



a  **KPM**
ANALYTICS brand

Solutions for Wheat Tortillas Manufacturers



Tools measuring the primary criteria affecting final Wheat Tortillas quality:

- Water absorption of flours
- Quantity and quality of proteins
- Dough characteristics
(extensibility, elasticity, flexibility, stickiness, appearance, rollability ...)
- Starch properties
(damage, retrogradation)

INDUSTRY CHALLENGES

There are many different types of tortillas and great variation in manufacturing processes. However, one process that could be considered representative consists of mixing flour, water, salt, fat and leavening agents, followed by dividing the dough into balls and then a rapid proving (less than 10 minutes). The balls of dough are then pressed to flattened them. These steps are then followed by baking on a plate or tunnel type conveying oven. 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 quality of the flour. In particular, it is important to have good **water absorption** capacity to mitigate problems with **stickiness**. The division of the dough can be done by volumetric dosing equipment that pump the dough.

At this stage, the **dough consistency** and **viscosity** should be optimal. During flattening, the dough should show the desired **extensibility** and avoid **over-elastic** doughs that will impact the size of the finished product. The tortillas must be free of **aesthetic** defects such as cracks and have good **flexibility** for folding. In order to maintain their soft character, the starch retrogradation will have to be limited. Tortillas are usually produced from white flour, but wholemeal flour products are also possible.

Identifying 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 influence of the mechanisms involved differs for each production line. 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.

The quality criteria of tortillas are cell structure, opacity, pliability, appearance, texture and eating quality.

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 tortillas, the required level of hydration is low (30 - 40%). 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 added to the flour 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 when dividing and pressing tortillas. 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, at the moment, 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 pressing 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 :

This 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 pressing; 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 pressing. 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 appearance of the finished product. Elasticity is measured directly and exclusively with the **Alveolab**.

Flexibility:

One of the key parameters of tortilla quality is flexibility. The protein content (Infraneo) has a direct effect: a low protein level (<9%) will give an inflexible / brittle but more extensible product, while a high protein level (> 12%) will give a more flexible but of smaller diameter.

Beyond quantity, the quality of the protein network and the extensibility / elasticity balance (**Alveolab**) it possesses and supplies the dough is a key determinant. Flexibility is also positively influenced by the addition of amylases (**Amylab FN** and **Mixolab 2**) and a low level of damaged starch (**SDmatic**).

Appearance:

Tortillas may show cracks when folded (mainly on low-protein flours, Infraneo and Alveolab). Pillowing / bubbling problems during baking may also be present on flours. Protein too high and strong (**Infraneo** and **Alveolab**).

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 tortillas 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**.

Key Point \ Solutions	NIR	AMYLAB FN	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	
Flexibility	X	X	X		X	X
Appearance	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**, as well as the **stickiness**, the **consistency**, the **flexibility** and the **appearance**. The **Spectralab** is an infrared analyzer that operates based on reflectance. With a wider measurement spectrum, it also determines moisture and protein.



Measuring amylase enzyme activity

Amylab FN measures the amylase enzyme activity of flours, based on the Hagberg falling number principle, the global reference method in the cereal industry. It boasts innovative technology (induction heating, aluminum tube) allowing it to be simpler and safer to use than conventional devices. Also, the **Amylab FN** can be used in 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 the **flexibility** of tortillas.



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**, **flexibility** and **retrogradation**.



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)

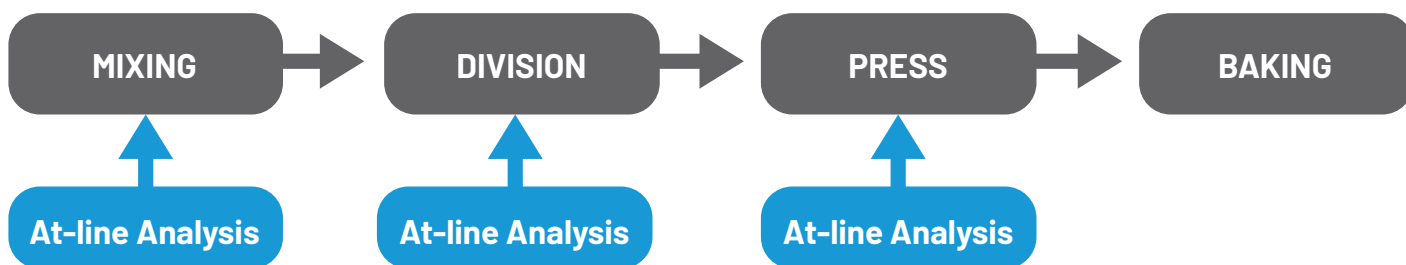
The **Alveolab** allows one to work with both constant hydration and adapted hydration. It measures **water absorption** and characteristics of the dough such as **extensibility**, **elasticity**, and **consistency** which also impact the **flexibility** and **appearance** of tortillas.



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**, development 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 the flours.

"AT-LINE" CONTROL*



*A typical example; other processes and control points can be imagined.

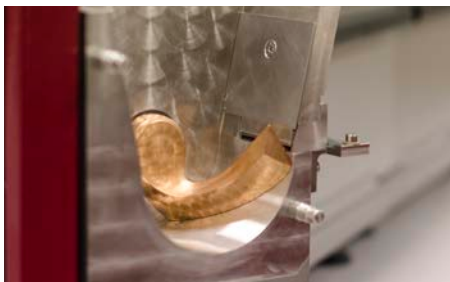
Depending on the technical constraints encountered, it is possible to adapt the analysis protocols.

THE TOOLS:



Mixolab 2 Kit 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)