19 Premixes and Complete Mixes

G. Plasch

19.1 Introduction and Definitions

This chapter gives an insight into a product group that has done much to bring variety and attractiveness to the range of bread and other baked products throughout the world, while at the same time making the production of the baked items more reliable and efficient: premixes and complete mixes (ready-mixed flours).

Like so many innovations in the food sector, premixes and complete mixes were "invented" in United States of America. It is characteristic of the American Way of Life to go about things in the most practical way, and it is easier to overcome traditional obstacles in the U.S. than here in Europe.
And premixes and complete mixes certainly do make the work of baking easier. Their predecessor was no doubt the mixture of wheat flour and baking powder for which a patent was applied in the USA in 1849. It already showed the main attributes of the premixes and complete mixes we know today.
It is in the nature of things that new aspects and characteristics are added to the basic idea in the course of the years. We shall come back to these later.

Whereas premixes and complete mixes had already achieved a certain significance in the USA and Canada before the Second World War, they did not start to gain a foothold in Europe until the 1950*s*: in other words, they have a European tradition of 50 years. All the more surprising, then, that there is still no standard, generally accepted definition of premixes or complete mixes. One of the main reasons lies in the difficulty of differentiating between complete mixes and (baking) premixes and/or baking concentrates. Seibel (1980) describes complete mixes as follows:

"Complete mixes are ready-made mixtures based on wheat and/or rye flour for making bread (including rolls) and pastry goods; they contain all the ingredients and additives that are stable in the mixture and serve a certain purpose in the baking process."

Here, by way of comparison, the shorter definition by Hegenbart (1998) from the University of Nebraska, that better expresses the idea of convenience behind the complete mixes:

"Complete mix: this type of mix is an all-inclusive, dry powder blend that requires the end user simply to add water; form or pan the resulting dough or batter; prove, if required; and bake."

Unlike Seibel, whose definition does not necessarily include the ingredients that are usually added fresh, such as eggs and yeast, Hegenbart regards these as constituents of complete mixes in the form of dried products. Otherwise he speaks of "dough bases".
These two definitions may be regarded as representing a number of others.

The main difference between complete mixes and premixes is that the latter contain only small amounts of the base flour, or none at all. The base flour is added by the baker. They do, however, contain all the other ingredients of the complete mixes, i.e. the components that determine the nature of the baked product, and the ingredients with technological properties.
The following is an example of a formula by which they are processed:

- 50 parts premix
- 50 parts flour of the type usual in the region
- Water and yeast.

The ratio of premix to flour may vary within wide limits.

19.2 The Basic Idea Behind Premixes and Complete Mixes

162 So the motive for the development of premixes and complete mixes was the notion of convenience, and remains so to this day. Initially it was chiefly a question of simplifying the production of baked goods and making it more reliable. There was to be no more complicated weighing of individual ingredients, that is often a source of error, especially with small components.

This was accompanied by easier storage, for it was sufficient to keep just a single product in stock instead of a whole collection of different ingredients. And in many cases it saved time in the production process – for example with pastry goods, where the laborious and time consuming cold and warm whipping procedure could be replaced by the simpler and faster "all in" method. Ultimately this all served to make production much more reliable. So it is not surprising that the first products on the market were those for pastry goods requiring a large number of ingredients. But these were very soon followed by products for bread and rolls.

These aspects are still very important wherever baking is not a trained occupation and is carried out largely by people with very little skill. In many cases it is the only way to introduce new items, which could not otherwise be produced, into a bakery's traditional range of products.

The latter is a factor that has had an enormous influence on the development of premixes and complete mixes over the course of time.

As the range of baked goods widened and the market increasingly demanded new varieties in addition to the standard products, so there was an ever-greater demand for premixes and complete mixes enabling such products to be made even under quite basic conditions.

This includes the use of raw materials not usual in conventional baking, such as grain products that are not bread cereals, or oil seeds. And in the "ethnic food" sector they have made an important contribution to enabling national or regional specialities to be produced and sold throughout the world, as required – for example typical European specialities in the Far East (Japan). And finally the premixes and complete mixes have done much to make new scientific findings in the field of

Fig. 191: Premixes increase the variety of baked goods (courtesy of AICHINGER GmbH, Wendelstein, Germany)

nutrition accessible in a practical form to a wide circle of bakers, so that consumers can profit from them in the form of baked goods.

163 All the above mentioned results in a larger variety of baked goods (Fig. 191) that can be offered even by small bakeries.

The original convenience benefits – simpler and safer processing, shorter production times, easier storage, greater reliability of production – are still as important as ever. But they are now complemented by additional services offered by the manufacturers, covering both the production sector and selling aids. The latter include information material on specific bakery products for consumers or information on the safety of the products and advertising messages to provide orientation in the more and more complex tangle of regulations and statutory requirements. Originally problem-solvers in the production sector, premixes and complete mixes have developed into problem-solvers of a general nature.
Tab. 98 summarizes the benefits of premixed flours and premixes.

19.3 Composition of Complete Mixes

As the name suggests, the main constituent is flour – wheat and/or rye flour, depending on the type of product, and including coarse and wholemeal flours. And "main constituent"

Tab. 98: Avantages of premixes and complete mixes

Easy way of rounding off the range of baked products
• e.g. by using new raw materials not usual in conventional baking,
• such as sunflower seeds, pumpkin seeds
Participation in market trends such as ethnic foods,
• e.g. ciabatta
Implementation of the findings of nutritional research,
• e.g. functional food and health food
Use of new production technologies
• e.g. freezing
Production of baked goods for specific consumer groups
• e.g. diabetics
Less laborious preparation
Simplification of work by the user, since the individual components have already been weighed
Shorter production time
Easier storage and stock-keeping
Optimization of the ratio of flour to other, functional ingredients in order to achieve a good end product while taking financial requirements into account
Consistent quality of the baked goods
Services by the manufacturers of complete mixes in the form of
• help with production technology
• information material for consumers / advertising
• safety of the products from the point of view of the food laws
Solutions to problems of all kinds

Tab. 99: Main constituents of complete mixes

Component	Bread and rolls	Pastry
Base flours geared specially to the particular type of product and production technology	X	X
Sugars and starch saccharification products	X	X
Dried milk products	X	X
Fat	X	X
Salt	X	X
Dried sponge doughs and sour doughs	X	
Dried yeast	X	
Chemical raising agents (baking powder)		X
Dried egg products		X
Flavour-giving ingredients such as cocoa, spices and/or flavourings		X

applies to quality as well as quantity. The quality of most baked goods is determined very largely by the properties of the flour used for making them. The smaller the range of end products to be baked from a particular flour, the easier it is to make up a tailor-made flour to achieve optimum quality. Complete mixes exploit this advantage to the full. Not only do they ensure high-quality end products; they also save the user the trouble of stocking special flours for certain applications or types of product.

165 As the definition by Seibel (1980) quoted at the beginning says, complete mixes contain "all the ingredients and additives that are stable in the mixture". As far as bread is concerned that means chiefly salt as the standard constituent and, where usual, sugars and starch saccharification products, dried milk products and/or fat. Yeast is not always included, although the use of dried yeast raises the convenience level; it may shorten the shelf-life of complete mixes. A further possibility is the use of dried sponge doughs and sour doughs. In addition to the products already mentioned, complete mixes for pastry goods contain other ingredients that are typical of the particular products (Tab. 99).

The basic composition can be complemented by a number of other ingredients that give the product its special characteristics (Tab. 100).

And finally there is another group of substances used at the bakery – the baking improvers, or the raw materials of which they consist. Baking improvers are defined as:

Tab. 100: Constituents that determine the nature of the baked product

Product class	Example
Products ground from other types of cereals, including pseudo-cereals	Barley, oats, maize, buckwheat, quinoa, amaranth
Fibre-rich edible brans from cereals and leguminous plants	Wheat, rye, oats, soybeans
Malt products	Malt flour, roasted malt flour, malt extract
Oil seeds	Pumpkin seeds, linseeds, sesame seeds, soy, sunflower seeds, walnuts
Dried potato products	Powder, flakes
Dried milk products	Buttermilk and whey powder, yoghurt powder, dried quark
Ingredients that give the end product special health-promoting effects	Vitamins, minerals, secondary plant metabolites

"mixtures of foods, including additives, intended to facilitate or simplify the production of baked goods, compensate for the fluctuating processing properties of the raw materials and influence the quality of the finished products."

166 Alongside the flour quality selected for the particular product it is the baking improvers, or the effective agents they contain, that ensure the best possible result of the baking process almost independently of the technical equipment a particular bakery may have. These agents are also listed in (Tab. 101).

Not only do these ingredients make the production of baked goods more reliable and ensure consistently high quality even under very basic production conditions. They also make it possible to influence the quality of the baked goods specifically. This is most obvious in the case of ingredients that help to give the goods their characteristic taste (malt products, spices, flavourings) or colour (colour-giving foods, colorants). But there are also a number of other quality attributes that can be optimized in this way.

Tab. 101: Constituents of baking improvers

Constituent	Main function/improvement
Foods with technological effects	
Pre-gelatinized flour/pre-gelatinized starch	Water absorption, dough properties, shelf-life
Malt flours and malt extracts	Flavour, colour, crustiness
Wheat gluten	Dough stability, volume yield
Various sugars and starch saccharification products such as glucose syrup and maltodextrins	Flavour, colour, fermentation, crustiness
Dried milk products	Flavour, colour, bread texture
Soy flour, soy protein	Dough properties, bread texture
Vegetable and animal fats and oils	Dough properties, bread texture, volume yield
Colour-giving foods (e.g. dark malt products, spinach powder, cherry juice powder, carrot extract)	Colour
Additives	
Flour improvers (ascorbic acid, cysteine)	Dough properties, volume yield
Emulsifiers (e.g. lecithin, mono- and diglycerides, also esterified; stearoyl lactylate, polyglycerol ester, propylene glycol ester etc.)	Dough properties, volume yield, crumb structure, shelf-life, crustiness
Acidulants and acidity regulators (lactic, acetic and citric acid, including salts of these; acid phosphates)	Dough stability, microbial shelf-life
Thickeners and stabilizers, including the modified starches (e.g. alginates, CMC, guar meal, carob gum)	Water absorption, dough properties, shelf-life
Sugar substitutes and artificial sweeteners	Flavour, energy reduction
Colorants	Colour
Enzymes	
Amylases	Volume yield, colour, shelf-life
Proteinases	Dough softening
Xylanases	Dough properties, bread structure, volume yield,
Oxidases	Dough "drying" and stability
Lipases	Dough stability, volume yield

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It is these possibilities of influencing the quality of baked goods that constantly give rise to the fear that the use of premixes or complete mixes will result in a standardized range of products. That these fears are groundless is proved by the very fact that such standardization has not come about in the half-century in which premixes and complete mixes have been used in Europe. On the contrary: the range of baked products on sale has expanded greatly, and premixes and complete mixes are partly responsible for this expansion. On the other hand, all attempts have so far failed to introduce complete mixes enabling small bakeries to produce branded goods whose main characteristic is that they are sold everywhere in the same quality and with the same appearance. The main reason is that in spite of the necessary standardization, premixes and complete mixes leave the user enough scope for creativity; whereas branded products do not permit such creativity, skilled bakers in small establishments use it to perfection. Moreover, the market share of the complete mixes is too small to create a uniform range of baked products.

19.4 Production Methods

To the extent that premixes and complete mixes are only mixtures of dry raw materials in powder form, they can generally be made with relatively simple blending equipment. Of course the raw materials must be analyzed before they are processed further to ensure that they have the required, specified properties.

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Blending is timed in such a way that it creates a homogeneous mixture. Moreover, care must be taken to ensure that the mixture does not separate as the product settles, or during transportation. That is especially important when raw materials with different particle sizes are used, for example in products containing oil seeds. The separate packaging of ingredients with different granulation or containing pieces, of the kind familiar from household cake mixtures, is practically never found in products intended for the baking industry.

A rather more complex production system is needed if considerable amounts of fat, oil and/or emulsifiers have to be added to the flour mixture. Up to an added fat content of about 10% in relation to the powder constituents, flour is a good carrier onto which fat and/or oil can be sprayed. In certain cases it may be a help to use dry ice. If larger amounts of fat have to be worked in, powdered products are often used in which the fat is surrounded or coated with small amounts of highly effective carrier substances in a previous spraying process. This method is also used with emulsifiers to keep them free of lumps, so that they can be processed at the desired particle size.

And finally, when choosing the fat it has to be taken into account that the advantages baking fats have as a result of their specially adjusted crystalline structure are lost when they are worked into premixes/complete mixes; this means that special fats may have to be used.

In some respects the same applies to dried egg products. If these are used at all, care must be taken that the technically important attributes of fresh egg (emulsifying properties, gas retention) are not lost in the drying process. That cannot always be guaranteed, and it is often the reason why they are not used and preference is given to fresh or frozen egg in the baking process.

19.5 Manufacturers of Premixes and Complete Mixes

Premixes/complete mixes are one of the ways in which the results of research in the fields of baking technology and nutritional science are made available to the baking industry in the form of ready-made solutions to problems, so that they can be used by bakers and passed on to the consumer in finished foods. As consumer expectations change, on the one hand, and the technical methods of baking develop, so the premixes/complete mixes have to meet the resulting new requirements. These are the most important factors that stimulate the development of premixes and complete mixes.

Possible manufacturers are mainly companies that have to do with flour as a raw material, and/or with baking technology, and also carry out research that goes beyond the technology usual in the flour milling industry, i.e. optimizing the processing quality of the ground cereals. These companies may be mills that of necessity have to do with flour as the main raw material and have decided, irrespective of their size, to carry out the research necessary for making premixes and complete mixes.

In the industrial sector they are more and more often manufacturers of baking improvers who initially concentrated more on baking technology, and how to influence it with combinations of active ingredients, and have always regarded themselves as problem-solvers for bakers. It is only natural that they make efforts to encourage the trend towards premixes.

19.6 The Market for Premixes and Complete Mixes

Premixes and complete mixes have their established place in the market, but reliable figures indicating the volume or value of the production of ready-mixed flours or the amount of premixes and complete mixes used are not available. At best, estimates can be made on the basis of information from those involved in the market, i.e. manufacturers and users, and these estimates are not free of subjective impressions. But although no binding figures can be determined on this basis, it is possible to identify trends and developments.

169 Bode (2002) estimates the market for complete mixes in Germany at about 180,000 t, a little over half of this being ready-mixed flours for bread (including small baked goods) and the rest made up of products for pastry goods. Since about 6.6 mio t of bread cereal are ground to meet domestic demand, this constitutes a share of about 3 - 3.5% of the flour market. The market for complete mixes is probably in the same order of magnitude in France, the Benelux countries and the United Kingdom, although the ratio of bread to pastry goods may well differ. It is even more difficult to obtain reliable figures for the complete-mix market outside Europe.

There is a remarkable trend towards premixes and concentrates. As the basic idea is very similar to that of the complete mixes, they are often placed in the same product category as these without differentiation, which makes it even more difficult to compare the figures for the complete-mix market.

Premixes offer certain advantages in respect of cost, for instance if base flours are available at a very low price or complete mixes have to be transported over long distances, i.e. if transport costs are comparatively high. In international trade, agricultural products – especially flour – are often subject to heavy customs duty as well, and this makes it essential to seek such solutions. We may expect the significance of these premixes to increase in future at the expense of the complete mixes. This applies both to Europe and the non-European regions.

19.7 Users of Premixes and Complete Mixes

168 Being convenience products requiring a great deal of research, both premixes and complete mixes are fairly expensive, and this sets limits to the economic benefit that can be derived from their use. In general we have to assume that complete mixes, especially, are only used in exceptional cases when it is a question of making large amounts of standard products. For this purpose there are usually other, cheaper solutions that result in end products of a similarly high and uniform quality.

On the other hand the use of premixes, and especially complete mixes, suggests itself wherever there is a need to bake small batches of products that constitute an attractive extension or addition to the overall range and have a positive effect on total sales, but which could not be produced economically by conventional methods. And if there is also a need to explain these niche products, the only way to solve the problem is by recourse to premixes or complete mixes; otherwise one

would have no access to these interesting market segments. An example of this is baked products with functional properties.
Ultimately, all manufacturers of bakery products have to weigh up the financial and other pros and cons ("image!") and decide on a solution that seems to be the best for them.

19.8 Global Significance

These remarks on market opportunities and further development apply to premixes and complete mixes in general, but there may well be regional differences with regard to detail, for example weighting within the range of products that can be made from them. In Europe, for instance, we have to expect a growing proportion of products for making "healthy" baked goods with functional properties, which may be at the expense of products containing oil seeds. It is difficult to tell, at present, what role organic ("bio") products will play in this context. But the market for such products is likely to be larger in Western Europe than in Central Europe. On these assumptions we may expect a reasonable expansion in the bread sector, whereas there is likely to be little change in the field of pastry goods.

164 Neither premixes nor complete mixes are cheap. So they will assert themselves chiefly where they make an existing range of products more attractive by permitting new variants and at the same time consumers are willing and able to buy the relevant products. Regional differences can be detected here too. In North America there is primarily a trend towards premixes and complete mixes for "ethnic food" alongside products for pastry goods; in South America there is also a demand for specialities based on local crops and more recently "functional food". In the Near and Middle East and especially in the Far East, where bread and other baked goods have less tradition, mixtures from which European and/or American products can be baked are much in demand. "Functional food" is following in their wake. On the other hand, in the Near and Middle East there are no more than the first signs of mixtures from which traditional, regional products can be baked. In all the countries of these regions, in which bakery products do not look back on a long tradition, the use of premixes and complete mixes is most important in the restaurant sector (= hotel kitchens run by European cooks).
And finally Africa: apart from South Africa, premixes/complete mixes have scarcely found a market in this continent so far.

In many regions throughout the world, bread has the function of a staple food, and staple foods usually have a low price so that all sections of the population can afford them. This sets a decisive limit to the worldwide trade in premixes and complete mixes, even if markets for them exist. A second limit is of a technical nature: namely the shelf-life of the products. Depending on their composition or certain ingredients they contain, premixes/complete mixes often have a shelf-life of only six months, sometimes even less. Up to a point this can be prolonged by using dried flours, and in the case of fatty products by using antioxidants. Nevertheless, in many cases lengthy shipment for export, especially to regions with a hot, damp climate, is very difficult if not impossible. An alternative is to shift production to the region in question and to export only the know-how for the formulation and the technique for realizing it. If necessary this can be complemented by providing certain ingredients, especially such with technical and/or nutritional effects such as emulsifiers and enzymes. These can then be combined with inexpensive local raw materials on the spot to make up the end product – a method that is increasingly being practised by well-known manufacturers of complete mixes and premixes.

19.9 References

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