

Manual of Ice Cream

by

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Foreword

M Jacob, Chief Environmental Health Officer

Ice cream was reputedly first introduced in the 17th century to Great Britain when Henrietta Maria, granddaughter of Katerina De Medici became wife of Charles I, bringing with her her own servants including 2 chefs, 1 of which had invented ice cream. By the late 18th century it had become well established as a popular confection and has really never looked back since. It gained its early popularity in the richer household kitchens and the first commercial factory producing ice cream did not appear until the mid 19th century in the United States. Today, ice cream is probably the most common dessert available in public eating places, and the growth of home freezers has brought the product into millions of households on a regular basis. As a popular confection, either to be consumed from a cone on the beach or as a dessert course at dinner, it is unrivalled in its variety and enjoyability. Due to the efforts made in the last 40 years by the ice cream manufacturing industry in the United Kingdom, ice cream is now one of the safest foods commercially produced and sold. This represents a substantial achievement by the industry as the ingredients contained in ice cream and the product itself if handled incorrectly, can represent a perfect media for pathogenic growth and a potential for food-borne disease outbreaks. Risks arise also because of the large number of children who consume the product and the popularity of ice cream in institutional and hospital catering. Any contamination could cause problems for the more vulnerable.

Quality standards, however, have not always been as good as they are at the present time. In earlier days metallic contamination was widespread and in the early part of this century the hygienic conditions at sales points were very poor. Unwashed freezers, unwashed serving spoons and dishes at retail level offset the advantages of cleanly produced heat processed ice cream mix. Before the 1939 war, there was little UK legislation specifically covering ice cream sales. When the manufacture and sale of ice cream was renewed after the war, the generally haphazard conditions and poor equipment led to a major outbreak of paratyphoid in Aberystwyth. Over 200 cases were caused by an infected carrier involved in producing the ice cream.

This disaster led to the introduction of the first Ice Cream (Heat Treatment) Regulations 1947 which required all manufacturers of ice cream large and small to bring their standards up to established best practices. The industry itself played an important part in the development of the legal standards and the industry continues to work closely with government departments on legislation, and the development of codes of practice to ensure the ice cream remains a safe product. The enforcement of specified heat treatment was a watershed for the industry and since its introduction outbreaks of illness arising from the consumption of ice cream have virtually, been non-existent in the UK.

For the future, the use of new recipes, the addition of other ingredients such as fruit, nuts and various flavours, the introduction of "self-pasteurising" machines for the dispensing of soft ice cream and other aspects of new technology related to the vast quantities of ice cream now being sold means that the surveillance of safety and quality must be consistent with these new developments.

The microbiological safety of ice cream has been re-examined recently along with an examination of all foods that have a potential for causing illness. The Richmond Committee in Par II of its report published in November 1990, commented that problems may arise at different points in the processing of ice cream. Initially this may be with the use of contaminated ingredients; then ineffective pasteurisation which may allow any pathogens present to survive; there could be post-pasteurisation contamination during homogenisation; possible microbial contamination with the cooling and storage of the ice cream mix and the potential for contamination from packaging.

The Committee also emphasised that cross-examination risks may arise in shops selling ice-cream through lack of hygiene and poor handling techniques at the point of sale. This is particularly true when it is sold through the use of scoops or otherwise portioned where implements may, without adequate precautions, cause cross contamination. If the ice cream is dispensed by machine, the Committee stressed the importance of following the manufacturer's instructions in respect of the use of the machine; proper cleaning, temperature control and in all circumstances, ensuring the personal hygiene of the staff involved. It was recognised that individually packed portions of effectively processed ice cream, if kept at the appropriate temperature, should be safe.

The Government endorsed the Committee's recommendation that retailers, when selling ice cream which is not prepacked, follow closely the Ice Cream Federation and Ice Cream Alliance Hygiene Guidelines which were produced in association with the Institution of Environmental Health Officers: the Milk Marketing Board and the Department of Health.

The public has rightly become increasingly aware of the need for food safety and responsible traders are facing this challenge. This timely publication, which is a comprehensive guide to the manufacture and sale of ice cream, assists in meeting this challenge by providing appropriate advice to the independent trader on important aspects of the industry, as well as covering hygiene and legislative requirements. The author, Basil Crowhurst, has a long experience in the industry, and as a member of the Institute of Food Technologists is well qualified to produce this manual.

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Preface

The modern ice cream industry has developed so rapidly in the last 4 decades as to be hardly recognisable as the simple trade of the early 1900s, sponsored by the Italians who came to Britain and settled first in Clerkenwell, London, with many later moving to Scotland, forming the Scottish-Italian families now so well established there, still in the same trade.

With no legal control at all during this period, ice cream was made very crudely, being mainly simple boiling of milk, cream, sugar and cornflour, and using hand-stirred ice/salt freezers: today, the ice cream industry is a multi-million investment, with very sophisticated equipment, and strict legislation at all stages.

The original Italians did, however, form the basis of the hundreds of family ice cream businesses which have been handed on to generations of the same family, so that Britain is probably unique in still maintaining a local ice cream industry all over the country, enabling the local preferences in palatability to be explored to the full.

Large national wholesalers have also flourished in this growing industry, but have turned their attention from the ordinary "cone" of ice cream into products of a more exotic nature, offering complete and wonderful "sweets", not only for catering, but pre-packed for the housewife, who also buys larger packs of bulk ice cream to store in domestic freezers.

The independent ice cream manufacturer has today a vast amount of new plant and machinery, and many have invested quite heavily in modern units.

However, this has brought with it the need for detailed information on modern production methods, and this book is offered to assist in this direction; a particular field of concern today is the mass of legislation affecting the trade, and no ice cream manufacturer can be expected to understand all the intricacies of lawyers' jargon, and it is hoped that the explanations given will at least guide in the right direction.

The larger manufacturer will also hopefully find matters of interest, as it is appreciated that among the independents, several are today quite moderately sized wholesalers and distributors of ice cream.

The text has been written in simple language wherever possible, and explanations given on many technical terms, and it is hoped that the several "Tables" will prove of sufficient interest to warrant the occasional reference.

The future of the ice cream industry is bright, as the high quality products offered today are a really healthy and safe source of food.

B.C.

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List of Contents

Foreword		iii
Preface		vii
Acknowledgements		ix
List of Data Tables		xii
Chapter 1	The History of Ice Cream	1
Chapter 2	Classification, Properties and Food Values	13
Chapter 3	Ingredients, Emulsions, Flavours	25
Chapter 4	Formulation of Ice Cream Recipes	57
Chapter 5	Processing Ice Cream	75
Chapter 6	Freezing the Ice Cream	99
Chapter 7	Packaging, Hardening and Storage	131
Chapter 8	Costing Ice Cream	151
Chapter 9	Hygiene and Quality Control	163
Chapter 10	Legislation on Ice Cream	193
Appendix 1	Useful Names and Addresses	217
Appendix 2	Plant & Equipment Suppliers	219
Appendix 3	Ingredients Suppliers	223
Index		i

List of Data Tables

Table 1	Energy values	21
Table 2	Solubility of sugar	33
Table 3	Solids from cereal fillers	41
Table 4	Solids from soya flour	42
Table 5	Analyses of typical commercial chocolate	54
Table 6	Relation of fat to sugar in ice cream	59
Table 7	Use of dextrose	60
Table 8	Fat and solids levels for various types of ice cream freezers	64
Table 9	Weight of liquid ice cream mix	64
Table 10	Solids produced by fillers	65
Table 11	Relative density of sugar syrups	71
Table 12	Conversion of pressure units	81
Table 13	Strength of brine	98

CHAPTER 1: The History of Ice Cream

Ice has been known for table use since time immemorial, and there are Biblical references to its use by Solomon. It is reported that Alexander the Great, originally King of Macedonia, was so fond of ice that a frozen confection, the macedoine, was named after him.

Cooling liquids by evaporation from the outer surfaces of their porous containers has also been practised in hot countries for many centuries, and is still widely used. Examples are the porous earthenware jar or "chatty" still used for cooling drinking water in the Middle East and elsewhere, and many current designs of butter and milk coolers.

Ice has also been used for many centuries to cool liquids; this probably led to the formation of a kind of soft sludge, which may have brought about a product of a water-ice type. The method of making freezing solutions by adding salt to ice was not known in very early times, and it seems apparent for this reason alone that no ice cream could have been produced.

Water ices, probably containing fruit juices, were made in Southern Europe as early as the 15th century, where the first use of an artificial aid to lower the freezing-point was made by adding saltpetre to ice. Various records of frozen ices can be found in European history of the 16th century: these were simple water ices.

Snow gathered from mountain tops, in hot countries which had high enough mountains, was compressed and converted into a kind of ice by saturation with water: this was cut into small blocks and stored in cool caves, or cellars.

Such products, however, were simply frozen water: they were obviously unsweetened, as the temperature of the mixture would not be low enough to freeze even weak sugar solutions.

Ice cut from lakes in severe winters was also stored for summer use in temperate climates, underground "ice-houses" being a feature of great country houses of Britain and Europe.

Ice was first shipped to London about 1830, and a man named Gunter seems to have come into prominence about that time, as a seller of frozen confections. Supplies of ice later came from Norway to London, and the sale of ice became a fairly large business through the family of Gatti. Importation of ice continued until about the 1920's, when mechanical refrigeration came into being, and ice was manufactured artificially in the large cities. Refrigeration and cold storage has practically stopped the trade in block ice today.

The Birth of Ice Cream

The earliest history of ice cream is shrouded in mystery, and although quite a number of stories of its beginning have been published from time to time, none seem to have any real foundation.

The first record of "cream ice" appeared in "The Experienced English Housekeeper" in 1769. In his Ice Cream Lectures, 1945-46, the late Leonard Feltham refers to provincial newspaper announcements that named persons would be selling ice cream on certain days and at certain hours, such statements being quite frequent in the 1700's. In the early days of such ice cream manufacture, it was quite a luxury and could only be afforded by well-to-do people.

The first book ever published on ice cream was written in 1887 by a Mrs A.B. Marshall, being produced for cookery students in her own London school; reference was also made to ice cream recipes in her cookery book, published about a year later.

Mrs Marshall is also credited with a new ice cream machine, which was a rotary type, turned by hand and fitted with scraper blades; freezing was effected, as always in those early days, by surrounding the can with salt-ice mixture. This was a laborious process, requiring considerable exertion and lots of time! At a much later date, the hand operation was replaced by mechanical drive, in which the blades were rotated by a simple power-driven gear arrangement: the first models had a top drive, but in 1920 a bottom drive was introduced.

The composition of these early ices was quite simple; those in the earliest records from Italy and France were usually composed of milk, eggs, and cream. The proportion of cream varied considerably, but eggs were added to the extent of about 20 fresh eggs per gallon. Sugar was the only other ingredient, and it seems as if these early ice creams were fairly rich and sweet.

Mrs Marshall gives a number of different recipes in her book, and she can also be said to be the first person to use gelatine in ice cream.

Between 1860 and 1875, large numbers of Italians came to England, and many of them entered the ice cream business, setting up numerous shops for this purpose; there seems little doubt that this started the vast ice cream industry that exists in modern Britain.

The main developments in manufacture took place in the USA, and in 1848 a mechanical hand freezer was patented there. The freezing can was turned by a stepped-up geared handle, which also revolved an internal beater fitted with wooden scraper blades. Ice cream was also being produced on a large scale in 1851 by a Jacob Fussell.

About that time, the first attempts to apply mechanical refrigeration to purposes other than ice production were made, and British engineers began refrigerating food cargoes in ships. This application was not firmly established until 1880, when the first cargo of Australian frozen meat was imported. The American ice cream trade was inspired by this achievement to develop the application of refrigeration to ice cream freezing, and the first brine freezer was marketed in the USA in 1902.

Other important developments were also occurring at about this time, and Gaulin in Paris, invented the first homogeniser, which he produced in 1899. It was shown at the Paris Exhibition, but aroused no interest until about 1905, when the first commercial model was installed in Philadelphia.

These two developments, the mechanically refrigerated freezer and the homogeniser, started a fairly rapid expansion in ice cream technology, and efforts were concentrated on producing faster freezing, with its inherent better texture.

Meanwhile, in England, the Italians had improved on the simple ice cream recipes; cornflour was first added to the milk-cream mixture about 1890. Arrowroot was also introduced at about the same time, to give the ice cream extra thickness and stability. The slow-freezing hand-operated freezers gave very little, if any, over-run, and the addition of cornflour improved the texture enormously. This type of ice cream, (containing milk, cream, sugar, cornflour, eggs, and sometimes, gelatine), continued for many years until the new mechanical freezers came into general use, when a different approach to recipes became necessary. These simple recipes, in which the cornflour was completely gelatinised by boiling, required no homogenisation, because the

fat phase was relatively stable in the cornflour gel: in any case, the slow whipping did not cause it to separate out.

The first direct-expansion freezer was introduced in 1914, and could freeze a batch of ice cream in about 10 minutes. This first machine was very troublesome, and was not perfected until 1922. In 1927, Henry Vogt produced the continuous freezer, which still bears his name: this was the first freezer that controlled the amount of air whipped into the ice cream, and hence the amount of over-run.

Because a pressure exists within this freezer, the finished ice cream can be drawn off at lower temperatures. A similar freezer, but with a different method of air-control, was later introduced by The Creamery Package Company.

The development of these fast freezers, and the relatively higher over-run, soon brought about a need for improved mix recipes, and during the 1920's, butter-fat began to replace cream: butter-fat had to be homogenised, which started the regular use of the homogeniser in ice cream processing. The old hand-operated freezer was also developed into the modern vertical freezer, the ice-salt mixture being replaced by a mechanically refrigerated brine bath - this improved the simpler recipes, and also offered a limited amount of over-run.

While development of freezers was taking place, more attention was being given to the storage of ice cream; the first small condensing unit, (using sulphur dioxide), was designed in 1920, and the first refrigerated storage cabinet appeared in 1922, to be followed in 1926 by the combined vertical freezer and storage cabinet. Improvement in the design of this type of combination led to its immense popularity, and even today, many small manufacturers still utilise the combined vertical freezer-storage cabinet.

Early Street Trading

The Italian ice cream merchants had meanwhile established what could be regarded as the first efforts at street trading: they would convey their ice cream around the streets in hand-carts, or sometimes on a horse-drawn cart, highly and gaily decorated with canopies or bunting.

Their habits at this time caused the introduction of the name "Hokey Pokey" for ice cream. This name has persisted for a long time, and had its origin in the fact that the Italians shouted in the streets: "Ecco un poco", which

translated means "try a little". In their peculiar dialect, this sounded like "aika poca", which the London cockney took to be the name of the product they were selling, and started asking for "okey pokey". Educated Londoners, knowing the cockney habit of dropping "h's", assumed this to mean "hokey pokey", and in 19th century England, ice cream was commonly known by that name!

These Italian vendors sold their hokey pokey on pieces of paper in the 1860's, but in about 1865, they introduced the licking glass, which was a shallow dish, brought up internally to convenient tongue-depth by means of a false bottom.

Wafer cornets (cones), and cups were introduced in about 1870, followed by wafer biscuits in about 1875: both these items were of British origin, and indeed, the USA saw the first wafer biscuit, imported from England, at a World Fair in 1904. The Americans soon copied the idea, adding powdered milk and egg to the simple English batter mix, and produced the large cake cone in 1905, which the British public saw for the first time at the Wembley Exhibition in 1921.

Early Mechanisation

By 1909, most English cities had electricity supplies, and power-driven freezers began to make their appearance, the first being produced by Demarco of Glasgow, in 1910. In 1912, the bottom drive for the freezing can was introduced and the first U-frame for holding the scraper blades inside the freezer can was patented.

It is interesting to note that all that was needed to start an ice cream business in 1920 was a simple freezer, costing about £9; an electric motor and installation, at about £5: a pan and paddle to boil the mix, costing about £2; and a large gas ring. Compare this with the modern factory where installations can run into many thousands of pounds!

All the developments in mechanical refrigeration which had progressed so rapidly in the USA, were not immediately introduced into Britain, mainly because the British ammonia refrigeration plants then in use were far too large for small individual manufacturers. It was as late as 1920, before the first small mechanical freezer, using carbon dioxide as refrigerant was introduced, the steel coil carrying the refrigerant being immersed in a brine bath, which occupied the space previously used for the ice-salt mixture round the vertical freezer.