

EDITED BY
S. T. BECKETT

INDUSTRIAL CHOCOLATE MANUFACTURE AND USE

THIRD EDITION

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Industrial Chocolate Manufacture and Use

Third Edition

Edited by

S.T. Beckett
Nestlé R&D Centre
York, UK



Blackwell
Science

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Jonathan C. Hoskin has co-authored with Paul Dimick several scientific review papers on non-enzymatic browning during the processing of chocolate. While at Clemson University, where his main interest included chocolate flavour chemistry, the flavour chemistry of dairy products, dairy processing and food and light interactions, he published over 15 technical publications. He currently is programmer analyst at the Division of Computer Information Technology, Clemson University.

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Vince Martin trained as an economist before working in marketing, production and packaging for both confectionery and grocery lines. He has had over 40 years of experience of packaging, not only in production but also in the fields of research and development. During his career he was a member of many industrial committees and has been the judge of numerous competitions.

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Eppo Meursing studied chemistry and microbiology at the University of Amsterdam. He worked for over 30 years in the field of cocoa, as head of the laboratory of Cacao de Zaan, president of the Analytical Committee of the International Office of Cocoa, Chocolate and Confectionery and an author. He was also actively involved in the SGS Cocoa Bean Collection and Data Bank, which he founded 11 years ago.

Edward Minson is currently Flavors Sales Manager with the Eskimo Pie Corporation in New Berlin, Wisconsin, USA. He has held various research and development management positions with Grace Cocoa/Ambrosia Chocolate and was a research chemist at the Ralston Purina Company. He holds an M.S. in food science from the University of Wisconsin, a B.S. in food science from the University of Massachusetts and an MBA from Marquette University.

Roy B. Nelson has had almost 40 years in the confectionery industry, starting as a confectionery machinery designer, followed by 9 years with Baker Perkins as a design engineer. He presented a paper to the 21st PMCA Production Conference in 1967 on tempering and enrobing. He joined John Mackintosh & Son Ltd in 1968 as Research Manager, and after 6 years moved to Tourell for 18 months, developing new ideas in gas cooking and systems designs. He has been with Rowntree Mackintosh and subsequently Nestlé for more than 20 years as chief designer and computer-aided design manager, using computer and state-of-the-art developments.

Colin Nuttall, by profession a statistician, worked for Mars Confectionery from 1945 to 1982, retiring as Corporate Planning Manager and Secretary to the Board of Management. He was Chairman of the Statistics Committee of the Cocoa, Chocolate and Confectionery Alliance, and for 10 years the first President of the Joint International Statistics Committee for the ISCMA and the International Office of Cocoa and Chocolate, which awarded him their Gold Medal in 1982. He was a founder member of the Henley Centre for Forecasting, and remained on the Management Council until his death in 1990.

Jane A. Smith is manager of the Legislation Unit, which is part of the Information and Training Division at Leatherhead Food Research Association UK. She has written a number of book chapters and journal articles on regulatory issues in the food industry.

Geoff Talbot (B.Sc., MRSC, C.Chem.) joined Unilever Research from the University of Manchester Institute of Science and Technology. During more than 20 years with Unilever Research in Welwyn and Culworth House, he studied the use of speciality fats in confectionery applications. Much of this research was directed at the use of cocoa butter equivalents and encompassed novel processes in the production of cocoa butter equivalents, the optimization of the composition of cocoa butter equivalents using both mathematical and physical methods of analysis, and the application of cocoa butter equivalents and their use to optimize both the processing and sensory characteristics of chocolate. During this period he also studied the phenomena of fat migration and moisture migration in confectionery products, authored several papers and lectured on these topics. Ten years ago he moved to Loders Croklaan Ltd, as Senior Applications and Technical Services Manager for the UK.

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Preface

It is now 10 years since the first edition of *Industrial Chocolate Manufacture and Use* was published and 5 years since the second edition was written. It is therefore very gratifying to have been asked to revise this book once again and I am very grateful to those authors who have once again updated their chapters. Ten of these in fact contributed to the first edition. As with every other industry, however, both people and technology change and this new edition has had six of the chapters completely rewritten. For three of these the original author had left the industry or was not able to revise their contribution. The international nature of the book has, however, been retained with two of the new authors coming from the USA, one from The Netherlands and two from New Zealand; the first authors from the southern hemisphere.

The book has also been increased in size by four chapters to a new total of 25. Two of the new chapters relate to the fact that chocolate is more and more being produced on large plants and then transported to other user factories, sometimes in other countries. The first of these chapters looks at the transport and storage of bulk chocolate and is an extended version of part of one of the original chapters. The other chapter is completely new and looks at the legal restraints that exist for chocolate in many parts of the world. This, of course, applies to finished products as well as the bulk material.

Many chocolate products on the market are produced by the panning process. Although this is a relatively complicated procedure, and sometimes regarded as an art, it had previously been described in one short section. This has been remedied in this edition by devoting a full chapter to the topic.

The ingredients from which chocolate is manufactured tend to be more expensive than those for many other foods and it is therefore important that they are not wasted, when something goes wrong with their processing. For this reason the fourth new chapter deals with the subject of rework and how it can be dealt with safely.

Many of the other chapters have had a significant update. There have been a lot of new ingredients produced for the chocolate industry over the last 10 years and this is reflected in the new sections related to lower calorie sugar replacers (Chapter 3), ingredients derived from milk (Chapter 4), anti-bloom fats (Chapter 17) and reduced calorie fats (Chapter 18). Novel processing technology has also become more widely used and single-shot depositors and the frozen cone/plunger method are included in the book for the first time (Chapter 22).

It is hoped that the book will continue to provide an up-to-date scientific and technical approach to the principles of chocolate manufacture, from the growing of the cocoa beans to the packaging and marketing of the final product. As the processes become larger and more complex, the aim is to give the reader the principles behind them in a practical and readable form. As with any multi-author book there

are some repetitions, and indeed some apparent contradictions are present. These have been deliberately left as each author has written according to his or her own experience. They are also an indication that our knowledge remains incomplete and that there is still a lot for researchers into cocoa and its products to do. Mistakes still occur, however, and I would welcome readers informing me of them: but for a letter from a researcher in an American university, a printing error in one of the equations would have existed in all three editions.

I would once again like to thank all the authors who have contributed to the book for the care they have taken and the time they have spent in producing their chapters. Even revising an original chapter can take a considerable effort in confirming new information, updating references, etc. There cannot be many industries where people from competing companies and different continents come together to produce a book. The wide range of knowledge and experience of the different authors has greatly added to its usefulness to people within chocolate making and has resulted in the first two editions being present in factories in Asia, Africa and South America, as well as in those countries in which it was written.

I would also like to thank Nestlé for their help and permission to carry out this revision, my family for their help with the figures and indexing and for putting up with me spending most of my free time on it, and the publisher for giving me the opportunity and encouragement to produce a new edition.

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