Bushels, Test Weight, Shrink, and Storage

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What is a bushel and how does it relate to test weight?

A bushel is a volume measurement. Specifically, a volume bushel is the equivalent of 1.244 cubic feet (normally, a figure of 1.25 cubic feet is used). Looking at it another way, there are 4 pecks or 32 quarts in a bushel. Test weight is a measure of the weight of grain (usually expressed in pounds) per volume bushel. Each different type of grain has a standard bushel weight at a specific moisture content. These are: corn (shelled) – 56 lbs. at 15.5% moisture, soybean – 60 lbs. at 13% moisture, oats – 32 lbs. at 14% moisture, wheat – 60 lbs. at 13.5% moisture, and barley – 48 lbs. at 14.5% moisture. Given these relationships, volume calculations can be used to get a reasonable estimate of the number of bushels. Similarly, grain weight can be used to estimate bushels and is probably the most accurate method if adjusted for moisture.

The question sometimes arises as to how you figure the equivalent shelled grain bushels of ear corn. In this case, a volume bushel is figured as 2.5 cubic feet.

What is the relationship between grain moisture and test weight?

Grain moisture and test weight are related from the standpoint that as moisture increases, test weight decreases. For example, corn at 20% moisture will have a test weight that is 2 pounds lower than the same corn dried to 15.5% moisture. It doesn't matter whether the drying is done naturally in the field or artificially in a bin. This year's high measured test weights may be due, in part, to the fact that corn was much drier coming off the field than is normally the case. One reason why test weight increases as grain dries is that dry kernels pack together more easily than wet ones. Additionally, as moisture decreases, the kernels shrink and this allows for more kernels to fill a volume bushel.

What factors influence test weight?

Test weight is most often influenced by stresses that occur during the grain-filling period of the plant. Factors that decrease the rate or duration of grain fill can result in lower test weights at harvest. These stresses can be subtle or fairly dramatic. Included among these factors are drought, excessive soil moisture, nutrient deficiencies, lack of sunlight, temperature extremes, insect damage to leaf and stem tissue, frost, and hail. There are also differences in hybrids and varieties. Although test

weight may be a consideration when selecting hybrids or varieties, don't make it the only one at the expense of other important characteristics such as yield and disease resistance.

What goes into determining a "shrink factor"?

Shrink is the weight loss that occurs to corn during a mechanical drying process. The shrink factor is usually cited as the percentage weight loss for each point of moisture removed. When considering water weight loss only, the shrink factor is constant for any given final moisture [determined by dividing 100 by (100 minus the percent final moisture)]. For example, the shrink factor for a final moisture of 15 percent is 1.176. Total water loss for corn dried from 25 percent down to 15 percent would then be 11.76 percent (10 points removed x 1.176). The other factor that goes into determining a total shrink is handling loss. There will typically always be some weight loss to corn after it is dried that is not fully accounted for by water loss alone. Actual handling loss will vary from one operation to another but should be less than 1 percent of the total weight loss. Typically, handling loss increases as initial grain moisture increases.

Quoted shrink factors from grain buyers differ for several reasons. First, they may use a different final moisture to determine water shrink. Second, and probably the biggest factor, is that they use different values for handling loss when determining their final shrink factor(s).

How long can I hold corn in a bin that isn't completely dry?

Corn storability is a function of grain temperature and moisture content. For example, corn put in the bin at 60 degrees and 16% moisture can be held for up to 5 months. However, this same corn at 18% moisture can only be held for about 2 months. Likewise, as the temperature of the grain decreases, the allowable storage time at a given moisture increases. There is another component to grain storage aside from initial temperature and moisture. It involves the relationship between the outside air temperature and the grain temperature. It is recommended that the grain temperature be kept within 20 degrees of the outside air temperature. This means stored grain will need to be cooled to a temperature of 20 to 30 degrees for safe winter storage. The best way to do this is with aeration fans.