

Machinability, Extensibility, Shaping

For the consumer,
a consistently product,
well presented and attractive,
is a token of quality, moreover it reflects
the baker's expertise.



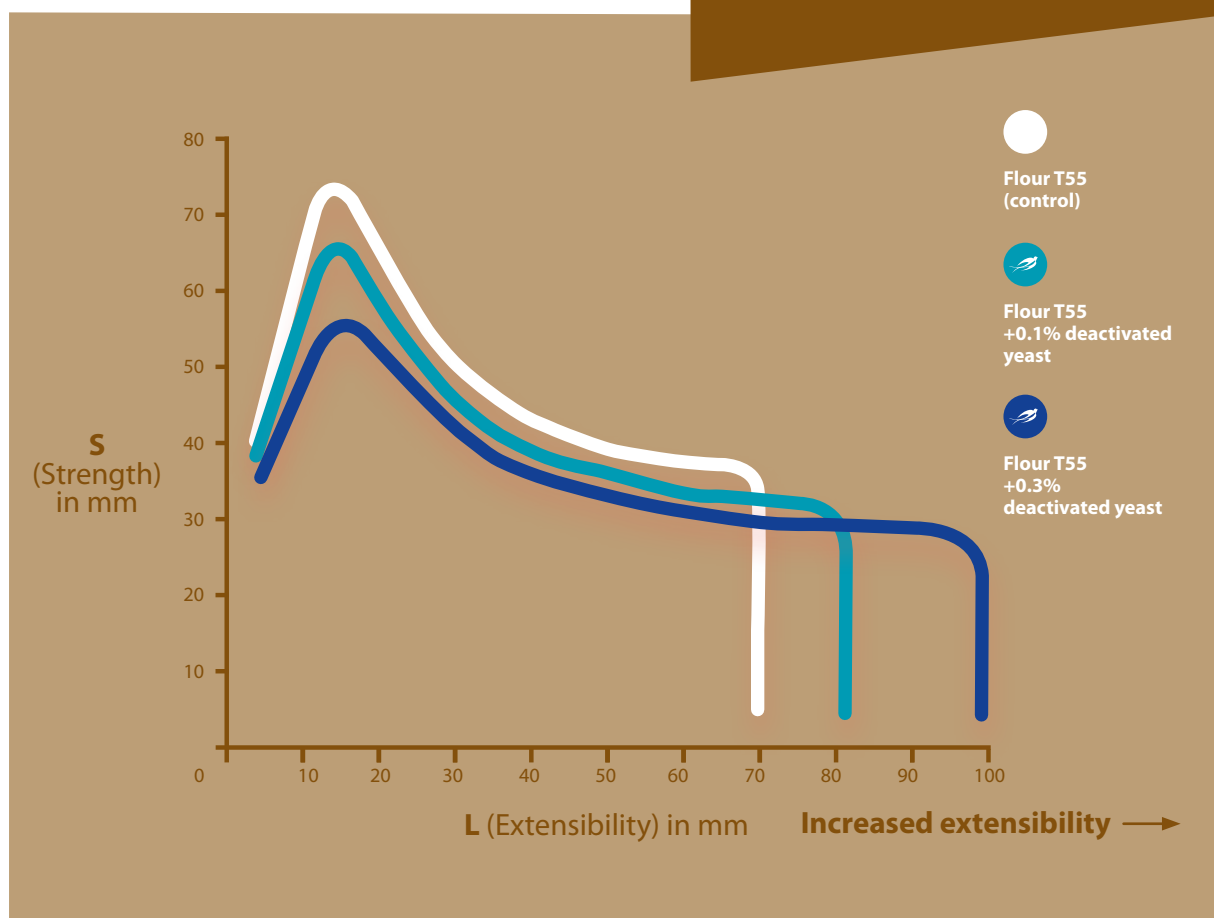
During mixing, the inter-twined strands of gluten are unravelled and rearranged together to form the gluten network that will trap the CO₂ gases produced in fermentation. During the formation of this network, redox reactions create disulphide bonds within the gluten proteins largely responsible for the viscoelastic properties of dough. Their activity is enhanced by the introduction of air during mixing and by the presence of oxidants, such as ascorbic acid.

THE CONSEQUENCES OF EXCESS DOUGH MATURATION

- **extended smoothing time** of dough,
- **difficulty** or impossibility **to pass onto automatic dividers**,
- **difficulty in shaping** resulting in dough shrinking (short baguettes), uneven products (oval-shaped pizzas or pastry discs), dough tearing or excessive thinning of dough in the lamination.

These constraints may lead to flat, misshapen finished products or irregular results.

Improved extensibility allows to reduce, if not to eliminate dough shrinking.



IMPROVED EXTENSIBILITY OF DOUGH MEASURED WITH A CHOPIN ALVEOGRAPH

DEACTIVATED YEAST FOR IMPROVED MACHINABILITY, EXTENSIBILITY AND SHAPING

What is deactivated yeast?

Deactivated yeast is obtained from live yeast, produced in a specific fermentation process before undergoing thermal treatment. This action inhibits yeast fermentation power and destroys its cell walls, thereby making the glutathione content available and soluble in its environment. Deactivated yeast is therefore a product of natural origin: in terms of regulation, it is therefore not regarded as a food additive and its labelling varies depending on the country (i.e. "yeast" or "deactivated fermenting agent").

How does it work?

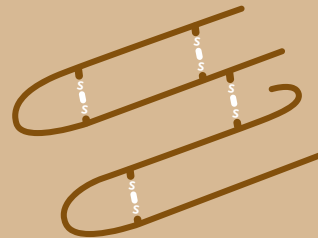
Deactivated yeast is rich in tripeptides naturally present in yeast. These reduce the number of strong bonds between the protein macromolecules and consequently facilitate sliding between them. The impact is visible from the beginning of the mixing step and at each stage in the process with the following results:

- **reduced mixing time** and lower oxidation due to faster dough smoothing process;
- **easy insertion into the divider** and more even dough pieces due to inhibited dough maturation during first rise;
- **shaping/lamination made easy** due to increased extensibility and reduced elasticity. Shrinkage phenomena are thus avoided, and the rest time between folding stages is shortened and presentation on the automated lines is more regular;
- **optimised volume** (dough extensibility reduces resistance to gas expansion).

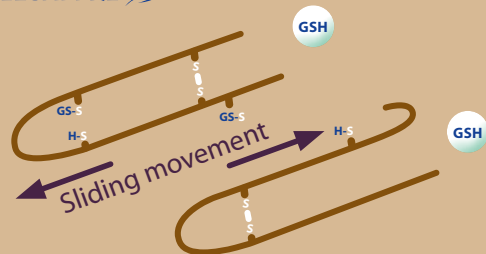
Lesaffre deactivated yeast minimises the formation of disulphide bonds between the gluten strands.

Gluten protein chains slide more easily alongside each other, thereby allowing volume increase and reducing shrinking.

WITHOUT DEACTIVATED YEAST



WITH DEACTIVATED YEAST LESAFFRE



Glutathione /gluten bond



Disulphide bond (oxidised form)



Reduced form



Glutathione brought by yeast

OPERATING PRINCIPLE OF GLUTATHIONE



PROTEASES, TO BE USED WITH CAUTION

Proteases, whether of bacterial or fungal origin, are permitted in certain bakery applications as processing aids. They are commonly used in the production of tin bread and buns, which require a very soft dough when placing in moulds. They are also used for the manufacture of crackers, biscuits or wafers, which would otherwise be adversely affected by excessive elasticity.

Proteases, which work hydrolysing gluten, should nonetheless be handled with care: their action on the gluten substrate is effective throughout the entire process until the enzymes are denatured during baking. A lack of knowledge of their use can result in liquefied dough, especially on automated production lines.



LESAFFRE SOLUTIONS

Lesaffre has developed several types of solution to resolve problems of machinability, extensibility and shaping:

• Breaking the disulphide bonds with :

- **deactivated yeast**, a natural reducing agent rich in glutathione, which is used to obtain a more voluminous end product and more uniform quality. Furthermore, deactivated yeast enables to keep a better structure of extruded doughs;

- **L-cystéine**, a reducing agent of animal or bacterial origin, which has the same operating principle as deactivated yeast. Unlike yeast, L-cysteine is a food additive (E920). Some countries do not permit its use. Using such a concentrated product requires precise dosing and therefore specific equipment;

These solutions are more caring in that they modify the structure of gluten network without adversely affecting the protein chains.

• by breaking the bonds between amino acids with the aid of proteases.

These break the gluten protein chains and weaken the structure. In order to bring sufficient and moderate flexibility to the dough, the proteases need to be pure and highly specific, in other words they must have a strong affinity for the target substrate (gluten).

Most of the active principles described are available in the Lesaffre range. Nevertheless, given their activity and dosage levels, use is recommended either with:

- **neutral bases**, thus facilitating dosage level compatible with the environment.

- **or as mixes**, which allow to optimise dosage, by acting on the existing synergies between the active principles, and better regulate the potentially undesirable effect of using pure substances.