

2.3: Milling of Wheat

Milling of wheat is the process that turns whole grains into flours. The overall aims of the miller are to produce:

- A consistent product
- A range of flours suitable for a variety of functions
- Flours with predictable performance

The very first mill operation is analyzing the grain, which determines criteria such as thgeluten content and amylase activity. It is at this point that decisions about blending are made.

Following analysis, milling may be divided into three stages:

- Cleaning and conditioning – ridding the grain of all impurities and readying it for milling
- Crushing or breaking – breaking down the grain in successive stages to release its component parts Reduction – progressive rollings and siftings to refine the flour and separate it into various
- categories, called streams

Cleaning

Wheat received at the mill contains weeds, seeds, chaff, and other foreign material. Strong drafts of air from the aspirator remove lighter impurities. The **disc separator** removes barley, oats, and other foreign materials. From there, the wheat goes to the scourers in which it is driven vigorously against perforated steel casings by metal beaters. In this way, much of the dirt lodged in the crease of the wheat berry is removed and carried away by a strong blast of air. Then the magnetic separator removes any iron or steel.

At this point, the wheat is moistened. Machines known as whizzers take off the surface moisture. The wheat is then **tempered**, or allowed to lie in bins for a short time while still damp, to toughen the bran coat, thus making possible a complete separation of the bran from the flour-producing portion of the wheat berry. After tempering, the wheat is warmed to a uniform temperature before the crushing process starts.

Crushing or Breaking

The objectives at this stage are twofold:

- Separate as much bran and germ as possible from the endosperm
- Maximize the flour from the resulting endosperm

Household grain mills create flour in one step — grain in one end, flour out the other — but the commercial mill breaks the grain down in a succession of very gradual steps, ensuring that little bran and germ are mixed with any endosperm.

Although the process is referred to as crushing, flour mills crack rather than crush the wheat with large steel rollers. The rollers at the beginning of the milling system are corrugated and break the wheat into coarse particles. The grain passes through screens of increasing fineness. Air currents draw off impurities from the middlings. Middlings is the name given to coarse fragments of endosperm, somewhere between the size of semolina and flour. Middlings occur after the “break” of the grain.

Bran and germ are sifted out, and the coarse particles are rolled, sifted, and purified again. This separation of germ and bran from the endosperm is an important goal of the miller. It is done to improve dough-making characteristics and colour. As well, the germ contains oil and can affect keeping qualities of the flour.

Reduction

In the reduction stage, the coarser particles go through a series of fine rollers and sieves. After the first crushing, the wheat is separated into five or six streams. This is accomplished by means of machines called **plansifters** that contain sieves, stacked vertically, with meshes of various sizes. The finest mesh is as fine as the finished flour, and some flour is created at an early stage of reduction.

Next, each of the divisions or streams passes through cleaning machines, known as purifiers, a series of sieves arranged horizontally and slightly angled. An upcurrent draught of air assists in eliminating dust. The product is crushed a little more, and each of the resulting streams is again divided into numerous portions by means of sifting. The final crushings are made by perfectly smooth steel rollers that reduce the middlings into flour. The flour is

then bleached and put into bulk storage. From bulk storage, the flour is **enriched** (thiamine, niacin, riboflavin, and iron are added), and either bagged for home and bakery use or made ready for bulk delivery.

Extraction Rates

The extraction rate is a figure representing the percentage of flour produced from a given quantity of grain. For example, if 82 kg of flour is produced from 100 kg of grain, the extraction rate is 82% ($82 \div 100 \times 100$). Extraction rates vary depending on the type of flour produced. A whole grain flour, which contains all of the germ, bran, and endosperm, can have an extraction rate of close to 100%, while white all-purpose flours generally have extraction rates of around 70%. Since many of the nutrients are found in the germ and bran, flours with a higher extraction rate have a higher nutritional value.

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