

GRAIN STORAGE MANAGEMENT

Supplemental Heat – Do I Need It?

Should I add supplemental heat to my bin?

When it comes to natural air-drying, this is a common question. To answer this, you'll need to evaluate the environmental conditions, as well as your natural air-drying equipment. If you're dealing with low ambient air temperatures and/or high relative humidity (RH), then yes, adding supplemental heat to your natural air-drying system will help. If you have aeration fans and equipment in place that provide 0.75 - 1 CFM per bushel, adding supplemental heat will also be beneficial.

Supplemental heaters are typically electric or gas fired. Electric heaters are recommended on smaller bins when minimal or intermittent heat is required. Gas fired heaters are useful when larger BTU outputs are required for larger airflow rates. Whatever the case, it's important to closely match fan, heater, and bin size to produce optimum airflow and temperature values for the type of grain being dried.

When natural air drying is used, the ambient air needs to be a minimum of 10° C to allow the drying process to occur. With the help of a low temperature supplemental heater, you'll have the ability to raise ambient air temperature by 8 - 12° C with a 60,000 or 100,000 BTU heater and 15 to 35° C with a 200,000 BTU heater. With the smaller BTU output heater, you can continue to dry grain until the ambient temperature drops to approximately 0° C and with the 200,000 BTU heater, you'll be able to dry until the ambient temperature drops to approximately -10° C.

The benefits of adding a low temperature supplemental heater go beyond raising the temperature. Increasing the temperature by 10° C also lowers relative humidity (RH) by 50%. RH plays a vital role in grain drying. By lowering the RH and increasing the temperature inside the bin, air can remove moisture from the grain more efficiently. This helps when trying to dry grain in high humidity situations. By adding heat, drying times will be reduced, resulting in lower operating costs.

When drying grain, it's important to pay attention to RH, as well as the equilibrium moisture content (EMC) of specific crops. The EMC of grain is the minimum moisture content grain will dry at a given temperature and RH when exposed to those conditions over a period of time. Sometimes natural air-drying seems to stall out after a period of success. Quite often, this stalled drying process is a result of grain reaching its EMC. Supplemental heat (to reduce RH and increase temperature) will allow the drying process to continue in these situations. The chart below shows the relationship of RH to a temperature in different types of grains and where the moisture content reaches an equilibrium. The chart also shows that by increasing the temperature, humidity will decrease, allowing for more moisture to be removed from the grain.



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	14.4
70	14	15	9	10.3	14	15.4
75	15	16	9.8	11.1	15	16.4
79	16	17	10.8	12	15.8	17.1
83	17	18	12	13.2	16.9	18.2
86	18	19	13.4	14.5	17.8	19

Weather plays an important role when using natural air drying and impacts the conditions within your bins. Adding too much heat to your bin can overdry grain in the bottom of the bin before the grain at the top of the bin reaches safe storage conditions. Temperature and moisture cables can track the drying front as it moves through the bin. When adding supplemental heat to your system to keep temperatures above 10° C and the humidity low, up to .75% of moisture can be removed every 24 hours. When considering airflow, air temperature, RH, and EMC, supplemental heating can provide optimal drying conditions. Successfully applying natural air-drying systems on your farm will enable you to start harvest earlier, helping you finish earlier in the season and rest assured knowing your grain is protected.

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