CHOPIN TECHNOLOGIES

a KPM ANALYTICS brand

Solutions for Burger Buns Manufacturers

Tools for measuring the primary criteria affecting final Burger Buns quality:

- Water absorption of flours
- Quantity and quality of proteins
- Characteristics of the dough (consistency, extensibility, elasticity, stickiness ...)
- Amylase enzyme activity
- Starch properties (damage, retrogradation)
- Dough development and gas production capacity during fermentation
- Volume and color

INDUSTRY CHALLENGES

The burger bun manufacturing process consists of mixing flour + water + salt + yeast (sometimes with a little fat or sugar) followed by a division in the form of balls of dough which will then be deposited in a mold. These operations are then followed by a fermentation step and then 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, while not leaving room for the development of **stickiness** problems. The dough can be divided by **volumetric** dosers that pump the dough. At this stage, **consistency** and **viscosity** should be optimal. During cuting, the dough should show good **extensibility** and dough that is too **elastic** will be avoided at is will negatively impact the size of the finished product.

During the **fermentation**, the gluten network must be of a suitable quality to ensure the **development of the dough** (following the production of CO_2) and its **stability** (CO_2 retention) which, together, will promote the volume of the finished product.

The finished product will also have to have a **color** adapted to the preferences of the consumers. Finally, in order to preserve the freshness of the bread, the starch **retrogradation** must be limited.

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.

It is common to use vital wheat gluten (to strengthening the “hinge”) and a high amount of sugar in bun production.

Master the Key Points of the Process

Water absorption:

This is the quantity of water that can be added to the flour to give it the necessary 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 burger buns, the required level of hydration is high (about 60%). The amount of water that any flour can absorb increases with high levels of protein, damaged starch (particle size) or pentosans. 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 cutting. 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 rolling 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**.

Volume:

The volume of the burger buns is primarily influenced by the volume of CO_2 produced by the yeast during fermentation. This volume is measured directly by the **Rheo F4**. The amount of CO_2 produced depends on the intrinsic activity of the yeast and also the amount of simple sugars available. The latter is directly influenced by the activity of the amylases present in or added to the flour, which degrade a portion of the starch into simple sugars, usable by the yeast. Amylase enzyme activity is measured with the **Amylab FN**.

Damaged starch, measured by the **SDmatic** is more easily attacked by amylases. It therefore positively impacts the volume. The volume is also dependent on the quality of the gluten network, measured with the **Alveolab** and the **Mixolab**. This determines the ability of the dough to develop during fermentation, and to retain the CO_2 produced, measured with the **Rheo F4**.

Color:

The burger buns are judged more or less appetizing by consumers according to their color. This parameter is essentially governed by the Maillard reaction, occurring during baking, which relates to the action of sugars on proteins. The more free sugars, the darker the burger buns will be. The colour, as with the volume, is related to amylase enzyme activity (**Amylab FN**), and indirectly by the level of damaged starch (**SDmatic**).

Retrogradation:

After baking, the starch will tend to partially recrystallize. This phenomenon is called retrogradation and explains why the products become hard (stale). The faster the starch retrogradation, the faster the burger buns will lose its freshness. As a result, flours with slow retrogradation are favored. The beginning of retrogradation is very easily measured with the **Mixolab 2**. Damaged starch has the effect of reducing the speed of retrogradation, it is measured with the **SDmatic**.

Solutions / Key Point	NIR	AMYLAB FN	SDMATIC	SRC-CHOPIN	ALVEOLAB	MIXOLAB 2	RHEO F4
Water absorption	X		X	X	X	X	
Stickiness	(X)		X	X			
Dough consistency	(X)		(X)	(X)	X	X	
Extensibility					X		
Elasticity					X		
Volume		X	X		X	X	X
Color		X	X				
Retrogradation			(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** and **consistency**. The **Spectralab** is an infrared analyzer that operates based on reflectance. With a much wider measurement spectrum, it particularly it also determines moisture and protein.

Measuring amylase enzyme activity

Amylab FN measures the amylase activity of flours, based on the Hagberg falling number principle, the global reference method in the cereal industry. It benefits from innovative technologies (induction heating, aluminum tube) allowing it to be simpler and safer to use than conventional appliances. Also, the **Amylab FN** embeds a rapid test mode, called the Testogram, which allows it to provide a result in 90 seconds, regardless of the sample. Amylase enzyme activity impacts **volume** and **color** of finished product.

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**, **stickiness**, **consistency**, **retrogradation**, as well as **volume** and **color** of finished product.

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**.

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.

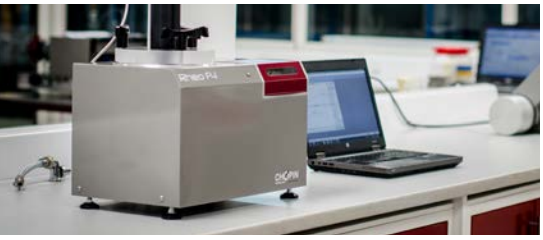
Completely adaptable, the Alveolab directly measures:

- **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**. The quality of the protein network also influences the **volume** of the finished product.

Measuring the characteristics of the dough during mixing and baking

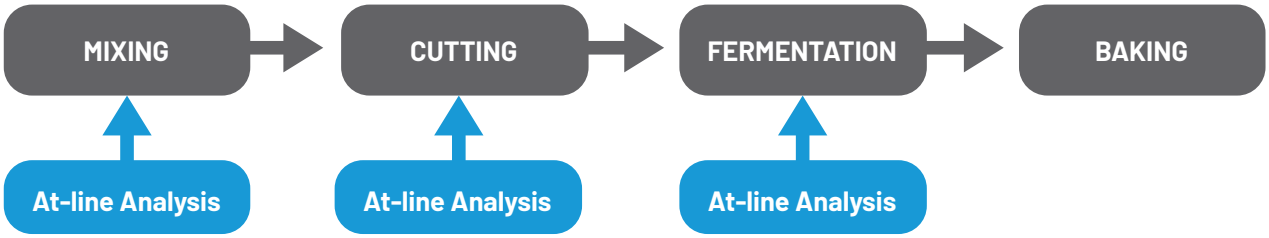
The **Mixolab 2** is the only internationally standardized device (AACC, ICC, ISO, CEN, Afnor, Gost, etc.) that can perform a complete analysis of dough that is subjected to increasing temperature. It measures **dough hydration**, mixing behavior (**consistency**, development time, stability, and so on) that will impact the volume of the finished product. 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.



Measuring the development and stability of the dough during fermentation

Rheo F4 is the only device on the market that can measure yeast gas production, dough development and gas retention of the dough (porosity and tolerance during **fermentation**) in a single test. These parameters directly influence the **volume** of the finished product.

"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 analysis protocols.

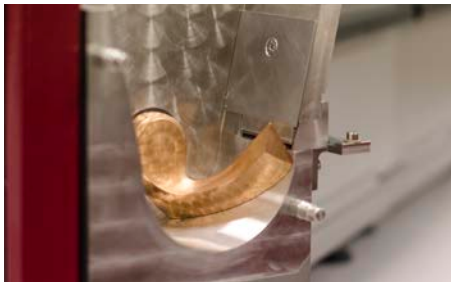
The tools:

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.

Rheo F4 Fermentation chamber

The fermentation chamber of the Rheo F4 is suitable for receiving samples of approximately 300 grams of dough.



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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