Enhancing traditional methods for flour quality analysis

Automating the SRC method saves time and optimises process efficiencies

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Dr Louise Slade, who co-developed the manual SRC method, passed away on October 7, 2021.

The entire KPM Analytics team would like to recognise Dr Slade's tremendous contribution to and the profound impact on the baking and milling industries.

Flour has been an integral part of human subsistence for centuries. Over the years, as with anything having a long history, there has been a gradual but consistent evolution of grain, wheat, and flour processing.

When it comes to maintaining flour quality, there has also been an evolution of testing procedures and processes that have been used – all of them with an inherent list of benefits and challenges.

Whether it's a miller conducting flour quality testing several times a day or a cracker producer testing raw materials coming into the plant once a week, flour quality testing is critical to ensuring the best possible final product.

For decades, rheological tools, such as the Alveograph were used to help assess the baking quality of wheat flour. And in the late 1980s, Louise Slade and Harry Levine (Nabisco company (now Mondelez), USA) developed the Solvent Retention Capacity (SRC) method to complement the information provided by the Alveograph.

As a result of the work of Doctors Slade and Levine, the manual SRC method has been recognised as the standard for the industry and has been identified as the AACC (Cereals & Grains Association, formerly American Association of Cereal Chemists) method 56-11.02 SRC.

Comprehensive analysis

As fundamental as flour has been to our existence, it's only been in modern times that more sophisticated technology has been available to obtain a true understanding of numerous components or variables, such as flour hydration or damaged starch, and the SRC method is one of those "recent" technological advancements.

The SRC method provides data to determine how we can impact the growth of various types of wheat; the benefits of different types of wheat and the flours produced; or how different types of flour will react to the commercial baking processes required to mass-produce baked products.

For millers, the SRC method has become key in evaluating, identifying, and selecting preferred hard wheat and soft wheat flours for a wide variety of bakery applications, or as a

method to enhance biscuit wheat breeding, procurement, flour milling, flour quality and performance and cracker/cookie product quality and conformance.

For food producers, by better selecting their flour supplies, they can limit the adjustments of their production line, which represents a considerable advantage in terms of productivity and quality.

The SRC method is typically performed by laboratory technicians, and as part of a raw materials control process, the lab results would be reviewed by a quality manager or a production manager. Or, if the SRC testing is done as part of the development of a new product, the R&D manager would assess the results.

In either case, the SRC method provides important data to the facility and ensures that whatever action is needed can be taken to improve the product and/or the process.

The SRC method characterises flour hydration qualities; specifically, the water absorption tendencies, which is a critical element in the baking process. Depending on the amount of water, it can have problematic repercussions on the production line or on the final product.

If too little water is added to the flour, the dough is brittle, dry, and hard; if too much water is added, the dough becomes sticky, wet, and soft. With this valuable information provided by the SRC method, millers and bakers have a better understanding of their product as well as their process and can ultimately optimise product quality.

Saving considerable time & effort

As much as the SRC method has been an important tool for the industry, providing critical information for millers and bakers alike, it hasn't been without its challenges and drawbacks.

One of the primary challenges of the manual method is that it's a laborious and time-consuming process, requiring a lab technician to execute multiple steps over a one-hour period.

From the initial preparation of individual solvent solutions, to the weighing of flour, mixing and shaking of the solvent and flour solution, centrifugation, decanting/draining of the supernatant, to weighing of the remaining pellet, the manual method isn't necessarily complicated, but there are numerous steps that require the focused attention of the technician throughout the entire testing process.

A distraction from the process could result in inaccurate or incomplete testing. Additionally, lab technicians working for the same company, but operating in different locations, may perform the test slightly different, which means the company is getting inconsistent results from location to location.

Given the multiple steps in the manual process, there are equal numbers of opportunities for human error or even simple data variations, which makes it difficult to replicate the testing method from one batch of flour to the next, from one technician to the next, or from one facility to the next.

So, when a producer is making crackers or cookies or tortillas, and the product needs to be identical in San Francisco or Paris, having multiple opportunities for human error during a QC test can often impact product consistency and quality.

Providing valuable flour quality data & information

Since its development in the late 1980s, the SRC method has provided valuable flour quality data and information to the industry, in spite of the challenges, and it's been responsible for important advancements – not the least of which is the development of new wheat strains.

Given the proven significance of the manual method, there were those who felt there was an opportunity to automate the manual SRC method, to take advantage of further technological capabilities and make it that much more appealing.

In 2014, Chopin Technologies, a KPM Analytics brand, and the company behind the development of rheological test standards that the industry has been using for 100 years, developed the SRC-Chopin Analyzer that automates the manual method.

Today, with standardised automated methods from both AACC and ICC (56-15.01 and 186, respectively), this automated alternative delivers the same information as the manual method, but in a simpler and more precise and consistent way.

The SRC-Chopin 2 Analyzer, the second-generation instrument recently introduced into the market by KPM Analytics, provides a complete walk-away operation, reducing operator involvement by 60 percent.

To run the automated tests using the analyser, training for lab staff is minimal. The technician simply fills the syringes and tubes and weighs the samples, and the analysis is performed by the instrument, including calculating results at the end of the test. Injection, shaking, centrifugation and calculation operations are all carried out by the analyser, freeing up the lab technician to do other important tasks.

The automation also reduces operator engagement and ultimately minimises the impact of operator error. With the automated process being simpler, more precise, and more consistent, the analyser supplies data that is 30 percent more repeatable with a process that is 50 percent more reproducible than the manual method.

With the automated process, person-to-person, experiment-to-experiment, and site-to-site variability is essentially eliminated, enabling flour standardisation across suppliers and across facility locations, whilst bakers and millers can make confident assessments regarding their flour quality and final product requirements.

Additionally, the improved data of the automated method provides a common language across the grain and flour value chain, which establishes a strong basis for commercial transactions.

Increased repeatability & reproducibility

In looking at various testing processes that have been developed over the years for the milling and baking industry, flour quality testing such as the SRC method have provided millers and bakers with important information that allows them to continuously improve their end-product and to gain a better understanding of their process.

In automating the manual SRC method, advancing flour quality testing, progress has been made and efficiencies have been gained, saving time and money. Whilst the increased repeatability and reproducibility of the testing allows the industry to optimise their process and modernise their facilities well into the future.