DESIGN FOR PROCESS ENGINEERS

CRC Press 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.

CHEMICAL INDUSTRIES

Some vols. include Buyers' guide.

11TH INTERNATIONAL SYMPOSIUM ON PROCESS SYSTEMS ENGINEERING - PSE2012

Elsevier

POPULAR SCIENCE

Popular Science gives our readers the information and tools to improve their technology and their world. The core belief that Popular Science and our readers share: The future is going to be better, and science and technology are the driving forces that will help make it better.

CHEMICAL ENGINEERING PROGRESS

ENVIRONMENTAL BIOTECHNOLOGY

A BIOSYSTEMS APPROACH

Academic Press *Environmental Biotechnology: A Biosystems Approach* introduces a systems approach to environmental biotechnology and its applications to a range of environmental problems. A systems approach requires a basic understanding of four disciplines: environmental engineering, systems biology, environmental microbiology, and ecology. These disciplines are discussed in the context of their application to achieve specific environmental outcomes and to avoid problems in such applications. The book begins with a discussion of the background and historical context of contemporary issues in biotechnology. It then explains the scientific principles of environmental biotechnologies; environmental biochemodynamic processes; environmental risk assessment; and the reduction and management of biotechnological risks. It describes ways to address environmental problems caused or exacerbated by biotechnologies. It also emphasizes need for professionalism in environmental biotechnological enterprises. This book was designed to serve as a primary text for two full semesters of undergraduate study (e.g., *Introduction to Environmental Biotechnology* or *Advanced Environmental Biotechnology*). It will also be a resource text for a graduate-level seminar in environmental biotechnology (e.g., *Environmental Implications of Biotechnology*). * Provides a systems approach to biotechnologies which includes the physical, biological, and chemical processes in context * Case studies include cutting-edge technologies such as nanobiotechnologies and green engineering * Addresses both the applications and implications of biotechnologies by following the life-cycle of a variety of established and developing biotechnologies

CHEMICAL ENGINEERING

PROCESS ENGINEERING RENEWAL 2

RESEARCH

John Wiley & Sons *Process engineering emerged at the beginning of the 20th Century and has become an essential scientific discipline for the matter and energy processing industries. Its success is incontrovertible, with the exponential increase in techniques and innovations. Rapid advances in new technologies such as artificial intelligence, as well as current societal needs – sustainable development, climate change, renewable energy, the environment – are developments that must be taken into account in industrial renewal. Process Engineering Renewal 2 focuses on research in process engineering, which is partly overshadowed by the sciences that contribute to its development. The external constraints of this interface science must be seen in relation to conservation, sustainable development, global warming, etc., which are linked to current success and the difficulty of taking risks in research.*

UN RENOUVEAU DU GÉNIE DES PROCÉDÉS 2

RECHERCHE

ISTE Group *Apparu au début du siècle précédent, le génie des procédés est devenu une discipline scientifique incontournable pour les industries de transformation de la matière et de l'énergie. Son succès ne se dément pas avec l'augmentation exponentielle des techniques et des innovations. Le développement rapide de nouvelles technologies comme l'intelligence artificielle ou de nouveaux besoins sociétaux (développement durable, réchauffement climatique, énergies renouvelables, environnement, etc.) implique des évolutions qui doivent être prises en considération dans le nouveau industriel. Ce second volume s'intéresse aux recherches menées en génie des procédés, partiellement occultées par les sciences qui concourent à son développement. Les contraintes externes de cette science d'interface doivent être mises en regard avec des conservatismes divers, liés au succès actuel et à la difficulté de la prise de risque en recherche.*

23 EUROPEAN SYMPOSIUM ON COMPUTER AIDED PROCESS ENGINEERING

OPTIMAL DESIGN OF SWRO DESALINATION PROCESSES WITH BORON LEVEL CONSIDERATIONS

Elsevier Inc. Chapters *Reverse osmosis is the leading technology for seawater desalination. We have recently introduced a systematic two-step approach based on process network optimization techniques [1]. The methodology allows for a reliable and relatively quick determination of optimal process structures for seawater reverse osmosis (SWRO) desalination systems, as well as for the analysis of trends across different design classes [1] for a given economic objective and typical design constraints. The approach was subsequently extended to address detailed water quality information as part of the process network synthesis, by developing simple but realistic membrane element models based on commercial simulators, in order to account for the rejection of individual seawater constituents throughout the temperature ranges of interest [2]. This enables the design for common product water specifications whilst capturing membrane-scaling issues. This work expands our previous efforts, and more specifically addresses the*

issue of boron removal, which is often a key challenge in SWRO design. RO membrane element models that allow for the tracing of individual constituents throughout the processing system, including boron, were developed and incorporated into the process network optimization problem formulation. The superstructure optimization formulations were also expanded so as to handle additional design decisions associated with Boron removal in SWRO process networks. This includes selecting suitable combinations for several options of membrane elements types listed by the ROSA membrane simulator (Dow), determining optimum pH conditions required for these membrane element choices, and acid/base dosing adjustments required. The approach has been illustrated with a case study that involves seawater qualities with salinities ranging from 35 to 50 ppt. The results highlight the variation in optimal designs depending on the given feed water quality, the desired salinity removal and the acceptable boron level in the permeate stream.

CARBON DIOXIDE CAPTURE AND STORAGE

SPECIAL REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

Cambridge University Press IPCC Report on sources, capture, transport, and storage of CO₂, for researchers, policy-makers and engineers.

THE NATIONAL UNION CATALOG, PRE-1956 IMPRINTS

A CUMULATIVE AUTHOR LIST REPRESENTING LIBRARY OF CONGRESS PRINTED CARDS AND TITLES REPORTED BY OTHER AMERICAN LIBRARIES

FOSSIL ENERGY UPDATE

OCEANIC INDEX

ISA CONFERENCE PROCEEDINGS

BULLETIN

JOURNAL OF THE INSTITUTION OF ENGINEERS (INDIA).

CHEMICAL ENGINEERING DIVISION

NUCLEAR SCIENCE ABSTRACTS

NSA is a comprehensive collection of international nuclear science and technology literature for the period 1948 through 1976, pre-dating the prestigious INIS database, which began in 1970. NSA existed as a printed product (Volumes 1-33) initially, created by DOE's predecessor, the U.S. Atomic Energy Commission (AEC). NSA includes citations to scientific and technical reports from the AEC, the U.S. Energy Research and Development Administration and its contractors, plus other agencies and international organizations, universities, and industrial and research organizations. References to books, conference proceedings, papers, patents, dissertations, engineering drawings, and journal articles from worldwide sources are also included. Abstracts and full text are provided if available.

THE CHEMICAL ENGINEER

NEW SERIAL TITLES

A union list of serials commencing publication after Dec. 31, 1949.

DIRECTORY OF AMERICAN RESEARCH AND TECHNOLOGY

HISTORY, DEVELOPMENT AND MANAGEMENT OF WATER RESOURCES - VOLUME I

EOLSS Publications These volumes are part of Encyclopedia of Water Sciences, Engineering and Technology Resources in the global Encyclopedia of Life Support Systems (EOLSS), which is an integrated compendium of twenty one Encyclopedias. The two volumes present state-of-the art subject matter of various aspects of History, Development and Management of Water Resources These volumes are aimed at the following five major target audiences: University and College Students Educators, Professional Practitioners, Research Personnel and Policy and Decision Makers.

PROCESS TECHNOLOGIES FOR WATER TREATMENT

Springer Science & Business Media The Brown Boveri Scientific Symposia by now are part of a firmly established tradition. This is the tenth event in a series which was initiated shortly after Corporate Research was created as a separate entity in our company; the symposia are held every other year. The themes have been: 1969 Flow Research on Blading 1971 Real-Time Control of Electric Power Systems 1973 High-Temperature Materials in Gas Turbines 1975 Nonemissive Electrooptic Displays 1977 Current Interruption in High-Voltage Networks 1979 Surges in High-Voltage Networks 1981 Semiconductor Devices for Power Conditioning 1983 Corrosion in Power Generating Equipment 1985 Computer Systems for Process Control 1987 Process Technologies for Water Treatment The tenth event in an uninterrupted series that by now goes back almost 20 years is a good opportunity to make a few remarks on the guiding rules that have governed our symposia. Why have we chosen these titles? At the outset we established certain selection criteria; we felt that a subject for a symposium should fulfill the following three requirements: It should characterize a part of an established discipline; in other words, it should describe an area of scholarly study and research. It should be of current interest in the sense that important results have recently been obtained and considerable research is still being undertaken in the world's scientific community. It should

bear some relation to the scientific and technological activity of the company.

CATALOGUE OF THE PUBLIC DOCUMENTS OF THE ... CONGRESS AND OF ALL DEPARTMENTS OF THE GOVERNMENT OF THE UNITED STATES FOR THE PERIOD FROM ... TO ...

PLATING AND SURFACE FINISHING

THE FOURTH INDUSTRIAL REVOLUTION

Penguin UK The founder and executive chairman of the World Economic Forum on how the impending technological revolution will change our lives We are on the brink of the Fourth Industrial Revolution. And this one will be unlike any other in human history. Characterized by new technologies fusing the physical, digital and biological worlds, the Fourth Industrial Revolution will impact all disciplines, economies and industries - and it will do so at an unprecedented rate. World Economic Forum data predicts that by 2025 we will see: commercial use of nanomaterials 200 times stronger than steel and a million times thinner than human hair; the first transplant of a 3D-printed liver; 10% of all cars on US roads being driverless; and much more besides. In The Fourth Industrial Revolution, Schwab outlines the key technologies driving this revolution, discusses the major impacts on governments, businesses, civil society and individuals, and offers bold ideas for what can be done to shape a better future for all.

TRANSACTIONS

SELECTED WATER RESOURCES ABSTRACTS

PROCESS SYNTHESIS

Academic Press Volume 23 of *Advances in Chemical Engineering* covers the active field of process synthesis. There are currently three prevalent approaches to complex process synthesis strategies: heuristics-based selection, geometric representation, and optimization methods. This volume addresses a variety of these synthesis strategies for process subsystems, representing only a sample of the state-of-the-art of process synthesis research. The five papers in this volume address quite different process subsystems and application areas but still combine basic concepts related to a systematic approach. All five of the papers develop successful synthesis methods for their respective cutting-edge applications. As a group, the papers serve to highlight many unresolved issues in process synthesis and also provide guidelines for future research. Considers current approaches to process synthesis problems Examines areas of possible future research Articles written by leading experts in the field

WASTE

A HANDBOOK FOR MANAGEMENT

Academic Press *Waste: A Handbook for Management, Second Edition*, provides information on a wide range of hot topics and developing areas, such as hydraulic fracturing, microplastics, waste management in developing countries, and waste-exposure-outcome pathways. Beginning with an overview of the current waste landscape, including green engineering, processing principles and regulations, the book then outlines waste streams and treatment methods for over 25 different types of waste and reviews best practices and management, challenges for developing countries, risk assessment, contaminant pathways and risk tradeoffs. With an overall focus on waste recovery, reuse, prevention and lifecycle analysis, the book draws on the experience of an international team of expert contributors to provide reliable guidance on how best to manage wastes for scientists, managers, engineers and policymakers in both the private and public sectors. Covers the assessment and treatment of different waste streams in a single book Provides a hands-on report on each type of waste problem as written by an expert in the field Highlights new findings and evolving problems in waste management via discussion boxes

BRITISH CHEMICAL ENGINEERING & PROCESS TECHNOLOGY

EDS, ENVIRONMENTAL DATA SERVICE

PROCESS AND CHEMICAL ENGINEERING

THE ENGINEER

CHEMICAL REACTOR DESIGN AND CONTROL

John Wiley & Sons *Chemical Reactor Design and Control* uses process simulators like Matlab®, Aspen Plus, and Aspen Dynamics to study the design of chemical reactors and their dynamic control. There are numerous books that focus on steady-state reactor design. There are no books that consider practical control systems for real industrial reactors. This unique reference addresses the simultaneous design and control of chemical reactors. After a discussion of reactor basics, it: Covers three types of classical reactors: continuous stirred tank (CSTR), batch, and tubular plug flow Emphasizes temperature control and the critical impact of steady-state design on the dynamics and stability of reactors Covers chemical reactors and control problems in a plantwide environment Incorporates numerous tables and shows step-by-step calculations with equations Discusses how to use process simulators to address diverse issues and types of operations This is a practical reference for chemical engineering professionals in the process industries, professionals who work with chemical reactors, and students in undergraduate and graduate reactor design, process control, and plant design courses.

BIOMASS GASIFICATION AND PYROLYSIS

PRACTICAL DESIGN AND THEORY

Academic Press *This book offers comprehensive coverage of the design, analysis, and operational aspects of biomass gasification, the key technology enabling the production of biofuels from all viable sources--some examples being sugar cane and switchgrass. This versatile resource not only explains the basic principles of energy conversion systems, but also provides valuable insight into the design of biomass gasifiers. The author provides many worked out design problems, step-by-step design procedures and real data on commercially operating systems. After fossil fuels, biomass is the most widely used fuel in the world. Biomass resources show a considerable potential in the long term if residues are properly handled and dedicated energy crops are grown. Includes step-by-step design procedures and case studies for Biomass Gasification Provides worked process flow diagrams for gasifier design. Covers integration with other technologies (e.g. gas turbine, engine, fuel cells)*

THE COLLEGE BLUE BOOK

SUSTAINABLE UTILIZATION OF NATURAL RESOURCES

CRC Press *Increased research is going on to explore the new cleaner options for the utilization of natural resources. This book aims to provide the scientific knowhow and orientation in the area of the emerging technologies for utilization of natural resources for sustainable development to the readers. The book includes production of energy and lifesaving drugs using natural resources as well as reduction of wastage of resources like water and energy for sustainable development in both technological as well as modeling aspects.*

RE-ENGINEERING THE CHEMICAL PROCESSING PLANT

PROCESS INTENSIFICATION

CRC Press *The first guide to compile current research and frontline developments in the science of process intensification (PI), Re-Engineering the Chemical Processing Plant illustrates the design, integration, and application of PI principles and structures for the development and optimization of chemical and industrial plants. This volume updates professionals on emerging PI equipment and methodologies to promote technological advances and operational efficacy in chemical, biochemical, and engineering environments and presents clear examples illustrating the implementation and application of specific process-intensifying equipment and methods in various commercial arenas.*