Monitor Stored Grain Condition;

Retain the Value of Your Crop

Studies in Nebraska have shown that most corn coming out of the combine is number one grade. To help ensure a quality product also comes out of the bin, monitor stored grain frequently to catch problems before they result in major losses.

Grain graders use four criteria to set the market grade of corn. These are:

1. Test weight
2. Broken kernels and foreign matter (BCFM)
3. Damaged kernels
4. Odor

Nothing can be done to improve grain quality once it is lost so it's important to maintain the quality you have. The two biggest factors affecting grain quality are **mold** and **insects**. The two most important management practices are

1. Managing moisture content
2. Managing grain temperature

Managing Moisture Problems

Mold growth affects two of the criteria for determining market grade: test weight and odor. Mold growth nearly stops when the moisture content of corn is below 16%. As long as grain is above 16% moisture, mold organisms will attack the grain, breaking down the starch and using it as the energy source for metabolism. Carbon in the starch is combined with oxygen, creating heat. The heat created in this process results in dry matter loss. Think of it as taking some of the corn and setting it on fire to create the same amount of heat. The difference is, instead of burning some corn to ash, a portion of the dry matter is lost from every affected kernel. This reduces test weight.

The rate of microbial respiration increases as the moisture content of the grain increases. It also increases with increasing grain temperature. *Table 1* shows the estimated shelf life of corn when held in the laboratory under carefully controlled conditions. The shelf life is defined as the time the corn can be held under the stated conditions before it loses one-half percent of its dry matter (this is about the maximum dry matter loss before corn loses a market grade).

Table 1. Shelf Life* (days) for aerated shelled corn

	Corn Moisture Content (wet basis)					
Temp°F	15%	17%	19%	21%	23%	25%
75	115	37	16	9	6	5
70	154	49	22	12	8	6
65	206	66	29	16	11	8
60	275	88	39	22	14	10
55	414	133	58	32	21	14
50	621	199	88	48	30	21
45	931	299	131	72	45	32
40	---	448	197	107	68	48
35	---	671	295	161	102	72

*Based on 0.5% dry matter decomposition. Proper aeration management is required to keep corn at the specified temperature.

Since microbial respiration creates heat in the grain, it can result in a run-away process — more heat causes faster respiration rates which create even greater heat. The shelf life estimates in *Table 1* assume a constant temperature is maintained in the grain. If the grain is not being aerated to carry away heat generated in the grain, the shelf life is estimated to be only one-third as long as shown in Table 1. This is why we recommend continuous aeration, rain or shine, when corn moisture content is above 18% and periodic aeration to maintain a uniform temperature anytime the moisture content is above 15.5%.

Managing Temperature Problems

Insect damage directly affects three of the four criteria used to determine market grade: damaged kernels, odor, and BCFM. In the upper Midwest we have the advantage of being able to cool our fall harvested grain simply by running the aeration system when ambient air temperature is lower than the grain temperature. Insects are far less active at temperatures below 50°F. Most species go completely dormant at 40°F, and many are killed below 30°F. Temperature affects mold growth as well. Mold growth is reduced below 50°F and nearly stops at temperatures below 40°F. Mold activity is greatly reduced below 16% moisture content at all temperatures. The university therefore recommends bringing corn down to 15% moisture and cooling it to between 30°F and 40°F if the grain will be held into the winter months. If held into the summer months, corn should be dried to 14% by May. Soybean moisture content should be two points lower than corn, 13% for winter delivery and 12% for spring delivery.

A bin of corn is a huge investment and should be monitored at least monthly throughout the storage period. Check grain temperature with a grain temperature probe several places near the

sidewall and near the center of the bin at least monthly. If there is more than a 10° difference in temperature, run the aeration fan to push a temperature front through the grain to create uniform temperature in the grain mass. This will stop convection currents from forming in the grain, leading to a wet spot in the top-middle of the bin.

Even when the temperature probe does not indicate a problem, check further. Open the access hatch on the roof and start the aeration fan. Lean into the hatch and feel the air on your face. Is the air warmer than expected? Does it have a musty or moldy smell? Can you feel high humidity in the exhaust air as it hits your face? Does condensation form on the bin roof on a cold day? These can be signs of the presence of a wet spot somewhere in the grain mass that may have been missed when you probed the grain. If you detect a potential problem, open all the exhaust hatches and continue to run the aeration fan. If the bin is equipped with a stirring device, make a round or two while aerating to break up pockets of high moisture grain. If the bin does not have stirring devices, it may be wise to remove several hundred bushels of grain from the bin to locate and break up wet spots.

The amount of time required to push a temperature front through grain depends on the airflow rate. To estimate how many hours it will take to push a temperature front through grain, divide 15 by the airflow rate in cfm/bushel. (A temperature front will take 15 hours with 1 cfm per bushel, 30 hours with 0.5 cfm per bushel and 150 hours with an airflow rate of 0.1 cfm per bushel.) Check grain temperature at several locations to determine when the cooling front has been pushed completely through the grain.

Finally, when not running the aeration system, remember to close roof hatches to prevent rain and snow from getting into the bin. Also cover the fan opening whenever it's not running to prevent problems caused by the chimney effect that can draw in moist air at the bottom of the bin and up through the grain. This can result in wet moldy grain on the bottom of the bin caused by condensation of moisture onto the cold grain.

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