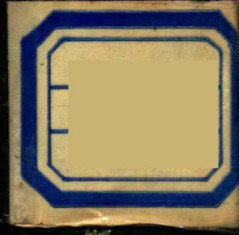



FLOUR CONFECTIONERY
MANUFACTURE



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Flour Confectionery Manufacture

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Preface

As the manufacture of flour confectionery has developed from a craft, reliant on the skills of its workers, to a mechanised industry, it has become necessary to understand the principles underlying the processes involved.

Flour confectionery products are not uniquely defined. This allows considerable variation in both the formulation and processing methods. In particular, it is recognised that product nomenclature may differ both between, and within countries. The author has, however, made every effort to produce material which is as unambiguous as possible.

The subject is approached from a problem solving viewpoint. Problem solving involves specifying what is known, defining the objective and formulating a plan, usually based on solving a related problem by means of a known solution. Up to date information on the nature of raw materials, the types of equipment available and the changes which occur during processing is provided. An objective approach to the description of products is outlined and recipes are given as possible starting points. Factors affecting the decisions of managers and technologists during development work and methods of controlling the resultant operation are also discussed.

A detailed guide on the structure of the book, and on how to use it are given in the Introduction.

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Useful information was supplied by John Hunt (Bolton) Ltd, Morton Machines, F. Hoffmann-La Roche & Co., Lucas Meyer, The British Arkady Company Ltd, Bush Boake Allen Ltd, Ovengloves Bakery, York, and Mr E.B. Jackson of Cerestar UK Ltd. Particular acknowledgement is due to Mr A.E. Watts of Betty's Bakery, Harrogate, and Mr Bell and his staff at their York shop for providing facilities and samples for photography. Mrs A. Massey is thanked for providing the wedding cake picture. In addition, I am grateful to the helpful and efficient staff of the Reading Room at the British Library Lending Division at Boston Spa and thank Dr N.J. Jardine for help with nutritional data.

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C.A.S.

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Introduction

Flour confectionery has a long established place in the human diet, a situation which is likely to continue for the foreseeable future. However, despite the popularity of such products, there is considerable impetus for change from two main directions. The economic pressures which caused the rapid development of mass production are still with us, and changing consumer attitudes must be taken into account. Both encourage the exploration of novel ingredients, and deviation from traditional manufacturing methods. This book aims to encourage such changes by presenting factual data derived from the traditional approach, adding new knowledge gleaned over the last 20 years, and then considering efficient and effective ways of using that information.

The law includes several definitions of flour confectionery. For the purpose of this book, the definition adopted is as follows:

'Flour confectionery' means any cooked food which is ready for consumption without further preparation (other than reheating), of which a characteristic ingredient is ground cereal, including shortbread, sponges, crumpets, muffins, macaroons, ratafias, pastry and pastry cases, meringues, petit fours and uncooked pastry and pastry cases, but not including bread, pizzas, biscuits, crispbread, extruded flat bread or any food containing a filling which has, as an ingredient, any cheese, meat, offal, fish, shellfish, vegetable protein material or microbial protein material.'

The purpose of the book

As manufacturers have sought ways of reducing costs, large and small manufacturers have tended to move in different directions. Many small producers now use pre-prepared mixes which require little more than baking and decorating. On the other hand, the large manufacturers have moved towards fully automated production methods.

The consumer is continually bombarded with information from various pressure groups. As a result, many consumers have developed health-conscious attitudes based on this information. Whether or not this information is valid, the manufacturer should adapt his processes to meet the resultant demand for 'healthy' and 'safe' products. The fact that a consumer adds

dietary constraints to product selection criteria is not a reason for denying him or her the pleasing sensations provided by the traditional product. In order to satisfy the consumer, therefore, the manufacturer needs to consider novel ways of making products and extending the product range offered. Since the accepted wisdom appears to change from day to day, this requires a considerable increase in flexibility of the production operation.

Previous books on this topic have followed the traditional craft-based approach. This describes a way of making a range of products, providing a fund of useful information, but offers little assistance to those aiming for flexibility and originality. Scientists tend to study small sections of the topic in great depth, again providing a fund of valuable data, which aids understanding but frequently allows the detail to obscure the overall picture. Bennion and Bamford [1], recommended those entering the industry to gain a knowledge of chemistry and physics, in addition to acquiring the craft skills. They introduced some science into the text, pointing the way to a greater integration of the two approaches. The rapid growth of scientific knowledge has increased the need to merge the two disciplines. However, for the manufacturer, who has to fully satisfy both customer and accountant, the problem is not the availability of factual knowledge but how it can be used in effective and innovative ways. The aim here is to tackle this question.

How to use the book

It is anticipated that readers will fall into four main groups, each needing to approach the text in slightly different ways. These are:

1. Readers new to the topic (in particular, students of food science and technology) seeking basic information.
2. Technologists, with experience in part of the flour confectionery field or a related discipline, seeking to broaden their range of expertise.
3. Workers in the field with a problem to solve.
4. Technologists seeking inspiration to generate new ideas.

Preliminary exploration of the topic

For those with limited acquaintance of flour confectionery, a good starting point would be either Chapter 6 or Chapter 10. The choice depends on whether one is interested in the range of products, or in how a product can be made. Chapter 10 on basic manufacturing recipes and processes follows naturally from the section on products, and encourages consideration of raw materials (Chapters 1-3) and the changes which occur during processing (Chapters 7 and 8). The relevance of other chapters depends on the use to be made of the information gleaned from the topics indicated.

Broadening experience

The approach outlined for beginners can be appropriate to this group of readers, although the search through the chapters would need to be more selective.

However, an alternative for the more experienced would be to start with Chapters 7 and 8, which concentrate on the changes occurring during processing and accentuate the similarities between the different product groups. In many cases, these similarities extend beyond the flour confectionery arena into other related disciplines. The more mathematically minded reader would be encouraged to move from these topics to examine Chapter 11. This covers a range of topics intended to help make effective use of available data from any appropriate source. Detailed information in other aspects can be accessed as required by use of the contents table and index.

Problem solving

The ideas outlined in Section 11.1 make a good starting point, encouraging the reader to analyse the problem in a holistic manner. For those with an interest in mathematical techniques and aids, Section 11.3 offers ideas on how the problem can be expressed in a quantitative form. Once the problem has been analysed, the main deficiencies in available information can be identified and the relevant sections of the book explored for ideas. Good models, particularly those of a quantitative nature, give an indication of whether or not a possible solution idea is likely to produce the desired result.

For problems which are frequently met, a suggestion may appear in the problem solving Chapter 11. If not, using Chapters 7, 8 and 10 may indicate alternative strategies. If the problem relates to product storage, Section 7.10 should be explored.

The section on controlling the operation offers ideas on how to monitor progress. Of greater importance, the data generated by the routine application of these methods, suitably processed, offers a warning of impending problems. The earlier a potential problem is identified, the longer the time available to find a satisfactory solution. Methods for identifying trends from, apparently random, data are mentioned in Chapter 9.

Innovators

Innovation is continually required to maintain the consumer's interest in the product range offered. The final chapter on flour confectionery and the future discusses the factors which affect product purchase. The majority of innovative projects will involve either product range extension, or relative price reduction.

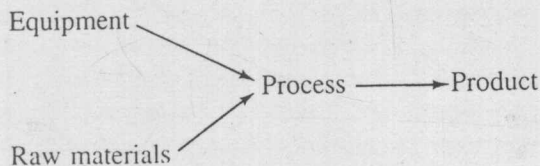
Chapter 6 offers ideas for range extension. Apart from products made by others, which relate to the present product range, new ways of presenting products may be deducible from practices in unrelated aspects. Once the product objective has been defined, either as a specific item or a broad general area to be explored, the chapters considering raw materials and processes will need to be examined. Modelling of process ideas may also prove helpful.

Price reduction objectives start with an established, well-defined product. The task is to find a new route to that product and will, therefore, involve a change in the materials used and/or the machinery employed. The probable starting point would be the chapters exploring the changes which take place in converting the materials to the end result. Modelling may be helpful, while the use of control procedures to generate the necessary data will be required. Product control methods are essential for comparing any proposed solutions with the existing product. The raw material chapters will indicate some possible alternative starting points; the machinery chapter may offer ideas for more flexible equipment.

While this book has attempted to supply the basic information on all aspects of flour confectionery, it must be remembered that many of the best innovative ideas come from totally unrelated experience. Using available knowledge, of raw materials and their chemical and physical properties, with or without the help of modelling procedures, can lead to ideas which cannot be implemented with the equipment currently used in the industry. Hence, the innovator must be encouraged to look to other industries for process equipment and process ideas.

The structure of the book

The structure of the book is based on a model developed during 30 years of problem solving in the confectionery and related industries. In its simplest form, the model can be represented by the diagram below. (Chapter 11 considers the structure and classification of problems and gives a more detailed form of the model.)



The first five chapters consider the equipment and materials potentially available. These are bought in by the manufacturer, and hence the freedom

to use them is constrained by the environment within which the bakery operates.

Chapter 1 examines the major raw materials, while Chapter 2 deals with the other materials which can be used with the basic ones to give a wider range of products. This is followed by a chapter on materials and product intermediates which can be used to decorate the basic products.

Chapters 4 and 5 cover flour confectionery packaging materials and processing equipment, respectively.

Chapter 6 deals with the basic products emerging from the bakery oven, and considers the decoration and the finished product.

Chapters 7 and 8 discuss the changes that occur in the raw materials during processing, which lead to the quality characteristics sampled by the final consumer.

Chapter 7 looks at the unit operations involved in flour confectionery production, and the changes that occur in the feel and appearance of the material. Chapter 8 considers these same effects in terms of the chemical and physical changes that occur during processing.

Chapter 7 also discusses the changes which can occur during transport and distribution. Although these changes are outside the control of the baker, he/she must protect the product against them by use of packaging etc.

Chapter 9 considers how the manufacturer can control the operation, and hence ensure that customers are satisfied.

Section 9.1 outlines the approaches available for quality control by monitoring both the ingredients bought in, and the product coming off the production line. Section 9.2 considers how the process operations are controlled. The process rules are laid down during the development phase and are followed during the operational phase. Monitoring is needed to check that the desired changes are in fact occurring.

However well controlled, there is a risk of the undesirable and unintended happening in a production plant. There is a need to check that the rules are being followed and that standards of hygiene etc. are maintained. This is the subject of Section 9.3.

The remaining chapters take the information from the previous nine chapters and examine ways in which that information can be used.

Chapter 10 outlines approaches to the various flour confectionery products. In the plan-devising stage of problem solving, this provides a source of solutions to similar problems, which may be acceptable as a starting point.

Chapter 11 extends this by summarising causes of previously studied difficulties met in bakery operations. It then outlines some of the techniques available for designing experiments and making quantitative predictions by effective use of available data.

Finally, in Chapter 12, some of the trends for future development are suggested and discussed.

A glossary of terms is provided. This covers terms used in this book and some of the related terms used within the industry.

Reference

1. Bennion, E. and Bamford, G.S.T. (1973) *The Technology of Cakemaking*, Blackie and Son Ltd, Glasgow.

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