BUSINESS PROGRAMS

Strategies For Managing Energy-Related Grain Drying Costs

TECHNICAL DATA SHEET

To learn more about Focus on Energy, call 800.762.7077 or visit focusonenergy.com

Forty years ago farmers did not worry about the energy costs associated with grain drying. They harvested ears of corn, stored them in open air cribs and let Mother Nature dry the crop naturally. Today, most farmers use harvesters that shell corn kernels from the cob at harvest time. However, this method presents a challenge: corn kernels are more difficult to air dry. Farmers now use energy-powered drying equipment to ensure their grain is properly dried prior to storage.

Grain drying equipment generally uses natural gas or propane for heat, and relies on electric-powered fans to move the heated air through the storage unit. While these systems dry crops more effectively, they also add significantly to a farm's energy bills.

Natural gas prices have steadily increased over the last several years and the outlook for the future is for continued increased costs. Electricity costs are also rising, although at a slower rate. Therefore, it makes economic sense to ensure that every grain drying unit is operating as efficiently as possible. When replacing an older unit farmers should select the most energy efficient equipment available. Studies show that newer, energy efficient grain drying units can use 30 percent to 40 percent less energy than older models.

If possible, take advantage of Mother Nature's "free" drying unit—the sun—by delaying harvesting so that grain can field dry naturally. However, given Wisconsin's unpredictable weather, this energy saving tip may not always be a realistic option due to increased field losses later in the fall. If the grain is to be fed to cows, consider storing it as High Moisture Shelled Corn. This will also allow harvesting to start earlier in the fall, helping to spread out the hectic harvest season.

COMMON SENSE STRATEGIES FOR IMPROVING ENERGY EFFICIENCY

1. Maintain existing equipment properly.
2. Monitor grain moisture levels regularly.
3. Make smart retrofit/replacement decisions.

ENERGY EFFICIENCY STARTS WITH PROPER MAINTENANCE

Skipping annual maintenance chores will cost more than you think. You will add to your monthly energy bill, shorten the lifespan of the equipment and affect the quality of the grain product. Estimates show that routine maintenance can reduce energy use by 10 percent each year.

Factors such as dirty equipment, poorly lubricated bearings and incorrectly calibrated thermostats and sensors, reduce a unit's energy and operating efficiency. The Checklist for Energy Efficient Grain Drying (located on the back) highlights several "to dos" for every energy-powered grain drying system. Use the checklist as a reminder each year.

OPERATIONAL ISSUES: DO NOT OVER-DRY GRAIN

This piece of advice may sound obvious: over-drying grain wastes energy and reduces grain test weight.

TABLE 1. EXAMPLES OF ENERGY SAVINGS FROM FOCUS ON ENERGY PROJECTS

CUSTOMER	BUSHELS CORN DRIED PER YEAR	ENGERY EFFICIENT TECHNOLOGY	SAVINGS (THERMS)	ANNUAL SAVINGS (DOLLARS)
Farm A	1.4 million	Heat recovery jacket on continuous flow dryer	52,620	$ 26,310
Farm B	65,000	Continuous flow in-bin dryer system	2,663	$ 3,201
Farm C	100,000	Motors and dryer system	4,000	$ 3,600
Farm D	250,000	Continuous flow in-bin dryer system	12,956	$ 12,274

focus on energy℠
The power is within you.

CHECKLIST FOR ENERGY EFFICIENT GRAIN DRYING	
MAINTENANCE TASKS (PERFORM AT LEAST ONCE A YEAR)	
☐	Keep all components of the drying unit clean, including the floors, columns, fan housings and fan blades. Make sure drain holes are open and not clogged with dirt or chaff.
☐	Check belt drives and ensure they are in good condition, and at appropriate tension level. Ensure that pulleys are aligned.
☐	Ensure that all bearings are properly lubricated and, if necessary, tighten all mounting bolts and secure locking collars.
☐	Check calibration of grain moisture sensors and thermostats and recalibrate if necessary.
☐	Call gas company or LP supplier and have certified technician check gas pressure regulators.
☐	Check burner flame for proper color (blue indicates complete combustion, yellow signals poor combustion), pressure regulator and inlet air adjustment.
OPERATIONAL ISSUES	
☐	Prepare grain properly before placing it in drying bin; clean chaff and dirt from grain to ensure efficient airflow through the grain pack.
☐	Check grain moisture content frequently to avoid over-drying.
RETROFIT/REPLACEMENT CONSIDERATIONS	
☐	Install automated controls on your existing system to reduce fuel consumption and avoid over-drying of grain.
☐	Retrofit an in-bin continuous flow drying system into an existing storage unit and reduce energy use by about 40 percent, when compared with other drying strategies. Capacities can reach 17,000 bushels per day for a 48-foot bin with 10 percent moisture reduction.
☐	Consider dryeration or in-bin cooling to increase column dryer capacity and reduce drying energy by 15 percent to 25 percent.
☐	Install heat recovery on column dryers and reduce energy costs by 10 percent to 20 percent.
☐	Replace existing dryer with a newer, more efficient type. For example, continuous flow in-bin dryers, mixed flow dryers and column dryers with suction cooling are the most efficient high temperature dryers and will reduce energy use and costs by 15 percent to 40 percent, when compared with a typical continuous cross-flow dryer.

You should have your moisture tester calibrated before the drying season and check grain moisture content often. Once grain has reached its optimal moisture level (approximately 15 percent to 16 percent), transfer it out of the drying unit. Batch dryers are more prone to over-drying. If a bin dryer is being used, a stirring device can save up to 30 percent in drying costs by mixing the dry grain from the bin floor with the higher moisture grain on the top of the bin.

New grain drying units often come with an automated control system that regulates the temperature of the dryer's air based on the corn's moisture level. These computerized controls offer more precise moisture and energy management capabilities than manual systems. Additionally, the systems are automated, so farmers can work on other tasks and not worry about constantly checking and adjusting temperature levels.

For example, a manufacturer's microcomputer control system was tested for two seasons and researchers found that it improved energy efficiency by 18 percent when compared with manual systems, and reduced over-drying by 54 percent.

[1]Computer Control System for Continuous and Semi-Continuous Grain Dryers, CADDET, December 7, 2003

DO YOU HAVE GRAIN BINS WITH FULL PERFORATED FLOORS AND AERATION?

Low temperature bin drying (better suited for small, less than 10,000 bushels per year operations)

You might consider using ambient or natural air drying if the corn crop comes out of the field at less than 22 percent moisture. Ambient or low temperature bin drying in a typical weather year uses half the energy that a traditional cross-flow, high temperature dryer uses. The energy source switches from 98 percent natural gas or propane to 100 percent electrical energy. If multiple grain bins are available, fill them each with a layer of grain (layered fill) rather than completely filling one bin at a time. The shallow grain depth allows the grain to dry faster because of higher air flow, (higher air flow rate per bushel) and reduces the risk of spoilage. Fans should be started when the filling process begins. The fans should run constantly until the grain is dry, usually four to eight weeks or until the grain temperature drops below 30°F.

Bill McNall, owner of BJM Farms, near Janesville, replaced his old grain drying unit with an in-bin continuous flow drying system. His system uses computer controls to constantly monitor moisture levels and match the temperature of the drying air to the corn's moisture levels.

"The automation is incredible," he said. "The computer controls eliminate so much of the work I used to do. I've noticed a big difference on my energy bills."

The system's computerized moisture sensing system maximizes energy efficiency by minimizing both electricity and natural gas use. Focus on Energy estimates that this system will reduce the McNalls' energy bills by an estimated $14,000 each year. The installation cost was approximately $20,000.

"I hope other farmers take a look at this technology," said Bill McNall. "It eliminates so much work. I had to fire myself and give myself a new job on the farm!"

Using Combination drying

To reduce some of the risks associated with ambient air drying, use a high temperature dryer to dry the corn down to about 20 percent and then finish drying it using ambient air or a low temperature bin dryer. The grain can be transferred hot to the bin dryer and the aeration fans can be started immediately. This can reduce energy requirements by up to 60 percent and will improve grain quality due to less kernel cracking. The capacity of a high temperature dryer is doubled or tripled when using combination drying.

MAKE SMART RETROFIT/REPLACEMENT CHOICES

Farmers can obtain the largest energy efficiency savings when retrofitting an existing grain drying unit or replacing it with a new one. The example, above, illustrates one Wisconsin farmer's experience. Slow cooling used on some high efficiency dryers will result in the added benefit of less kernel breakage and increased mill-ability.

FOCUS ON ENERGY CAN HELP REDUCE YOUR GRAIN DRYING COSTS

By partnering with a Focus on Energy agricultural energy advisor, you can improve the energy efficiency of your grain drying system. Financial incentives may be available to offset the costs of installing a new system. For more information, contact Focus on Energy at 800.762.7077 or visit our Web site at focusonenergy.com.