

Preface (First Edition)

My credentials for writing this book are three decades of experience in the canning industry, the research that has supported it, and the establishment of a specialized training course on the thermal processing of packaged foods. My first encounter with the industry was to accompany Tom Gillespy around the various factories of the members of Campden Research Association. He took his annual leave for many years visiting the industry and was dedicated to ensuring that the requirements of good manufacturing practice were observed. The occasion on which I accompanied him, was his last trip before retirement, and I shall always be grateful to him for the kindly advice he gave me on all aspects of canning and food processing. Nobody could have had a better introduction to the industry. In a small way, this book is an appreciation and a memorial to some of his work. He was greatly respected in academic and industrial circles.

This book is concerned with the physical and engineering aspects of the thermal processing of packaged foods—i.e., the heating and cooling of food products hermetically sealed in containers. The two commonest types of container used for this process are glass bottles and cans, although more recently a variety of plastic containers has been added to the list. The main aim of the book is to examine the methods that have been used to establish the time and temperature of processes suitable to achieve adequate sterilization or pasteurization of the packaged food.

It is written from the point of view of the food process engineer, whose principal role is to design, construct, and operate food processing equipment to produce food of acceptable quality and free from public health hazards. The engineering approach requires a knowledge of the microbiological and physico-chemical factors required to solve the necessary equations to establish the safety of the process. In some ways, the canning process is unique, in as much as it requires a mathematical model of the sterilization value to determine the adequacy of the process. Over the last 70 years, a considerable amount of time and energy has been spent around the world on developing suitable mathematical methods to calculate the effectiveness of various processing regimes in order to ensure the safe production of foods. In this book, the various methods and theoretical models on which they are based, for determining adequate times and temperatures for achieving sterility, are discussed and examined.

Most books on canning tend to deal with this subject either by means of a generalized technological description of the process, containers, and products, or from a bacteriological point of view. This book, however, attempts to deal with the more fundamental engineering aspects of the heating and cooling process and the mathematical modeling of the sterilization operation—aspects that are dealt with more briefly elsewhere. Many hundreds of papers have been published on this subject and an untold amount of thermal processing experimental work carried out. Each canning company usually has a person specializing in thermal processing, as well as microbiological laboratory and pilot plant facilities. Much of the academic research work reported is essentially an extension of basic principles, and the development of new, and alternative methods of calculation rather than the discovery of new principles. Some of the work makes a critical comparison of various authors' work and assesses the improvements or otherwise that accrue from using a particular method. Some of it uses new mathematical techniques to perform already established methods, while other work analyzes the errors resulting from the use of different methods of heat penetration. The research and development work is important in training people in the principles of one of the best and well-established methods of making shelf-stable food products.

This book will be of interest to technical managers, process engineers, and research workers as a guide to the literature and the principles underlying thermal processing. It will be of use to those in the industry who are concerned with achieving adequate processes, as well as to those who are concerned with the development of equipment. It will also act as a guide to those who are concerned with the development of legislation, and help them to assess the realities of whatever they wish to impose on the manufacturing industry. Finally, it is hoped that this book will inspire and enthuse research workers to even greater endeavors in this area.

I am most grateful for advice and help from former colleagues, and also to many friends throughout the world.

S.D. HOLDSWORTH

Preface (Second Edition)

In this new edition, the historical perspective of the development of thermal processing has been retained and much new additional material has been added. The development of the subject, as indicated by the amount of research that has been done during the last ten years, has been remarkable, and shows that the technology is very viable and expanding world-wide.

The main developments that have been included are: a) the increased use of new packaging materials, including retortable pouches and the use of containers made from other plastic composite materials, b) the application of newer processing methods which use heat transfer media such as hot water, air/steam, and steam/water, which are necessary for the newer forms of packaging material, c) new methods of theoretically calculating the heat transfer characteristics during processing, including three-dimensional modeling and application of computerized fluid dynamics (CFD) techniques, d) implications of newer models for microbial destruction, e) revised techniques for process evaluation using computer models, including CD software, f) development of process schedules for quality optimization in newer packaging materials, and g) important new aspects of methods of retort control.

Unlike other texts on thermal processing, which very adequately cover the technology of the subject, the unique emphasis of this text is on processing engineering and its relationship to the safety of the processed products.

The authors hope that they have produced an adequate text for encouraging research workers and professional engineers to advance the operation of the manufacturing processes to ensure the production of high quality products with assured safety.

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