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William F. Wilcke

University of Minnesota

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POST-HARVEST MANAGEMENT STRATEGIES FOR '93 CORN

William F. Wilcke
Assistant Professor
Extension Agricultural Engineer
Department of Agricultural Engineering
University of Minnesota, St. Paul

Cool, wet growing seasons like 1993 can result in late harvest of wet, immature, low-quality corn. Quality problems include:

- low-test weight—and test weight might not increase during drying like it does with mature corn,
- high BCFM content (broken corn and foreign material, commonly called fines) and high susceptibility to further breakage,
- poor storability,
- and possibly, preharvest contamination with mycotoxins produced by *Fusarium* fungi.

Artificial drying of this wet corn is slow and expensive and can aggravate quality problems. Our challenges are:

- to control drying costs,
- to select and manage drying systems to get as much capacity (bushels per hour) as we can without further degrading grain quality,
- and after the corn is dry, we need to manage storage bins carefully to prevent spoilage.

**Artificial Drying**

**Avoid drying.**

One of the best ways to control drying costs is to completely avoid drying, if possible. When test weight is low, discounts in the commercial marketplace are usually greater than the real loss in feed value of the corn. In other words, corn producers would probably be better off using the corn as feed on their own farms, or selling it directly to someone who can feed it. Beef and dairy operations, and some swine operations, have opportunities to feed corn without drying it. Beef and dairy operations might be able to make more silage or high-moisture ground ear corn. If conventional silos aren’t available, bags or plastic-covered piles might be options. High-moisture shelled corn might be an option for beef, swine, or dairy. Optimum moisture is 25 to 30%. Up to 35% moisture is acceptable, but above 35%, corn will likely leach excessively, bridge, and freeze in the silo.
Before immature corn is harvested for feed, it should be checked for signs of *Fusarium* fungi. If the corn is moldy, samples should be tested for mycotoxins. Once mycotoxin levels are known, decisions can be made about type of livestock to feed the corn to (susceptibility to mycotoxins varies by age, species, and breeding status), how to feed it, or whether to harvest the corn at all.

Leaving corn to dry in the field over winter is not recommended. For one thing, the risk of experiencing high field losses is very great. For another, spring harvest can delay planting and reduce the yield of next year’s crop.

**Don’t overdry.**

With proper aeration, corn fed during winter months can be held at 15 to 18% moisture. Corn that will be sold or held into spring should be dried to 14 to 15% moisture. Corn for long-term storage should be dried to 13%. Drying beyond these moisture contents isn’t necessary for properly-managed storage and it takes extra energy, reduces dryer capacity, reduces weight available for sale, and makes kernels more susceptible to breakage.

**Dryers need preseason and in-season maintenance.**

In years when corn is unusually wet at harvest, we see a greater number of dryer breakdowns and dryer fires. This is because dryers are used more hours than normal, and because low-quality corn results in a build up of chaff and fines in and around the dryer. To keep the dryer running reliably and to reduce the chance of fire, dryer managers should spend some extra time cleaning and servicing dryers before harvest and during harvest. Check controls and safety features, replace worn parts, and buy some critical spare parts to have on hand.

**Watch drying temperature in gas-fired dryers.**

For gas-fired dryers, increasing the drying temperature will increase capacity and might improve energy efficiency, but it will also result in poorer test weight and greater breakage susceptibility. If quality is the main concern, operate at lower temperatures. Also, high drying temperatures can cause darkening of immature kernels. If the dryer is producing dark kernels, poor test weight, or a lot of cracked kernels, turn the temperature down.

**Unload grain hot and cool it slowly.**

This technique improves dryer capacity, saves energy, and improves grain quality. If hot grain is moved directly into storage and cooled slowly (compared to cooling in the dryer), the grain will normally lose one to two percentage points of moisture during cooling.
If grain is kept hot for at least four hours before cooling (called dryeration), moisture loss during cooling is even greater (a total of two to three percentage points) and corn quality is much better. Grain should be moved after dryeration because there is so much condensation inside the bin during cooling.

Be aware that moisture loss during cooling is greater in cold weather. The rule of thumb for moisture loss during slow or delayed cooling of hot corn from high-temperature dryers is about 0.25 percentage point for every 10 degrees F of cooling. So if harvest is late and drying and cooling corn take place during cold weather, moisture loss will be greater than in normal years. This means dryers might have to be unloaded at a slightly higher moisture to avoid overdrying. It also means there will be more condensation in the bin where corn is cooled and the grain will have to be managed more carefully to prevent spoilage along the sidewalls.

Combination drying is another option for improving quality and for getting corn out of high-temperature dryers sooner. In this process, corn is partially dried in a high-temperature dryer to 20 to 24% moisture and then moved hot to a natural-air drying bin. Combination drying can take three to six weeks, depending on weather and airflow, but it really improves grain quality and greatly increases capacity of the high-temperature dryer.

Manage natural-air dryers differently when corn is wet.

Most natural-air dryers are designed for 20 to 24% moisture corn. In a year when corn doesn’t dry to 24% in the field, here are some options:

- Use combination drying. Dry the corn to 20 to 24% moisture in a high-temperature dryer before natural-air drying.
- Don’t fill the bin completely. If bins are only partially filled, airflow per bushel is higher, and wetter corn can be put into the bin.
- Use layer filling. If the bin is filled gradually over a period of several weeks, the first corn put into the bin can be wetter than 24%. Airflow per bushel and drying rate are high for the first layers put into the bin.

In a normal year, if drying isn’t finished by winter, producers can keep grain cool and resume drying in spring. But if harvest is late and the drying front hasn’t moved at least half way up through the bin before winter, move at least part of the corn out of the bin to prevent spoilage when spring weather arrives.

Wet corn leads to excessive fines.

Fines are small pieces of broken grain and foreign material. More fines are produced when corn is wet, because combines have to be set for more aggressive shelling, which causes more kernel cracking and breaking. Also, wet corn is exposed to high temperatures for long periods of
time in gas-fired dryers. The heat causes stress cracks in kernels and makes them more likely to break in handling.

Fines cause storage problems because they spoil faster than whole kernels, they have high airflow resistance, and they accumulate in high concentrations under grain spouts. Manage grain to reduce fines production.Unload grain hot from high-temperature dryers and cool it slowly in storage to minimize stress cracking. Also, handle grain gently by keeping augers full and by minimizing drop heights.

Consider using a grain cleaner to remove fines from grain before filling drying or storage bins, and use grain spreaders to uniformly distribute fines throughout bins. Another option is to fill bins without using spreaders and periodically withdraw fines that accumulate over the center unloading sump during bin filling.

Uneven harvest moisture leads to spoilage problems.

After cool, wet growing seasons, corn moisture often varies widely—even within individual fields. A few wet loads of corn can lead to spoilage in storage bins or natural-air drying bins. When harvest moisture is uneven, measure moisture of every load going into and coming out of gas-fired dryers and adjust dryer controls as needed. Also, measure the moisture of every load bound for natural-air dryers. If corn is too wet for normal natural-air drying, layer fill the bin (extend bin filling over a period of several weeks) or partially dry the corn in a gas-fired dryer.

Gas use is slightly greater in cold weather.

Late harvest usually means lower outdoor temperatures during drying. How much more gas does it take for gas-fired dryers? The additional gas use is mainly for heating the air; the extra amount required to heat the grain itself is pretty small. For example, let’s look at the increase in energy use for two different dryers when the outdoor temperature drops from 40°F to 0°F.

For a dryer operated at 240°F,
\[
\frac{(240 - 0) + (240 - 40)}{240} = \text{about 1.2 times as much gas at 0°F as at 40°F}
\]

For a dryer operated at 140°F,
\[
\frac{(140 - 0) + (140 - 40)}{140} = \text{about 1.4 times as much gas at 0°F as at 40°F}
\]

Storage Management

Manage stored grain carefully.

Corn that is immature or has low quality or has been subjected to long exposure to high drying temperatures doesn’t store very well. This corn is probably not a very good candidate for long-term storage programs (more than a year). Even for shorter storage periods, immature corn needs to be managed more carefully than fully mature corn to keep it in condition.
Manage fines.

Make sure you don’t have a fines accumulation in the center of storage bins. Clean corn before storage, use spreaders to distribute fines uniformly throughout the bin, or periodically withdraw fines from the bin center during bin filling.

Aerate to cool grain to about 35°F.

Run aeration fans as long as necessary (cooling time depends on airflow per bushel) to cool all corn in the bin to about 35°F. If you know airflow per bushel, you can estimate required cooling time, but it’s best to actually measure corn temperature to be sure cooling is complete.

Check stored grain more frequently than normal.

Normally we recommend checking stored grain every one to two weeks in warm weather and every two to four weeks in cold weather. It might be necessary to check immature grain twice as often as mature grain. Checking grain condition involves:

- smelling exhaust air for musty or sour odors,
- examining kernels for signs of mold or insects,
- checking for surface crusts and signs of moisture migration,
- and measuring and recording grain temperatures and comparing them to previously recorded temperatures. (Increasing temperatures are a sign of mold or insect activity.)

Deal with any abnormal conditions quickly by aerating, moving, cleaning, or redrying the problem grain.

Work Safely!

Late, wet harvests usually mean long hours, bad weather, high stress, and more accidents. Take steps to reduce accidents:

- Provide plenty of lighting around grain handling facilities to make night work safer.
- Build a shed or use a camping trailer to provide a warm, dry place for workers to escape the noise and weather and get some rest, and to store the moisture tester and harvest records.
- Plan facilities so that grain vehicles never have to back into position.
- Replace guards and shields after doing repair work.
- Wear a respirator designed to filter mold spores when working around moldy grain.
- Be aware of grain suffocation hazards: stay out of flowing grain; don’t walk on crusts of moldy grain in partially emptied bins; and keep your distance from steep piles of moldy grain (they could collapse at any time).