Energy Efficient Grain Drying

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Basic Facts:

- Grain drying occurs when water is evaporated from the grain through the addition of heat energy.
- With some variation by temperature, it takes about 1000 Btu (British Thermal Units) to evaporate one pound of water.
- Air flow serves to carry this evaporated moisture away from the grain.
- There are no known methods to bypass the previous facts.

Field Drydown:

- Requires no “out of pocket” costs.
- Under normal Iowa fall conditions, corn loses about 0.5 to 1.0 percent moisture content per day.
- Balancing costs are associated with timeliness and increasing field losses.
- Pre-harvest field losses average 2 Bu/A but are rarely “average”.

Field Drydown:

- Plan for adequate number of harvest days.
- Scout fields for stalk health and harvest damaged fields first.
- Pay close attention to machine settings and harvest conditions.

Post-harvest Drying Energy Use:

Dryer type	Btu/lb. water removed
Natural air	1000 – 1200
Low temperature	1200 – 1500
Batch in bin	1500 – 2000
High temperature	2000 – 3000
High temperature with air recirculating	1800 – 2200

Source: NDSU Extension Grain Drying bulletin

Post-harvest Drying Energy Use:

High temp: 0.018 gal. LP/bushel/point

range 0.010 – 0.025

Natural air: 0.33 kWh/bushel/point

range 0.30 – 0.40

Natural Air Drying:

- Low energy input, high energy efficiency
- Low drying rate (a month or more/bin)
- Performance depends heavily on weather
- Probability of success in the upper Midwest decreases significantly with grain moisture over 22 percent.

Natural Air Drying:

- Plan for success (equipment and management)
- Airflow is critical
  - Keep grain and floor clean
  - 1.25 to 1.5 cfm/bu minimum for Iowa
- Have a back-up plan
  - Move to dry
  - Spring drying with natural air
  - Feed

Heated Air Drying:

energy/100 bushel/10 pts. removal

System	gal LP	kWh
High speed, high T, cool in the dryer	20.0	10
Batch in bin with stir	18.0	10
High T, cool in storage	17.5	8
Continuous flow bin	17.0	10
Dryeration	14.5	7
Combination Drying	8.0	70
Natural air	0.0	140

Source: National Corn Handbook, NCH-14

Heated Air Drying:

System	Drying speed
High speed, high T, cool in the dryer	1
Batch in bin with stir	<1
High T, cool in storage	1.35
Continuous flow bin	1
Dryeration	1.6
Combination Drying	3
Natural air	4 weeks

Source: National Corn Handbook, NCH-14

Heated Air Drying:

- Plan for success (equipment and management)
- Match wet storage to harvest and drying rate
- Transfer grain hot and delay cooling
  - 1-2 pts additional moisture removal
  - 25% energy reduction
  - 30-60% higher dryer capacity
- Recirculate cooling and/or drying air
  - 10-30% energy reduction

Heated Air Drying:

- Consider combination high/low temperature drying
  - 50% energy reduction
  - 300% dryer capacity increase
- Use automated moisture sensing
- Check moisture meters and equipment often