BINcast® : A Decision Support Tool for On-Farm Grain Storage Management

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There has been a rapid increase in on-farm grain storage capacity in the major grain-producing regions of North America in recent years. Farmers are leveraging this increased capacity to create operational flexibility and to capitalize on higher market prices in the post-harvest season. With additional and larger capacity bins, longer storage periods, and the practice of increasing harvest through-put by harvesting grains at higher moistures, there comes the extra challenge associated with proper on-farm grain conditioning and management. Proper conditioning maintains grain quality and therefore minimizes the potential for revenue losses through grain grade deductions.

To help growers minimize storage losses, Weather INnovations Incorporated (WIN) has developed an online grain conditioning advisory called BINcast®. This advisory provides a valuable management tool and can be utilized at several levels of complexity.

BINcast® - Basic Version

Try it out at: www.weatherinnovations.com/bincast

BINcast® is a weather-based advisory for improving grain conditioning in aeration grain storage systems. The online model provides 5-day, site-specific forecasts of optimal times for operating fans.

The basic tool does not require any monitoring of environmental conditions inside the storage bin.

Grain that is conditioned using ambient air can be managed with site-specific weather forecasting programs to predict any grain's equilibrium moisture content at any time.

By allowing weather drivers to determine the optimal times to run bin aeration systems, grain quality can be maintained, energy consumption reduced, and producers will have better management control. The basic version has just three easy steps:

Step 1 - Find your field on the customized GoogleMap©:

Step 2 - Select your grain:

Step 3 - View the forecast of your best upcoming aeration opportunities, signified by the dark green sections:

Date Time	Forecast		
	Temp (°C)	RH (%)	EMC (%)
Thu. at 12 AM	15.4	83	18.4
Thu. at 1 AM	14.8	86	19.3
Thu. at 2 AM	14.1	89	20.4
Thu. at 3 AM	13.3	91	21.2
Thu. at 4 AM	12.5	92	21.7
Thu. at 5 AM	11.8	93	22.3
Thu. at 6 AM	11.3	93	22.4
Thu. at 7 AM	12.5	91	21.3
Thu. at 8 AM	15.0	85	19.0
Thu. at 9 AM	17.6	76	16.6
Thu. at 10 AM	19.7	70	15.2
Thu. at 11 AM	21.3	67	14.5
Thu. at 12 PM	21.1	67	14.5
Thu. at 1 PM	21.0	63	13.9
Thu. at 2 PM	23.4	53	12.1
Thu. at 3 PM	23.5	51	11.8
Thu. at 4 PM	23.9	51	11.7
Thu. at 5 PM	23.8	50	11.6
Thu. at 6 PM	23.7	51	11.7
Thu. at 7 PM	23.3	54	12.2

BINcast® - Advanced Version

Producers enter in essential fan, bin and grain characteristics, in order for BINcast® to optimize the drying schedule according to the target moisture content for the grain. A fully-deployed BINcast® system includes some reference monitoring units in a few of a producer's grain bins.

This provides a producer with a checks-and-balances system that can lead to increased confidence in BINcast®. As a result, a producer may decide to avoid the considerable cost of installing in-bin sensors in all of their grain bins.

Theoretical Background

The storage life of grain is influenced by temperature and moisture content. Aeration inside bins helps to balance the temperature within the stored grain and prevent the migration of moisture inside piles. The ambient relative humidity and temperature nearby the bin area are key factors in determining when to turn the aeration fan on or off.

Turning on fans is beneficial for removing grain moisture only when the ambient relative humidity is lower than the equilibrium relative humidity, corresponding to the equilibrium moisture content (EMC) of the grain.

The BINcast® model is based on the assumption that the sensible heat lost by the air flowing through the bed is equivalent to the latent heat due to moisture vaporization.

Behind the BINcast® Model

Three main factors were considered in development of BINcast®:
- forecasted ambient weather conditions surrounding a storage bin
- infrastructure and installation of the bin
- type and specific properties of commonly-stored grains

The flowchart below illustrates the models major components: