# Ag & Energy Conservation Practices Lesson 3

**Drying Grain Compare and Contrast**

Low temperature bin dryers:

Low temperature bin dryers use high capacity fans to push slightly heated air through the grain to promote drying. The air is heated with electrical resistance heaters up to 10 degrees Fahrenheit (6° Celsius) above ambient temperature. The slight heating of the air reduces the relative humidity of the air and results in faster drying compared to ambient air or natural air bin dryers. Some growers only use the heaters during periods of high humidity so drying is not delayed or slowed. The amount of airflow, measured in cubic feet per minute (cfm) per bushel, varies according to regional differences.

A low temperature bin dryer contains a full perforated floor, fans with capacity of 1 to 1.5 cfm per bushel or higher, grain spreader and grain unloading equipment.

The moisture content of the grain that can be dried in this type of dryer is limited to a maximum of about 24% without spoiling but is subject to the harvest date and yearly weather. Early harvest (September 1) would have a maximum grain moisture content of 19%, while grain harvested in late October or early November could have the highest moisture content, about 24% and not spoil before dry.

There are three ways in which grain is typically loaded into low temperature bin dryers, and each works when adapted to specific operation needs: single filling, layered filling, and controlled filling. In single filling, the bin is filled at the rate of harvest. Layered filling involves loading the bin at a specific height per length of time, for example, 1/4 bin depth per week. In controlled filling, grain is loaded into the bin according to its moisture content and grain drying progress. Layered or controlled filling reduces drying times compared to single fill and reduces the risk of spoilage. Grain should be screened to remove fines and a grain spreader is highly recommended when filling to evenly distribute fines in the bin and reduce storage problems. Grain is dried and stored in the same bin which reduces handling. Adding low temperature heat does not reduce the amount of air flow required to dry grain, although adding heat can decrease drying times up to 45%.

Low temperature bin dryers are more energy efficient than continuous flow and high temperature batch bin dryers, but may cost more to operate depending on electricity costs. As drying occurs in the bin, the bottom layer will be over-dried in order to get the grain above it dry. Over-drying reduces energy efficiency. Stirring mechanisms pull some of the dry grain off the floor and allow higher moisture grain from above to replace it. Stirring mechanisms can increase air flow by 1/3 and increase the energy efficiency of low temperature bin dryers by 20% to 25%.

Continuous flow in-bin dryers:

A continuous-flow in-bin grain dryer is an automated high-temperature bin dryer that contains a perforated floor, grain spreading device, sweep auger, automated control system and grain unloading equipment. LP gas or natural gas is used for a heat source for drying. The dryer can be loaded with grain to a depth of 3 to 9 feet and wet grain is placed on top of the drying grain, eliminating the need for wet bins. As the heated air rises through the grain during drying, it picks up moisture and preheats the wet grain. The automated control system periodically senses the grain moisture and if the grain is dry, the sweep auger removes a layer of dry grain from the bin floor. Grain is unloaded intermittently as it dries, and is transferred to storage bins while still hot, where it is cooled (in-bin cooling).

When compared to other high temperature dryers, continuous flow in-bin dryers are among the highest in energy efficiency for high temperature dryers. Ambient air or low temperature bin dryers are more energy efficient but continuous-flow in-bin dryers usually cost less to operate because of lower energy costs. Dryeration can be used with continuous-flow in-bin dryers instead of in-bin cooling and reduce energy costs by an additional 10 to 15%.

Dryeration:

Dryeration is a steeping process that allows the moisture in the grain kernel to equalize before cooling. The process can be used with any high temperature dryer, continuous or batch, and is advantageous because it can reduce energy costs by up to 25% and reduce stress cracking and kernel breakage. This process involves drying the grain down to 2.0 to 3.0 percent points of moisture content above the final storage moisture, transferring the grain while hot into a steeping bin, and allowing the grain to steep for four to twelve hours before aeration fans are turned on. The dryeration bins need fan capacity of 0.5 to 1.0 cfm per bushel depending on how fast the grain needs to be cooled.

After the grain is cooled and dried, it must be moved from the steeping bin to prevent spoilage from moisture that condenses on the bin walls. Typically two steeping bins are used so harvesting can proceed continuously. While one bin is being filled the second bin is steeping, cooling and being emptied. This process can save 15% to 25% of energy costs, and increase drying capacity by 50% to 70%. The exception is high-temperature batch-bin and continuous-flow in-bin dryers which will reduce energy costs by about 10% and increase drying capacity by about 35%.

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| **Advantages of Low Temperature Bin Dryers** | **Disadvantages of Low Temperature Bin Dryers** |
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| **Advantages of Continuous Flow In Bin Dryers** | **Disadvantages of Continuous Flow In Bin Dryers** |
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| **Advantages of Dryeration** | **Disadvantages of Dryeration** |
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1. Which method of drying grain would you recommend and why?