

## Superheated Steam Drying And Processing

It's been nearly 40 years since the last book on infrared heating for food processing was published, and in the meantime, the field has seen significant progress in understanding the mechanism of the infrared (IR) heating of food products and interactions between IR radiation and food components. Infrared Heating for Food and Agricultural Processing presents the latest applications of IR heating technology, focusing on thermal processing of food and agricultural products.

Coverage Ranges from Fundamentals to Economic Benefits With an emphasis on novel application, the text includes chapters that address such topics as: Infrared heating system design Drying Blanching Baking Thawing Pest management Food safety improvement Where applicable, this readily accessible guide reviews case studies to address specific industrial issues and the economic benefits of IR heating. Infrared Heating for Food and Agricultural Processing is a well-organized resource for food processing engineers and also quality control and safety managers in food processing and food manufacturing operations.

This five-volume series provides a comprehensive overview of all important aspects of modern drying technology, concentrating on the transfer of cutting-edge research results to industrial use. Volume 5 is dedicated to process intensification by hybrid processes that combine convective or contact heat transfer with microwaves, ultrasound or radiation. Process intensification by more efficient choice, distribution, and flow of the drying medium - such as impinging jet drying, pulse combustion drying, superheated steam drying, drying in specially designed spouted beds - are thoroughly discussed. Moreover, methods that favorably affect the process by changing the structure of the drying product, e.g. foaming, electroporation, are treated. Emphasis is placed on drying, including freeze-drying, of sensitive materials such as foods, biomaterials and pharmaceuticals. Released Volumes of Modern Drying Technology: \* Volume 1: Computational Tools at Different Scales ISBN 978-3-527-31556-7 \* Volume 2: Experimental Techniques ISBN 978-3-527-31557-4 \* Volume 3: Product Quality and Formulation ISBN 978-3-527-31558-1 \* Volume 4: Energy Savings ISBN 978-3-527-31559-8 \* Set (Volume 1-5) ISBN 978-3-527-31554-3

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 with food engineering and processing operations today.

Shellfish is a broad term that covers various aquatic mollusks, crustaceans and echinoderms that are used as food. They have economic and ecological importance and have been consumed as food for centuries. Shellfish provide high quality protein with all the dietary amino acids essential for maintenance and growth of the human body. Shellfish are a major component of global seafood production, with shellfish aquaculture rapidly growing in recent years. There are many different processing methods used across the world. Shellfish are very perishable foods and must be preserved just after catching or harvesting. This makes the preservation of seafood a critical issue in terms of quality and human health. To date there have been a number of books on seafood processing and preservation, but all of them have been mostly focused on fish. Shellfish Processing and Preservation is the first reference work to focus specifically on shellfish, providing comprehensive coverage of the production methods, biological makeups and preservation methods of all major shellfish species. Individual sections focus on crustaceans such as shrimps and prawns, crabs and lobsters plus molluscs including mussels, scallops and oysters. Cephalopods such as squid and octopus are also covered in depth. For each species processing and preservation methods such as chilling, freezing, canning and curing are examined, plus the important safety aspects specific to each shellfish type. Shellfish Processing and Preservation is an essential publication for any researchers or industry professionals in search of a singular and up-to-date source for the processing and preservation of shellfish.

By far the most commonly encountered and energy-intensive unit operation in almost all industrial sectors, industrial drying continues to attract the interest of scientists, researchers, and engineers. The Handbook of Industrial Drying, Fourth Edition not only delivers a comprehensive treatment of the current state of the art, but also serves as a consultative reference for streamlining industrial drying operations. New to the Fourth Edition: Computational fluid dynamic simulation Solar, impingement, and pulse combustion drying Drying of fruits, vegetables, sugar, biomass, and coal Physicochemical aspects of sludge drying Life-cycle assessment of drying systems Covering commonly

encountered dryers as well as innovative dryers with future potential, the Handbook of Industrial Drying, Fourth Edition not only details the latest developments in the field, but also explains how improvements in dryer design and operation can increase energy efficiency and cost-effectiveness.

Food Process Engineering and Technology, Third Edition combines scientific depth with practical usefulness, creating a tool for graduate students and practicing food engineers, technologists and researchers looking for the latest information on transformation and preservation processes and process control and plant hygiene topics. This fully updated edition provides recent research and developments in the area, features sections on elements of food plant design, an introductory section on the elements of classical fluid mechanics, a section on non-thermal processes, and recent technologies, such as freeze concentration, osmotic dehydration, and active packaging that are discussed in detail. Provides a strong emphasis on the relationship between engineering and product quality/safety Considers cost and environmental factors Presents a fully updated, adequate review of recent research and developments in the area Includes a new, full chapter on elements of food plant design Covers recent technologies, such as freeze concentration, osmotic dehydration, and active packaging that are discussed in detail

This five-volume series provides a comprehensive overview of all important aspects of modern drying technology, concentrating on the transfer of cutting-edge research results to industrial use. Volume 4 deals with the reduction of energy demand in various drying processes and areas, highlighting the following topics: Energy analysis of dryers, efficient solid-liquid separation techniques, osmotic dehydration, heat pump assisted drying, zeolite usage, solar drying, drying and heat treatment for solid wood and other biomass sources, and sludge thermal processing.

Consumer-driven products have kept the food industry at the forefront of technological innovations. For example, the redefinition of the once accepted compromise between convenience and quality is just one of the current issues driving the development of new products. An overview of a range of solutions for these challenges, Innovation in Food Engineering: New Techniques and Products addresses not only new or alternative technologies but also new products, materials, and additives that have emerged as a response to current and emerging issues faced by the food industry. This book provides a comprehensive overview of modern processing technologies and their use to develop new or improved food products and ingredients that meet consumers increased demands for quality and safety. Each chapter in the Innovative Techniques section begins with a critical review of the fundamentals of the new or modified technique, its advantages, and relevant results. They include a description of the actual industrial scenario where the technique can be applied, emphasizing benefits and economical relevance of this sector. The chapters in the New Materials, Products, and Additives section identify the potential of the new or modified product, discuss its production route, and compare it with

traditional alternatives. While there are many books available on both topics, this is one of the first to cover processing technologies and their use to produce new and improved food products. Written by internationally recognized experts and pioneers and comprehensive in scope, the text highlights promising techniques and remaining challenges. In the constantly changing global marketplace, keeping up with new developments is important—keeping ahead of them is essential. This book keeps you up to date on the latest technology and paves the way for future developments.

The two-volume set IFIP AICT 392 and 393 constitutes the refereed post-conference proceedings of the 6th IFIP TC 5, SIG 5.1 International Conference on Computer and Computing Technologies in Agriculture, CCTA 2012, held in Zhangjiajie, China, in October 2012. The 108 revised papers presented were carefully selected from numerous submissions. They cover a wide range of interesting theories and applications of information technology in agriculture, including Internet of things and cloud computing; simulation models and decision-support systems for agricultural production; smart sensor, monitoring, and control technology; traceability and e-commerce technology; computer vision, computer graphics, and virtual reality; the application of information and communication technology in agriculture; and universal information service technology and service systems development in rural areas. The 53 papers included in the first volume focus on decision support systems, intelligent systems, and artificial intelligence applications.

This book provides recent advances in research on drying of particulate and porous materials. It is based on a selection of papers presented at the XI Polish Drying Symposium 2005. The contributions cover theoretical, as well as experimental and modeling research on heat and mass transfer processes during drying of porous material and fluidized beds. The book is a pioneering contribution to the science and technology of drying of particulate solids.

One of the main concerns of the food industry is the need for high-quality fresh fruits and fruit products with good sensory quality, long shelf life, and high nutritional value. To meet these demands, new processing technologies are under investigation and development. *Advances in Fruit Processing Technologies* incorporates fundamentals in food processing. *Woven Terry Fabrics: Manufacturing and Quality Management* encompasses all aspects of terry fabric production, from raw material choice and weave design to technological developments, dyeing, and quality evaluation. Nothing feels more luxurious and comforting than wrapping myself or one of my children in a thick, soft, fluffy towel after bathing says Lindsey, a healthcare administrator and mother of two children in Boston. Consumers pay an average 15 USD for a bath towel. So, it has become a luxury item today. To meet the demand of growing population, the terry fabric industry has grown to a large extent. Lots of technological developments have taken place in this field. Provides an excellent overview of the best production methods, quality control systems, latest research, and process parameters Offers in-depth information on all aspects of production Covers comprehensively, for the first time, the whole process from raw material

through to finished fabric Includes coverage of technological developments

This book contains selected papers presented during technical and plenary sessions at the World Renewable Energy Congress, the world's premier conference on renewable energy and sustainable development. All papers were rigorously peer reviewed. The Congress, held at Murdoch University in Perth, Western Australia from February 5 -9, 2017, with the theme of "Transition Towards 100% Renewable Energy", featured keynote speakers and parallel technical sessions highlighting technical, policy, and investment progress towards achieving 100% renewable energy ranging in scale from households to cities to large regions, with a focus on the challenges and opportunities transforming the global energy systems. The book highlights contributions from thought leaders involved in the supply, distribution, consumption, and development of sustainable energy sources.

Essentials & Applications of Food Engineering provides a comprehensive understanding of food engineering operations and their practical and industrial utility. It presents pertinent case studies, solved numerical problems, and multiple choice questions in each chapter and serves as a ready reference for classroom teaching and exam preparations. The first part of this textbook contains the introductory topics on units and dimensions, material balance, energy balance, and fluid flow. The second part deals with the theory and applications of heat and mass transfer, psychrometry, and reaction kinetics. The subsequent chapters of the book present the heat and mass transfer operations such as evaporation, drying, refrigeration, freezing, mixing, and separation. The final section focuses on the thermal, non-thermal, and nanotechnology-based novel food processing techniques, 3D food printing, active and intelligent food packaging, and fundamentals of CFD modeling. Features 28 case studies to provide a substantial understanding of the practical and industrial applications of various food engineering operations Includes 178 solved numerical problems and 285 multiple choice questions Highlights the application of mass balance in food product traceability and the importance of viscosity measurement in a variety of food products Provides updated information on novel food processing techniques such as cold plasma, 3D food printing, nanospray drying, electrospraying, and electrospinning The textbook is designed for undergraduate and graduate students pursuing Food Technology and Food Process Engineering courses. This book would also be of interest to course instructors and food industry professionals.

With more than 12M tons of dairy powders produced each year at a global scale, the drying sector accounts to a large extent for the processing of milk and whey. It is generally considered that 40% of the dry matter collected overall ends up in a powder form. Moreover, nutritional dairy products presented in a dry form (eg, infant milk formulae) have grown quickly over the last decade, now accounting for a large share of the profit of the sector. Drying in the Dairy Industry: From Established Technologies to Advanced Innovations deals with the market of dairy powders issues, considering both



final product and process as well as their interrelationships. It explains the different processing steps for the production of dairy powders including membrane, homogenisation, concentration and agglomeration processes. The book includes a presentation of the current technologies, the more recent development for each of them and their impact on the quality of the final powders. Lastly, one section is dedicated to recent innovations and methods directed to more sustainable processes, as well as latter developments at lab scale to go deeper in the understanding of the phenomena occurring during spray drying. Key Features: Presents state-of-the-art information on the production of a variety of different dairy powders Discusses the impact of processing parameters and drier design on the product quality such as protein denaturation and viability of probiotics Explains the impact of drying processes on the powder properties such as solubility, dispersibility, wettability, flowability, floodability, and hygroscopicity Covers the technology, modelling and control of the processing steps This book is a synthetic and complete reference work for researchers in academia and industry in order to encourage research and development and innovations in drying in the dairy industry.

This collection of recent activities provides researchers and scientists with the latest trends in characterization and developments of composed materials and structures. Here, the expression 'composed materials' indicates a wider range than the expression 'composite material' which is many times limited to classical fibre reinforced plastics. The idea of composed structures and materials is to join different components in order to obtain in total better properties than one of the single constituents can provide. In this collection, well known experts present their research on composed materials such as textile composites, sandwich plates, hollow sphere structures, reinforced concrete as well as classical fibre reinforced materials.

With the world's growing population, the provision of a safe, nutritious and wholesome food supply for all has become a major challenge. To achieve this, effective risk management based on sound science and unbiased information is required by all stakeholders, including the food industry, governments and consumers themselves. In addition, the globalization of the food supply requires the harmonization of policies and standards based on a common understanding of food safety among authorities in countries around the world. With some 280 chapters, the Encyclopedia of Food Safety provides unbiased and concise overviews which form in total a comprehensive coverage of a broad range of food safety topics, which may be grouped under the following general categories: History and basic sciences that support food safety; Foodborne diseases, including surveillance and investigation; Foodborne hazards, including microbiological and chemical agents; Substances added to food, both directly and indirectly; Food technologies, including the latest developments; Food commodities, including their potential hazards and controls; Food safety management systems, including their elements and the roles of stakeholders. The Encyclopedia provides a platform for experts from the field of

food safety and related fields, such as nutrition, food science and technology and environment to share and learn from state-of-the art expertise with the rest of the food safety community. Assembled with the objective of facilitating the work of those working in the field of food safety and related fields, such as nutrition, food science and technology and environment - this work covers the entire spectrum of food safety topics into one comprehensive reference work. The Editors have made every effort to ensure that this work meets strict quality and pedagogical thresholds such as: contributions by the foremost authorities in their fields; unbiased and concise overviews on a multitude of food safety subjects; references for further information, and specialized and general definitions for food safety terminology. In maintaining confidence in the safety of the food supply, sound scientific information is key to effectively and efficiently assessing, managing and communicating on food safety risks. Yet, professionals and other specialists working in this multidisciplinary field are finding it increasingly difficult to keep up with developments outside their immediate areas of expertise. This single source of concise, reliable and authoritative information on food safety has, more than ever, become a necessity.

A unique and interdisciplinary field, food processing must meet basic process engineering considerations such as material and energy balances, as well as the more specialized requirements of food acceptance, human nutrition, and food safety. Food engineering, therefore, is a field of major concern to university departments of food science, and chemical and biological engineering as well as engineers and scientists working in various food processing industries. Part of the notable CRC Press Contemporary Food Engineering series, *Food Process Engineering Operations* focuses on the application of chemical engineering unit operations to the handling, processing, packaging, and distribution of food products. Chapters 1 through 5 open the text with a review of the fundamentals of process engineering and food processing technology, with typical examples of food process applications. The body of the book then covers food process engineering operations in detail, including theory, process equipment, engineering operations, and application examples and problems. Based on the authors' long teaching and research experience both in the US and Greece, this highly accessible textbook employs simple diagrams to illustrate the mechanism of each operation and the main components of the process equipment. It uses simplified calculations requiring only elementary calculus and offers realistic values of food engineering properties taken from the published literature and the authors' experience. The appendix contains useful engineering data for process calculations, such as steam tables, engineering properties, engineering diagrams, and suppliers of process equipment. Designed as a one or two semester textbook for food science students, *Food Process Engineering Operations* examines the applications of process engineering fundamentals to food processing technology making it an important reference for students of chemical and biological engineering interested in

food engineering, and for scientists, engineers, and technologists working in food processing industries.

In food processing, thermal operations are the most common and conventional methods for obtaining and treating different products. This book covers basics and advances in thermal processing of food. These include drying processes, evaporation, blanching, deep fat frying, crystallization, extraction, and ohmic heating, in terms of food engineering and process design aspect. It further describes theoretical aspects, the basics of rate kinetics, and their application for the analysis of food quality indices including practical-oriented issues related to food technology. Traditional and new extraction techniques are also covered. Key features: Presents engineering focus on thermal food processing technologies. Discusses sub-classification for recent trends and relevant industry information/examples. Different current research-oriented results are included as a key parameter. Covers advances in drying, evaporation, blanching, crystallization, and ohmic heating. Includes mathematical modeling and numerical simulations. Food Processing: Advances in Thermal Technologies is aimed at graduate students and professionals in food engineering, food technology, and biological systems engineering

Technological Interventions in Processing of Fruits and Vegetables presents a wide selection of the latest concepts in the fast-changing field of processing of fruits and vegetables (FAV). It provides key information on many new and different techniques used for processing of fruits and vegetables while also exploring the pros and cons of the various methods. There is an urgent need to explore and investigate waste in the processing of fruits and vegetables and how different processing technologies can be used most effectively. This volume, in short, conveys the key concepts and role of different technology in processing of fruits and vegetables, keeping mind the special processing requirements of fruits and vegetables, waste issues, nutritional value, and consumer concerns. This volume offers a wealth of information on today's technology for fruit and vegetable processing and will be a valuable resource for industry professionals, agricultural/food processing researchers, faculty and upper-level students, and others.

The second edition of Emerging Technologies in Food Processing presents essential, authoritative, and complete literature and research data from the past ten years. It is a complete resource offering the latest technological innovations in food processing today, and includes vital information in research and development for the food processing industry. It covers the latest advances in non-thermal processing including high pressure, pulsed electric fields, radiofrequency, high intensity pulsed light, ultrasound, irradiation, and addresses the newest hurdles in technology where extensive research has been carried out. Provides an extensive list of research sources to further research development Presents current and thorough research results and critical reviews Includes the most recent technologies used for shelf life extension, bioprocessing simulation and optimization



The Encyclopedia of Food and Health provides users with a solid bridge of current and accurate information spanning food production and processing, from distribution and consumption to health effects. The Encyclopedia comprises five volumes, each containing comprehensive, thorough coverage, and a writing style that is succinct and straightforward. Users will find this to be a meticulously organized resource of the best available summary and conclusions on each topic. Written from a truly international perspective, and covering of all areas of food science and health in over 550 articles, with extensive cross-referencing and further reading at the end of each chapter, this updated encyclopedia is an invaluable resource for both research and educational needs. Identifies the essential nutrients and how to avoid their deficiencies Explores the use of diet to reduce disease risk and optimize health Compiles methods for detection and quantitation of food constituents, food additives and nutrients, and contaminants Contains coverage of all areas of food science and health in nearly 700 articles, with extensive cross-referencing and further reading at the end of each chapter Vegetables are an important article of commerce both in developed and developing economies. Many studies point to importance of vegetables in our diet. Handbook of Vegetables and Vegetable Processing serves as a reference handbook on vegetables and vegetable processing containing the latest developments and advances in this fast growing field. The book can be considered as a companion to Y. H. Hui's popular Handbook of Fruits and Fruit Processing (2006). Handbook of Vegetables and Vegetable Processing is contemporary in scope, with in-depth coverage of new interdisciplinary developments and practices in the field of vegetables emphasizing processing, preservation, packaging, and nutrition and food safety. Coverage includes chapters on the biology, horticultural biochemistry, microbiology, nutrient and bioactive properties of vegetables and their significant commercialization by the food industry worldwide. Full chapters are devoted to major vegetables describing aspects ranging from chemistry to processing and preservation. World-renowned editors and authors have contributed to this essential handbook on vegetables and their production, technology, storage, processing, packaging, safety and commercial product development. Special Features: Coverage includes biology and classification, physiology, biochemistry, flavor and sensory properties, microbial safety and HACCP principles, nutrient and bioactive properties In-depth descriptions of key processes including, minimal processing, freezing, pasteurization and aseptic processing, fermentation, drying, packaging, and application of new technologies Entire chapters devoted to important aspects of over 20 major commercial vegetables including avocado, table olives and textured vegetable proteins Unparalleled expertise on important topics from more than 50 respected authors Natural and Artificial Flavoring Agents and Dyes, Volume 7 in the Handbook of Food Bioengineering series, examines the use of natural vs. artificial food dyes and flavors, highlighting some of the newest production and purification methods. This solid resource explores the most recent trends and benefits of using natural agents over artificial in the production of

foods and beverages. Using the newest technologies and evidence-based research methods, the book demonstrates how natural flavoring agents and dyes can be produced by plants, microorganisms and animals to produce higher quality foods that are more economical and safe to the consumer. Explores the most common natural compounds and how to utilize them with cutting edge technologies Includes information on the purification and production processes under various conditions Presents the latest research to show benefits of using natural additives

Still the Most Complete, Up-To-Date, and Reliable Reference in the Field Drying is a highly energy-intensive operation and is encountered in nearly all industrial sectors. With rising energy costs and consumer demands for higher quality dried products, it is increasingly important to be aware of the latest developments in industrial drying technology

Development of Direct Contact Superheated Steam Drying Process for Biomass Final Report Evaluation of the Superheated Steam Drying Process for Wool Introduction to Advanced Food Process Engineering CRC Press

Coal accounts for approximately one quarter of world energy consumption and of the coal produced worldwide approximately 65% is shipped to electricity producers and 33% to industrial consumers, with most of the remainder going to consumers in the residential and commercial sectors. The total share of total world energy consumption by coal is expected to increase to almost 30% in 2035. This book describes the challenges and steps by which electricity is produced from coal and deals with the challenges for removing the environmental objections to the use of coal in future power plants. New technologies are described that could virtually eliminate the sulfur, nitrogen, and mercury pollutants that are released when coal is burned for electricity generation. In addition, technologies for the capture greenhouse gases emitted from coal-fired power plants are described and the means of preventing such emissions from contributing to global warming concerns. Written by one of the world's leading energy experts, this volume is a must-have for any engineer, scientist, or student working in this field, providing a valuable reference and guide in a quickly changing field.

Food Process Engineering: Emerging Trends in Research and Their Applications provides a global perspective of present-age frontiers in food process engineering research, innovation, and emerging trends. It provides an abundance of new information on a variety of issues and problems in food processing technology. Divided into five parts, the book presents new research on new trends and technologies in food processing, ultrasonic treatment of foods, foods for specific needs, food preservation, and food hazards and their controls.

This book focuses on Chemical Engineering and Processing, covering interdisciplinary innovation technologies and sciences closely related to chemical engineering, such as computer image analysis, modelling and IT. The book presents interdisciplinary aspects of chemical and biochemical engineering interconnected with process system engineering, process safety and computer science.

Presents Drying Breakthroughs for an Array of Materials Despite being one of the oldest, most energy-intensive unit operations, industrial drying is perhaps the least scrutinized technique at the microscopic level. Yet in the wake of today's global energy crisis,

drying research and development is on the rise. Following in the footsteps of the widely read first edition, *Advanced Drying Technologies, Second Edition* is the direct outcome of the recent phenomenal growth in drying literature and new drying hardware. This edition provides an evaluative overview of new and emerging drying technologies, while placing greater emphasis on making the drying process more energy efficient in the green age. Draws on the Authors' 60+ Years of Combined Experience Fueled by the current energy crisis and growing consumer demand for improved quality products, this thoroughly updated resource addresses cutting-edge drying technologies for numerous materials such as high-valued, heat-sensitive pharmaceuticals, nutraceuticals, and some foods. It also introduces innovative techniques, such as heat-pump drying of foods, which allow both industrial practice and research and development projects to save energy, reduce carbon footprints, and thus improve the bottom line. Four New Chapters: Spray-Freeze-Drying Fry Drying Refractance Window Drying Mechanical Thermal Expression Requiring no prior knowledge of chemical engineering, this single-source reference should assist researchers in turning the laboratory curiosities of today into the revolutionary novel drying technologies of tomorrow.

A comprehensive approach to selecting and understanding drying equipment for chemical and mechanical engineers A detailed reference of interest for engineers and energy specialists working in the process industry field, *Drying in the Process Industry* investigates the current state of the art of today's industrial drying practices, examines the factors influencing drying's high costs in both equipment and energy consumption, and summarizes key elements for keeping drying operations under budget and performing at peak capacity safely while respecting the environment. Extensive coverage of dryer basics as well as essential procedures concerning the selection of industrial dryers—such as how to gather results of relevant laboratory measurements, carry out small-scale tests, and correctly size equipment—help to inform readers on criteria for generating scalable specifications that greatly assist buying decisions. *Drying in the Process Industry*: Takes a practical approach to drying equipment, from an author with four decades in the industry Describes a diverse array of drying equipment (convective, like flash, spray, fluid-bed, and rotary; contact, like paddle and steam; radiation) from an engineer's perspective Provides quick and ready access to drying technologies with references to more detailed literature Treats drying in the context of the entire production process True of all process facilities where drying plays an important role, such as those in the chemical, pharmaceutical, plastics, and food industries, the purchase of improper industrial drying equipment can significantly affect a manufacturer's economic bottom line. With the guidance offered in this book, engineers will be able to confidently choose industrial drying equipment that increases profits, runs efficiently, and optimally suits their needs.

Food materials are processed prior to their consumption using different processing technologies that improve their shelf life and maintain their physicochemical, biological, and sensory qualities. *Introduction to Advanced Food Process Engineering* provides a general reference on various aspects of processing, packaging, storage, and quality control and assessment systems, describing the basic principles and major applications of emerging food processing technologies. The book is divided into three sections, systematically examining processes from different areas of food process engineering. Section I covers a wide range of advanced

food processing technologies including osmo-concentration of fruits and vegetables, membrane technology, nonthermal processing, emerging drying technologies, CA and MA storage of fruits and vegetables, nanotechnology in food processing, and computational fluid dynamics modeling in food processing. Section II describes food safety and various non-destructive quality assessment systems using machine vision systems, vibrational spectroscopy, biosensors, and chemosensors. Section III explores waste management, by-product utilization, and energy conservation in food processing industry. With an emphasis on novel food processes, each chapter contains case studies and examples to illustrate state-of-the-art applications of the technologies discussed.

This is the second publication stemming from the International Congress on Engineering in Food, the first being Food Engineering Interfaces, based on the last ICEF10. The theme of ICEF 11, held in Athens, Greece in May 2011, is “Food Process Engineering in a Changing World.” The conference explored the ways food engineering contributes to the solutions of vital problems in a world of increasing population and complexity that is under the severe constraints of limited resources of raw materials, energy, and environment. The book, comprised of 32 chapters, features an interdisciplinary focus, including food materials science, engineering properties of foods, advances in food process technology, novel food processes, functional foods, food waste engineering, food process design and economics, modeling food safety and quality, and innovation management.

Food processing technologies are an essential link in the food chain. These technologies are many and varied, changing in popularity with changing consumption patterns and product popularity. Newer process technologies are also being evolved to provide the added advantages. Conventional and Advanced Food Processing Technologies fuses the practical (application, machinery), theoretical (model, equation) and cutting-edge (recent trends), making it ideal for industrial, academic and reference use. It consists of two sections, one covering conventional or well-established existing processes and the other covering emerging or novel process technologies that are expected to be employed in the near future for the processing of foods in the commercial sector. All are examined in great detail, considering their current and future applications with added examples and the very latest data. Conventional and Advanced Food Processing Technologies is a comprehensive treatment of the current state of knowledge on food processing technology. In its extensive coverage, and the selection of reputed research scientists who have contributed to each topic, this book will be a definitive text in this field for students, food professionals and researchers.

Drying Principles and Practice presents the fundamental principles that underlie drying arts as a basis for explaining the behavior of a drying plant. This book begins with an introductory chapter, followed by an account of the phenomena that causes the influence of moisture on its host material and manner in which moisture may be expelled by heat into the

humid surroundings. The quantitative description of the way a moist material dries and how it dries under commercial conditions are also provided. The remainder of this text is devoted to surveying less-common methods of drying, moisture-measurement techniques, dryer-control systems, and aspects of the choice and design of industrial dryers. This publication is valuable to engineers, but is also a good source for senior undergraduate and postgraduate students engaged in studies of heat with mass transfer.

The goal of all drying research and development is to develop cost-effective innovative processes that yield high-quality dried products with less energy consumption and reduced environmental impact. With the literature on drying widely scattered, *Advanced Drying Technologies for Foods* compiles under one cover concise, authoritative, up-to-date assessments of modern drying technologies applied to foods. This book assembles a number of internationally recognized experts to provide critical reviews of advanced drying technologies, their merits and limitations, application areas and research opportunities for further development. Features: Provides critical reviews of advanced drying technologies Discusses the merits and limitations of a variety of food drying technologies Explains drying kinetics, energy consumption and quality of food products Reviews the principles and recent applications of superheated steam drying The first four chapters deal with recent developments in field-assisted drying technologies. These include drying techniques with the utilization of electromagnetic fields to deliver energy required for drying, for example, microwave drying, radio frequency drying, electrohydrodynamic drying, and infrared radiation drying. The remainder of this book covers a wide assortment of recently developed technologies, which include pulse drying, swell drying, impinging stream drying, and selected advances in spray drying. The final chapter includes some innovative technologies which are gaining ground and are covered in depth in a number of review articles and handbooks, and hence covered briefly in the interest completeness. This book is a valuable reference work for researchers in academia as well as industry and will encourage further research and development and innovations in food drying technologies.

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