

Centrifugal Pumps Basic Concepts Of Operation

Introduction to Practical Fluid Flow provides information on the the solution of practical fluid flow and fluid transportation problems through the application of fluid dynamics. Emphasising the solution of practical operating and design problems, the text concentrates on computer-based methods throughout, in keeping with trends in engineering. With a focus on the flow of slurries and non-Newtonian fluids, it will be useful for and engineering students who have to deal with practical fluid flow problems. Emphasises flow of slurries and Non-Newtonian fluids. Covers the application of fluid dynamics to the solution of practical fluid flow and fluid transportation problems.

This book is both a state-of-the-art review of centrifugal pump technology and a practical guide to designers. Continuous development over a period of several decades has led to a rational approach to the understanding, design, and development of centrifugal pumps. Many aspects of this consistent approach are outlined in this book. Detailed description of all the important elements of a pump stage are included. Particular attention is paid to the impeller and the diffuser, which are the key elements in achieving the necessary head rise. Inlets, volutes, collectors, and return channels are also discussed in depth. Extensive use is made of the graphs, line drawings, and photographs. The text includes several hundred references which cover all of the important developments int the technology base over the past forty years. Computational fluid dynamics (CFD) and experimental testing are emphasized as essentials parts of the design review process. [Source : d'après la 4e de couverture].

Numerous developments have taken place in centrifugal pumps to transfer liquids for different

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applications in efficient manner. A safe, cost effective & efficient operation at rated capacity, efficiency and high reliability is the basic requirement of pumps. To meet the objective, the book deals with basic concept of theory added working principle, different type of pump & their application, constructional features, design guide lines & rotor dynamics, selection, erection, trouble diagnosis & remedial actions in abnormal situations. The metallurgical requirements and developments for pump components had been discussed briefly for acquaintance of plant engineers to help in selection &, procurement. Concept of NPSH, specific speed, sealing system and Characteristic curves of pump with the help of graphs, theoretical formulae, sketches and examples may promote understanding in field applications. Operation and Maintenance philosophy is presented to cover wide domain of pumping system The systematic and predictive maintenance programs & their applications are discussed related to centrifugal pumps. A brief out line discussions are presented on electric system involved in pump installation and maintenance. Since, alignment of pump, especially the multi stage pumps with driver (motor or steam turbine) plays a vital role in smooth operation and machine life, author has dealt separately the alignment methods and practices with illustrative practical examples. The book is formatted in the form of Work Book to help the working engineers as reference at any stage of their task performance.

The development of new techniques and the refinement of established procedures make cardiac surgery a fast-moving field. Core concepts in cardiac surgery has been developed to make it an invaluable textbook for the professional cardiac and cardiothoracic surgeon, covering both topical issues and updates in cardiac surgery. This provides the practising cardiac surgeon with current updates in the field, and controversial issues that affect everyday

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practice. Written by an international team of renowned cardiac surgeons, each topic is split into a review of the current literature and then important technical details. Their wealth of professional experience has been distilled into tips and common pitfalls in practice throughout the book. Extensively illustrated with full-colour photographs and artwork to facilitate understanding of complex procedures, Core concepts in cardiac surgery is also available on a companion website, to allow the authors to update the text regularly to reflect developments in the discipline.

Condition monitoring and its part in maintenance, pump performance and the effect of water, performance analysis and testing of pumps for condition monitoring, performance analysis and its application to optimise time for overhaul, other methods of performance analysis for pump condition monitoring, vibration analysis of pumps -- basic, vibration analysis of pumps -- advanced methods, other uses of condition monitoring information, other condition monitoring methods, positive displacement pumps, case studies in condition monitoring of pumps. Based on the authors' highly successful text Fundamentals of Fluid Mechanics, A Brief Introduction to Fluid Mechanics, 5th Edition is a streamlined text, covering the basic concepts and principles of fluid mechanics in a modern style. The text clearly presents basic analysis techniques and addresses practical concerns and applications, such as pipe flow, open-channel flow, flow measurement, and drag and lift. Extra problems in every chapter including open-ended problems, problems based on the accompanying videos, laboratory problems, and computer problems emphasize the practical application of principles. More than 100 worked examples provide detailed solutions to a variety of problems.

Pumps are commonly encountered in industry and are essential to the smooth running of many

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industrial complexes. Mechanical engineers entering industry often have little practical experience of pumps and their problems, and need to build up an understanding of the design, operation and appropriate use of pumps, plus how to diagnose faults and put them right. This book tackles all these aspects in a readable manner, drawing on the authors' long experience of lecturing and writing on centrifugal pumps for industrial audiences.

Established as the standard reference on cardiopulmonary bypass, Dr. Gravlee's text is now in its Third Edition. This comprehensive, multidisciplinary text covers all aspects of cardiopulmonary bypass including sections on equipment, physiology and pathology, hematologic aspects, and clinical applications. This edition features a new section on cardiopulmonary bypass in neonates, infants, and children and a new chapter on circulatory support for minimally invasive cardiac surgery. Other highlights include state-of-the-art information on low-volume circuits and other new equipment and discussions of outcomes data for on-pump and off-pump surgeries.

Condition modelling and control is a technique used to enable decision-making in manufacturing processes of interest to researchers and practising engineering.

Condition Monitoring and Control for Intelligent Manufacturing will be bought by researchers and graduate students in manufacturing and control and engineering, as well as practising engineers in industries such as automotive and packaging manufacturing.

Cavitation in centrifugal pumps is regarded as the main cause of deterioration of

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important parts of the pump, including impellers and volute. In order to examine this phenomenon, first a two-stage BB2 pump of the API design was experimentally investigated in terms of head and flow rate in single-phase flow and flow with cavitation, then the results were compared to those of the model created in the ANSYS CFX software environment. In addition, the Stepanov and Dixon theories were employed to optimize the fluid flow inlet conditions in the impeller. The main focus in the present study is on the concepts of cavitation in the pumps, the performance curves of the pumps, and the net positive suction head (NPSH) of the system. The ultimate objective in this project is to investigate the predictive curves of the system aiming to specify the cavitation initiation area.

The Second International Symposium on Centrifugal Pumps – The State of the Art and New Developments is the latest in a successful and prestigious series of IMechE Event Publications. Experts in the field of pumps and pumping have come together to produce these unique papers which cover reducing costs by using less components and better seals, bearings and couplings, increasing and maintaining pump efficiency using high speed super-synchronous motors; and improving safety. Complete Contents: Closed valve flow field investigation using computational fluid dynamics A new class of seal-less pump with synchronous integrated canned magnetic drive Development of a new generation of customer focused water pumps Improving pump reliability through its secondary components Variable medium speed pumps combine superior performance

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with reduced life cycle cost (LCC) The Weir VSR 2100 - A new concept in high-pressure pumping High-speed pumps using integrated motor technology Derby transfer pumping station - inception to commissioning State-of-the-art boiler feed pump upgrade for Ratcliffe Power Station Centrifugal Pumps will be invaluable reading to those involved with pumps and pumping, including makers and users, component suppliers, refurbishers, contractors, consultants, and researchers.

This practical reference describes the occurrence of cavitation in a centrifugal pump, and how unacceptable cavitation can be avoided. It explains cavitation problems such as hydraulic performance loss, hydrodynamically or thermodynamically induced surging, and cavitation erosion. General guidelines for acceptable operation conditions, such as, net positive suction head (NPSH) margins and minimum flowrates, are presented along with evidence and logic for these proposed guidelines.

The deep blue ocean world has been bestowed upon men as a valuable resource. It has afforded men with a variety of benefits, including navigation, treasures buried within its waves, and petroleum or other crude fuels discovered deep beneath its surface. All of these resources are focused on a marine engineering degree in order to be exploited and utilised. The marine engineering Book focuses on educating students about ways for extracting crude oil and fossil fuels from deep beneath the seabed, navigational support for ships, off-shore reservoir extraction, ship maintenance and care, and a variety of other topics. Marine engineers extract and dig up crude oil and fossil fuels

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deep beneath the seabed. The marine engineers track down ships that have lost their bearings and drag them back on course. Marine engineers play an important part in the rescue of many lives. Not to mention ship maintenance and care, which is handled by marine engineers. They look after the ship's upper body, internal machineries, electrical wiring, and propellers. This aids in maximising the performance of the ships and extending their lifespan. All of these examples demonstrate the need of a marine engineering study in today's world. As a result, a marine engineering school proves to be a godsend for men's exploitation of the ocean's blue world. Contrary to popular assumption, marine engineering is an important part of engineering for a variety of sectors. Marine engineering is frequently required by the oil and gas industry, maritime corporations, and export-import industries. Having said that, it merely implies that marine engineering supports these industries. Marine engineering benefits these industries in a variety of ways. As a result, maritime engineering is in high demand in many of these industries. Furthermore, it will maintain maritime engineering relevant for as long as it is required. Everyone understands that transportation needs to be maintained on a regular basis. They require care in the form of frequent examinations, repairs, and even a fresh coat of paint. Marine engineers will be called upon to assist with ship repairs and upkeep onboard. The upkeep of a ship is expensive, but it is necessary. Maintaining the ship is an excellent idea if you want to maintain a long-term business with regular profitability. Marine engineers are also in charge of maintaining a

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boat's safety. Boating accidents, such as fires, engine failures, and so forth, are rarely discussed. Boaters and ship operators frequently assume that nothing bad will happen onboard. They are, however, completely incorrect. They completely forgot that even when the boats are docked or berthed, anything can happen. As a result, having a marine engineer on board to assist with ship maintenance is ideal. As a marine engineer, you have a considerable amount of say and influence over future maritime legislation. This is primarily due to the fact that maritime engineers, for obvious reasons, know their sector better than anyone else. As a result, they are in a stronger position to advocate for better maritime legislation. A marine engineer is a relatively new engineering specialisation. Certain abilities and elements, however, can be transferred to other engineering fields. When marine engineers are laid off, their transferrable abilities have proven effective in finding new jobs in the same industry. Marine engineers, on the whole, learn distinct areas of engineering than other types of engineers. This means that when they are seeking for a new engineering career, they can switch to a different type of engineering. They simply need to upgrade themselves by upskilling in other areas of engineering. Marine engineers are beneficial in a variety of ways. They make a significant contribution to the maritime industry, which benefits a variety of other industries that rely on the water.

Covers the basic concepts of hydronic system operation and design, including piping systems, pipe materials and fittings, centrifugal pumps, terminal units, expansion tanks

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and water chillers. Topics include: components of closed and open hydronic systems; basic concepts of piping system design; different types of pipe used in hydronic systems; how centrifugal pumps operate; how to match pumps to systems; what variables are involved in terminal unit control; and how to optimize water chiller operation. Separate I-P and SI editions.

This important new reference addresses the principles and calculations dealing with the hydraulics of water systems. *Hydraulics for Operators* includes what is necessary for a basic understanding of water and wastewater utility operations, and it emphasizes practical applications of these principles. This practical reference covers a wide variety of important subjects such as mass density and flow, pressure, open channel flow, pumping, friction loss, and flow measurement. *Hydraulics for Operators* is loaded with graphics, and sample exercises are included to ensure this new book is an easily understood reference. It is a must for your operator library.

A hands-on, applications-based approach to the design and analysis of commonly used centrifugal pumps *Centrifugal Pump Design* presents a clear, practical design procedure that is solidly based on theoretical fluid dynamics fundamentals, without requiring higher math beyond algebra. Intended for use on the factory floor, this book offers a short, easy-to-read description of the fluid

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mechanic phenomena that occur in pumps, including those revealed by the most recent research. The design procedure incorporates a simple computer program that allows designs to be checked immediately and corrected as needed; readers learn to calibrate the performance calculation program based on their own test data. Other important features of this book include: * Up-to-date coverage of detailed design data * Guidance on selection, troubleshooting, and modification of existing pumps * A numerical example illustrating the design of a pump as readers move through the book * Manual calculations-including worked examples-and personal computer program listings critical to pump design * Ample references to all subjects for further study This unique handbook closes the gap between research and application and puts the fundamentals of advanced fluid mechanics where they will do the most good: in the hands of engineers, teachers, and designers who create industrial pumps.

Food Engineering Handbook: Food Engineering Fundamentals provides a stimulating and up-to-date review of food engineering phenomena. Combining theory with a practical, hands-on approach, this book covers the key aspects of food engineering, from mass and heat transfer to steam and boilers, heat exchangers, diffusion, and absorption. A complement to Food Engineering Handbook: Food Process Engineering, this text: Explains the interactions

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between different food constituents that might lead to changes in food properties Describes the characterization of the heating behavior of foods, their heat transfer, heat exchangers, and the equipment used in each food engineering method Discusses rheology, fluid flow, evaporation, and distillation and includes illustrative case studies of food behaviors Presenting cutting-edge information, Food Engineering Handbook: Food Engineering Fundamentals is an essential reference on the fundamental concepts associated with food engineering today. This Book, Written With An Applications-Oriented Approach, Is Divided Into Four Parts. Part I Covers The General Aspects Of Fluid Flow And Pumps Including The Governing Theories Of Fluid Flow. Part Ii Covers The Design And Construction Of Pumps And Auxiliaries, Drives Etc. Part Iii Presents Pump Selection Criteria And Procurement Actions Including Fittings And Maintenance Requirements. Part Iv Includes Miscellaneous Items Like Key To Symbols, Conversion Tables Etc. For Reference. Various Aspects Of Pumps Have Been Explained In Systematic Detail, Starting From Basic Concepts And Going On To Industrial Applications. The Exposition Is Well Illustrated With Diagrams And Solved Examples. With All These Features, This Is An Invaluable Book For Practicing Engineers And Designers. Mechanical Engineering Students Would Also Find It Extremely Useful.

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Slurry Transport Using Centrifugal Pumps Springer Science & Business Media

Introduction to Food Engineering deals with the engineering concepts in food processing employing a unit operations approach. The book focuses on mass and energy balances, fluid flow, energy utilization, refrigeration, heat transfer, food freezing, evaporation, dehydration, and psychometrics. It is in line with primary topics recommended by the Institute of Food Technologists of the U.S.A. The text reviews some concepts related to food science such as the equation of state and perfect gas law, laws of thermodynamics, and conservation of mass. The book also discusses the transport of liquid foods and the three types of utilities used in food processing: 1) steam generation and utilization; 2) natural gas utilization; and 3) electric power utilization. The text explains how to determine the properties of food and the different approaches that can be used to obtain the food's thermal properties prior to using the proper heat-exchange equipment. Food preservation also involves freezing (direct or indirect contact systems), evaporation, dehydration, and psychometrics (involving thermodynamic properties of gas-vapor mixtures). The book is suitable for nutritionists, food technologists, advanced under-graduate and beginning graduate students in food science and technology, and professionals whose works are in the food processing, research, and preservation industry.

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1,1 Applications of Slurry Transport Vast tonnages are pumped every year in the form of solid-liquid mixtures, known as slurries. The application which involves the largest quantities is the dredging industry, continually maintaining navigation in harbours and rivers, altering coastlines and winning material for landfill and construction purposes. As a single dredge may be required to maintain a throughput of 7000 tonnes of slurry per hour or more, very large centrifugal pumps are used. Figures 1-1 and 1-2 show, respectively, an exterior view of this type of pump, and a view of a large dredge-pump impeller (Addie & Helmley, 1989). The manufacture of fertiliser is another process involving massive slurry-transport operations. In Florida, phosphate matrix is recovered by huge draglines in open-pit mining operations. It is then slurried, and pumped to the wash plants through pipelines with a typical length of about 10 kilometres. Each year some 34 million tonnes of matrix are transported in this manner. This industry employs centrifugal pumps that are generally smaller than those used in large dredges, but impeller diameters up to 1.4 m are common, and drive capacity is often in excess of 1000 kW. The transport distance is typically longer than for dredging applications, and Chapter 1 Figure 1.1. Testing a dredge pump at the GIW Hydraulic Laboratory Figure 1.2. Impeller for large dredge pump 1. Introduction 3 hence a series of pumping stations is often used. Figure 1-3 shows a boost-

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pump installation in a phosphate pipeline.

This book is written for a common man who has curiosity to know about the Centrifugal Pumps. This book will be useful for the Engineering Students and will add to their knowledge and also for the Industrial Professionals who use Centrifugal Pumps in their plants. Pump types are explained in a very short and simple manner. Technical jargon is avoided as far as possible. Minimum technical terms required to have better understanding of the subject are also explained. After describing all types of pumps, a chapter on selection of pumps in the end gives some understanding how the pump is selected

Comprehensive Biomaterials brings together the myriad facets of biomaterials into one, major series of six edited volumes that would cover the field of biomaterials in a major, extensive fashion: Volume 1: Metallic, Ceramic and Polymeric Biomaterials Volume 2: Biologically Inspired and Biomolecular Materials Volume 3: Methods of Analysis Volume 4:

Biocompatibility, Surface Engineering, and Delivery Of Drugs, Genes and Other Molecules Volume 5: Tissue and Organ Engineering Volume 6: Biomaterials and Clinical Use Experts from around the world in hundreds of related biomaterials areas have contributed to this publication, resulting in a continuum of rich information appropriate for many audiences. The work addresses the current status of nearly all biomaterials in the field, their strengths and weaknesses, their future prospects, appropriate analytical methods and testing, device applications and performance, emerging candidate materials as competitors and disruptive technologies, and strategic insights for those entering and operational in diverse biomaterials applications, research and development, regulatory management, and commercial aspects. From the outset, the goal was to review materials in the context of medical devices and tissue

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properties, biocompatibility and surface analysis, tissue engineering and controlled release. It was also the intent both, to focus on material properties from the perspectives of therapeutic and diagnostic use, and to address questions relevant to state-of-the-art research endeavors. Reviews the current status of nearly all biomaterials in the field by analyzing their strengths and weaknesses, performance as well as future prospects Presents appropriate analytical methods and testing procedures in addition to potential device applications Provides strategic insights for those working on diverse application areas such as R&D, regulatory management, and commercial development

This handbook summarizes the research results on hydraulic problems in centrifugal pump design and describes the state of the art in a comprehensive way. For this 4th edition, current research results of practical relevance were included. The selection and presentation of the material was oriented towards the needs of pump manufacturers, system planners and pump operators. Much space is devoted to understanding the physical relationships as essential knowledge for correct application. The latter is supported by more than 160 diagrams and tables for calculation and problem diagnosis . The book has been extensively updated. New additions: - A separate chapter on "Vibrations on vertical pumps". - Measurements of hydraulic exciter and impeller reaction forces - Alternating stresses and fatigue fractures of impellers - a critical study on the accuracy of numerical flow calculations of pumps - Design of inlet housings and double spirals for multistage pumps.

Everything important, up-to-date and practical about turbopumps can be found in this book. The material is arranged to cover the most important topics, from basic theories to practical applications. This book can also serve as a useful textbook for students who are taking

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courses in the area of turbopumps and hydraulic machineries. It is the complete reference book for turbopumps.

This Book Presents A Practical-Oriented, Sound, Modularized Coverage Of Fundamental Topics Of Basic Electrical Engineering, Network Analysis & Network Theorems, Electromagnetism & Magnetic Circuit, Alternating Current & Voltages, Electrical Measurement & Measuring Instrument And Electric Machines. Salient Features: # Clarification Of Basic Concepts # Several Solved Examples With Detailed Explanation # At The End Of Chapters, There Are Descriptive And Numerical Unsolved Problems # Written In Very Simple Language And Suitable For Self-Study # Step-By-Step Procedures Given For Solving Numerical

This one-stop reference brings together essential information from a wide range of leading sources, providing coverage of important day-to-day topics, including fundamentals, key technologies, best practices, and rules of thumb.

Working Guide to Pumps and Pumping Stations: Calculations and Simulations discusses the application of pumps and pumping stations used in pipelines that transport liquids. It provides an introduction to the basic theory of pumps and how pumps are applied to practical situations using examples of simulations, without extensive mathematical analysis. The book begins with basic concepts such as the types of pumps used in the industry; the properties of liquids; the performance curve; and the Bernoulli's equation. It then looks at the factors that affect pump performance and the various methods of calculating pressure loss in piping systems. This is followed by discussions of pump system head curves; applications and economics of centrifugal pumps and pipeline systems; and pump simulation using the software PUMPCALC. In most cases, the theory is explained and followed by solved example problems in both U.S.

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Customary System (English) and SI (metric) units. Additional practice problems are provided in each chapter as further exercise. This book was designed to be a working guide for engineers and technicians dealing with centrifugal pumps in the water, petroleum, oil, chemical, and process industries. Calculations for their selection, sizing and power output Case studies based on the author's 35 years of field experience Covers all types of pumps Simplified models and simulations

This collection of all of Stan Shiels' articles for World Pumps covers specification, operational issues, troubleshooting and the well-known 'PumpAcademy' articles which covered specific topics of importance to pump engineers. The result is a volume which is enjoyable and instructive to read, containing facts and opinions as fresh as the day they were written. *The late Stan Shiels had over 35 years experience as a professional engineer and over a period of nearly 15 years made a regular contribution to World Pumps magazine. *This book includes 28 articles which will form a valuable resource to the pump engineer. *Articles cover many aspects of pump specification, operation and troubleshooting

Pumping Machinery Theory and Practice comprehensively covers the theoretical foundation and applications of pumping machinery. Key features: Covers characteristics of centrifugal pumps, axial flow pumps and displacement pumps Considers pumping machinery performance and operational-type problems Covers advanced topics in pumping machinery including multiphase flow principles, and two and three-phase flow pumping systems Covers different methods of flow rate control

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and relevance to machine efficiency and energy consumption Covers different methods of flow rate control and relevance to machine efficiency and energy consumption

Food Engineering Handbook, Two-Volume Set provides a stimulating and up-to-date review of food engineering phenomena. It also addresses the basic and applied principles of food engineering methods used in food processing operations around the world. Combining theory with a practical, hands-on approach, this set examines the thermophysical properties and modeling of selected processes such as chilling, freezing, and dehydration, and covers the key aspects of food engineering, from mass and heat transfer to steam and boilers, heat exchangers, diffusion, and absorption. Comprised of Food Engineering Handbook: Food Engineering Fundamentals and Food Engineering Handbook: Food Process Engineering, this comprehensive resource:

- Explains the interactions between different food constituents that might lead to changes in food properties
- Describes the characterization of the heating behavior of foods, their heat transfer, heat exchangers, and the equipment used in each food engineering method
- Discusses rheology, fluid flow, evaporation, distillation, size reduction, mixing, emulsion, and encapsulation
- Provides case studies of solid–liquid and supercritical fluid extraction and food behaviors
- Explores fermentation, enzymes, fluidized-bed drying, and more

Presenting cutting-edge information on new and emerging food engineering processes, Food Engineering Handbook, Two-Volume Set offers a complete reference on the fundamental concepts, modeling, quality, safety, and technologies associated

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with food engineering and processing operations today.

This last, the education of pump users, is precisely what this book was intended to do. To what extent we must have achieved our purpose, our readers must decide. My good friend and associate, J. T. (Terry) McGuire, and I have been working very closely together for a long time. Our view of engineering problems and of their solutions coincide to an astonishing degree. When I was asked to prepare a second edition of my book Centrifugal Pumps, it was logical that I turned to Terry and suggested that he be my coauthor on this project. He agreed to do so, and his cooperation has been most valuable, both in improving the resultant work and in easing my burden. It would be presumptuous on my part to pretend that nothing has changed in the technology of centrifugal pumps during the 30 years since I prepared the manuscript for the first edition of this book. Let me, then, speak of some of these changes.

This edition of 'Introduction to Food Engineering' presents the engineering concepts and unit operations used in food processing, in a unique and challenging blend of principles with applications.

Simply put, this book explains what exactly needs to be done if a facility wants to progress from being a one, two or three year pump MTBF plant, and wishes to join the leading money-making facilities that today achieve a demonstrated pump MTBF of 8.6 years.

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