

7.3. Grain Drying and Aeration Tips

- **WHAT IS THE DIFFERENCE BETWEEN AERATION, NATURAL AIR DRYING, AND GRAIN DRYING WITH A SUPPLEMENTAL HEATER?** Aeration is used to control and provide uniform temperature for a grain mass. Natural air drying is generally used for farm bins and is a method of drying grain without using supplemental heat and is recommended at 1 cfm (13.4 L/s) per bushel of grain. Grain drying refers to adding supplemental heat to lower the moisture content of a grain mass at a flow rate of greater than 1 cfm (13.4 L/s) per bushel of grain. All three methods will help extend storage life for grain and prevent spoilage.
- **HOW MUCH POWER DO I NEED TO DRY GRAIN?** When natural air drying or when grain drying with a supplemental heater you need roughly 1 HP (0.75 KW) for every 1000 BU (35.2 cubic meters) of grain. When aerating, you need roughly 1 HP (0.75 KW) for every 10,000 BU (352 cubic meters) of grain. These are approximations only as the height of grain influences the required power as well. Consult your local dealer to accurately size a fan.
- **WHEN CAN I BEGIN TO HARVEST?** With a complete natural air drying system in place, crops can be taken off above normal moisture content (example: wheat 18%-20%). Under warm, low, relative humidity conditions you should see 3/4–1% of drying taking place per day. This allows a 7–10 day advance on harvest time as well as more harvesting hours per day.

Note

Natural air drying should be used as a management tool and not as a late harvest emergency drying system. If late harvest conditions are cool and damp (conditions less than 50°F (10°C)) natural air drying will be slow and adding supplemental heat is much more effective.

- **AT WHAT TEMPERATURE DOES NATURAL AIR DRYING BEGIN?** Grain drying begins at 50°F (10°C). Anything less than 50°F (10°C) means the air is too cold and can only hold a small amount of moisture; therefore, moisture removal from grain will be very slow.
- **WHEN SHOULD I START MY FAN FOR NATURAL AIR DRYING?** In order to create a uniform drying front, the bin must be filled to the height of at least half of the bin's diameter above the system. (Example: A 14' (4.3 m) diameter bin needs to have a minimum of 7' (2.13 m) of grain above the system). The best uniform drying front can be produced by filling your bin and then turning on the fan. Turning your fan on too soon can cause uneven drying and negative results.
- **WHEN SHOULD I START MY FAN FOR AERATION?** The aeration fan should be started as soon as the aeration ducts are covered with grain when filling. Once started, to prevent crusted grain, air flow through the grain bin must be maintained until the bin reaches the desired temperature.

Table 3. Moisture Content of Grains

Relative Humidity of Air %	Wheat Equilibrium Moisture Content %		Canola Equilibrium Moisture Content %		Corn Equilibrium Moisture Content %	
	at 25°C (77° F)	at 10°C (50° F)	at 25°C (77° F)	at 10°C (50° F)	at 25°C (77° F)	at 10°C (50° F)
58	12	13	7.5	8.6	12.2	13.5
64	13	14	8.2	9.4	13.0	14.4
70	14	15	9.0	10.3	14.0	15.4
75	15	16	9.8	11.1	15.0	16.4
79	16	17	10.8	12.0	15.8	17.1
83	17	18	12.0	13.2	16.9	18.2
86	18	19	13.4	14.5	17.8	19.0



- **SHOULD I SHUT MY FAN OFF AT NIGHT OR WHEN IT RAINS?** NO! High moisture grain drying (16% - 20%) requires continuous air flow to prevent the drying front from crusting over and restricting airflow.
- **DOES FAN OPERATION AT NIGHT OR IN HIGH HUMIDITY CONDITIONS REVERSE THE DRYING PROCESS?** We tend to think that a fan will force moisture back into a bin in high humidity conditions. However, it is much more difficult to put moisture back into the grain than it is to take it out. In fact, grain in the bottom of the bin that may be a little over-dried would benefit from taking on a little moisture. At 19% moisture and 50°F (10°C), corn that hasn't been dried will remain constant as the 86% relative humidity moisture level in the air equals the moisture in the grain, refer to [Table 3 on page 37](#).
- **IF I ADD SUPPLEMENTAL HEAT, CAN I DRY IN HIGH HUMIDITY CONDITIONS?** Adding supplemental heat (when available) to the natural air drying process will reduce relative humidity and increase the rate of moisture movement. Therefore, a low temperature supplemental heater will increase the drying rate and reduce the drying time.
- **CAN LOW TEMPERATURE SUPPLEMENTAL HEAT CUT MY DRYING TIME WITHOUT INCREASING COSTS?** A rule of thumb relating temperature increase to relative humidity decrease is: a temperature increase of 50°F (10°C) above outside air temperature will reduce the relative humidity by half.

Example:

50°F (10°C) and 70% relative humidity
 + 50°F (10°C) (increased by supplemental heat)
 = 68°F (20°C) and 35% relative humidity

- When low-temperature heat is added in high-humidity conditions, drying times can be reduced up to 8 days. By reducing operating time, overall costs are less than operating only the fan under these conditions.

With the average harvest period generally 30–40 days, it's comforting to know you can depend on supplemental heat, not the weather, to get the job done.

Important

Care should be taken when operating a supplemental heater under low humidity conditions. This can cause severe over-drying at the bottom of the bin.

- **HOW DO I KNOW WHEN MY GRAIN IS DRY?** Approximate drying chart based on a complete Aeration System:

Approximate Condition	Approximate Drying %
Ideal warm days / dry conditions	1% per day
Warm days & cool nights	1/2% per day
Cool days & cool damp nights	1/4% per day
Cold days & cold nights	0% per day
Warm days & cool nights (supplemental heat added)	3/4% per day

Important

If you add 1 or 2 loads of grain at 18% moisture into the bin, assume the bin to be at 18% average moisture — don't reduce the average if some loads are at a lower percentage.

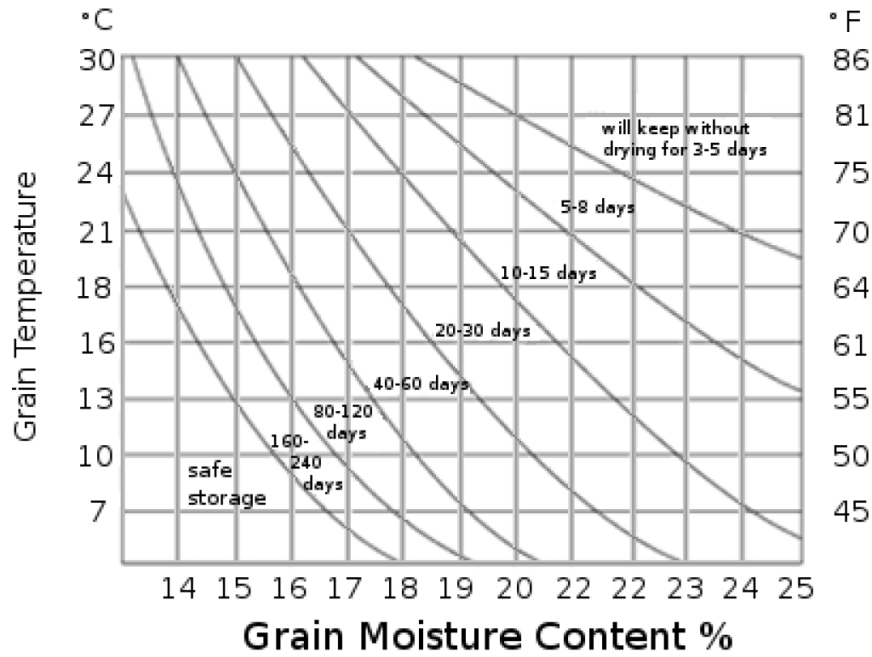
Important

Do not count the first day in the drying process; it takes 14–16 hours for the bin to equalize its temperature.

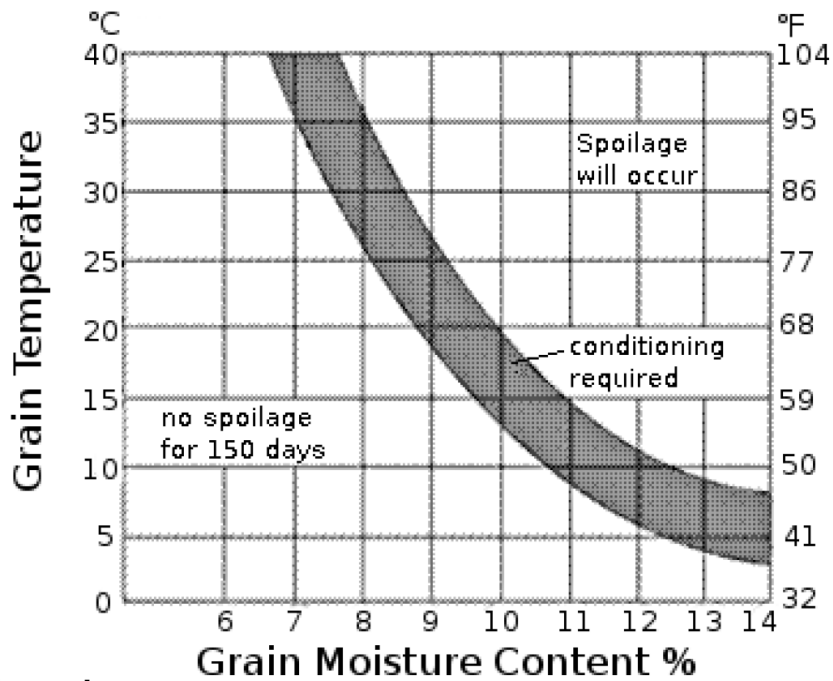
- **WHEN NATURAL AIR DRYING OR WHEN USING SUPPLEMENTAL HEAT, WHEN SHOULD I SHUT MY FAN OFF?** When bin samples show the grain is dry, turn off the fan.
- **WHEN NATURAL AIR DRYING, WHAT CAN I DO WHEN THE AIR TEMPERATURE DOES NOT REACH 50°F (10°C)?** There are a couple of options available at this point:
 1. You can dry the grain in a grain dryer and then cool it down with the bin fan to maximize the grain dryer daily output.
 2. You can wait until the outside air temperature falls to 23 to 14°F (-5 to -10°C) and then run the fan for 24–48 hours to cool the entire grain mass to a storage state (see charts that follow). Once spring conditions return, you can resume the natural air drying process.



Figure 5. Grain Drying Charts



CEREAL GRAINS



Canola