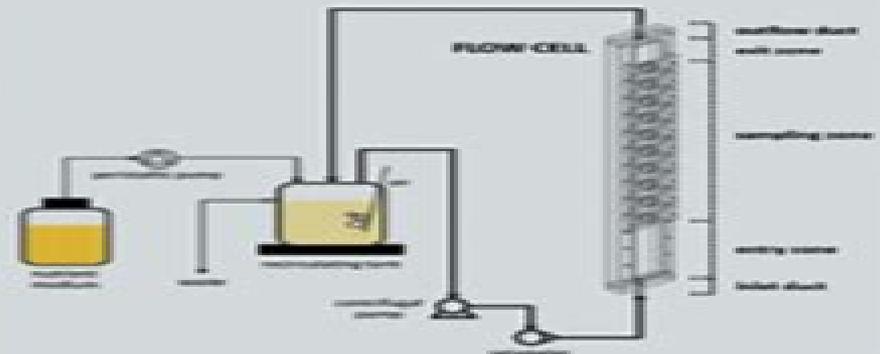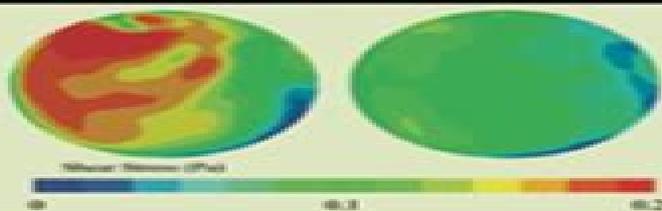SECOND EDITION

COMPUTATIONAL FLUID
DYNAMICS IN FOOD PROCESSING

EDITED BY

DA-WEN SUN

Computational Fluid Dynamics In Food Processing

Christian Drosten

Computational Fluid Dynamics In Food Processing:

   Computational Fluid Dynamics in Food Processing Da-Wen Sun,2018-10-26 Since many processes in the food industry involve fluid flow and heat and mass transfer Computational Fluid Dynamics CFD provides a powerful early stage simulation tool for gaining a qualitative and quantitative assessment of the performance of food processing allowing engineers to test concepts all the way through the development of a process or system Published in 2007 the first edition was the first book to address the use of CFD in food processing applications and its aims were to present a comprehensive review of CFD applications for the food industry and pinpoint the research and development trends in the development of the technology to provide the engineer and technologist working in research development and operations in the food industry with critical comprehensive and readily accessible information on the art and science of CFD and to serve as an essential reference source to undergraduate and postgraduate students and researchers in universities and research institutions This will continue to be the purpose of this second edition In the second edition in order to reflect the most recent research and development trends in the technology only a few original chapters are updated with the latest developments Therefore this new edition mostly contains new chapters covering the analysis and optimization of cold chain facilities simulation of thermal processing and modeling of heat exchangers and CFD applications in other food processes   **Computational Fluid Dynamics Applications in Food Processing** C. Anandharamakrishnan,2013-08-13 Computational Fluid Dynamics CFD has been applied extensively to great benefit in the food processing sector Its numerous applications include predicting the gas flow pattern and particle histories such as temperature velocity residence time and impact position during spray drying modeling of ovens to provide information about temperature and airflow pattern throughout the baking chamber to enhance heat transfer and in turn final product quality designing hybrid heating ovens such as microwave infrared infrared electrical or microwave electrical ovens for rapid baking model the dynamics of gastrointestinal contents during digestion based on the motor response of the GI tract and the physicochemical properties of luminal contents retort processing of canned solid and liquid foods for understanding and optimization of the heat transfer processes This Brief will recapitulate the various applications of CFD modeling discuss the recent developments in this field and identify the strengths and weaknesses of CFD when applied in the food industry   Computational Fluid Dynamics in Food Processing Da-Wen Sun,2018-10-26 Since many processes in the food industry involve fluid flow and heat and mass transfer Computational Fluid Dynamics CFD provides a powerful early stage simulation tool for gaining a qualitative and quantitative assessment of the performance of food processing allowing engineers to test concepts all the way through the development of a process or system Published in 2007 the first edition was the first book to address the use of CFD in food processing applications and its aims were to present a comprehensive review of CFD applications for the food industry and pinpoint the research and development trends in the development of the technology to provide the engineer and technologist working in research development and operations in

the food industry with critical comprehensive and readily accessible information on the art and science of CFD and to serve as an essential reference source to undergraduate and postgraduate students and researchers in universities and research institutions This will continue to be the purpose of this second edition In the second edition in order to reflect the most recent research and development trends in the technology only a few original chapters are updated with the latest developments Therefore this new edition mostly contains new chapters covering the analysis and optimization of cold chain facilities simulation of thermal processing and modeling of heat exchangers and CFD applications in other food processes

Modeling Food Processing Operations Serafim Bakalis,Kai Knoerzer,Peter J Fryer,2015-04-28 Computational modeling is an important tool for understanding and improving food processing and manufacturing It is used for many different purposes including process design and process optimization However modeling goes beyond the process and can include applications to understand and optimize food storage and the food supply chain and to perform a life cycle analysis Modeling Food Processing Operations provides a comprehensive overview of the various applications of modeling in conventional food processing The needs of industry current practices and state of the art technologies are examined and case studies are provided Part One provides an introduction to the topic with a particular focus on modeling and simulation strategies in food processing operations Part Two reviews the modeling of various food processes involving heating and cooling These processes include thermal inactivation sterilization and pasteurization drying baking frying and chilled and frozen food processing storage and display Part Three examines the modeling of multiphase unit operations such as membrane separation extrusion processes and food digestion and reviews models used to optimize food distribution Comprehensively reviews the various applications of modeling in conventional food processing Examines the modeling of multiphase unit operations and various food processes involving heating and cooling Analyzes the models used to optimize food distribution

Advanced Computational Techniques for Heat and Mass Transfer in Food Processing Krunal Gangawane,Madhuresh Dwivedi,2022-02-01 Computational methods have risen as a powerful technique for exploring the system phenomena and solving real life problems Currently there are two principle computational approaches for system analysis continuous and discrete In the continuous approach the governing equations can be obtained by applying the fundamental laws such as conservation of mass momentum and energy over an infinitesimal control volume On the other hand the discrete approach concentrates on mimicking the molecular movement within the system Both approaches have pros and cons and continuous development and improvement in the existing computational methods are ongoing Advanced Computational Techniques for Heat and Mass Transfer in Food Processing provides in a single source information on the use of methods based on numerical and computational analysis as applied in food science and technology It explores the use of various numerical computational techniques for the simulation of fluid flow and heat and mass transfer within food products Key Features Explores various numerical techniques used for modeling and validation Describes the knowhow of numerical

and computational techniques for food process operations Covers a detailed numerical or computational approach of the principles of heat and mass transfer in the food processing operation Discusses the detailed computational simulation procedure of the food operation Recent years have witnessed a rapid development in the field of computational techniques owing to its abundant benefit to the food processing industry The relevance of advanced computational methods has helped in understanding the fundamental physics of thermal and hydrodynamic behavior that can provide benefits to the food processing industry in numerous applications As a single information source for those interested in the use of methods based on numerical and computational analysis as applied in food science and technology this book will ably serve any food academician or researcher in learning the advanced numerical techniques exploring fluid flow crystallization and other food processing operations *Studies on Thermal Sterilization of Liquid Foods Using CFD* Ghani Albaali,2011-11 **Innovative Food Processing Technologies** Kai Knoerzer, PhD,Pablo Juliano, PhD,Peter Roupas, PhD,Cornelis Versteeg, PhD,2011-01-31 Part of the IFT Institute of Food Technologists series this book discusses multiphysics modeling and its application in the development optimization and scale up of emerging food processing technologies The book covers recent research outcomes to demonstrate process efficiency and the impact on scalability safety and quality and technologies including High Pressure Processing High Pressure Thermal Sterilization Radiofrequency Ultrasound Ultraviolet and Pulsed Electric Fields Processing Ideal for food and process engineers food technologists equipment designers microbiologists and research and development personnel this book covers the importance and the methods for applying multiphysics modeling for the design development and application of these technologies **Applications of Computational Fluid Dynamics (CFD) in the Agri-food Industry** Da-Wen Sun,2002 *Mathematical Modeling of Food Processing* Mohammed M. Farid,2010-05-21 Written by international experts from industry research centers and academia Mathematical Modeling of Food Processing discusses the physical and mathematical analysis of transport phenomena associated with food processing The models presented describe many of the important physical and biological transformations that occur in food during proces **Computational Fluid Dynamics for the Food Industry** G. M. Scott,1992 Advanced Computational Approaches for Drying in Food Processing Krunal M. Gangawane,Madhuresh Dwivedi,Ram Chandra Pradhan,2024-09-17 Computational methods have become important techniques for drying in food processing There are two principle computational approaches for system analysis continuous and discrete In the continuous approach the governing equations can be obtained by applying the fundamental laws such as conservation of mass momentum and energy over an infinitesimal control volume These equations are further discretized by using a suitable discretization technique The recovered set of algebraic equations are then solved by an applied numerical method The discrete approach concentrates on mimicking the molecular movement within system Recent years have witnessed a rapid development in the field of computational techniques owing to its abundant benefit to the food processing industry The relevance of advanced computational methods

has helped in understanding the fundamental physics of thermal and hydrodynamics behavior that can provide benefits to the food processing industry in numerous applications such as drying evaporation sterilization mixing and refrigeration Advanced Computational Approaches for Drying in Food Processing examines the use of different numerical computational techniques for the simulation of fluid flow and heat and mass transfer from within food products such as cereal chicken beef fruits vegetables and more The text promotes a thorough understanding of the drying process and its pivotal role in various applications in food processing plus advances in computer simulation techniques which have witnessed rapid popularity due to factors such as low cost and ease in parametric study CFD analysis and its use in developing new dryers modification of current systems energy saving and process optimization is covered in full plus appropriate modelling for enhancement of food quality Different phytochemical changes are explored plus novel strategies for the use of renewable energy optimization of energy consumption and heat recovery and application of environmentally friendly technologies This book provides a single information source for readers interested in the use of methods based on numerical computational analysis as applied for drying phenomenon in food science and technology   *Heat Transfer in Food Processing* S. Yanniotis,2007 Heat Transfer is important in food processing This edited book presents a review of ongoing activities in a broad perspective

   Integration of Tracing with Computational Fluid Dynamics for Industrial Process Investigation International Atomic Energy Agency,2004 This publication can be used as basic course in tracer methodology in the curricula of chemical engineering engineering processing and oil and gas reservoir engineering faculties at universities It is also expected to be of wider interest for the further development of skills and confidence to carry out field work The report will also be of interest to industrial managers and decision makers who are generally educated in areas outside of nuclear applications This book seeks to inform both specialist and non specialist readers about the application and impact of radiotracer technology in modern industry   **The Use of Computational Fluid Dynamics for the Microbial Assessment of Food Processing Equipment** Konstantia Asteriadou,2005   **Fifth International Conference on Factory 2000 - the Technology Exploitation Process, 2-4 April, 1997** ,1997   **Mechanical Automation and Materials Engineering** Daniel Chen,2013-08-16 Selected peer reviewed papers from the 2nd International Conference on Mechanical Automation and Materials Engineering ICMAME 2013 August 9 11 2013 Wuhan China   Symposium Series Institution of Chemical Engineers (Great Britain),1992   Food Processing Operations Modeling Soojin Jun,Joseph M. Irudayaraj,2008-11-27 The second edition of Food Processing Operations Modeling focuses on novel processing technologies relevant to food safety and quality as well as new commercialized computational fluid dynamics software to model complex food processing systems Addressing engineering principles and backed by numerical approaches this edition features new chapters that provide in depth coverage of high pressure processing design and analysis pulsed electric field processing and modeling radio frequency heating ozone treatment and UV pasteurization of food materials The text updates new information on infrared

heating of biological materials as well as modeling electrical resistance heating of foods **Proceedings of the ...** **Conference of Food Engineering** ,2001 *Food Processing* ,1999

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