Multiphase Flow And Fluidization Continuum And Kinetic Theory Descriptions 1st First Edition By Gidaspow Dimitri Published By Academic Press 1994

This book is for engineers and students to solve issues concerning the fluidized bed systems. It presents an analysis that focuses directly on the problem of predicting the fluid dynamic behavior which empirical data is limited or unavailable. The second objective is to provide a treatment of computational fluidization dynamics that is readily accessible to the non-specialist. The approach adopted in this book, starting with the formulation of predictive expressions for the basic conservation equations for mass and momentum using kinetic theory of granular flow. The analyses presented in this book represent a body of simulations and experiments research that has appeared in numerous publications over the last 20 years. This material helps to form the basis for university course modules in engineering and applied science at undergraduate and graduate level, as well as focused, post-experienced courses for the process, and allied industries.

Apresenta tendências, novas idéias e descobertas recentes no campo da Transferência Computacional de Calor e Massa

For the first time, a book is being edited to address how results from one scale can be shifted or related to another scale, say from macro to micro or vice versa. The new approach retains the use of the equilibrium mechanics within a scale level such that cross scale results can be connected by scale invariant criteria. Engineers in different disciplines should be able to understand and use

the results.

Fluidized bed (FB) combustion and gasification are advanced techniques for fuel flexible, high efficiency and low emission conversion. Fuels are combusted or gasified as a fluidized bed suspended by jets with sorbents that remove harmful emissions such as SOx. CO2 capture can also be incorporated. Fluidized bed technologies for near-zero emission combustion and gasification provides an overview of established FB technologies while also detailing recent developments in the field. Part one, an introductory section, reviews fluidization science and FB technologies and includes chapters on particle characterization and behaviour, properties of stationary and circulating fluidized beds, heat and mass transfer and attrition in FB combustion and gasification systems. Part two expands on this introduction to explore the fundamentals of FB combustion and gasification including the conversion of solid, liquid and gaseous fuels, pollutant emission and reactor design and scale up. Part three highlights recent advances in a variety of FB combustion and gasification technologies before part four moves on to focus on emerging CO2 capture technologies. Finally, part five explores other applications of FB technology including (FB) petroleum refining and chemical production. Fluidized bed technologies for near-zero emission combustion and gasification is a technical resource for power plant operators, industrial engineers working with fluidized bed combustion and gasification systems and researchers, scientists and academics in the field. Examines the fundamentals of fluidized bed (FB) technologies, including the conversion of solid, liquid and gaseous fuels Explores recent advances in a variety of technologies such as pressurized FB combustion, and the measurement, monitoring and control of FB combustion and gasification Discusses emerging technologies and examines applications of FB in other processes

Applications of the Kinetic Theory of Granular Flow

Recent Advances in Renewable Energy Systems

Fluidized Bed Technologies for Near-Zero Emission Combustion and Gasification

From Multiscale Modeling to Meso-Science

Computational Fluid Dynamics and the Theory of Fluidization

Computational Methods in Multiphase Flow V

Computational and Numerical Simulations is an edited book including 20 chapters. Book handles the recent research devoted to numerical simulations of physical and engineering systems. It presents both new theories and their applications, showing bridge between theoretical investigations and possibility to apply them by engineers of different branches of science. Numerical simulations play a key role in both theoretical and application oriented research.

Useful as a reference for engineers in industry and as an advanced level text for graduate engineering students, Multiphase Flow and Fluidization takes the reader beyond the theoretical to demonstrate how multiphase flow equations can be used to provide applied, practical, predictive solutions to industrial fluidization problems. Written to help advance progress in the emerging science of multiphase flow, this book begins with the development of the conservation laws and moves on through kinetic theory, clarifying many physical concepts (such as particulate viscosity and solids pressure) and introducing the new dependent variable--the volume fraction of the dispersed phase. Exercises at the end of each chapterare provided for further study and lead into applications not covered in the text itself. Treats fluidization as a branch of transport phenomena Demonstrates how to do transient,

multidimensional simulation of multiphase processes The first book to apply kinetic theory to flow of particulates Is the only book to discuss numerical stability of multiphase equations and whether or not such equations are well-posed Explains the origin of bubbles and the concept of critical granular flow Presents clearly written exercises at the end of each chapter to facilitate understanding and further study

Because of the importance of multiphase flows in a wide variety of industries, including power, petroleum, and numerous processing industries, an understanding of the behavior and underlying theoretical concepts of these systems is critical. Contributed by a team of prominent experts led by a specialist with more than thirty years of experience, the Multiphase Flow Handbook provides such an understanding, and much more. It covers all aspects of multiphase flows, from fundamentals to numerical methods and instrumentation. The book begins with an introduction to the fundamentals of particle/fluid/bubble interactions followed by gas/liquid flows and methods for calculating system parameters. It includes up-to-date information on practical industrial applications such as boiling and condensation, fluidized beds, aerosols, separation systems, pollution control, granular and porous media flow, pneumatic and slurry transport, and sprays. Coverage then turns to the most recent information on particle/droplet-fluid interactions, with a chapter devoted to microgravity and microscale flows and another on basic multiphase interactions. Rounding out the presentation, the authors discuss numerical methods, state-of-the art instrumentation, and advanced experimental techniques. Supplying up-to-date, authoritative information on all aspects of multiphase flows along with numerous problems and examples, the Multiphase Flow Handbook is the most complete reference available for understanding the flow of multiphase

mixtures.

A concise and clear treatment of the fundamentals of fluidization, with a view to its applications in the process and energy industries.

Fundamentals of Multiphase Flow

Select Proceedings of ICOME 2021

Diameter-Transformed Fluidized Bed

The History of Multiphase Science and Computational Fluid Dynamics

Proceedings of an Advanced Seminar Conducted by the Mathematics Research Center, the University of Wisconsin--Madison, May 26-28, 1982

Singular Perturbations and Asymptotics

There is increasing world-wide interest in obtaining an understanding of various multiphase flow phenomena and problems in terms of a common language of multiphase flow. This volume contains state-of-the-art papers which have been contributed from all over the world by experts working on all aspects of multiphase flows. The volume also highlights international technology-sharing in the fields of energy, environment and public health, in order to create a brighter and sustainable future for man and for all life in the next century. It is intended that this volume will serve as a major source of literature for the advancement of multiphase flow and allied fields.

This book tells the story of how the science of computational multiphase flow began in an effort to better analyze hypothetical light water power reactor accidents, including the “loss of coolant” accident. Written in the style of a memoir by an author with 40 years’ engineering research experience in computer modeling of fluidized beds and slurries, multiphase computational fluid dynamics, and multiphase flow, most recently at Argonne National Laboratory, the book traces

how this new science developed during this time into RELAP5 and other computer programs to encompass realistic descriptions of phenomena ranging from fluidized beds for energy and chemicals production, slurry transport, pyroclastic flow from volcanoes, hemodynamics of blood-borne cells, and flow of granular particulates. Such descriptions are not possible using the classical single-phase Navier-Stokes equations. Whereas many books on computational techniques and computational fluid dynamics have appeared, they do not trace the historical development of the science in any detail, and none touch on the beginnings of multiphase science. A robust, process-rich account of technologic evolution, the book is ideal for students and practitioners of mechanical, chemical, nuclear engineering, and the history of science and technology.

Discusses the CFD-DEM method of modeling which combines both the Discrete Element Method and Computational Fluid Dynamics to simulate fluid-particle interactions. Deals with both theoretical and practical concepts of CFD-DEM, its numerical implementation accompanied by a hands-on numerical code in FORTRAN Gives examples of industrial applications

Publisher Description

Solid-Liquid Two Phase Flow

Continuum and Kinetic Theory Descriptions

Computational heat and mass transfer – CHMT 2001- Vol. I

Multiphase Reactive Flows

Particulates And Continuum-Multiphase Fluid Dynamics

Multiphase Flow and Fluidization

The purpose of this book is to introduce researchers and graduate students to a broad range of applications of computational

simulations, with a particular emphasis on those involving computational fluid dynamics (CFD) simulations. The book is divided into three parts: Part I covers some basic research topics and development in numerical algorithms for CFD simulations, including Reynolds stress transport modeling, central difference schemes for convection-diffusion equations, and flow simulations involving simple geometries such as a flat plate or a vertical channel. Part II covers a variety of important applications in which CFD simulations play a crucial role, including combustion process and automobile engine design, fluid heat exchange, airborne contaminant dispersion over buildings and atmospheric flow around a re-entry capsule, gas-solid two phase flow in long pipes, free surface flow around a ship hull, and hydrodynamic analysis of electrochemical cells. Part III covers applications of non-CFD based computational simulations, including atmospheric optical communications, climate system simulations, porous media flow, combustion, solidification, and sound field simulations for optimal acoustic effects.

This volume contains the proceedings of an advanced seminar on Singular Perturbations and Asymptotics in Madison, Wisconsin on May 28-30, 1980 under the auspices of the Mathematics Research Center of the The University of Wisconsin-Madison, sponsored by the United States Army and supported by the Office of Naval Research. The subject

of singular perturbations, not to mention asymptotics, is too large for a single conference, and the selection of topics reflects areas of recent research activity and advances.

Discover the cutting-edge in multiphase flows used in the process industries In Multiphase Flows for Process Industries: Fundamentals and Applications, a team of accomplished chemical engineers delivers an insightful and complete treatment of the state-of-the-art in commonly encountered multiphase flows in the process industries. After discussing the theoretical background, experimental methods, and computational methods applicable to multiphase flows, the authors explore specific examples from the process industries. The book covers a wide range of multiphase flows, including gas-solid fluidized beds and flows with phase change. It also provides direction on how to use current advances in the field to realize efficient and optimized processes. Filling the gap between theory and practice, this unique reference also includes: A thorough introduction to multiphase flows and the process industry Practical discussions of flow regimes, lower order models and correlations, and the chronological development of mathematical models for multiphase flows Comprehensive explorations of experimental methods for characterizing multiphase flows, including flow imaging and visualization In-depth examinations of computational models for simulating multiphase flows Perfect for chemical and

process engineers, Multiphase Flows for Process Industries: Fundamentals and Applications is required reading for graduate and doctoral students in the engineering sciences, as well as professionals in the chemical industry.

Treating multiphase systems with emphasis on the aspect of fluid dynamics and as an introduction to research in multiphase flow, this book covers definitive concepts, methods, and theories which have been validated by experimental results. A textbook for college seniors and graduate students and a research reference, it is a coherent presentation that facilitates the understanding of physical interactions. The book's focus is fluid dynamics, with extension to other transport processes of heat and mass transfer, and chemical relations to illustrate applications of multiphase flow. The exercise problems at the end of each chapter assist the reader in formulating and solving physical problems and gaining a sense of magnitude of interacting effects and events. Extended details and corollaries are also included in these exercise problems. Some of the topics in the exercise problems may also be incorporated as topics for the lectures.

Numerical Simulation for Next Generation Thermal Power Plants

Multiphase Flows for Process Industries

Instrumentation for Fluid Particle Flow

Proceedings of an Advanced Seminar

Topics in Multiphase Transport Phenomena

This book is an undertaking of a pioneering work of uniting three vast fields of interfacial phenomena, rheology and fluid mechanics within the framework of solid-liquid two phase flow. No wonder, much finer books will be written in the future as the visionary aims of many nations in combining molecular chemistry, biology, transport and interfacial phenomena for the fundamental understanding of processes and capabilities of new materials will be achieved. Solid-liquid systems where solid particles with a wide range of physical properties, sizes ranging from nano- to macro- scale and concentrations varying from very dilute to highly concentrated, are suspended in liquids of different rheological behavior flowing in various regimes are taken up in this book. Interactions among solid particles in molecular scale are extended to aggregations in the macro scale and related to settling, flow and rheological behavior of the suspensions in a coherent, sequential manner. The classical concept of solid particles is extended to include nanoparticles, colloids, microorganisms and cellular materials. The flow of these systems is investigated under pressure, electrical, magnetic and chemical driving forces in channels ranging from macro-scale pipes to micro channels. Complementary separation and mixing processes are also taken under consideration with micro- and macro-scale counterparts. - Up-to-date including emerging technologies - Coherent, sequential

approach - Wide scope: microorganisms, nanoparticles, polymer solutions, minerals, wastewater sludge, etc - All flow conditions, settling and non-settling particles, non-Newtonian flow, etc - Processes accompanying conveying in channels, such as sedimentation, separation, mixing

Multiscale modeling is becoming essential for accurate, rapid simulation in science and engineering. This book presents the results of three decades of research on multiscale modeling in process engineering from principles to application, and its generalization for different fields. This book considers the universality of meso-scale phenomena for the first time, and provides insight into the emerging discipline that unifies them, meso-science, as well as new perspectives for virtual process engineering. Multiscale modeling is applied in areas including: multiphase flow and fluid dynamics chemical, biochemical and process engineering mineral processing and metallurgical engineering energy and resources materials science and engineering Jinghai Li is Vice-President of the Chinese Academy of Sciences (CAS), a professor at the Institute of Process Engineering, CAS, and leader of the EMMS (Energy-minimizing multiscale) Group. Wei Ge, Wei Wang, Ning Yang and Junwu Wang are professors at the EMMS Group, part of the Institute of Process Engineering, CAS. Xinhua Liu, Limin Wang, Xianfeng He and Xiaowei Wang are associate professors at the EMMS Group, part of the Institute of Process Engineering, CAS. Mooson Kwauk is an emeritus director of the Institute of Process Engineering,

CAS, and is an advisor to the EMMS Group.

The story of multiphase science and computational fluid dynamics (CFD) has never been documented heretofore. It is a new and by now a rather robust science and one which must be told how it came to be before the founders and key contributors pass on. If any one of an amazing chain of incidents, and coincidences had never happened, multiphase science and CFD would never have evolved and the story this book tells would never have materialized. This book presents my personal recollection tracing the most signal events in the history of the initiation, development, and propagation phases of multiphase science and computational fluid dynamics (CFD) which initiated in 1970.

"This book provides various approaches to computational gas-solids flow and will aid the researchers, graduate students and practicing engineers in this rapidly expanding area"--Provided by publisher.

Theory and Modeling of Dispersed Multiphase Turbulent Reacting Flows

Computational Techniques for Multiphase Flows

Theory, Methods and Practice

Fundamentals and Practice

Multiscaling in Molecular and Continuum Mechanics: Interaction of Time and Size from Macro to Nano

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Together with turbulence, multiphase flow remains one of the most challenging areas of computational mechanics and experimental methods and numerous problems remain unsolved to date. Multiphase flows are found in all areas of technology, at all length scales and flow regimes. The fluids involved can be compressible or incompressible, linear or nonlinear. Because of the complexity of the problems, it is often essential to utilize advanced computational and experimental methods to solve the complex equations that describe them. Challenges in these simulations include modelling and tracking interfaces, dealing with multiple length scales, modelling nonlinear fluids, treating drop breakup and coalescence, characterizing phase structures, and many others. Experimental techniques, although expensive and difficult to perform, are essential to validate models. This book contains papers presented at the Fifth International Conference on Computational Methods in Multiphase Flow, which are grouped into the following topics: Multiphase Flow Simulation; Interaction of Gas, Liquids and Solids; Turbulent Flow; Environmental Multiphase Flow; Bubble and Drop Dynamics; Flow in Porous Media; Heat Transfer; Image Processing;

Interfacial Behaviour.

This book explores the Energy Minimization Multi-scale (EMMS) theory and the drag model for heterogeneous gas-solid fluidized flows. The results show that the cluster density plays a critical role with regard to drag. A novel cluster model is proposed and indicates that the profile of cluster density is single-peaked with the maximum value located at solid concentrations of 0.1~0.15. The EMMS theory is improved with the cluster model and an accurate drag model is developed. The model's universality is achieved by investigating the relationship between the heterogeneity and flow patterns. The drag model is subsequently verified numerically and experimentally.

This book aims to face particles in flows from many different, but essentially interconnected sides and points of view. Thus the selection of authors and topics represented in the chapters, ranges from deep mathematical analysis of the associated models, through the techniques of their numerical solution, towards real applications and physical implications. The scope and structure of the book as well as the selection of authors was motivated by

the very successful summer course and workshop "Particles in Flows'' that was held in Prague in the August of 2014. This meeting revealed the need for a book dealing with this specific and challenging multidisciplinary subject, i.e. particles in industrial, environmental and biomedical flows and the combination of fluid mechanics, solid body mechanics with various aspects of specific applications.

Fluid Dynamics is one of the most important topics of applied mathematics and physics. Together with complex flows and turbulence, multiphase flows remains one of the most challenging areas of computational mechanics, and even seemingly simple problems remain unsolved to date. Multiphase flows are found in all areas of technology, at all length scales and flow regimes. The fluids involved can be compressible or incompressible, linear or nonlinear. Because of the complexity of the problem, it is often essential to utilize advanced computational and experimental methods to solve the complex equations that describe them. Challenges in these simulations include nonlinear fluids, treating drop breakup and coalescence, characterizing phase structures, and many others.This volume brings together

work presented at the Fourth International Conference on Computational and Experimental Methods in Multiphase and Complex Flows. Featured topics include: Suspensions; Bubble and Drop Dynamics; Flow in Porous Media; Interfaces; Turbulent Flow; Injectors and Nozzles; Particle Image Velocimetry; Macroscale Constitutive Models; Large Eddy Simulation; Finite Volumes; Interface Tracking Methods; Biological Flows; Environmental Multiphase Flow; Phase Changes and Stochastic Modelling.

A Chemical Engineering Perspective

Essentials of Fluidization Technology

Fundamentals and Applications

Application to biology, physics, material science, mechanics, structural and processing engineering

Formulation, Implementation and Application to Multiphase Flows

Computational Simulations and Applications

Since the late 1970s there has been an explosion of industrial and academic interest in circulating fluidized beds. In part, the attention has arisen due to the environmental advantages associated with CFB (circulating . fluidized bed) combustion systems, the incorporation of riser reactors employing cir culating fluidized bed technology in petroleum refineries for fluid catalytic cracking and, to a lesser extent, the successes of CFB technology for calcina tion reactions and Fischer-Tropsch synthesis. In part, it was also the

case that too much attention had been devoted to bubbling fluidized beds and it was time to move on to more complex and more advantageous regime,S of operation. Since 1980 a number of CFB processes have been commercialized. There have been five successful International Circulating Fluidized Bed Confer ences beginning in 1985, the most recent taking place in Beijing in May 1996. In addition, we have witnessed a host of other papers on CFB funda mentals and applications in journals and other archival publications. There have also been several review papers and books on specific CFB topics. However, there has been no comprehensive book reviewing the field and attempting to provide an overview of both fundamentals and applications. The purpose of this book is to fill this vacuum.

Mixed or multiphase flows of solid/liquid or solid/gas are commonly found in many industrial fields, and their behavior is complex and difficult to predict in many cases. The use of computational fluid dynamics (CFD) has emerged as a powerful tool for the understanding of fluid mechanics in multiphase reactors, which are widely used in the chemical, petroleum, mining, food, beverage and pharmaceutical industries. Computational Techniques for Multiphase Flows enables scientists and engineers to the undertand the basis and application of CFD in muliphase flow, explains how to use the technique, when to use it and how to interpret the results and apply them to improving aplications in process enginering and other multiphase application areas including the pumping, automotive and energy sectors. Understandable guide to a complex subject Important in many industries Ideal for potential users of CFD

The Multiphase Flow Handbook, Second Edition is a thoroughly updated and reorganized revision of the late Clayton Crowe’s work, and provides a detailed look at the basic

concepts and the wide range of applications in this important area of thermal/fluids engineering. Revised by the new editors, Efstathios E. (Stathis) Michaelides and John D. Schwarzkopf, the new Second Edition begins with two chapters covering fundamental concepts and methods that pertain to all the types and applications of multiphase flow. The remaining chapters cover the applications and engineering systems that are relevant to all the types of multiphase flow and heat transfer. The twenty-one chapters and several sections of the book include the basic science as well as the contemporary engineering and technological applications of multiphase flow in a comprehensive way that is easy to follow and be understood. The editors created a common set of nomenclature that is used throughout the book, allowing readers to easily compare fundamental theory with currently developing concepts and applications. With contributed chapters from sixty-two leading experts around the world, the Multiphase Flow Handbook, Second Edition is an essential reference for all researchers, academics and engineers working with complex thermal and fluid systems.

Multiphase Flow and FluidizationContinuum and Kinetic Theory DescriptionsElsevier

Dynamics of Multiphase Flows

Computational Gas-Solids Flows and Reacting Systems: Theory, Methods and Practice

Multiphase Fluid Dynamics

Multiphase Flow Handbook, Second Edition

Chemical Reactor Modeling

Investigations on Mesoscale Structure in Gas–Solid Fluidization and Heterogeneous Drag Model

This book presents the select proceedings of 5th International Conference on Mechanical Engineering (ICOME 2021). It discusses the recent challenges and trends in renewable energy in Asia. Various topics covered include electrical energy, new and renewable energy, energy engineering and management, fuels and combustion, turbomachinery, and HVAC. The book will be a valuable reference for students, researchers, and professionals interested in sustainable energy and allied fields.
Theory and Modeling of Dispersed Multiphase Turbulent Reacting Flows gives a systematic account of the fundamentals of multiphase flows, turbulent flows and combustion theory. It presents the latest advances of models and theories in the field of dispersed multiphase turbulent reacting flow, covering basic equations of multiphase turbulent reacting flows, modeling of turbulent flows, modeling of multiphase turbulent flows, modeling of turbulent combusting flows, and numerical methods for simulation of multiphase turbulent reacting flows, etc. The book is ideal for graduated students, researchers and engineers in many disciplines in power and mechanical engineering. Provides a combination of multiphase fluid dynamics, turbulence theory and combustion theory Covers physical phenomena, numerical modeling theory and methods, and their applications Presents applications in a wide range of engineering facilities, such as utility and industrial furnaces, gas-turbine and rocket engines, internal combustion engines, chemical reactors, and cyclone separators, etc.

A focus on methods of measurement and options for engineers and scientists performing research and evaluation of particle-fluid flow systems. Improved instrumentation for measurement in this field is an essential element in the progress of research and engineering of multi-phase flow systems. Some of the most original and productive research specialists in the field of particle-fluid flow systems are assembled in this book, which is an important and current reference volume.--[Source inconnue].

本书介绍了流态化科学与工程方面的研究进展,与多相反应工程和工艺相关的粉体、造粒、绿色化工和生态工业等前沿领域的新内容和新进展,以及能源与环境等涉及可持续发展的战略问题。

Multiphase Flow Handbook

Dynamically Structured Flow in Pulsed Fluidised Beds

Theory of Dispersed Multiphase Flow

Computational and Numerical Simulations

Coupled CFD-DEM Modeling

Multiphase Flow 1995

Understand multiphase flows using multidisciplinary knowledge in physical principles, modelling theories, and engineering practices. This essential text methodically introduces the important concepts, governing mechanisms, and state-of-the-art theories, using numerous real-world applications, examples, and problems. Covers all major types of multiphase flows, including gas-solid, gas-liquid (sprays or bubbling), liquid-solid, and gas-solid-liquid flows.

Introduces the volume-time-averaged transport theorems and associated Lagrangian-trajectory modelling and Eulerian-Eulerian multi-fluid modelling. Explains typical computational techniques, measurement methods and four representative subjects of multiphase flow systems. Suitable as a reference for engineering students, researchers, and practitioners, this text explores and applies fundamental theories to the analysis of system performance using a case-based approach.

This book analyses the use of a pulsed gas flow to structure bubbling gas-solid fluidised beds and to induce a special fluidisation state, called "dynamically structured flow", as a promising approach to process intensification. It explores the properties of bubbles rising in staggered periodic arrays without direct interaction, assessing their size, separation, and velocity, and explains how a highly uniform, scalable flow offers tight control over the system hydrodynamics. These features are desirable, as they not only bypass engineering challenges occurring in traditional operations, such as maldistribution and non-uniform contact, but also allow to decouple conflicting design objectives, such as mixing and gas-solid contact. The thesis also presents computational simulations which reveal the periodic transitions of the particulate phase between fluid-like and solid-like behaviour. This book will be of interest to researchers, engineers, and graduate students alike, particularly those working in industrial drying, combustion, and chemical production.

This book closes the gap between Chemical Reaction Engineering and Fluid Mechanics. It provides the basic theory for momentum, heat and mass transfer in reactive systems. Numerical

methods for solving the resulting equations as well as the interplay between physical and numerical modes are discussed. The book is written using the standard terminology of this community. It is intended for researchers and engineers who want to develop their own codes, or who are interested in a deeper insight into commercial CFD codes in order to derive consistent extensions and to overcome "black box" practice. It can also serve as a textbook and reference book.

The book provides highly specialized researchers and practitioners with a major contribution to mathematical models' developments for energy systems. First, dynamic process simulation models based on mixture flow and two-fluid models are developed for combined-cycle power plants, pulverised coal-fired power plants, concentrated solar power plant and municipal waste incineration. Operation data, obtained from different power stations, are used to investigate the capability of dynamic models to predict the behaviour of real processes and to analyse the influence of modeling assumptions on simulation results. Then, a computational fluid dynamics (CFD) simulation programme, so-called DEMEST, is developed. Here, the fluid-solid, particle-particle and particle-wall interactions are modeled by tracking all individual particles. To this purpose, the deterministic Euler-Lagrange/Discrete Element Method (DEM) is applied and further improved. An emphasis is given to the determination of inter-phase values, such as volumetric void fraction, momentum and heat transfers, using a new procedure known as the offset-method and to the particle-grid method allowing the refinement of the grid resolution independently from particle size. Model validation is described in detail. Moreover,

thermochemical reaction models for solid fuel combustion are developed based on quasi-single-phase, two-fluid and Euler-Lagrange/MP-PIC models. Measurements obtained from actual power plants are used for validation and comparison of the developed numerical models.

A Personal Memoir

Computational Methods in Multiphase Flow IV

Particles in Flows

Circulating Fluidized Beds

Multiphysics Modelling of Fluid?Particulate Systems

Computational Techniques for Multiphase Flows, Second Edition, provides the latest research and theories covering the most popular multiphase flows The book begins with an overview of the state-of-the-art techniques for multiple numerical methods in handling multiphase flow, compares them, and finally highlights their strengths and weaknesses. In addition, it covers more straightforward, conventional theories and governing equations in early chapters, moving on to the more modern and complex computational models and tools later in the book. It is therefore accessible to those who may be new to the subject while also featuring topics of

interest to the more experienced researcher. Mixed or multiphase flows of solid/liquid or solid/gas are commonly found in many industrial fields, and their behavior is complex and difficult to predict in many cases. The use of computational fluid dynamics (CFD) has emerged as a powerful tool for understanding fluid mechanics in multiphase reactors, which are widely used in the chemical, petroleum, mining, food, automotive, energy, aerospace and pharmaceutical industries. This revised edition is an ideal reference for scientists, MSc students and chemical and mechanical engineers in these areas. Includes updated chapters in addition to a brand-new section on granular flows. Features novel solution methods for multiphase flow, along with recent case studies. Explains how and when to use the featured technique and how to interpret the results and apply them to improving applications.

Multiphysics Modelling of Fluid-Particulate Systems provides an explanation of how to model fluid-particulate systems using Eulerian and Lagrangian methods. The computational

cost and relative merits of the different methods are compared, with recommendations on where and how to apply them provided. The science underlying the fluid?particulate phenomena involves computational fluid dynamics (for liquids and gases), computational particle dynamics (solids), and mass and heat transfer. In order to simulate these systems, it is essential to model the interactions between phases and the fluids and particles themselves. This book details instructions for several numerical methods of dealing with this complex problem. This book is essential reading for researchers from all backgrounds interested in multiphase flows or fluid-solid modeling, as well as engineers working on related problems in chemical engineering, food science, process engineering, geophysics or metallurgical processing. This book puts forward the concept of the Diameter-Transformed Fluidized Bed (DTFB): a fluidized bed characterized by the coexistence of multiple flow regimes and reaction zones, achieved by transforming the bed into several sections of different diameters. It reviews

fundamental aspects, including computational fluid dynamics simulations and industrial practices in connection with DTFB. In particular, it highlights an example concerning the development of maximizing iso-paraffins (MIP) reactors for regulating complex, fluid catalytic cracking reactions in petroleum refineries. The book is a must-have for understanding how academic and industrial researchers are now collaborating in order to develop novel catalytic processes.