CHOPIN TECHNOLOGIES

a KPM ANALYTICS brand

Solutions for Noodles Manufacturers

Tools for measuring the primary criteria affecting final Noodles quality:

- Water absorption of flours
- Ash content
- Quantity and quality of proteins
- Starch properties (damage, gelatinization)

INDUSTRY CHALLENGES

Noodles are widely consumed in East and Southeast Asia and are a staple in Northern China. The popularity of noodles, particularly that of instant noodles, has spread globally. There are two general types of wheat flour noodles: white salted (example: Udon), and yellow alkaline (example: Ramen). Noodles are generally made from common wheat flour, rather than from semolina or farina obtained from Durum wheat, and contain salt(s), in addition to flour and water. However, starch noodles, made principally from mung bean starch, are also produced throughout Asian countries but are consumed less frequently than flour noodles.

Chinese noodles are generally made from hard wheat flours, characterized by bright creamy white or bright yellow color and firm texture. Japanese white salted noodles are typically made from soft wheat flour of medium protein content. It is desirable to have a creamy white color and a soft, elastic texture in Japanese noodles. The finer particle size and lower protein of soft wheat flour gives the soft, elastic bite and smooth surface desired for Japanese white salted noodles. As flour **protein** content increases, noodle **firmness** increases; therefore, the optimal flour protein for Japanese white salted noodles is lower than for yellow alkaline noodles. As protein content increases, flour becomes darker and, accordingly, noodle brightness is reduced.

Noodles can be made from either red wheat or white wheat. However, white wheat has an advantage over red wheat for making noodles because the bran specks from white wheat are less conspicuous.

There are many different types of noodles and great variation in manufacturing processes. However, one process that could be considered representative consists of mixing a combination of flour, water, and salt, followed by rolling the dough and then cutting it. These steps are then followed by either cooking or drying.

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**. Furthermore, during rolling, the dough should exhibit optimal **consistency**, and above all, good **extensibility**.

When cutting, avoid dough that is too **elastic**, as this will affect the appearance of the finished product. The finished product should have a perfect color, without **specks**, and satisfy consumers in terms of **texture**, **consistency**, and **firmness when cooked**.

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 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 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 give it the necessary plasticity (firmness, extensibility, elasticity). If you do not add in enough water, the dough is dry, hard, and brittle; if you add in too much, it becomes soft and sticky. For noodles, the required level of hydration is generally relatively low (between 30 and 40%). The amount of water that any flour can absorb increases with higher levels of protein, damaged starch (particle size), and 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**).

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, or 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 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**).

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 problems when rolling and cutting noodles. 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.

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

Specks:

Specks are present in high-extraction flours. They indicate the contamination of white flour by bran and are closely related to ash content. They affect the color of the finished product, making it grayer and less glossy. For noodles, we want the ash content to be as low as possible (0.30-0.50%). It can be measured using appropriate **NIR** tools (**Spectralab)**.

Firmness when cooked:

It is important that noodles maintain their structure during cooking. In particular, starch should not be allowed to leach into the cooking water and thereby cause stickiness between the noodles. Achievement of this depends on optimal isolation of the starch granules in the protein matrix. Damaged starches tend to leach more easily. We therefore measure flour starch damage with the **SDmatic**.

Noodle texture:

Noodle texture largely depends on firmness after cooking and on how gelatinization occurs. Some types (udon) need a higher gelatinization peak than others. It is possible to measure the behavior of dough during gelatinization with the **Mixolab 2**. Starch damage, which modifies its gelatinization capabilities, is measured with the **SDmatic**.

Solutions / Key Point	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	
Specks	X				
Firmness when cooked		X			X
Noodle texture		X			X

X : direct measurement. (X) : indirect measurement

CHOPIN TECHNOLOGIES' SOLUTIONS IDENTIFY THE KEY ELEMENTS AFFECTING THE QUALITY OF YOUR 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 that affect the **absorption of water**, such as humidity and protein content, as well as **stickiness** and **consistency**. The **Spectralab** is an **NIR** analyzer that operates based on reflectance. With a wider measurement spectrum, it is particularly well suited for measuring ash content.

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**, **texture**, and **firmness when cooked**.

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 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:

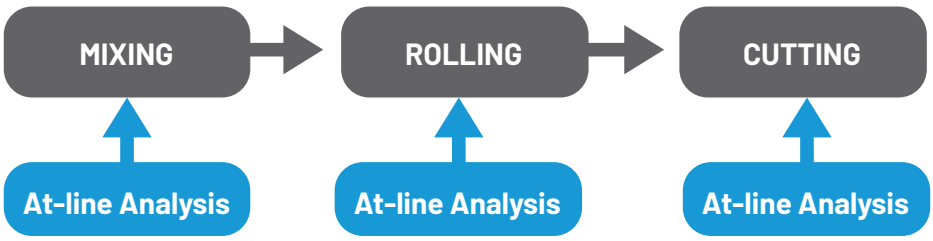
- **Firmness** (the resistance of the dough to deformation, its consistency)
- **Extensibility** (the ability to stretch the gluten network)
- **Elasticity** (the tendency of the dough to return to its original position after stress)
- **Force** (the work required to deform the dough)

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 cooking

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** and mixing behavior such as **consistency**, development time, stability, and so on. It is the only device that allows one 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 and make the best possible estimate of **texture** and **firmness when cooked**.

AT-LINE CONTROL *

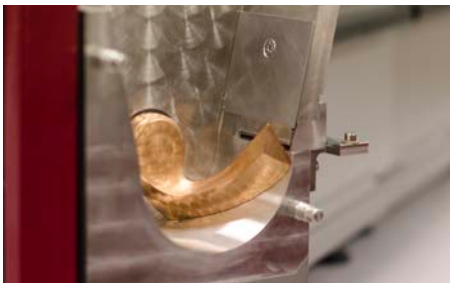


*A typical example; other processes and control points can be inferred.
Depending on the technical constraints encountered, it is possible to adapt the analysis protocols.

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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