

Purpose and importance of dampening in wheat milling process

Dampening is an essential part of the wheat milling process. Affecting the flour quality and extraction, an effective dampening operation helps millers achieving better results.

The process of dampening, also referred to as tempering or conditioning, is an important process in grain milling that is used to provide optimum moisture level of the grain before the grinding process. This optimum moisture can be defined as 'the bran should be hard enough to be separated from the endosperm easily, and the endosperm should be soft enough to be milled properly'.

The process plays an important role on the milling yield and bread-making quality of the flour. It ultimately helps to adjust the flour moisture content as well, which has an important role on profitability.

Impact of the dampening process: How does it work?

The fragile wheat bran tends to crumble during milling, making its separation from the flour harder, ultimately reducing the quality of the flour. The dampening process allows the endosperm to mellow and soften, and the bran to get elasticity so that they can be separated easily from each other.

- When the moisture of wheat is above the optimum level, it will be very difficult to separate the bran and endosperm during milling and sifting, due to the increasing cohesion and stickiness of the bran and endosperm.
- If the moisture is lower than the optimum level, the bran and endosperm both become easily crumbled, obtaining a higher amount of flour but of a lower quality.
- In optimal dampening conditions, the bran can be observed in bigger particles like flakes during the milling, and easily separated in sifting operation.

The Process: How dampening is applied?

The dampening process includes two main stages. The first one is bringing the moisture content of the wheat to the optimum level by adding water, or extracting water in some cases.

The second stage is the resting period in dampening silos for a certain time, to allow the absorption of the water and spreading it along the entire wheat kernel. The water must have enough time to penetrate into the kernel, which is called as "dampening time".

Factors Affecting the Dampening Process

Grain dampening can be considered as a hydrothermal process. The three main factors affecting the dampening process are: water amount, temperature, and time. It should be considered that the final moisture of flour should not exceed 14.5%, otherwise the flour quality will be negatively affected during the storage.

Water Amount

Water significantly impacts the efficiency in milling and sifting. The optimum level of moisture before the grinding process varies depending on the type of wheat. The ideal moisture levels prior to milling (at the 1st break) is given in Chart 1.

In dampening, generally 5-8% water is added to the grain. Especially for hard wheat, since it is not possible to add it all at once, the process is completed in two stages.

The maximum amount of water that can be absorbed by a grain corresponds to 40% of its weight.

Temperature

The heat accelerates both the absorption and the spreading of water into the wheat kernel. Thus, the required time for dampening is shortened with the increasing temperatures.

When the level of moisture in the grain is higher than desired, hot air is used to reduce the amount of water in the wheat. The use of heat in dampening reduces time as and also contributes to the flour quality, however; it should be also considered that high temperatures may affect the wheat structure negatively.

The relation between the temperature and dampening time is shown in the Chart 2.

Time

The duration of the process is determined by grain properties and the temperature applied. However, for the even spreading requires a resting period of 12-24 hours for soft wheat and 24-48 hours for hard wheat as detailed in the Chart 3.

Along with these factors, others such as the type of wheat, ambient conditions etc. affect the dampening

Type of Wheat	Ideal Moisture (%)
Very Hard	16.5 - 17.5%
Hard	16.0 – 17 %
Semi Hard	15.5 - 16.0%
Soft	14.5 - 15.0%

Chart 1. Ideal moisture before milling

Temperature (C°)	Dampening Time
21	2 -3 days
27	12 hrs
40	8 hrs
60	2 hrs
80	40 min

Chart 2. Relation of temperature and dampening period

Type of Wheat	Dampening Time (hours)
Very hard	36-48
Hard	24-36
Semi-hard	18-24
Semi-soft	12-18
Soft	6-12

Chart 3. Tempering time for different types of wheat

process. For this reason, different dampening procedures can be applied during the summer or winter periods.

Nebuliser (TNBM) device can be used when it is difficult to reach desired moisture content due to very hard wheat types, excess ambient temperatures etc. In this process, 0.3 -0.5 % amount of water is sprayed into the wheat to support water absorption.

Debimeter (TEDM) is also used for the adjustment of water amount during dampening process.

Dampening Methods and Technology

Various methods and technologies are used for dampening of the wheat including cold, warm, and hot dampening, vapor dampening, microwave and ultrasound dampening etc.

Alapala's **Intensive Dampening Machine (TCTS)** is widely and effectively used to increase the moisture level in grains. The inclined helsonic screw it features, the wheat is homogenously mixed with water. The machine offers a high capacity and efficiency in the dampening process.

Compared to inclined models, Alapala's **Horizontal Dampening Machine (TCTI)** offers even better efficiency in dampening with more water absorption in shorter periods.

The machine consists of two independent sections with different paddle design and rotor diameter. The first section is designed for pre-mixing process, while the intensive mixing and dampening operation is carried out in the following section.

Complementing the machines mentioned above, **Automatic Dampening Machine (TOCA)** measures the moisture content, temperature, flow rate, and specific gravity and calculates the required amount of water automatically. It delivers a very high precision with infrared technology.



Intensive Dampening Machine (TCTS)



Horizontal Dampening Machine (TCTI)



Automatic Dampening Machine (TOCA)