The Importance of Degree of Bake Measurement for Biscuits

The challenge faced by this customer was to standardise their production processes and produce biscuits to target colour and moisture content specifications, minimising any subjectivity associated with a process operator’s perception of colour.

The solution was to integrate NDC’s on-line MM710e Degree of Bake (DOB) measurement into their process. This instrument closely imitates the response of the human eye to changes in brownness. The MM710e measures both the product colour and moisture content of the biscuits over a moving conveyor to detect the change in surface brownness of their baked products.

NDC’s on-line Degree of Bake (DOB) and moisture measurements yield significant improvements in quality and productivity:

“No now the factory can make perfect biscuits all day long. Production is up. Customer complaints have plummeted. Energy consumption has dropped and the scrap is now minimal.

The payback has been rapid.”

NDC’s MM710e on-line sensor and HMI

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NDC Technologies MM710e Gauges were subsequently installed by this leading Australasian Biscuit Factory to measure the Degree of Bake (DOB) and moisture content of their products. The gauge uses both visible and Near Infra-Red light (NIR) to analyse the surface of the biscuit to produce meaningful measurements for process control, optimisation and quality reporting. The MM710e comes in a food grade enclosure making it suitable to mount over the production line and required minimal calibration to their products.

“These gauges have revolutionised our baking process because previously we had no means of standardising the product colour to ensure that all the operators “baked to the same” target. Colour was always subjective, in that the product was baked to a process operator’s perception of the optimum colour. This was obviously flawed but we had no real absolute measurement system or way of standardising what we do. Over the years external colour standards were used and referenced, but pictures and photo quality can fade and be difficult to reproduce and emulate on line. Furthermore, customer complaints have centred mainly on products being too pale or too dark.”

“The MM710e DOB gauge values are set up by the Production Specialist for the ideal degree of bake and provide measurements that correspond to how light or dark the product actually is. Individual product recipes are stored in each gauge memory, so that the ideal bake colour for every product represents a target DOB value of ‘50’, even though the biscuit types differ greatly in baking colour, such as with Gingernuts or...
Digestives. A higher DOB reading indicates a darker baking colour and a lower reading a lighter baking colour. These readings enable the operator to make necessary corrective adjustments to the oven conditions, thus removing the subjectivity of ‘what colour the product should be’.”

“The colour reading from the gauge is used as the key quality indicator. As the line speed for each product is always the same, if the colour is correct, then the resulting moisture will also be within specification. The measurement information from the gauge is presented to the operators in a graphical form for easy interpretation on their SCADA screen workstations. This real-time feedback of the baking process can also be viewed in both the management and production offices on large SCADA screens. For example, over an 8 hour period the gauges provide 1000 colour readings and 1000 moisture readings, giving detailed quality information from every product produced.”

“The MM710e represents a powerful tool to all its operational users and has revolutionised the baking process within the factory. Each product can be literally baked to the same specification every time in terms of colour and moisture by simply looking at the measurement information on a screen. This has been reflected in the CPMU (out of specification) data that has plummeted on each line it has been implemented on.”

**Degree of Bake Applications**

Other applications for the Degree of Bake (DOB) measurement include:

- Biscuits or Cookies
- Crackers
- Savoury Snack Foods (Corn or Potato): Baked or Fried

In a world where food yields from manufacturing processes have become ever more important, improved control from the use of simultaneous measurements of moisture, oil and Degree of Bake enables manufacturers to produce a highly consistent, within specification, top-quality product and minimize production scrap or rework.