

Bread baking beyond the millennium

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Since the conception of the industrial bakery, the most significant advances have been the invention of the steam tube oven, the introduction of the first travelling oven, the ability to slice and wrap loaves automatically, and the Chorleywood Bread Process. We are now at the dawn of a new era with the rapid development of computerised control Systems. The steam tube oven provided for the first time a degree of temperature control and a hygienic baking environment. The travelling oven made automatic high output processing possible. The facility to slice and wrap loaves provided a convenient and hygienic way to distribute bread and the Chorleywood Bread Process enabled higher yields to be achieved in much shorter fermentation times, using a higher proportion of domestically grown wheat than had previously been possible and giving longer shelf life.

Throughout the history of industrial bread making, the baker and the engineer have supported each other to find solutions to one another's problems and aspirations and I have every reason to believe that this relationship is as important today as at any time in the past.

Despite Henry Ford's assertion that 'history is bunk', it can be helpful to look back before taking the plunge to consider what may be ahead of us with regard to the future of the industrial baking sector.

Background

Prior to the first world war there were approximately 20,000 independent bakeries. Most of them were very small and servicing the local community either through their own or other retail outlets or directly to the customer with a regular door to door service.

Gradually, with the increase in mechanisation and the ability to make bread in significant volume, the industrial plant baker was gaining a significant share of the market which had reached about 20% by the outbreak of the second world war. With further improvements in production methods and the means of distribution, a further rapid expansion of the industry took place.

My company has been closely allied to the baking industry and influential in its development, particularly during the industry's formative years.

The one major development with which my company delayed in appreciating its potential was the Chorleywood Bread Process, which was exploited by Tweedy in its initial stages. This company is now part of the APV group.

After joining Baker Perkins in 1961, I was appointed sales representative for Scotland and I can well remember driving up to Glasgow on January 2, 1968 to commence my selling career. This was after a four year period of intensive training - an important element which is sadly overlooked these days by many companies in all sectors of business activity.

What did I find on my arrival in Glasgow? The city boasted 10 major industrial plant bakeries, the largest of which was the United Cooperative Baking Society with 17 travelling ovens and a capacity equivalent to more than 1.5 million large loaves a week.

Today Glasgow has two major plant bakeries and there are only six in the whole of Scotland. This trend has been reflected generally throughout the UK.

The average capacity of plant 28 years ago was about 2,500 loaves an hour of large bread. Variety was very limited but mechanisation was relatively high. The Chorleywood process was still in its infancy and the range of doughmaking machinery was much broader than it is today.

Many plants used gridlap type high speed mixers although two-hour bulk fermented doughs were still common. Continuous or batch dough development systems such as Wallace and Tiernan, Oakes, Baker Tversson and Straughman were used in a number of bakeries. Often these machines incorporated a simple dough dividing mechanism and dropped the dough piece directly into the tin. These systems went out of favour with the introduction of lower protein flours and the demand for more product variety.

The patterns of distribution and sales were also quite different in those days. Deliveries to the customer on the doorstep were still common, many bread producers had their own retail shops and the multiple stores as we know them today were still in their infancy.

In fact the picture of distribution in the UK more than 25 years ago has similarities with continental Europe today and I will return to this feature in due course.

If that was the broad picture then, how far have we come? Not very far, I hear some of you say.

Present situation

While bread consumption has been in general decline over many years, there has been a slight reversal in the trend since 1992 and bread accounts for approximately 4.5% of all household expenditure.

Of the total volume of consumption in 1993, white bread accounted for nearly 57% compared with more than 82% in 1975. Conversely the consumption of brown bread rose from less than 10% to more than 23% during the same period. This reflects the growing consumer consciousness of the nutritional content of food products. Interestingly, during the past five years there has been a growing perception of the nutritional value of white bread, which may explain the slight increase in white bread sales.

Of course, one should only see these statistics as overall trends. It is difficult to assess to what extent the market has been distorted by the very heavy discounting by retailers, which has certainly affected the motivation for buying brown and wholemeal breads.

Let us look at some of the positive and negative aspects of the industrial bread baking scene which may give us clues as to the future trends and opportunities.

Positive:

Nearly everyone eats bread at some time during the year and there does appear to be growth in overall consumption. There is a clear recognition of the dietary value of bread and no one

can deny that it is value for money. The growth of snacking and the consequent increase in the purchase of sandwiches as a healthy food is self-evident.

Negative:

The industry is very highly competitive and margins are generally weak. While raw materials costs have been increasing, so also have discounts until very recently.

Trends and opportunities

There is a continuing trend towards premium brands which indicates that consumers are prepared to pay higher prices for quality. Retailers need to offer a range of products to emphasise their value for money range. If all bread is cheap, it is difficult to define the special offer. Perhaps most exciting and interesting of all from the equipment manufacturer's point of view is the potential for new and healthy products. These factors together with the opportunities for sales into continental Europe represent a challenge as well as a potential bright future for us all.

Of course, nothing is possible unless the bread baking industry can satisfy the existing market place in terms of quality, variety and service and in return command appropriate prices to stimulate investment.

The future

I would like to consider this under three main headings: the market place, the product range, and the machinery and process.

1. The market place

In 1994, the consumption of bread in the UK was approximately 2.2 million tonnes. This figure includes rolls and fruited breads. Standard 800g and 400g white bread accounted for half of this figure. In value terms this represents less than 40% of the market, which is a reflection of high discounting.

What is the comparison between the UK market place and continental Europe?

Let us have a look at the overall consumption of bread. In the UK we eat less bread per capita than any other country in Western Europe - with the Germans eating over 50% more than us. The Swiss and the French consume only marginally more than we do, which may come as rather a surprise.

In the UK, over 70% of all bread is made by industrial bakeries and in total there are some 4,000 operating bakeries including in-store bakeries. Compare this with European countries of similar population Spain 17,000, Germany and Italy 28,000 each, and France 38,000. In these countries the independent craft baker remains supreme, producing a wide variety of quality products with a short shelf life.

What can we interpret from these figures? First, that bread is the staple food throughout Western Europe. Second, that bread manufacture in Europe is still largely non-industrialised. And third, that the wrapped bread sector is a small share of the total market.

Normally the UK is subject to much criticism about its shrinking industrial base and its lack of efficiency.

However, we have in our breadmaking industry one which is highly automated and very efficient with probably the most sophisticated distribution system in the world.

With these significant competitive advantages, I believe the UK industry has a major opportunity in Europe. You may say that Europeans do not eat the types of bread that we consume in the UK. In fact they do, but not as yet in large quantities.

White sliced pan bread on the continent is generally regarded as a luxury product and there are companies such as Bimbo and Panrico in Spain, Harry's in France and Wendeln in Germany which are extremely successful in this market.

With the change in lifestyle, the European consumer is increasingly demanding conveniently packaged bread with a long shelf life. Is this not exactly what we have to offer from our industrial baking sector? And if we are prepared to lift our horizons to what is a practicable distribution area encompassing 200 million people in continental Europe, will this not have a significant effect on the development of industrial baking as we approach the millennium?

2. The product range

Although the range of bread types has extended significantly during the last 20 years, white tin bread still dominates and whereas at one time it received a poor press it is again regarded as a healthy nutritious food.

Unless there is a significant swing away from highly intensive production plant, which I think is doubtful due to the patterns of retailing which have developed in the UK, the white sliced loaf is likely to retain its pre-eminent position. It may change in structure and taste but I think it is a reasonable bet that it is here to stay.

What is likely to happen is that there will be two distinctive types of white bread, which for want of better words I will call commodity and premium.

There is little doubt that there is a basic demand for cheap white sliced bread. It is a product that is purchased on price and adequately meets the basic requirements of feeding hungry mouths and as a carrier for other foods.

Equally there is an existing and growing market potential for a higher quality product for consumption both in the UK and continental Europe. As this product is made from a superior recipe it has improved shelf life characteristics suitable for a wider area of distribution.

This differentiation could have an impact on the manufacturing process, as could the requirement for a variety of end product weights.

The capacity for soft buns is also likely to grow. The demand this summer has been exceptional, no doubt in part due to the weather but also the number of fast food outlets across Europe is growing at an accelerating rate, particularly in the former Communist countries. Changes in product characteristics are foreseen.

The demand for fruited breads and buns is increasing. The use of a variety of fruit types provides variety from a base recipe and increases shelf life.

Also the imaginative use of decoration, toppings and flavours has increased the range of products without a fundamental change to the recipe.

Another sector which has developed strongly in recent years is the part-baked range of crusty breads and rolls - usually frozen, although this last year has seen the development of the Milton Keynes Process which provides shelf life extension without the necessity to freeze.

Clearly the continued market expansion of this and other bake-off products from the industrial bakery perspective will be largely dependent on providing additional shelf life economically to extend the distribution potential and reduce the product control and processing requirements at the point of sale.

One range of products which is often excluded from bread statistics is pizza, the production, distribution and marketing of which has been revolutionised in the last 10 years. From being a cheap and cheerful crust formed on a sheeting line and jumble packed in a polythene bag, it is now a sophisticated deep pan with exotic topping and marketed as a high quality product. A first class, healthy family meal.

In fact the pizza crust making process is very closely aligned to breadmaking. I have found it somewhat puzzling that the industry has largely left it to specialist manufacturers to respond to the spectacular increase in demand.

What is also particularly interesting about pizza is that the product has been upgraded from a very ordinary commodity to a highly desirable, even a luxury article. Surely there are lessons to be learned here.

A whole range of ethnic products have found their way into the UK market, the most popular of which is pitta, together with other high temperature stone-baked products: ciabatta, garlic and tomato breads. It is probable that these will remain as niche opportunities.

Clearly the total product range is almost inexhaustible but I have endeavoured to select those likely to have the greatest potential growth in the market place, which the industrial bakery industry does or could potentially supply and which are likely to have the most profound effect on the design, processing parameters and manufacture of high output, automated equipment during the next decade.

3. The machinery and process

One of the difficulties which besets the machinery manufacturers is the change in raw materials, particularly flour quality. By the time a new machine appears on the market, significant change may have already taken place. This, of course, is particularly relevant with regard to mixing.

The removal of potassium bromate from the recipe has had a significant effect on dough development and has generally made the machining of dough more difficult. It has highlighted dough damage caused by forming machinery and while this may not be regarded as a major problem in the production of commodity bread, it does have implications for

premium bread. As suggested earlier, these two product ranges may be destined to be made in different ways.

It is reasonable to assume that commodity bread will be made from the lowest cost raw materials and the simplest process methods. With existing Chorleywood batch mixing, one can foresee a return to divider panning, which while having an effect on crumb structure will enable very high water content doughs to be made. The effect of higher yield, lower machinery cost and higher efficiency would certainly increase the gross margin.

Alternatively one might see the return of continuous mixing with a ribbon of dough, either cut with a simple divider and panned into a tin or the processing of a continuous extrusion through a tunnel prover, oven and cooler. The shape of the loaf would be determined through the shape of the orifice at the mixer outlet or the dough would be placed into a simple former running through the prover and oven.

The essential logic of considering something apparently so far removed from current processing methods is that once a metal tin to support and transport the dough piece is dispensed with, microwave baking becomes a practical proposition. Also the significant costs associated with tin straps and conveyors is removed.

We must not forget that at the end of the day bread is sold by weight and the number of slices. These factors can be determined at the end of the process rather than the beginning. In short a bread line would look more like a biscuit plant than the current configuration.

For premium bread, which is where I believe the area for expansion lies both in the UK and continental Europe, the overall specification of the plant is likely to be substantially similar to that of today.

During the last 25 years we have seen the steady increase in the output capacity of a tin bread plant from an average of 3,500 x 800 gram loaves per hour to 8,000 loaves per hour. However, despite available technologies to operate at up even twice these capacities, I am doubtful whether there can be any overall benefit derived from such huge plants.

The logistics involved in warehousing and distributing such vast quantities of bread are enormous and the problems associated with breakdowns both in terms of the plant and the impact of non-supply to the customer are potentially extreme.

However, if the industry is serious about making quality premium bread products, then certain areas of the process and plant need to be addressed.

In my opinion it is a fallacy to suggest that quality bread products cannot be made from no-time intensive mixing systems. After all, precise weighments and proportions of ingredients can be fed to the mixer, flour protein levels detected and doughs mixed to extremely accurate levels of energy. However, there has to be much greater interest in flavour and crumb structure.

I would expect to see a significant increase in the use of liquid fermentation systems in association either with high energy batch or continuous mixing systems. Also the use of both pressure as well as vacuum to develop and control the dough structure is likely to be more

widely explored as the potential becomes generally accepted. These comments apply equally to bun and roll products.

I think the debate between continuous and batch mixing will continue but at present there seems to be no particular advantage with regard to continuous mixing, other than maybe for single product plants. The ability to mix fruit up to 50% of flour recipe will also be a requirement.

As far as the dough make-up plant is concerned, there has been significant debate about the advantage and even the necessity of first proof. My feeling is that a short proof is desirable to relax the dough before final moulding and concerted effort should be and is being given to reduce dough damage at the divider, rounder and final moulder.

One factor which is having some effect on dough forming plant design is the loaf length, which is now up to 300mm long for some premium breads. This requires a final moulder with a wider pressure conveyor and more gentle forming to increase the dough piece length without shrinkage.

There is little I wish to say about proving and baking, partly because a serious design and process evaluation is underway within my own company.

However, the two main options of conveyerised and tunnel plant configurations are likely to take us into the next century. Continuous conveyor type plants are becoming more popular for both bread and buns as the directional pan transfers can be removed which generally improves the overall efficiency on plants of 7,000 loaves per hour and beyond.

There will be further improvements with regard to the control of prover heat and humidity. The use of live steam is clearly expensive and inefficient and more attention is being given to hygiene and accessibility to the proof chamber.

To what extent baking times could be or indeed should be further reduced is a matter of conjecture. Personally, I believe that the very fast baking times ostensibly used to minimise weight loss have been counter-productive in terms of crust development and therefore overall taste and quality.

Significant advances have been made in bread cooling control in the last decade but it is only recently that optimum cooling profiles through zonal cooling have been considered. In this respect, spiral cooling offers potential advantages over rack cooling. The vacuum cooling of standard bread has been discounted in the UK because it creates excessive weight loss but is widely used around the world for crusty bread and biscotte products.

In order to increase the potential distribution area, aseptic cooling and packaging materials will continue to be developed. It is already possible, even without modified atmosphere packaging, to achieve 10 days shelf life and this is likely to become commonplace for premium breads.

Undoubtedly the most significant development the industrial bakery is going to experience during the next decade is in process and management control. Sophisticated systems have been installed on a few plants but they tend to be over-complicated and relatively slow to respond.

The technology already exists to remotely control plants in terms of product batch ordering, recipe input, process parameters, fault finding and repair, and to download management information. Future automatic production lines are going to be operated and serviced by technicians and management will have immediate access to the plant status and efficiency.

With the latest European directives now in force with regard to health and safety, there should be significant improvements, particularly as far as imported machinery is concerned. This is absolutely necessary for the industry, and allows UK manufacturers to sell into a more equitable market, not only here but in continental Europe.

To sum up, the bread baking industry has to respond to the issues of cost, quality, variety and wider market penetration.

I believe it can do this by recognising the difference between commodity and premium products which must be reflected in the retail price; produce the variety of end products of sufficient volume to support and justify automated processing; and be confident that it is producing bread and related products which both the UK and continental Europe desires.

Plants will not be significantly higher in output than they are now but the process will be more accurately controlled and modified on the run and levels of efficiency will improve with less waste.

I hope that I have been able to paint a reasonably accurate picture of the current state of the industry and provide a few clues as to its direction in the future.