



IMPROVING LOAF QUALITY IN HIGH OUTPUT PLANT BAKERIES

By: David Hiles – Chief Engineer, Bakery Division, Baker Perkins Ltd



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Introduction

This white paper describes how industrial bakers can improve loaf quality by investing in the latest generation of mixing and forming equipment – either in the form of new machines, or as upgrades to installed capacity.

Synopsis

Baker Perkins has responded to the growing need for plant bakers to enhance quality, with innovative developments in mixing, dividing and moulding equipment. These concentrate on improved mixing and gentle dough handling, identified as essential in raising and maintaining product standards, without compromising economy of production.

Market conditions and opportunity

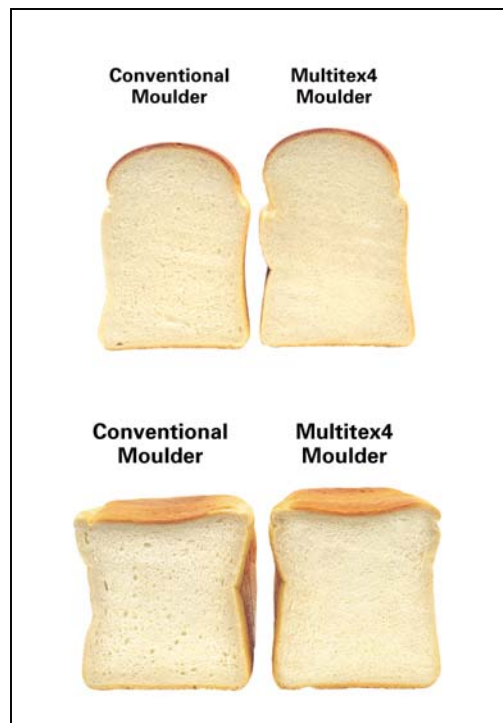
Many bread markets are static, or offer minimal organic growth prospects to the high output plant sector. To maintain or increase sales and profits, bakers must focus on quality as a means of acquiring and retaining new customers. In a price sensitive market, particularly at a time of rising ingredient costs, this has to be done without increasing manufacturing costs.

Quality improvements can be achieved with a relatively modest investment. While a complete new mixing and forming line will bring the maximum benefits, significant improvements can be obtained by replacing individual units. Retrofit packages for mixers, dividers and moulders have also been developed to allow bakers to take advantage of the latest technology by upgrading existing equipment.

Process background

Baker Perkins has upgraded the mixing, dividing and moulding processes to offer bakers improved loaf quality and process control, whilst retaining all the reliability and low cost of ownership of the original machines.

The focus is on developing the optimum cell structure in the mixer and then preserving it by gently handling the dough through the dividing, rounding and moulding stages. This maintains the integrity of the dough and results in a loaf with the ideal crumb structure and high consumer appeal.



Today's ranges of Tweedy™ mixer, Accurist2™ divider and Multitex4™ moulder build on the reputation of their predecessors for long-term reliability and high quality standards in large plant bakeries. The latest generation was developed in collaboration with plant bakers worldwide, to ensure that these standards were exceeded.

Tweedy™ mixing

Tweedy pressure/vacuum mixing gives cost saving and quality enhancing benefits including:

- Increased yield
- Improved crumb colour and softness
- Longer shelf life
- A reduction in expensive ascorbic acid, used to aid oxidation

The patented pressure/vacuum process involves sequential application of pressure and vacuum to the mixing bowl. Pressurising the bowl in the first phase of the mixing cycle traps air in the dough and ensures that there is sufficient oxygen to enhance the operation of the ascorbic acid. In the second phase, partial vacuum controls the size of the bubbles in the dough to refine the crumb structure.



The pressure and vacuum phases can be adjusted so that the full range of products can be made, from open-textured breads such as baguettes to pan breads with close and uniform structures. Traditional process control characteristics – flour/water weight proportioning, accurate water temperature blending, energy control and minor ingredient monitoring – are all retained.

The Tweedy™ is the definitive machine for the Chorleywood process and comprises a fully integrated mixer, weigher, tub hoist and control panel. They handle mechanically developed, bulk fermented or accelerated dough. They are ideal for bread using wheat or wheat/rye flour blends, bread rolls, hamburger buns and pizzas – and also cake and pastry mixing.

The majority of leading industrial bakeries in the UK and Ireland, Europe, South Africa and Australasia specify Tweedy™ machines, both for new projects and as replacements for older units. Mixing performance, reliability and low cost of ownership are the main reasons for their choice, but a flexible specification is also essential.

Bakeries need each system to be tailored to their individual requirements. Feeding arrangements can be adapted, the position of the operator interface is flexible and twin mixers can feed a single hoist. Precise ingredient weighing, effective ingredient dispersion and uniform dough development, consistent from mix to mix, are driven by an efficient control system.

The Tweedy™ range covers five machines. For plant bakers there is a choice of 220, 275, 340 and 385kg maximum batch sizes, with outputs reaching 5,400 kg/hour for a single mixer. A 170kg batch size machine is designed specifically for the small to medium sized baker.

Accurist2™ dividing

The new generation of Baker Perkins 'Accurist™' dough divider – the Accurist2™ - offers bakers improved product quality and process control with lower production costs, whilst retaining all the benefits of the original machine – long term reliability and high scaling accuracy.

The key development in the Accurist2™ is the introduction of servo-control to the ram motion, permitting low-pressure operation that minimises product damage and improves loaf quality.

The more gently dough is treated, the higher the cell count i.e. the number of micro-bubbles retained in the dough structure. The effect is to create a loaf with a finer crumb structure that is more resilient and has better colour.



Intelligent control of the ram movement means that pressure on the dough can be reduced by up to 50% as it is pushed into the division box, with no loss of scaling accuracy. Cell count increases as pressure is reduced, and trials over a range of products and weights show a consistent 10% increase.

The servo drive motor on the Accurist2™ replaces the mechanical linkage from the main drive. The fundamental advantage is independent, accurate control of pressure to a set point. Additionally, the introduction of an HMI provides full recipe control, including weight adjustment, whilst Dynamic Dough Control™ software allows the divider to respond to changes in the dough on every stroke for maximum consistency.

This new machine retains the consistent Accurist™ scaling accuracy that has set the industry standard for more than 20 years. Key to the success of more than 650 machines at work throughout the world is maintaining a Standard Deviation (SD) of just 2.5 to 3.5 grams on 900g dough pieces over 10,000 hours of operation, with no parts being replaced. New data on the performance of the Accurist2™ shows that low pressure operation and improved lubrication has further extended component life.

The Accurist2™ can produce a wide range of products, weights and throughputs, with a stroke rate varying between 8 and 30 per minute on both Chorleywood and fermented dough. An existing plant can easily accommodate the improved machine.

Multitex4™ moulding

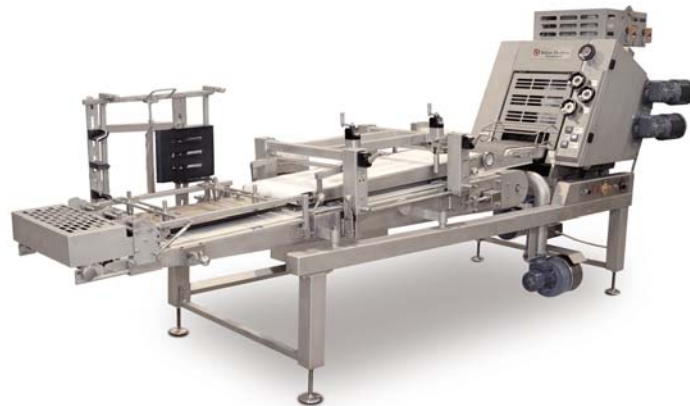
The Multitex4™ has, uniquely, four pairs of sheeting rollers with variable gap and speed control. This arrangement improves loaf quality by controlling size, shape and length-to-width ratio of the dough sheet prior to coiling. It allows tighter coiling, with more coils, while at the same time significantly reducing stress to the dough through a more progressive thickness reduction.

At the design stage, engineers and process technologists utilising bakery industry research into dough rheology identified gentle handling as the key factor in improving loaf quality. The number of sheeting rolls was clearly crucial: and after extensive testing, four pairs of rolls was identified as offering the optimum combination of performance, cost and reliability. An added bonus is that this configuration fits in a similar size frame to previous machines allowing retrofitting to existing moulders.

Gentle handling leads to an increase in cell count and less dough damage and together these benefits translate into better colour; a loaf up to 18% softer; and a strong, straight sided shape that fills the tin well – particularly important for sandwich producers.

Bakers purchasing the Multitex4™ have done so after comparative tests with conventional machines in the Baker Perkins Innovation Centre. Using their own ingredients to evaluate the benefits of the four-roll concept, they have found that volume and cell counts increase by around 10%, and there is a visible improvement in crumb structure.

Bakers also appreciate a solution to the centralisation issue. For both single and four-piece production centralisation of the dough piece is vital to repeatable set-up and consistent product quality. Rollers located prior to sheeting ensure the dough is presented consistently to the sheeting rollers from any direction – previously it had to be ‘in-line’.



As well as better loaf quality, the Multitex4™ offers significant improvements in operational efficiency. This combination of benefits makes a compelling case to replace previous generation machines with new technology. The majority of leading plant bakers in the UK have already invested in the Multitex4™.

The Multitex4™ has been designed to keep running under all production conditions because continuous operation generates additional profit. Unplanned stoppages of the moulder for clean-down have always been an annoying and costly part of the daily routine in plant bakeries. They are usually attributable to sticky dough that clogs up transfer plates, guides and scrapers: their origins are usually in changes in flour condition or quality, or amounts of dry ingredients and water.

Spring loading of the sheeting rolls and moulding boards allows doubles to pass through without smearing or sticking and thus avoids the need for cleaning stops. The spring loading of the board allows only parallel movement at each end, thus ensuring that the dough piece is always cylindrical. This helps with the quality and consistency of both single and four-piece loaves, while four-piecing is further enhanced by the use of the cut-through process. This is easier to set up and more stable in operation than the traditional W-forming method, as well as offering better tin fill, especially on shorter tins.

Another key feature of the Multitex4™ is the ability to change quickly between products. Two captive panning attachments are easily interchanged and other settings can be made in seconds using repeatable, calibrated adjustments. Fast changeover is becoming increasingly important as bakers seek to meet diversifying consumer demands by increasing the range of product sizes and types they offer. This process will accelerate dramatically in the UK when standard loaf sizes are abolished.

Equipment upgrades

Improved features developed for new machinery are offered as cost-effective ways to upgrade and adapt plant in mid-life. These upgrades ensure that the latest standards in quality, performance, hygiene and safety are available for existing installations. This enables bakers to extend the service life of their equipment and maximises the return on their initial investment.

Tweedy™ mixers

Pressure vacuum mixer conversion. Standard mixers can be converted to PV operation for improved loaf quality and increased yield.

Control system replacement or upgrade. Replacing or updating an obsolete control system improves process control and brings greater reliability.

Accurist™ dividers

Ram and knife upgrade. This achieves a reduction in oil consumption and dough leakage, and extends component life.

5000 to 9000 conversion. Throughput is increased: reliability and loaf quality are improved.

DC to AC conversion. AC motors are maintenance free, and completely sealed to minimise the risk of failure through ingress of water or dough.

Supertex moulders

Head replacement. Fitting a new Multitex4™ head to an existing moulder body improves loaf quality and increases operational efficiency.

Drive upgrade. Replacing a chain drive with a direct motor drive improves loaf quality and increases operational efficiency.

Innovation centre

The Innovation Centre at Peterborough in the UK contains a wide range of production and laboratory scale equipment dedicated to the bakery industry. Customers are guaranteed total confidentiality, working with or without the help of Baker Perkins' experienced food technologists. Companies from every part of the world find that thorough trials, often using their own raw materials, provide a reliable basis for trouble-free commissioning of new plant and launch of new lines.



The Bakery Innovation Centre enables industrial bakers interested in improving the quality of their bread to evaluate the different ways of achieving this. Pressure-vacuum mixing, low stress dividing and gentle moulding can all be tested as either individual units or a complete process upgrade.

Proving and baking facilities are also on hand so that improvements in texture, colour and softness can be seen in the final product. A C-Cell analyser is available for anyone wanting an objective measure of the difference in bread quality.

Contact details

Further information can be obtained from Keith Graham, Baker Perkins Limited, Manor Drive, Paston Parkway, Peterborough PE4 7AP. Telephone (+44) 1733 283000. Email

keith.graham@bakerperkinsgroup.com www.bakerperkinsgroup.com