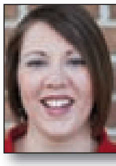
Conserve energy with dryeration



Farm Energy
By DANA PETERSEN

THE grain dryer is often the bottleneck limiting the harvesting rate, says Shawn Shouse, Iowa State University Extension ag engineer. Increasing drying rates using dryeration requires some additional time and grain handling equipment, but it also can reduce dryer fuel costs and increase drying capacity.

In dryeration, the drying process in the high-temperature dryer is halted before the grain reaches its final target moisture content. In this way, total drying capacity is increased because the dryer can accommodate more bushels per hour. Also, note that delayed cooling of the grain requires less total fuel to complete the drying process, thereby increasing energy efficiency.

In a high-temperature drying system, moisture is being removed from corn kernels faster than the moisture can equalize within the kernels. At the conclusion of the high-temperature drying cycle, the distribution of moisture is greater at the center of the kernel than around the outside edges. By implementing dryeration techniques that delay the cooling process by four to 12 hours, the moisture within the kernels has time to equalize.

Delayed cooling allows much of the excess moisture at the kernel's center to migrate toward the surface where it can be removed more easily. Cooling the corn after this resting period of "steeping" or "tempering" removes an extra 0.2 to 0.25 points of moisture from the corn for every 10 degrees of temperature change, says Shouse.

When compared to immediate cooling, this technique can remove an additional 2 to 3 total points of moisture in a typical high-temperature drying system.

By using dryeration, drying capacity can increase 50% to 70%, he adds. In addition, reductions in drying fuel consumption can increase energy efficiency 15% to 30%. Delayed cooling also reduces kernel brittleness and stress cracking of kernels during cooling, and improves millability.

Designing for dryeration

High-temperature grain drying systems designed for dryeration must be able to transfer hot grain from the dryer and hold it for several hours before cooling. This is best done in a dedicated cooling bin with full floor aeration, says Shouse. Because condensation accumulates on the bin sidewalls and nearby grain during delayed cooling in cold weather, using storage bins for delayed cooling is not recommended.

For batch loading and unloading, an ideal system has two cooling bins: One bin is loading, while the other bin is steeping and cooling. Cooling bins can be sized conveniently to hold one day's drying capacity. Cooling fans should be sized to cool the bin in about 12 hours. This requires about 1 cubic foot per minute of airflow per bushel of grain to be cooled (cfm/bu).

If you're upgrading your high-temperature drying system or adding cooling bins, consider sizing bins up to one-and-a-half times your current drying capacity to accommodate future growth and the fact that total drying capacity increases with dryeration. System layout and equipment maintenance are critical for dryeration.

Dryeration during harvest

You implement dryeration by transferring hot grain from the high-temperature dryer at a moisture content 2 to 3 points greater than the final target moisture, says Shouse. Let the first grain into the cooling bin steep for at least four hours, and preferably six to 12 hours, before starting the cooling fan.

When grain is cooled, transfer it to storage bins. Continue to monitor the final grain moisture content and modify drying times as needed. Avoid immediate bin cooling since this removes 1 to 2 points less moisture than delayed cooling with dryeration and does not provide as much protection against cracking.

More information is at *farmenergy.exnet.iastate.edu*. See "Dryeration and Combination Drying for Increased Capacity and Efficiency" (PM 2089K) and "Managing High-Temperature Grain Dryers for Energy Efficiency" (PM 2089F).

Petersen is program coordinator with the ISU Farm Energy Initiative.