Convenient Solutions – Premixes and Complete Mixes

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Introduction/definitions

The following paper 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: we are talking about premixes and complete mixes (ready-mixed flours).

Like so many innovations in the food sector, premixes and complete mixes were "invented" in 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 US 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 1950s: 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. *W. Seibel* describes complete mixes as follows:

> "Complete mixes are ready-made mixtures based on wheat and/or rye flour for making bread (including small baked products) 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 *S. Hegenbart* 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.

The basic idea behind premixes/complete mixes

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 small baked items.

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 milled 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 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.

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.

What do complete mixes consist of?

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” 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.

As the definition by Seibel 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.

These can be complemented by a number of other ingredients that give the product its special characteristics.

In addition to the sugars, fats and dried milk products already mentioned, complete mixes for pastry goods contain other ingredients that are typical of the particular products.

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:

> “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.”

Alongside the flour quality selected for the particular product it is the baking improvers, or the technical 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 technical agents include:

...

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.

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.

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. 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.

Who makes premixes/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.

The market for premixes/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.

J. Bode 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 million 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.

Who uses premixes/complete mixes?

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.

Is there a global market for premixes/complete mixes?

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.

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.

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- Production methods
- Who makes them?
- The market for premixes/complete mixes
- Who uses them?
- Is there a global market for them?

Slide 1

What speaks in favour of using premixes/complete mixes?

- 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

Slide 2

Definitions of complete mixes

Complete mixes are ready-made mixtures based on wheat and/or rye flour for making bread (including small baked products) 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. (W. Seibel)

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. (S. Hegenbart)

Slide 3

Premixes

Premixes contain little or no base flour, but otherwise all the important constituents of the complete mixes. The following is an example of a formulation:

20 - 80 parts premix
80 – 20 parts flour of the type usual in the region
Water and yeast

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Some of the advantages of using premixes/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 oil seeds (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/health food
- Use of new production technologies
    - e.g. freezing
- Production of baked goods for specific consumer groups
    - e.g. diabetics

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Additional benefits

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!

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Main constituents of complete mixes

- Base flours geared specially to the particular type of product and production technology
- Sugars and starch saccharification products
- Dried milk products
- Fat
- Dried sponge doughs and sour doughs
- (Dried yeast)

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Constituents that determine the nature of the baked product

- 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 (e.g. wheat, rye, oats, soybeans)
- Malt products
- Oil seeds e.g. pumpkin seeds, linseeds, sesame seeds, soy, sunflower seeds, walnuts)
- Dried potato products
- Dried milk products (e.g. buttermilk and whey powder, yoghurt powder, dried quark)
- Ingredients that give the end product special health-promoting effects (e.g. vitamins, minerals, secondary plant metabolites)

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Typical constituents of complete mixes for pastry goods

- Chemical raising agents (e.g. baking powder)
- Dried egg products
- Flavour-giving ingredients such as cocoa, spices and/or flavourings

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Definition of “baking improvers”

“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.”

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Constituents of baking improvers

1. Foods with technological effects

    - Pre-gelatinized flour/pre-gelatinized starch
    - Malt flours and malt extracts
    - Wheat gluten
    - Various sugars and starch saccharification products such as glucose syrup and maltodextrins
    - Dried milk products
    - Soy flour, soy protein
    - Vegetable and animal fats and oils
    - Colour-giving foods (e.g. dark malt products, spinach powder, cherry juice powder, carrot extract)

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Constituents of baking improvers

2. Additives

    - Flour improvers (ascorbic acid, cysteine)
    - Emulsifiers (e.g. lecithin, mono- and diglycerides, also esterified; stearoyl lactylate, polyglycerol ester, propylene glycol ester etc.)
    - Acidulants and acidity regulators (lactic, acetic and citric acid, including salts of these; acid phosphates)
    - Thickeners and stabilizers, including the modified starches (e.g. alginates, CMC, guar meal, carob gum)
    - Sugar substitutes and artificial sweeteners
    - Colorants

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Constituents of baking improvers

3. Enzymes

    - Amylases
    - Proteinases
    - Xylanases
    - Cellulases/hemicellulases

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Specific influencing of the quality of baked products, e.g.

- Flavour of the finished product
- Elasticity and texture of the crumb
- Crispness of the crust
- Prolongation of shelf life
- Optimization of baked volume
- Prolongation of microbiological stability (prevention of mould, protection against ropiness)
- Colour

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Production methods

- Raw materials in powder form: simple mixing process
- Problem of working in fats
- Limited use of dried egg products

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Manufacturers of premixes/complete mixes

- Flour mills
- Manufacturers of baking improvers

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Use of premixes/complete mixes

- Not usually for the mass products in the range of baked goods
- Ideal solution for rounding off the product range

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Regional differences in the markets

Europe: probably an increase in health food; organic products?

North America: products for pastry goods, ethnic foods

South America: use of local crops

Far East: European and American specialities

Africa: ?

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Limits to global activity

- Price of staple foods
- Shelf life

→ Conclusion: export know-how!

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