

## **NDSU Offers Soybean Drying, Storage Advice**

A challenging soybean harvest is creating many questions related to storage and drying, according to Ken Hellevang, agricultural engineer with the North Dakota State University Extension Service.

Soybeans at 11 percent moisture have similar storage characteristics to wheat or corn at 13 percent moisture, so an allowable storage time chart for cereal grains can be used to estimate allowable storage times for soybeans. For example, soybeans at 18 percent moisture content would be similar to cereal grains at 20 percent moisture, so soybeans would be expected to have an allowable storage time of about 50 days at 50 degrees. The allowable storage time is reduced to 25 days at 60 degrees and extended to about 90 days at 40 degrees.

The amount of natural air drying that will occur in late October and November is limited. The equilibrium moisture content of soybeans for air at 40 degrees and 70 percent relative humidity is 13.5 percent. An airflow rate of 1 cubic foot per minute per bushel (cfm/bu) is expected to dry soybeans with 18 percent moisture in about 70 days. Adding supplemental heat to raise the air temperature by 5 degrees will permit drying the soybeans to about 11 percent moisture in about 55 days.

Only about one-half of the beans would be expected to dry by mid-November, when outdoor temperatures become too cold to dry efficiently. Adding heat would cause the beans on the bottom of the bin to be dried to a lower moisture content and it would increase drying speed only slightly. Cool the soybeans to between 20 and 30 degrees for winter storage and complete drying in the spring. Hellevang recommends starting to dry when outdoor temperatures are averaging about 40 degrees.

Increasing the airflow rate will increase the drying speed. However, the fan horsepower required to achieve the higher airflow rate becomes excessive unless the grain depth is very shallow. For a soybean depth of 22 feet, the rule of thumb is that each 1,000 bushels of soybeans will need fan horsepower of about 1. Achieving an airflow rate of 1.5 cfm/bu will require about 2.5 horsepower and an airflow rate of 2 cfm/bu will need about 5 horsepower.

The type of fan greatly affects the airflow provided per horsepower, so use a fan selection software program such as the one developed by the University of Minnesota. It is available on the NDSU grain drying and storage Web site at <http://www.ag.ndsu.nodak.edu/abeng/postharvest.htm>. You also can use the chart for your fan that shows the amount of airflow delivered at various static pressures.

Soybeans can be dried in a high-temperature dryer, but the plenum temperature needs to be limited to minimize damage to the beans. Refer to the manufacturer's recommendations for maximum drying temperature. Typically the maximum drying temperature for nonfood soybeans is about 130 degrees. Even at that temperature, some skins and beans will be cracked.

One study found that with a dryer temperature of 130 degrees, 50 percent to 90 percent of the skins were cracked and 20 percent to 70 percent of the beans were cracked. Another study found that 30 percent of the seed coats were cracked if the drying air relative humidity was 30 percent, and 50 percent of the skins and about 8 percent of the beans were cracked at 20 percent relative humidity.

The relative humidity is reduced by one-half for each 20 degrees that the air is warmed. Therefore, if air at 40 degrees and 80 percent relative humidity is warmed to 60 degrees, the relative humidity is reduced to 40 percent, and if it is heated to 80 degrees, the relative humidity is reduced to 20 percent. Monitor the amount of damage occurring during drying and regulate the plenum temperature to obtain the acceptable amount of damage.

Food soybeans and seed beans must not have damage to the seed coat, so natural- air or low-temperature drying is the preferred drying method, Hellevang says.

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