



**FOOD**

**PROCESS DESIGN?**

**PLANT DESIGN?**

# Food Process Design

**George D. Saravacos, Zacharias B.  
Maroulis**



## **Food Process Design:**

Handbook of Food Process Design, 2 Volume Set Jasim Ahmed, Mohammad Shafiur Rahman, 2012-05-21 In the 21st Century processing food is no longer a simple or straightforward matter Ongoing advances in manufacturing have placed new demands on the design and methodology of food processes A highly interdisciplinary science food process design draws upon the principles of chemical and mechanical engineering microbiology chemistry nutrition and economics and is of central importance to the food industry Process design is the core of food engineering and is concerned at its root with taking new concepts in food design and developing them through production and eventual consumption Handbook of Food Process Design is a major new 2 volume work aimed at food engineers and the wider food industry Comprising 46 original chapters written by a host of leading international food scientists engineers academics and systems specialists the book has been developed to be the most comprehensive guide to food process design ever published Starting from first principles the book provides a complete account of food process designs including heating and cooling pasteurization sterilization refrigeration drying crystallization extrusion and separation Mechanical operations including mixing agitation size reduction extraction and leaching processes are fully documented Novel process designs such as irradiation high pressure processing ultrasound ohmic heating and pulsed UV light are also presented Food packaging processes are considered and chapters on food quality safety and commercial imperatives portray the role process design in the broader context of food production and consumption

**Food Process Design** Zacharias B. Maroulis, George D. Saravacos, 2003-05-09 This timely reference utilizes simplified computer strategies to analyze develop and optimize industrial food processes and offers procedures to assess various operating conditions engineering and economic relationships and the physical and transport properties of foods for the design of the most efficient food manufacturing technologies and equipment Food Process Design discusses the integration and economic profitability of the entire food processing plant including effective use of water energy and raw materials process profitability and wastewater reduction The book offers detailed numerical examples for major food processes including heating cooling freezing and more

*Food Plant Design* Antonio Lopez-Gomez, Gustavo V. Barbosa-Canovas, 2005-05-06 Although chemical engineering and food technology are subject areas closely related to food processing systems and food plant design coverage of the design of food plants is often sporadic and inadequately addressed in food technology and engineering books Some books have attempted to treat food engineering from this dual point of view but most have not achieved balanced coverage of the two Focusing on food processing rather than chemical plants Food Plant Design presents precise design details with photos and drawings of different types of food processing plants including food processing systems refrigeration and steam systems conveying systems and buildings The authors discuss the subject in an ordered format that gives you the tools to produce food products with minimum cost Including modeling procedures for food processing systems and auxiliary systems they elucidate synthesis techniques and procedures Using a clear structure

for different levels of information and data on different food processing alternatives the book outlines solutions to plant design problems in the context of overall optimization of an agro industrial system and corresponding food chain It provides the work procedures and techniques for solving the design problems of a food processing plant and in making a defined food product

**Food Process Design and Evaluation** RakeshK. Singh,2017 This new book provides detailed illustrated reports on important recent advances in processing of foods including separation mixing preservation and extrusion The authors are specialists in food processing from North America and Europe The reports were originally presented at the Conference of Food Engineering sponsored by the American Institute of Chemical Engineers in 1992 and 1993 they were selected rewritten and updated for this book Provided by publisher

**Introduction to Food Process Engineering** P. G. Smith,2003 This is a work on food process engineering which treats the principles of processing in a scientifically rigorous yet concise manner and which may be used as a lead in to more specialized texts for higher study It is equally relevant to those in the food industry who desire a greater understanding of the principles of the food processes with which they work

**Handbook of Food Process Design** Jasim Ahmed,Shafiur Rahman, This book will offer a comprehensive account of the design of all major food processing systems including both established and novel unit operations The range of equipment available for any given process will be described including the basic theoretical principles and modes of operation Advantages and limitations of the equipment within various relevant parameters such as size processing time cost and energy requirements will be explained and schematic diagrams will be provided to show the stages of each process component in detail The book also covers computer aided design and control systems cost considerations and cleaning and sanitation methods Practical examples of process design scenarios will be included to help the reader in specifying and designing their own operations All chapters will follow the following format 1 Purpose of unit operation2 What are the end products of the process 3 Process flow sheet material and energy balances and schematic diagram of the process and its components4 Basic theoretical principles and mode of operations 5 Different types of equipment available with their advantages and limitations What are the parameters we need to know For example time energy size and other factors 6 Empirical data and rules of thumb used to facilitate the various design calculations simplified equations and shortcut methods 7 Simple equations tables and graphs to estimate the design parameters 8 Process control operations and maintenance of the unit operations 9 Advanced levels of process design for complicated systems Computer aided process plant design 10 Cleaning and sanitation methods 11 Capital and operating cost for different size of the equipments 12 Summary and future needs 13 Worked out examples related to design

**Handbook of Food Processing Equipment** George Saravacos,Athanasios E. Kostaropoulos,2015-12-29 This text covers the design of food processing equipment based on key unit operations such as heating cooling and drying In addition mechanical processing operations such as separations transport storage and packaging of food materials as well as an introduction to food processes and food processing plants are discussed Handbook of Food Processing Equipment is an

essential reference for food engineers and food technologists working in the food process industries as well as for designers of process plants The book also serves as a basic reference for food process engineering students The chapters cover engineering and economic issues for all important steps in food processing This research is based on the physical properties of food the analytical expressions of transport phenomena and the description of typical equipment used in food processing Illustrations that explain the structure and operation of industrial food processing equipment are presented style font size 13 3333330154419px The materials of construction and fabrication of food processing equipment are covered here as well as the selection of the appropriate equipment for various food processing operations Mechanical processing equipment such as size reduction size enlargement homogenization and mixing are discussed Mechanical separations equipment such as filters centrifuges presses and solids air systems plus equipment for industrial food processing such as heat transfer evaporation dehydration refrigeration freezing thermal processing and dehydration are presented Equipment for novel food processes such as high pressure processing are discussed The appendices include conversion of units selected thermophysical properties plant utilities and an extensive list of manufacturers and suppliers of food equipment **Food Process**

**Modelling** L M M Tijskens, M L A T M Hertog, B M Nicolai, 2001-06-14 Food process modelling provides an authoritative review of one of the most exciting and influential developments in the food industry The modelling of food processes allows analysts not only to understand such processes more clearly but also to control them more closely and make predictions about them Modelling thus aids the search for greater and more consistent food quality Written by a distinguished international team of experts Food process modelling covers both the range of modelling techniques and their practical applications across the food chain *Food Process Engineering Operations* George D. Saravacos, Zacharias B. Maroulis, 2011-02-22 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 chem *Handbook of Food Factory Design* Christopher G. J. Baker, 2013-08-27 Food manufacturing has evolved over the centuries from kitchen industries to modern sophisticated production operations A typical food factory includes the food processing and packaging lines the buildings and exterior landscaping and the utility supply and waste treatment facilities As a single individual is unlikely to possess all the necessary skills required to facilitate the design the task will undoubtedly be undertaken by an interdisciplinary team employing a holistic approach based on a knowledge of the natural and biological sciences most engineering disciplines and relevant legislation In addition every successful project requires a competent project manager to ensure that all tasks are completed on time and within budget This Handbook attempts to compress comprehensive up to date coverage of these areas into a single volume It is hoped that it will prove to be of value across the food manufacturing community The multi disciplinary nature of the subject matter should facilitate more informed

communication between individual specialists on the team It should also provide useful background information on food factory design for a wider range of professionals with a more peripheral interest in the subject for example process plant suppliers contractors HSE specialists retailers consultants and financial institutions Finally it is hoped that it will also prove to be a valuable reference for students and instructors in the areas of food technology chemical engineering and mechanical engineering in particular

**Food Plant Economics** Zacharias B. Maroulis, George D. Saravacos, 2007-08-02 Applying the proven success of modern process engineering economics to the food industry Food Plant Economics considers the design and economic analysis of food preservation food manufacturing and food ingredients plants with regard to a number of representative food processes Economic analysis of food plants requires the evaluation of quantitative data from the design and operation of food processes and processing plants Accompanying downloadable resources include prepared Excel spreadsheets for calculating various food plants scenarios by applying appropriate data regarding the cost of equipment and equipment sizing material and energy balances and plant operating costs Beginning with a thorough background in the economics of a food plant the first three chapters summarize recent advances in food process and research technology the structure of the food system in the US and EU and the principles of modern design in food processes processing equipment and processing plants The second three chapters discuss process economics in relation to the food industry by applying the concepts of capital cost operating cost and cash flow to estimations of plant profitability Detailed chapters cover estimations of capital investment and operating costs including statistical data empirical models and useful rules of thumb The remaining three chapters apply the techniques of the previous discussions to food preservation plants such as concentration canning and dehydration manufacturing plants including wine bread and yogurt as well as ingredients plants that produce sugars and oils A useful appendix contains a glossary tables conversions nomenclature food properties and heat transfer coefficients A practical and comprehensive treatment of process economics Food Plant Economics provides a complete introduction to the application of this efficient technique to the food industry

**Food Process Engineering** Dennis R. Heldman, 2012-12-06 The Second Edition of Food Process Engineering by Dr Dennis Heldman my former student and co author Paul Singh his former student attests to the importance of the previous edition In the Foreword to the First Edition I noted the need for people in all facets of the food processing industry to consider those variables of design of particular importance in engineering for the food processing field In addition to recognizing the many variables involved in the biological food product being handled from production to consumption the engineer must oftentimes adapt equations developed for non biological materials As more and more research is done those equations are appropriately modified to be more accurate or new equations are developed specifically for designing to process foods This Edition updates equations used This book serves a very important need in acquainting engineers and technologists particularly those with a mathematics and physics background with the information necessary to provide a more efficient design to accomplish the objectives Of prime

importance at present and in the future is to design for efficient use of energy Now it is often economical to put considerably more money into first costs for an efficient design than previously when energy costs were a much smaller proportion of the total cost of process engineering

Handbook of Food Processing Theodoros Varzakas, Constantina Tzia, 2015-10-22 Packed with case studies and problem calculations Handbook of Food Processing Food Safety Quality and Manufacturing Processes presents the information necessary to design food processing operations and describes the equipment needed to carry them out in detail It covers the most common and new food manufacturing processes while addressing rele

**Food Process Engineering Operations** George D. Saravacos, Zacharias B. Maroulis, 2011-04-11 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

**Food Processing Operations and Scale-up** Kenneth J. Valentas, J. Peter Clark, Leon Levin, 2020-08-11 Intended for students and practitioners who have a basic education in chemical engineering or food science Contains basic information in each area and describes some of the fundamental ideas of processing development and design Examines the food industry structure how it works consumer products

*Thermal Food Processing* Da-Wen Sun, 2012-05-16 Thermal processing remains one of the most important processes in the food industry Now in its second edition Thermal Food Processing New Technologies and Quality Issues continues to explore the latest developments in the field Assembling the work of a worldwide panel of experts this volume

highlights topics vital to the food industry today and Evaporation Technology in Food Processing Seid Mahdi Jafari, Esra Capanoglu, Guven, Asli Can Karaca, 2024-02-29 Evaporation Technology in Food Processing Volume Nine in the Unit Operations and Processing Equipment in the Food Industry series explains the processing operations and equipment necessary for recent invented non thermal processing of different food products including ozonation plasma processing pulsed electric fields high pressure processing irradiation and high frequency processing These processes and unit operations are very important in terms of achieving favorable sensory properties and energy usage Written by experts in the field of food engineering this book targets Industrial Engineers working in the field of food processing and within food factories Divided in four sections Evaporation basics Different types of evaporators Application of evaporators in the food industry and Design control and efficiency of evaporators all chapters emphasize basic texts relating to experimental theoretical computational and or applications of food engineering principles and the relevant processing equipment to evaporation unit operations Thoroughly explores the processing operations and equipment necessary for the evaporation of different food products applying steam Brings new opportunities in food processing through innovative evaporation processes Covers the design control and efficiency of evaporators Handbook of Food Engineering Practice Kenneth J. Valentas, Enrique Rotstein, R. Paul Singh, 1997-07-23 Food engineering has become increasingly important in the food industry over the years as food engineers play a key role in developing new food products and improved manufacturing processes While other textbooks have covered some aspects of this emerging field this is the first applications oriented handbook to cover food engineering processes and manufacturing techniques A major portion of Handbook of Food Engineering Practice is devoted to defining and explaining essential food operations such as pumping systems food preservation and sterilization as well as freezing and drying Membranes and evaporator systems and packaging materials and their properties are examined as well The handbook provides information on how to design accelerated storage studies and determine the temperature tolerance of foods both of which are important in predicting shelf life The book also examines the importance of physical and rheological properties of foods with a special look at the rheology of dough and the design of processing systems for the manufacture of dough The final third of the book provides useful supporting material that applies to all of the previously discussed unit operations including cost profit analysis methods simulation procedures sanitary guidelines and process controller design The book also includes a survey of food chemistry a critical area of science for food engineers Hydrocolloids in Food Processing Thomas R. Laaman, 2011-06-09 In Hydrocolloids in Food Processing a group of the most experienced and impartial experts explains what stabilizers should be used and how they should be used food product by food product Numerous actual product formulations are packed into each chapter and the processing procedures to make these formulations are clearly described Food manufacturers are shown how to accurately use food stabilizers to make the highest quality food products Coverage includes all the practical details needed to ensure the most accurate QA



standards and testing procedures for each hydrocolloid Finally Hydrocolloids in Food Processing explains how to navigate the often tricky area of dealing with hydrocolloid suppliers An informative discussion of how hydrocolloid companies think and operate today is followed by precise strategies to ensure that the most mutually beneficial relationships can be obtained between specific customer types and appropriate types of suppliers     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

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