

## In-Bin Drying of Corn in 2009

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Late planting combined with the cool summer and poor conditions for field dry down have led to higher than normal harvest moistures for corn throughout the Midwest. Those producers with in-bin low temperature drying systems should use the layer drying procedure. In this approach the corn is harvested in intervals. Initially only enough shelled corn is harvested to fill the bin to a depth of about 3 to 4 feet. The fan is started as soon as enough corn is harvested to evenly cover the drying floor to a depth of 6 to 8 inches with wet corn. If the system is designed to deliver 1 cfm/bu when the bin is filled to a depth of 18 feet, the airflow through a 3 ft layer will be about 12.5 cfm/bu and the airflow through a 4 ft layer will be about 8.4 cfm/bu. This airflow should rapidly remove the moisture from the corn. The time required to dry this first layer will vary depending on the harvest moisture and ambient air conditions. It should be between 1 and 5 days. Monitor the moisture content of the top surface of the corn. When this top surface has dried uniformly to about 20% moisture, another layer can be added. Now there will be 6 to 8 feet in the bin and the airflow through the corn will be 4.7 to 3.2 cfm/bu. It will take longer to dry this second layer, unless the harvest moisture has dropped significantly during the time when the first layer was drying. This procedure is repeated for each successive layer until the bin is full. If more than one low temperature drying bin is available, the time interval between harvests can be reduced by placing a layer in each bin in succession.

**Use of heat with low temperature dryers:** To minimize drying costs, only use supplemental heat when it is needed. Later when the air relative humidity drops below 60% the bottom 1 to 2 ft. of corn in the bin will be over-dried. When the humidity increases to above 70% later, moisture will be added back to that dry layer. As the over dried corn picks up the moisture from the air, the relative humidity of the air will drop. By the time this air reaches the layer of wet grain, its relative humidity should be back down where it needs to be, below 60%. At the same time, the moisture of the over-dried layer at the bottom of the bin should increase, thereby at least partially correcting the over-drying problem. If there are more hours of relative humidity below 60% than there are hours above 60% in a 24 hour period, supplemental heat may not be needed. However, if a weather front moves through bringing rain and causing the air humidity to stay above 75% throughout the day, then supplemental heat should be used. If the air temperature is between 40 and 70°F and its relative humidity is 90%, increasing the air temperature by 10°F will decrease its relative humidity to 65%. If the initial relative humidity is 80% the 10°F temperature rise will decrease the relative humidity to 55%, and for an initial relative humidity of 70% the 10°F will decrease the air relative humidity to 50%. Supplemental heat can also be used when the daily high outside air temperatures drop below about 45°F or 50°F. At these lower air temperatures, the exchange of moisture between the corn and the air seems to slow down. Keep in mind that if the relative humidity of that 40°F air is below 60% or 70%, the bottom layers of corn will probably be over-dried. Relative humidity often drops during the day and increases at night. Therefore, using supplemental heat in the morning may also be a useful strategy.

**Other options:** When producers have access to a high temperature dryer or an in-bin batch drying system, it can be used to dry the corn to 19 to 20% before it is placed in the low temperature drying bin where the drying process is finished. High temperature drying is most efficient at the higher corn moistures, so the dryer capacity will be greater and the fuel cost per pound of water removed will be

lower. Unless the grain temperature remains above 60°F after it comes out of the high temperature dryer, the mold growth in the 19 to 20% moisture corn will be very slow. If airflow is at least 1 cfm/bu when the bin is full, it should be possible to dry the corn to safe storage moisture before appreciable mold develops. However, the progress of the in-bin drying should be monitored closely and the grain mass should be inspected for signs of mold growth!

***In-bin dryers with stirring:*** In-bin drying systems with stirring devices offer an advantage for wet drying years but they must be operated properly. The stirring almost (but not entirely) eliminates the problem with over-drying and allows supplemental heat to be used effectively because the over-dried kernels are mixed with the wetter kernels eliminating over-drying of portions of the bin. Often the stirrers cannot reach the corn at the very bottom of the bin. That means there will still be a layer of over-dried corn at the bottom. In addition, there is a ring around the outside of the bin that the stirring devices cannot reach. If these systems are used for very wet corn, that layer can begin to mold even when the rest of the corn is at a uniformly low moisture. One solution for the ring of wet corn is to unload the bin and thoroughly mix the corn as soon as the target average moisture has been reached. Drying with stirring is very inefficient once the average kernel moisture reaches 18%. Therefore, it is best to turn off the stirrers when average moisture reaches 18% and finish drying to the target moisture. Then the stirrers can be used for one final stirring to eliminate moisture variations. The producer that has additional drying bins can dry the corn to 18 to 20% moisture in their stirring system and then transfer the corn to another bin to complete drying without stirring.

***Removing Fine Material:*** There are advantages of removing fine material from corn before it is placed in storage. The fine material is readily available source of nutrients on which molds can grow. Therefore, mold grows more rapidly in wet corn containing fines than in the same corn from which fines have been removed. In addition, the fine material will interfere with air movement through the corn giving uneven air distribution within the bin. That often results in high moisture pockets of grain where mold can develop.

For more information on low temperature drying see Grain Quality Fact Sheet #5 Low Temperature Drying of the 1992 Corn Crop” at [www.grainquality.org](http://www.grainquality.org) Click on “Extension Publications” tab and then go to “Drying, Conditioning and Aeration.”