Agitation and Mixing

Hydration of flour

The hydration rate of the dough is a fundamental parameter from both qualitative and economic points of view. Each flour has a basic hydration rate which depends of course of its own organic properties, but also of a number of external parameters. The technique of incorporating water into flour, that is to say the various dough mixing parameters, starting with the mixing, can have an influence on the ability of the baker to take maximum advantage of the hydration capacity of his flour.

Composition of standard flours destined to the manufacture of bread

Starch:	68 à 72%	absorbs 1/3 its own weight in water	→ water absorption capacity from 22 to 24%
Water:	10 à 16%		→ water absorption capacity from 10 to 16%
Gluten:	8 à 12%	absorbs 3 its own weight in water	→ water absorption capacity from 24 to 36%
Sugars:	1 à 2 %		
Fat:	1,2 à 1,4 %		
Minerals:	0,5 à 0,6 %		
Vitamins			
Bran			
Total Capacity of water absorption			from 56 to 76%

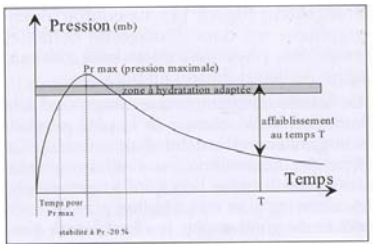
Thus, we see that the variation causes of hydration rate of flour are numerous, especially that apart from simple quantitative parameters above, you can add organic and environmental parameters:

- Extraction rate by flour bran: the absorption rate of water by the bran is higher than that of flour; the more we have bran in flour, the more it absorbs water volume.
- Its baking power (gluten quality)
- the humidity rate of room air

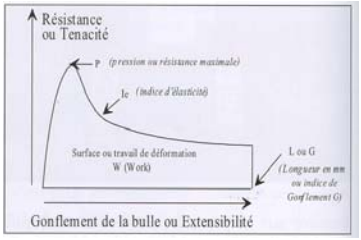
Importance of hydration

Water plays an essential role in the manufacture of bread dough. Water has the effect of inflating the starch granules and softening the gluten contained by the flour. Thus it promotes the formation of a fibrous network allowing the work of the dough. In addition, water dissolves the salt and creates a humid environment necessary for the action of yeast and enzymes, thus initiating the process of fermentation. The increase in dough hydration causes a lowering of their consistency, but provides improved scalability during the mixing. The PTO phenomena are accelerated. Despite a greater difficulty of shaping due to a more important sticky effect and less ability to deformation by compression, highly hydrated dough have a better ability to swelling and give rise to more developed breads. The moistness of the crumb is strengthened, we observe the constitution of more irregular seed cells and the conservation of bread is prolonged.

The theoretical hydration rate of the flour used is an experimental average value measured in the laboratory for standardized tests based on alveographic and rheological measures (farinograph, consistograph, alveograph). It is the result of a number of tests and correlations mainly aimed at expressing the optimal mechanical characteristics (elasticity, swelling, baking strength…) of the dough at set hydration values.



Consistency Curve



Alvéographic Curve

These experimental values are obtained based on optimal conditions and it is important to note that many parameters can fluctuate results. We cite mainly, among these variation factors, water quality (hardness, mineral content, impurities, and temperature), the ambient state of humidity and the optimization of mixing.

It is important to note that the mixing parameters are paramount and that it is possible to significantly increase the maximum hydration of the dough by adjusting the time and speed of mixing but also and mainly by using tools adapted to maximal stretching of fibers of the glutinous network to promote the phenomenon of water retention.

To Learn More:

Literature

- *Les Pains Français – Philippe Roussel, Hubert Chiron (Editions Maé-Erti)*
- *Le Compagnon Boulanger – Jean-Marie Viard (Editions Jerome Villette)*
- *La Boulangerie Moderne – Raymond Calvel (Editions Eyrolles)*

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