

Automated measurement of the solvent retention capacity (SRC) profile



Understand flour functionality

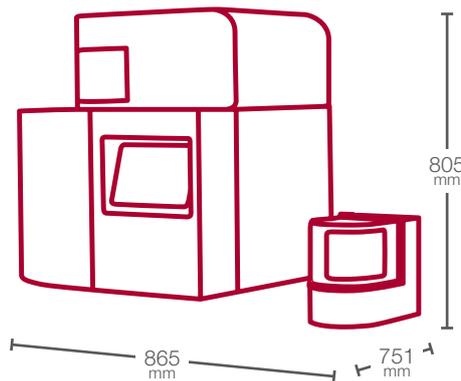
- By simultaneously and individually analyzing the main functional flour components (damaged starch, glutenins, pentosans) that directly influence final product quality

Universal test

- From breeding to baking, the entire wheat and flour industry and its supply chain benefit from SRC analysis, using a common language

Improved precision and reproducibility

- The SRC test method is recognized worldwide.* The SRC-CHOPIN machine identifies the solvent tubes, stores the flour weighing data, injects the solvents, shakes, centrifuges and drains the tubes, and then calculates all the results



100 Kg

220/240V - 50/60Hz
250W



Test time : **75 minutes**
Operator time : **20 minutes**

What is the SRC method?

The SRC method is a solvation assay for flours, which is based on the enhanced swelling behavior of individual flour polymer networks in selected single diagnostic solvents—deionized water, 5% w/w lactic acid in water (for glutenin), 5% w/w sodium carbonate in water (for damaged starch), and 50% w/w sucrose in water (for pentosans)—which are used to measure and predict the functional contribution of each individual flour polymer component [Kweon, Slade and Levine (2011)]. The widespread interest in the SRC method arises from the fact that a flour's three main functional components impact dough behavior during processing and baking. Glutenins, damaged starch, and pentosans are the three main network-forming polymers in wheat flour. They are functional polymers, because they greatly influence dough behavior during processing (e.g. machinability) and baking, as well as final product quality. Viscoelastic glutenins influence dough elasticity and extensibility, damaged starch influences dough stickiness, and the highly water-holding pentosans markedly increase dough viscosity. Existing rheological tools measure the combined, synergetic effects of the three flour polymers. The unique significance and importance of the SRC method is due to the fact that it complements existing rheological tools such as alveography, by enabling the user to analyze separately, deconvolute, and understand the individual functional contributions of each flour polymer. E.g., a flour's overall water absorption (or water-holding capacity) is determined and controlled by its three network-forming polymers. In cookie-making, for example, a flour's water absorption should be as low as possible, and in particular, with minimized contributions from pentosans and damaged starch. This fact illustrates that a given water requirement for a flour can have different causes, which can help to explain consequent differences in dough behavior during mixing, machining, and baking.

Who uses the SRC method today?

WHEAT BREEDERS

Whole-meal measurements: Studies have shown that SRC values obtained on a whole-grain wheat flour or meal can be used to predict SRC values for the corresponding straight-grade flour. This allows testing of small-sized breeding samples of wheat. [SRC testing can also be extended and usefully adapted to whole-grain flours or meals of grains and seeds other than wheat, such as oat flours and cocoa powders.]

Predictive correlations with existing methods: SRC values show good predictive correlations with other existing characterization methods (e.g. Mixograph, Zeleny test, Farinograph, etc.), and serve as valuable and insight-filled guides in developmental wheat breeding programs.



WHEAT/FLOUR MILLING INDUSTRY

Wheat tempering: Wheat tempering is an important stage of the milling process. Monitoring SRC values as a function of tempering conditions can help optimize flour functionality for a given extraction rate.

Wheat or flour blending: It is possible to calculate the results for each of the four SRC parameters for a wheat or flour blend, based on proportions by weight, in order to obtain a required flour functionality.

Chlorination: With increasing extent of flour chlorination, SRC analysis showed characterizing increases in water, sodium carbonate and sucrose SRC values, but a decrease in lactic acid SRC value.



SOFT WHEAT FLOUR BAKING INDUSTRY

Cookies and crackers: Typical SRC values for a good-quality cookie/cracker flour are water SRC < 51%, lactic acid SRC > 87%, sodium carbonate SRC < 64%, and sucrose SRC < 89%.

Sponge-and-dough products: Typical SRC values for a good-quality sponge-and-dough flour are water SRC < 57%, lactic acid SRC > 100%, sodium carbonate SRC < 72%, and sucrose SRC < 96%.

Japanese sponge cake: Water SRC values have been shown to be positively correlated with Japanese sponge cake volume.



HARD WHEAT FLOUR BAKING INDUSTRY

Bread volume: The higher the lactic acid SRC value of a bread flour, the higher is the baked loaf volume.

Bread specific volume: Higher sucrose SRC and/or sodium carbonate SRC values are detrimental to high specific volume.

Crumb-grain score: Increased SRC values for three solvents (lactic acid, sucrose, and sodium carbonate) result in a stiffer crumb structure in bread.



What are the benefits of the SRC-CHOPIN automated method?

ACCURACY

One drawback of the manual SRC method is that different laboratories can use different equipment (shaking, centrifuge), thus potentially leading to significant variations in test results. Because of its fully automated process, the SRC-CHOPIN offers practitioners a precision generally unachievable using the manual SRC method. Internal repeatability is greatly enhanced, but the biggest benefit is realized when comparing results from one laboratory to another. Thanks to this new opportunity for increased accuracy, SRC-CHOPIN results can be used to improve flour quality, and as quality targets for development of functional, end-use application-specific flour specifications.



SIMPLICITY

The manual SRC method calls for a series of operations, some of which are extremely operator-dependent and -variable (e.g. shaking). The SRC-CHOPIN greatly simplifies all these operations by automating each and every step of the method, from flour weighing to calculation of results.



TIME-SAVING

The manual SRC method includes many manual operations, some of which (e.g. shaking) have a very large influence on the results. But thanks to its fully automated procedure, the SRC-CHOPIN not only provides more accurate data, it also saves time, thus enabling users to test more flour samples per day.



ADAPTABILITY

The SRC-CHOPIN is primarily designed to test simultaneously two flours, each with all four SRC solvents (water, sucrose, sodium carbonate, and lactic acid). But the system is also perfectly suited to analyze just a single flour, or eight different flour samples with the same single solvent. The built-in software enables flexible testing of any possible combination of flour and solvent of interest to the user.



ALL-INCLUSIVE

The SRC-CHOPIN is a complete system; it includes a tube-shaking system, a centrifuge, and a tube-draining system. It is equipped with an external balance for weighing both the initial flour sample and the final wet pellet, in order to calculate the four SRC values and display them as an ordered profile on the integrated screen. All SRC data can also be transferred to a PC for further manipulations, such as calculation of a flour's Gluten Performance Index.

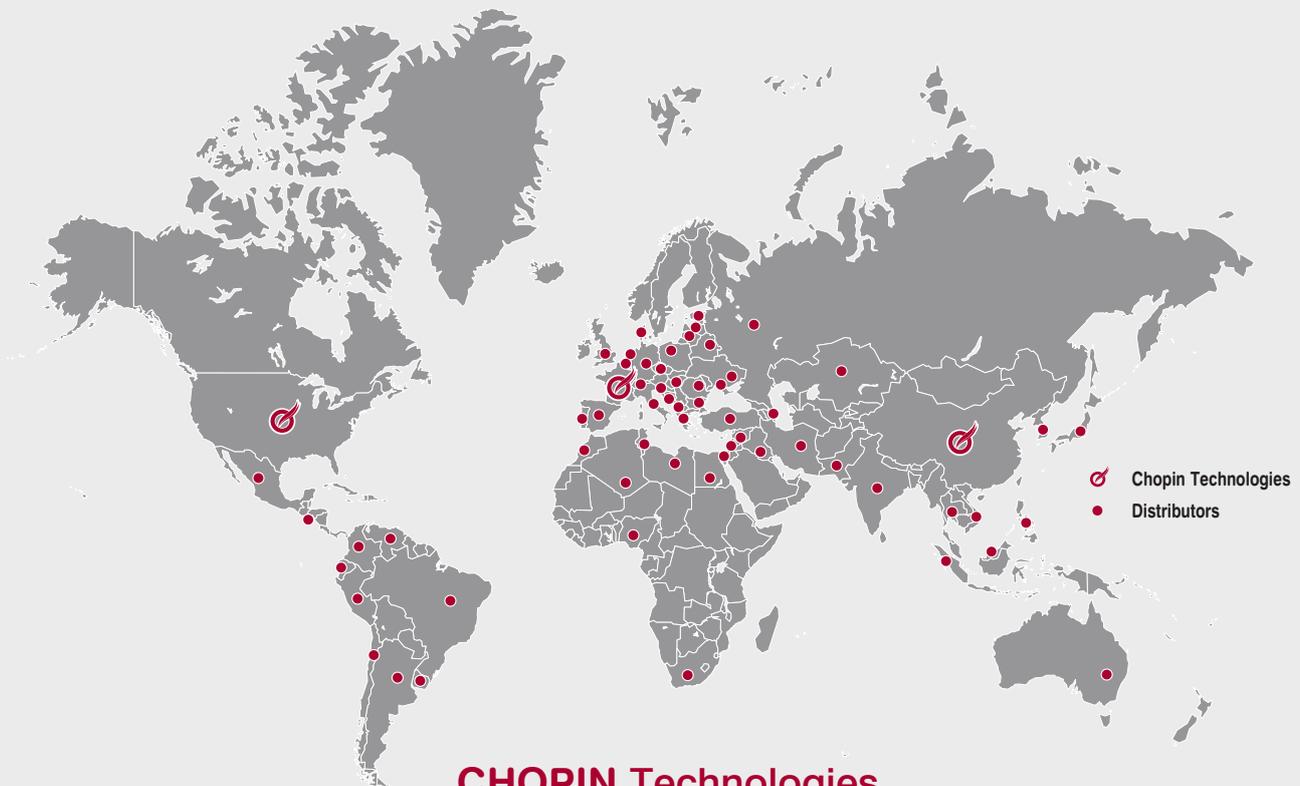


The SRC method is already widely recognized internationally

The SRC method is AACC International Approved Method N° 56-11. The SRC-CHOPIN follows exactly the same procedural steps as the standard manual method, thereby delivering the same results in a simpler and more precise and consistent way. Many publications on the meaning, impact, and valuable end-use applications of flour SRC results are available from SRC-method practitioners in the USA, Europe, China, India, Argentina, Japan, and many other countries.

Key publication

Kweon, M., Slade, L., and Levine, H. (2011). Solvent Retention Capacity (SRC) Testing of Wheat Flour: Principles and Value in Predicting Flour Functionality in Different Wheat-Based Food Processes and in Wheat Breeding -- a Review. *Cereal Chem.* 88(6):537-552.



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User-friendliness and precision

With its built-in touchscreen, the SRC-CHOPIN enables one to conduct the test and obtain the results.

Eight solvent-containing syringes are easily placed in the upper part of the machine, while the centrifuge tubes containing the flour samples are placed in the lower part.

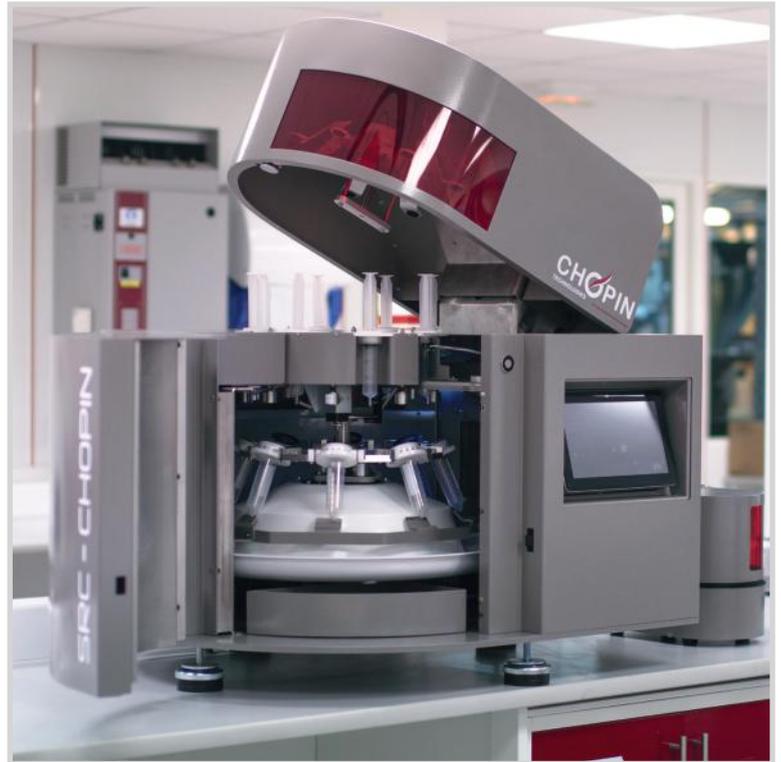
The operator actions are limited to the weighing of the 5.0 gram flour samples. All the later test operations, including calculation of SRC values, are done automatically by the machine, thus eliminating any risk of human error and improving accuracy of results.

Easy to clean and maintain

All the elements of the SRC-CHOPIN are easily accessible.

This makes it extremely easy to clean the unit on a daily basis and to access it for regular maintenance.

All materials used in the construction of the SRC-CHOPIN have been specially selected for their great sturdiness and their ease of cleaning.



Compact and robust system

With its compact footprint, the SRC-CHOPIN combines in the same unit a tube shaker*, a centrifuge*, and a calculator.

This specific design requires minimal laboratory work space.

The SRC-CHOPIN can be placed on a standard laboratory table.

**Patent-pending systems*

External Balance



The external balance is specifically designed to enable the user to obtain more accurate results.

An empty centrifuge tube is automatically recognized, thanks to a flashcode, and is then weighed.

The operator adds 5.0 grams of the flour sample to each tube.

The weight of “tube+flour” is automatically determined and transferred to the SRC-CHOPIN device. This serves as the basis for the automated calculation of the SRC value.

Finally, the “tube+gel” is weighed on the same balance, and the SRC result is automatically calculated.

Measurement principle

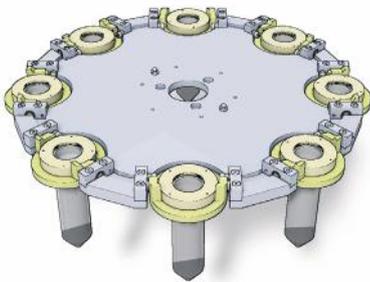
The principle of the SRC method (in accord with AACC Approved Method 56-11) is based on the preferential solvation and swelling of the three polymeric, network-forming flour components by selected, material-specific solvents. The greater the swelling, and the greater the resistance of the swollen network to compression by centrifugation, the higher is the solvent retention. The method enables the measurement of four key quality parameters of flour in one single test:

- Water absorption with the water SRC
- Pentosan functionality with the sucrose SRC
- Glutenin functionality with the lactic acid SRC
- Damaged starch functionality with the sodium carbonate SRC

These four functional properties are key parameters for the quality control of wheat flour. The SRC-CHOPIN finds its best uses in the breeding, milling, and baking industries, but can also add value throughout the rest of the wheat and flour supply chain.

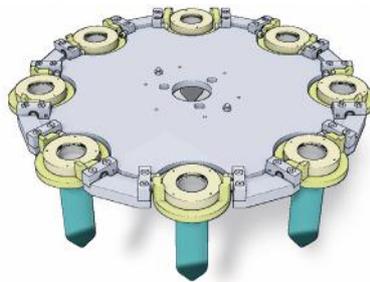
A fully automated and simple procedure

Step 1: Weigh the flour



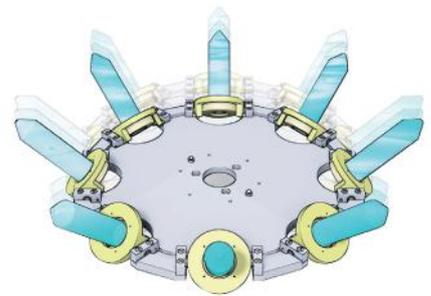
and place it in one of the eight automatically recognized centrifuge tubes.

Step 2: Auto-Solvent injecting



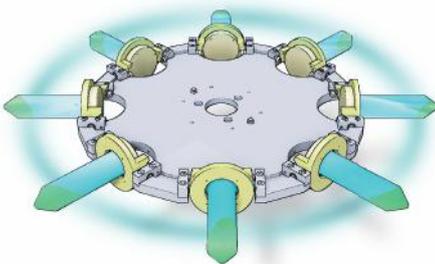
Pre-loaded syringes are placed above the tubes. All tubes are filled at the same exact time.

Step 3: Auto-Shaking



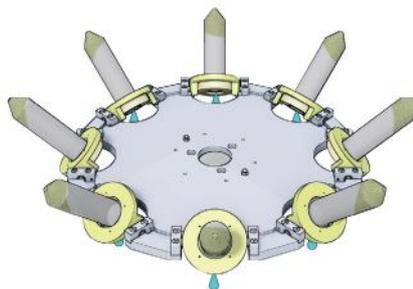
A patent-pending, automated system simulates proper shaking by hand.

Step 4: Auto-Centrifuging



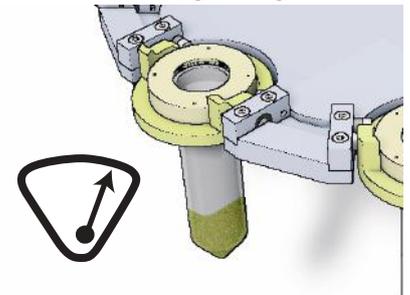
The procedure stops without braking, after all the tubes are centrifuged at 1000g for 15 minutes.

Step 5: Auto-Draining



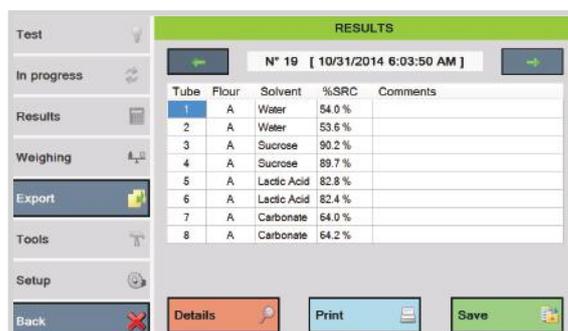
Caps are removed and tubes are upended to ensure complete draining.

Step 6: Weigh the gel



Each tube is weighed again, using the dedicated external balance.

Extra features



| RESULTS | | | | |
|---------------------------------|-------|-------------|--------|----------|
| N° 19 [10/31/2014 6:03:50 AM] | | | | |
| Tube | Flour | Solvent | %SRC | Comments |
| 1 | A | Water | 54.0 % | |
| 2 | A | Water | 53.6 % | |
| 3 | A | Sucrose | 90.2 % | |
| 4 | A | Sucrose | 89.7 % | |
| 5 | A | Lactic Acid | 82.8 % | |
| 6 | A | Lactic Acid | 82.4 % | |
| 7 | A | Carbonate | 64.0 % | |
| 8 | A | Carbonate | 64.2 % | |

All results are calculated, saved and printed.

Dedicated external balance: for weighing the empty tube, tube+flour, and tube+gel; all data are automatically transferred to the operating system, so no hand-writing, and no errors.

Intelligent tubes: centrifuge tubes are encoded and automatically recognized by the SRC-CHOPIN software.

Create your own testing protocol: test each of two flour samples with four solvents, or one flour sample with two sets of four solvents, or one flour sample with a single solvent eight times...the flexible SRC-CHOPIN

Transfer your data to a PC.