

Mechanical Agitator Power Requirements For Liquid Batches

Chemical and related industries often equip processes with mechanical agitators in continuous operation. Continuous systems with high incoming flow rates, such as those in water treatment applications, have experienced deviations between actual agitator power draw and that predicted with experimental data from batch studies. Occasionally, underestimating power draw can have costly consequences, such as shutting down a process for repairs. This work investigates the effects of flow on agitator power draw due to variables including impeller type and diameter, inlet diameter, and imposed flow rate for an agitated vessel in continuous operation with a bottom-centered inlet. It has been observed that some continuous systems experience significant differences in power draw from batch systems. Three radial-flow disc impellers were tested and each experienced nearly linear increases in power draw with increasing imposed flow. The S-4 impeller, a radial-flow impeller with no disc, experienced an increase in power draw with increasing imposed flow until reaching a maximum, after which the power draw rapidly decreased to a minimum, and then gradually began to rise again. The P-4 and HE-3 impellers in the down-pumping orientation experienced increases in power draw, which were steeper for the HE-3. The P-4 in the up-pumping orientation experienced a slight increase in power draw with increasing imposed flow rate, followed by a slight

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decrease, whereas the up-pumping HE-3 experienced a significant power draw decrease. General graphical correlations have been developed as the ratio of power number with flow to the power number without flow as a function of the imposed flow velocity to impeller tip speed ratio, in disagreement with literature models that predict that the power number ratio is determined by the ratio of imposed volumetric flow rate to impeller pumping rate. Only the S-4 data was correlated by the flow ratio. Some systems diverge from the correlations due to less imposed flow contacting the impeller discharge by mechanisms of bypassing and flooding. Also, some deviations may be due to data uncertainty and system temporal variance, which are difficult to quantify and should be considered in future studies.

This title is part of UC Press's Voices Revived program, which commemorates University of California Press's mission to seek out and cultivate the brightest minds and give them voice, reach, and impact. Drawing on a backlist dating to 1893, Voices Revived makes high-quality, peer-reviewed scholarship accessible once again using print-on-demand technology. This title was originally published in 1975.

This book is concise reference to designing mechanically sound agitation systems that will perform the process function efficiently and economically. Currently, all the books on bioreactor and fermenter design do not focus specifically on agitation. Sections cover agitator fundamentals, impeller systems, optimum power and air flow at peak mass transfer calculations, optimizing operation for minimum energy per batch, heat

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transfer surfaces and calculations, shaft seal considerations, mounting method, mechanical design, and vendor evaluation.

A staple in any chemical engineering curriculum New edition has a stronger emphasis on membrane separations, chromatography and other adsorptive processes, ion exchange Discusses many developing topics in more depth in mass transfer operations, especially in the biological engineering area Covers in more detail phase equilibrium since distillation calculations are completely dependent on this principle Integrates computational software and problems using Mathcad Features 25-30 problems per chapter

A pressure vessel is a container that holds a liquid, vapor, or gas at a different pressure other than atmospheric pressure at the same elevation. More specifically in this instance, a pressure vessel is used to 'distill'/'crack' crude material taken from the ground (petroleum, etc.) and output a finer quality product that will eventually become gas, plastics, etc. This book is an accumulation of design procedures, methods, techniques, formulations, and data for use in the design of pressure vessels, their respective parts and equipment. The book has broad applications to chemical, civil and petroleum engineers, who construct, install or operate process facilities, and would also be an invaluable tool for those who inspect the manufacturing of pressure vessels or review designs. * ASME standards and guidelines (such as the method for determining the Minimum Design Metal Temperature)are impenetrable and expensive: avoid both

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problems with this expert guide. * Visual aids walk the designer through the multifaceted stages of analysis and design. * Includes the latest procedures to use as tools in solving design issues.

Concept of Design for Agitator/MixerImran Pinjara

Outlines the concepts of chemical engineering so that non-chemical engineers can interface with and understand basic chemical engineering concepts Overviews the difference between laboratory and industrial scale practice of chemistry, consequences of mistakes, and approaches needed to scale a lab reaction process to an operating scale Covers basics of chemical reaction engineering, mass, energy, and fluid energy balances, how economics are scaled, and the nature of various types of flow sheets and how they are developed vs. time of a project Details the basics of fluid flow and transport, how fluid flow is characterized and explains the difference between positive displacement and centrifugal pumps along with their limitations and safety aspects of these differences Reviews the importance and approaches to controlling chemical processes and the safety aspects of controlling chemical processes, Reviews the important chemical engineering design aspects of unit operations including distillation, absorption and stripping, adsorption, evaporation and crystallization, drying and solids handling, polymer manufacture, and the basics of tank and agitation system design This landmark publication distills the body of knowledge that characterizes mineral processing and extractive metallurgy as disciplinary fields. It will inspire and inform

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current and future generations of minerals and metallurgy professionals. Mineral processing and extractive metallurgy are atypical disciplines, requiring a combination of knowledge, experience, and art. Investing in this trove of valuable information is a must for all those involved in the industry—students, engineers, mill managers, and operators. More than 192 internationally recognized experts have contributed to the handbook's 128 thought-provoking chapters that examine nearly every aspect of mineral processing and extractive metallurgy. This inclusive reference addresses the magnitude of traditional industry topics and also addresses the new technologies and important cultural and social issues that are important today. Contents Mineral Characterization and Analysis Management and Reporting Comminution Classification and Washing Transport and Storage Physical Separations Flotation Solid and Liquid Separation Disposal Hydrometallurgy Pyrometallurgy Processing of Selected Metals, Minerals, and Materials

Handbook of Industrial Mixing will explain the difference and uses of a variety of mixers including gear mixers, top entry mixers, side entry mixers, bottom entry mixers, on-line mixers, and submerged mixers The Handbook discusses the trade-offs among various mixers, concentrating on which might be considered for a particular process. Handbook of Industrial Mixing explains industrial mixers in a clear concise manner, and also: *

- * Contains a CD-ROM with video clips showing different type of mixers in action and a overview of their uses.
- * Gives practical insights by the top professional in the field.

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Details applications in key industries. * Provides the professional with information he did receive in school

First published in 1985. Routledge is an imprint of Taylor & Francis, an informa company.

This title is a general introduction aimed at all those involved in the engineering stages required for the manufacturr of the active ingredient and its dosage forms.

This book is for acquiring knowledge of designing a Agitator or Mixer. This Book explains Mechanical Design Process of Agitator with example of Designing a agitator,Flow patterns in agitator, Geometrical Relations for various types of agitator Impeller,Selection of agitator on the basis of Viscosity of fluids,Power Curves for Various Impeller for Calculation of Power Number to Calculate Power required for agitation by using Dimensionless equation of power number. This book gives you Overall Guideline of mechanical agitation process for better Understanding.

A companion and update to the first edition, this book explains the difference and uses of a variety of mixers including gear mixers, top entry mixers, side entry mixers, bottom entry mixers, on-line mixers, and submerged mixers, to name some of the more important ones. It also explains the difference between shear and flow in the mixture process and the connection of shear and flow to impeller design. It also discusses the trade-offs among various mixers, which might be considered for a particular process.

First published in 1945, Bailey's has become the standard reference on the food

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chemistry and processing technology related to edible oils and the nonedible byproducts derived from oils. This Sixth Edition features new coverage of edible fats and oils and is enhanced by a second volume on oils and oilseeds. This Sixth Edition consists of six volumes: five volumes on edible oils and fats, with still one volume (as in the fifth edition) devoted to nonedible products from oils and fats. Some brand new topics in the sixth edition include: fungal and algal oils, conjugated linoleic acid, coco butter, phytosterols, and plant biotechnology as related to oil production. Now with 75 accessible chapters, each volume contains a self-contained index for that particular volume.

Some no. include reports compiled from information furnished by State Foresters (and others).

Annotation Based on 138 proceedings papers from October 2002, this broad reference will become the new standard text for colleges and will become a must for engineers, consultants, suppliers, manufacturers.

This broad-based book covers the three major areas of Chemical Engineering. Most of the books in the market involve one of the individual areas, namely, Fluid Mechanics, Heat Transfer or Mass Transfer, rather than all the three. This book presents this material in a single source. This avoids the user having to refer to a number of books to obtain information. Most published books covering all the three areas in a single source emphasize theory rather than practical issues. This book is written with emphasis on

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practice with brief theoretical concepts in the form of questions and answers, not adopting stereo-typed question-answer approach practiced in certain books in the market, bridging the two areas of theory and practice with respect to the core areas of chemical engineering. Most parts of the book are easily understandable by those who are not experts in the field. Fluid Mechanics chapters include basics on non-Newtonian systems which, for instance find importance in polymer and food processing, flow through piping, flow measurement, pumps, mixing technology and fluidization and two phase flow. For example it covers types of pumps and valves, membranes and areas of their use, different equipment commonly used in chemical industry and their merits and drawbacks. Heat Transfer chapters cover the basics involved in conduction, convection and radiation, with emphasis on insulation, heat exchangers, evaporators, condensers, reboilers and fired heaters. Design methods, performance, operational issues and maintenance problems are highlighted. Topics such as heat pipes, heat pumps, heat tracing, steam traps, refrigeration, cooling of electronic devices, NO_x control find place in the book. Mass transfer chapters cover basics such as diffusion, theories, analogies, mass transfer coefficients and mass transfer with chemical reaction, equipment such as tray and packed columns, column internals including structural packings, design, operational and installation issues, drums and separators are discussed in good detail. Absorption, distillation, extraction and leaching with applications and design methods, including emerging practices involving Divided Wall and Petluk column arrangements,

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multicomponent separations, supercritical solvent extraction find place in the book. An examination of the relation between biodrug development and governmental regulation, focusing on the present state of collective knowledge of biotechnological practitioners, including the identification of the scientific basis on regulatory requirements in the field, as well as ways in which the

This Fertilizer Manual was prepared by the International Fertilizer Development Center (IFDC) as a joint project with the United Nations Industrial Development Organization (UNIDO). It is designed to replace the UN Fertilizer Manual published in 1967 and intended to be a reference source on fertilizer production technology and economics and fertilizer industry planning for developing countries. The aim of the new manual is to describe in clear, simple language all major fertilizer processes, their requirements, advantages and disadvantages and to show illustrative examples of economic evaluations. The manual is organized in five parts. Part I deals with the history of fertilizers, world outlook, the role of fertilizers in agriculture, and raw materials and includes a glossary of fertilizer-related terms. Part II covers the production and transportation of ammonia and all important nitrogen fertilizers-liquids and solids. Part III deals with the characteristics of phosphate rock, production of sulfuric and phosphoric acid, and all important phosphate fertilizers, including nitrophosphates and ammonium phosphates. Part IV deals with potash fertilizers-ore mining and refining and chemical manufacture; compound fertilizers; secondary and micronutrients; controlled-

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release fertilizers; and physical properties of fertilizers. Part V includes chapters on planning a fertilizer industry, pollution control, the economics of production of major fertilizer products and intermediates, and problems facing the world fertilizer industry. The successful implementation of greener chemical processes relies not only on the development of more efficient catalysts for synthetic chemistry but also, and as importantly, on the development of reactor and separation technologies which can deliver enhanced processing performance in a safe, cost-effective and energy efficient manner. Process intensification has emerged as a promising field which can effectively tackle the challenges of significant process enhancement, whilst also offering the potential to diminish the environmental impact presented by the chemical industry. Following an introduction to process intensification and the principles of green chemistry, this book presents a number of intensified technologies which have been researched and developed, including case studies to illustrate their application to green chemical processes. Topics covered include:

- Intensified reactor technologies: spinning disc reactors, microreactors, monolith reactors, oscillatory flow reactors, cavitation reactors
- Combined reactor/separator systems: membrane reactors, reactive distillation, reactive extraction, reactive absorption
- Membrane separations for green chemistry
- Industry relevance of process intensification, including economics and environmental impact, opportunities for energy saving, and practical considerations for industrial implementation.

Process Intensification for Green Chemistry

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is a valuable resource for practising engineers and chemists alike who are interested in applying intensified reactor and/or separator systems in a range of industries to achieve green chemistry principles.

From explanations of laws and regulations to hands-on design and operation-the Handbook has it covered!

Rules of Thumb for Chemical Engineers, Fifth Edition, provides solutions, common sense techniques, shortcuts, and calculations to help chemical and process engineers deal with practical on-the-job problems. It discusses physical properties for proprietary materials, pharmaceutical and biopharmaceutical sector heuristics, and process design, along with closed-loop heat transfer systems, heat exchangers, packed columns, and structured packings. Organized into 27 chapters, the book begins with an overview of formulae and data for sizing piping systems for incompressible and compressible flow. It then moves to a discussion of design recommendations for heat exchangers, practical equations for solving fractionation problems, along with design of reactive absorption processes. It also considers different types of pumps and presents narrative as well as tabular comparisons and application notes for various types of fans, blowers, and compressors. The book also walks the reader through the general rules of thumb for vessels, how cooling towers are sized based on parameters such as return temperature and supply temperature, and specifications of refrigeration systems. Other chapters focus on pneumatic conveying, blending and agitation, energy conservation, and process modeling. Chemical engineers faced with fluid flow problems will find this book extremely useful. Rules of Thumb for Chemical Engineers brings

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together solutions, information and work-arounds that engineers in the process industry need to get their job done. New material in the Fifth Edition includes physical properties for proprietary materials, six new chapters, including pharmaceutical, biopharmaceutical sector heuristics, process design with simulation software, and guidelines for hazardous materials and processes Now includes SI units throughout alongside

Bringing together the leading European expertise in behaviour and design of silos, this important new book is an essential reference source for all concerned with current problems and developments in silo technology. Silos are used in an enormous range of industries and the handling characteristics of many industrial materials require different approaches for successful, economical installations. For the first time, the many approaches taken by specialists in different fields are brought together in a unified way so that common problems can be addressed. This book is the result of a four-year European project - Concerted Action - Silos - funded under the Brite Euram programme which has involved over 100 expert engineers and researchers from all over Europe, in seven working groups.

This 2nd Edition of Coulson & Richardson's classic Chemical Engineering text provides a complete update and revision of Volume 6: An Introduction to Design. It provides a revised and updated introduction to the methodology and procedures for process design and process equipment selection and design for the chemical process and allied industries. It includes material on flow sheeting, piping and instrumentation, mechanical design of equipment, costing and project evaluation, safety and loss prevention. The material on safety and loss prevention and environmental protection has been revised to cover current procedures and legislation. Process integration and the use of heat pumps has been included in the chapter on energy

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utilisation. Additional material has been added on heat transfer equipment; agitated vessels are now covered and the discussion of fired heaters and plate heat exchangers extended. The appendices have been extended to include a computer program for energy balances, illustrations of equipment specification sheets and heat exchanger tube layout diagrams. This 2nd Edition will continue to provide undergraduate students of chemical engineering, chemical engineers in industry and chemists and mechanical engineers, who have to tackle problems arising in the process industries, with a valuable text on how a complete process is designed and how it must be fitted into the environment.

Bottom line: For a holistic view of chemical engineering design, this book provides as much, if not more, than any other book available on the topic. --Extract from Chemical Engineering Resources review. 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, this US edition has been specifically developed for the US market. It covers the latest aspects of process design, operations, safety, loss prevention and equipment selection, among others. Comprehensive in coverage, exhaustive in detail, it is supported by extensive problems and a separate solutions manual for adopting tutors and lecturers. In addition, the book is widely used by professions as a day-to-day reference. Provides students with a text of unmatched relevance for the Senior Design Course and Introductory Chemical Engineering Courses Teaches commercial engineering tools for simulation and costing Comprehensive coverage of unit operations, design and economics Strong emphasis on HS&E issues, codes and standards, including API, ASME and ISA design codes and ANSI standards 108 realistic

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commercial design projects from diverse industries

"Designed for an introductory course on Biochemical Engineering, this book interweaves bioprocessing with chemical reaction engineering concepts"--Back cover.

????:Fluid mixing technology

A volume of collected academic articles, €Cyanide Practice, 1910 to 1913 aims to educated readers on the uses of cyanide in the early 1900s around the world.

This volume is a valuable reference work for the student and the practising engineer in the chemical, pharmaceutical, minerals, food, plastics, paper and metallurgical industries. The second edition of this successful text has been thoroughly rewritten and updated. Based on the long running post-experience course produced by the University of Bradford, in association with the Institution of Chemical Engineers, it covers all aspects of mixing, from fundamentals through to design procedures in single and multi-phase systems. Experts from both industry and academia have contributed to this work giving both a theoretical practical approach. It covers dry and wet powders, single and two-phase liquids, solid/liquid and gas/liquid systems. The range of mixers available for such diverse duties is dealt with, including tumbler mixers for powders, mechanically agitated vessels, in-line continuous mixers and jet mixers. Coverage is given of the range of mixing objectives, varying from achieving

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product uniformity to obtaining optimum conditions for mass transfer and chemical reactions. This volume is a valuable reference work for the student and the practising engineer in the chemical, pharmaceutical, minerals, food, plastics, paper and metallurgical industries. The second edition of this successful text has been thoroughly rewritten and updated. Based on the long running post-experience course produced by the University of Bradford, in association with the Institution of Chemical Engineers, it covers all aspects of mixing, from fundamentals through to design procedures in single and multi-phase systems. Experts from both industry and academia have contributed to this work giving both a theoretical practical approach. It covers dry and wet powders, single and two-phase liquids, solid/liquid and gas/liquid systems. The range of mixers available for such diverse duties is dealt with, including tumbler mixers for powders, mechanically agitated vessels, in-line continuous mixers and jet mixers. Coverage is given of the range of mixing objectives, varying from achieving product uniformity to obtaining optimum conditions for mass transfer and chemical reactions.

In the 21st Century, processing food is no longer a simple or straightforward matter. Ongoing advances in manufacturing have placed new demands on the design and methodology of food processes. A highly interdisciplinary science,

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food process design draws upon the principles of chemical and mechanical engineering, microbiology, chemistry, nutrition and economics, and is of central importance to the food industry. Process design is the core of food engineering, and is concerned at its root with taking new concepts in food design and developing them through production and eventual consumption. Handbook of Food Process Design is a major new 2-volume work aimed at food engineers and the wider food industry. Comprising 46 original chapters written by a host of leading international food scientists, engineers, academics and systems specialists, the book has been developed to be the most comprehensive guide to food process design ever published. Starting from first principles, the book provides a complete account of food process designs, including heating and cooling, pasteurization, sterilization, refrigeration, drying, crystallization, extrusion, and separation. Mechanical operations including mixing, agitation, size reduction, extraction and leaching processes are fully documented. Novel process designs such as irradiation, high-pressure processing, ultrasound, ohmic heating and pulsed UV-light are also presented. Food packaging processes are considered, and chapters on food quality, safety and commercial imperatives portray the role process design in the broader context of food production and consumption.

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Biomining is the use of microorganisms in the recovery of metals from ores. During bioleaching, metals such as copper, nickel or zinc are oxidized through microbial action from the water-insoluble sulfide to the soluble sulfate forms. Although gold is inert to microbial action, microbes can also be used in gold recovery from certain types of ores because as they oxidize the ore, they open up its structure, thereby allowing a gold-solubilizing agent such as cyanide to penetrate the ore. The book describes several industrial bioleaching and biooxidation processes as well as the underlying theory and biology of the microbes involved.

The crash of the minerals super cycle is being felt by the global phosphate industry. Fortunate phosphate companies are watching their profits drop manyfold, and the not-so-lucky ones are turning to survival mode. The recent market squeeze and ever-increasing environmental pressures have, however, presented opportunities for developing technologies for extracting the most valuable elements from phosphate. This compilation from the 2015 Beneficiation of Phosphates Conference includes insights from dozens of internationally respected experts on key breakthroughs that will shape the industry in the years ahead. Learn from the best and the brightest in the industry. Topics include: • Recovery of rare earths from phosphate • Uranium recovery from phosphoric

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acid • Recovery of magnesium from high-dolomite phosphate rock • Phosphoric acid purification via byproducts production

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