CHOPIN TECHNOLOGIES

a KPM ANALYTICS brand

Solutions for Cookies manufacturers

Tools for measuring the primary criteria affecting final Cookies quality:

- Water absorption of flours
- Quantity and quality of proteins
- Damaged starch and dough stickiness
- Dough consistency, extensibility and elasticity
- Cracks and blisters

INDUSTRY CHALLENGES

A cookie is a small cake-like product, either flat or slightly raised, usually – but not always, with a relatively low moisture content, made from a dough or batter that is sufficiently viscous to permit the dough pieces to be baked on a flat surface. Cookies come in an infinite variety of shapes, sizes composition, texture, tenderness, colours and tastes. The term cookie is synonymous with biscuit, which is used in most countries other than the United States of America, and Canada.

Soft wheat flour is preferred to produce cookies because it binds less water that hard wheat flour. Water relationship in cookie dough has a major effect on cookie quality (i.e., cookie spread, texture). If hard wheat flour is used in a cookie formula, the result is usually a tough or very hard cookie that spreads little during baking. Superior cookies and biscuits are prepared with soft wheat flour and cookies made from such flour have better appearance and eating quality as well as a more tender bite than those made from hard wheat flour.

There are many different types of cookies and great variation in manufacturing processes. However, one process that could be considered representative consists of mixing flour, sugar, water, and fat (sometimes with a little salt and / or baking powder) followed by rolling and cutting. These steps are followed by baking. Varying periods of rest of the dough are common.

Because the recipe is relatively simple, the quality of the finished product depends greatly on the characteristics of the flour. In particular, it is important to have good **water absorption** capacity for the formation of the dough, while not leaving room for the development of **stickiness** problems.

The dough can be divided by volumetric dosers that pump a precise quantity of the dough.

At this stage, **consistency** and **viscosity** should be optimal. During rolling, the dough should show good **extensibility**. For the cutting phase, dough that is too **elastic** will negatively impact the size of the finished product. The cookies should also be free of **cracks or blisters**.

Identifiying the key elements that affect the final quality of the product is essential in order to implement effective quality control. There is a common knowledge base that can be applied; however, the mechanics of each production line influences the results. A more modern approach is for a company to objectively measure what works on its lines, and to focus its quality control on the most important elements.

Master the Key Points of the Process

Water absorption:

This is the quantity of water that can be added to the flour to result in the desired plasticity (firmness, extensibility, elasticity). If you do not put in enough water, the dough is dry, hard and brittle; if you put in too much, it becomes soft and sticky. For cookies, the required level of hydration is low (30 - 50%). The amount of water that any flour can absorb decreases with low levels of protein, damaged starch (particle size) or pentosans

These flour characteristics are particularly important in the manufacture of cookies (dry) because, as the water content of the finished products is very low (<5%), most of the water absorbed in the mixing process must be evaporated during baking, an expensive process. It is very simple to measure water absorption directly using the **Mixolab 2**, the **Alveolab**, and the **SRC-CHOPIN**. A good estimate can be obtained by measuring starch damage (**SDmatic**, **SRC-CHOPIN**), protein levels (**NIR**: **Infraneo**, **Spectralab**), and pentosans (**SRC-CHOPIN**).

Stickiness:

Stickiness appears when the water is added to flour and is not properly absorbed or retained by the dough. This phenomenon often occurs when starch damage or pentosan levels are too high and the protein levels are too low. Sticky dough causes process machine problems, mainly when mixing and shaping. Starch damage can be measured directly with the **SDmatic**, and protein levels are measured with **NIR** devices. The **SRC-CHOPIN** can simultaneously measure the quality of damaged starch, proteins, and pentosans.

Dough consistency:

Dough consistency depends on the amount of water added and the ability of the flour to absorb it. This consistency changes during mixing, reflecting the formation of the gluten network. For any given level of hydration, the consistency of the dough represents its firmness, its hardness. This depends, on the quantity and quality of the proteins, the starch damage, and the pentosans. Mixing consistency may be measured by either the **Mixolab 2** or, after shaping, by the, **Alveolab**. It is also possible to individually measure the factors responsible for consistency: proteins (**NIR**, **SRC-CHOPIN**), damaged starch (**SDmatic**, **SRC-CHOPIN**) and pentosans (**SRC-CHOPIN**).

Extensibility:

It is the capacity of the dough to be stretched without breaking. For a given consistency, it depends mainly on the quality of the protein network. Dough that is not very extensible will not spread during rolling; conversely, dough that is too extensible will not hold shape well enough. Extensibility is measured directly when testing with the **Alveolab**.

Elasticity:

Elasticity is the tendency of the dough to return to its initial position after its shape is distorted, such as by rolling. It takes a certain level of elasticity for the dough to be machinable. If the elasticity is too low, the dough won't hold shape; if it is too high, the dough will tend to retract, which impacts the size of the finished product. Elasticity is measured directly and exclusively with the **Alveolab**.

Cracks and blisters:

Two common faults in cookies making are cracks and blisters. The latter are linked to starch damage that is too high (measured by the **SDmatic**) and a protein network (protein level) that is too strong (measured by **NIR**) and/or tenacity (measured by the **Alveolab**).

In this case, water is distributed poorely between the 3 main molecules in the dough responsible for the absorption of water: gluten, damaged starch and pentosans. The **SRC-CHOPIN** makes it possible to analyze the contribution of each of these molecules and to determine the best profile for the manufacture of biscuits.

Key Point \ Solutions	NIR	SDMATIC	SRC-CHOPIN	ALVEOLAB	MIXOLAB 2
Water absorption	X	X	X	X	X
Stickiness	(X)	X	X		
Dough consistency	(X)	(X)	(X)	X	X
Extensibility				X	
Elasticity				X	
Cracks and blisters	X	X	X	(X)	

X : direct measurement. (X) : indirect measurement

CHOPIN TECHNOLOGIES' SOLUTIONS IDENTIFY THE KEY ELEMENTS AFFECTING THE QUALITY OF YOUR BAKING PRODUCTS

Measuring moisture and protein levels by near-infrared analysis (NIR)

The **Infraneo** is a near-infrared (**NIR**) analyzer that works on both whole and powdered grains. It uses transmittance and monochromator technology. Simple, reliable, and precise, it can rapidly measure many parameters such as humidity and protein content, that affect the **absorption of water**, **stickiness**, **consistency** such as humidity and protein content, as well as the phenomena of **cracks** and **blisters**. The **Spectralab** is an infrared analyzer that operates based on reflectance. With a wider measurement spectrum, it also determines moisture and protein.

Measuring starch damage

The **SDmatic** allows for simple, fast, safe analysis of starch damage. Based on the measurement of iodine absorption, it works on 1 gram of flour and provides results in only 10 minutes. The reliability of the **SDmatic** has been confirmed in international collaborative studies. It is a standardized method recognized by AACC, ICC, ISO, CEN Afnor, Gost, etc. Starch damage affects **water absorption**, **consistency**, and phenomena of **cracks and blisters.**

Measuring flour functionality

The **SRC-CHOPIN** is a means of measuring hydration based on the increased swelling capacity of the various flour polymers when they are in contact with particular solvents.

It performs 4 measurements in one automated test:

- **Water absorption** (Solvent: distilled water)
- **Glutenins** (Solvent: Lactic Acid)
- **Damaged starch** (Solvent: Sodium carbonate)
- **Pentosans** (Solvent: Sucrose)

The **SRC-CHOPIN** is a method recognized by the AACC. It allows one to measure **water absorption** and factors influencing the **stickiness** and **consistency of dough**, as well as the phenomena of **cracks** and **blisters**.

CHOPIN TECHNOLOGIES' SOLUTIONS IDENTIFY THE KEY ELEMENTS AFFECTING THE QUALITY OF YOUR BAKING PRODUCTS

Measuring firmness, extensibility, and elasticity

The **Alveolab** has been an internationally recognized method (AACC, ICC, ISO, CEN, Afnor, Gost, and others) for many years; it measures the characteristics of dough during the swelling of a bubble.

Completely adaptable, the Alveolab directly measures:

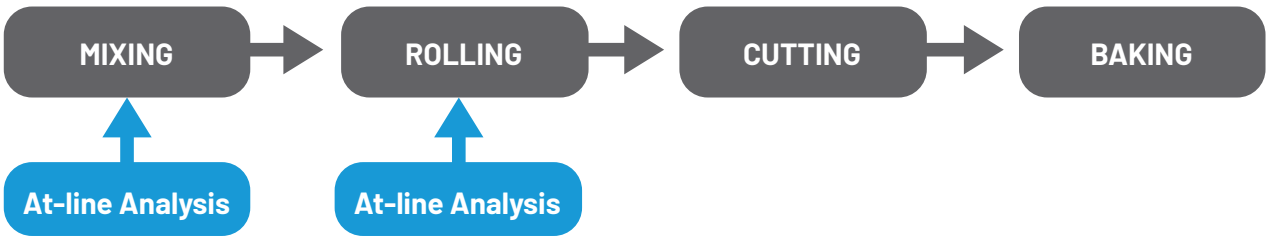
- **Firmness** (the resistance of the dough to deformation, its consistency)
- **Extensibility** (the ability to stretch the gluten network)
- **Elasticity** (the tendency of the dough to return to its original position after stress)
- **Force** (the work required to deform the dough)

The **Alveolab** allows one to work with both constant hydration and adapted hydration. It measures **water absorption** and characteristics of the dough such as **extensibility**, **elasticity**, and **consistency**.

Measuring the characteristics of the dough during mixing and baking

The **Mixolab 2** is the only internationally standardized device (AACC, ICC, ISO, CEN, Afnor, Gost, etc.) that can perform a complete analysis of dough that is subjected to temperature increase. It measures **dough hydration**, mixing behavior (**consistency**, deevelopment time, stability, and so on). It is the only device that allows you to observe the changes in the dough at the beginning of heating as well as during gelatinization and starch retrogradation. By working on representative doughs, the **Mixolab 2** allows one to get as close as possible to the actual conditions of use of flours.

"AT-LINE" CONTROL *

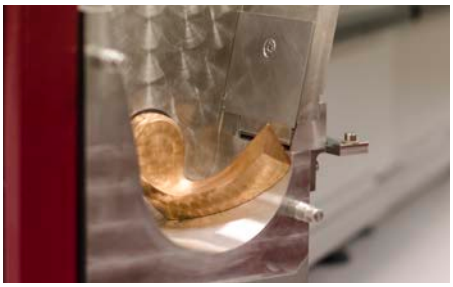


*A typical example; other processes and control points can be imagined.
Depending on the technical constraints encountered, it is possible to adapt the analysis protocols.

THE TOOLS:

Mixolab 2 Dough sample kit

The dough sample kit makes it possible to introduce, and to analyze simply, samples of about 100 grams of dough directly taken from the line.



Alveolab Kneader

The Alveolab kneader is suitable for receiving and extruding samples of approximately 300 grams of dough.

OUR TEAM IS HERE FOR YOU. CONTACT US!

Every manufacturing process, every factory, is different.

We'll help you:

- Define acceptance characteristics for the finished product.
- Define the key steps in the manufacturing process that influence the success of the finished product.
- Put in place effective quality control for these key steps (at-line control).
- Characterize your raw materials and assist you in setting up specifications based on what genuinely has an impact on your production.

HOW SHOULD I PROCEED?

Make a request on our website (*www.chopin.fr)*, and a technician will contact you to define the scope of your request.

Following this initial contact, an appointment (physical or virtual) will be scheduled which may lead to the establishment of a contract, possibly involving the provision of equipment* and the presence of an on-site technician* to assist you.

(Subject to availability)*

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