



Grain Quality Management for the 2013 Harvest

*Grain Journal Webinar
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www.grains.k-state.edu

Preharvest Outlook for Grain Quality:



2013 Crop

Dr. Charles Hurburgh
Agricultural Engineering
September 16 and 17, 2013

IOWA STATE UNIVERSITY
Extension and Outreach

GRAIN STORAGE TEAM



<http://www.abe.iastate.edu/extension-and-outreach/grain-quality/>
www.iowagrains.org

Corn Quality –2013

- **Hot and Dry: Most Likely Now**
 - Small kernels, low test weight (52-54 lb/bu)
 - Poor storage properties – **high variability**
 - Low and high test weight: root development
- **Hot and Wetter: Mostly Too Late Now**
 - Bigger kernels, normal+ test weight, wet corn?
 - Ok storage properties; still mixed quality

**Moisture and Test Weight variations:
More fines, inconsistent drying, wetter corn in bins.**





Average moisture content (MC), moisture content range, percentage point differential, and standard deviation (SD) in maize kernels collected at the inlet and outlet of commercial crossflow (CF), concurrent-flow (CCF), and mixed-flow (MF) dryers. (Source: Montross et al. 1994)

<i>Dryer Type</i>	<i>Average MC (%)</i>		<i>MC Range (%)</i>		<i>Point Differential</i>		<i>Standard Deviation</i>	
	In	Out	In	Out	In	Out	In	Out
CF	20.8	15.0	10.0 - 33.1	8.5 - 31.5	+23.1	+23.0	3.92	4.82
CCF	21.7	14.7	14.5 - 37.5	7.0 - 34.0	+23.0	+27.0	4.42	4.57
MF	22.4	14.8	8.5 - 38.5	8.0 - 35.5	+30.0	+27.5	4.23	4.19

Soybean Quality –2013

- **Hot and Dry: Most Likely Now**
 - Small beans, dry beans?, low protein
 - So late in planting...may still have some frost risk
- **Hot and Wetter: Not Likely Now**
 - Bigger beans, wetter beans, frost risk, composition?

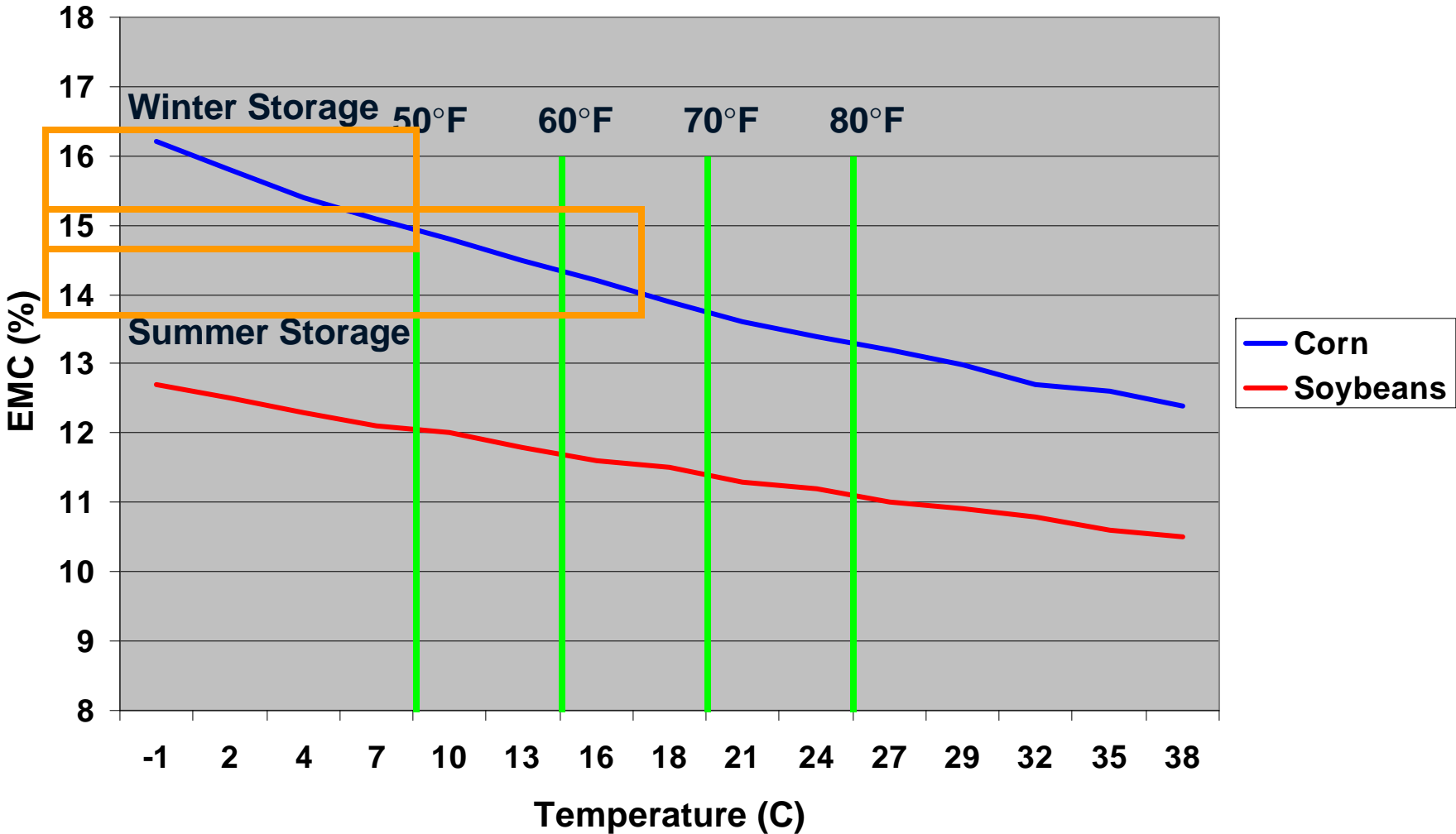
Late growth: Green stems and mixed quality
New moisture meter: +1-2% on green beans
Frost: Aerate for 2-4 weeks.





<http://cornandsoybeandigest.com/equipment/drying-cost-vs-harvest-loss>

Safe Grain Moisture Content (ERH = 65%)





Aspergillus Ear Rot (photo © Gary Munkvold)

← Aflatoxin

Vomitoxin →



Gibberella Ear Rot

(Photo Courtesy of: A. Robertson)



Fusarium Ear Rot - fumonisins
(photo © Gary Munkvold)



All the molds in one place!
Sac County, Iowa. August 9, 2009



Pencillium species produce ochratoxins
(Photo: Don White, University of Illinois)

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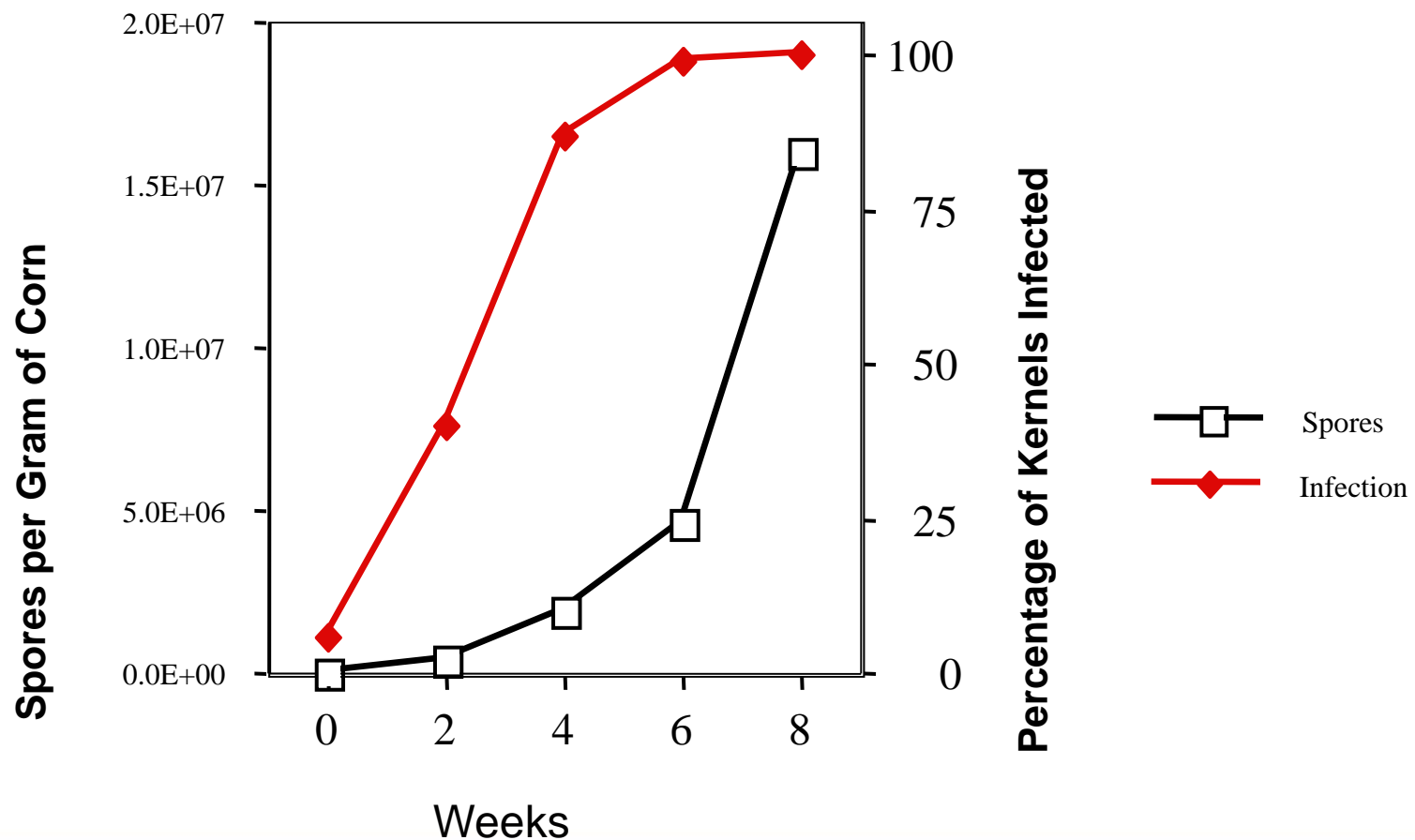
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www.iowagrains.org

Growth of *Aspergillus glaucus* in Corn 32°C (90°F), 15 % Moisture Content





S.L.A.M. Step 1: Sanitation

- Handling equipment
- Transportation vehicles
- Storage structures
 - inside and outside
- Pest prevention
 - *“Sanitation is pest control!”*
 - Residual protectants



S.L.A.M. Step 2: Loading

- Screening/Pre-cleaning
- Coring
 - single vs. multiple withdrawals
- Leveling
 - spreading (mechanical, gravity)
- Sealing
 - fans, leaks, cracks



**Gravity
Cleaner**

Pre- Cleaning

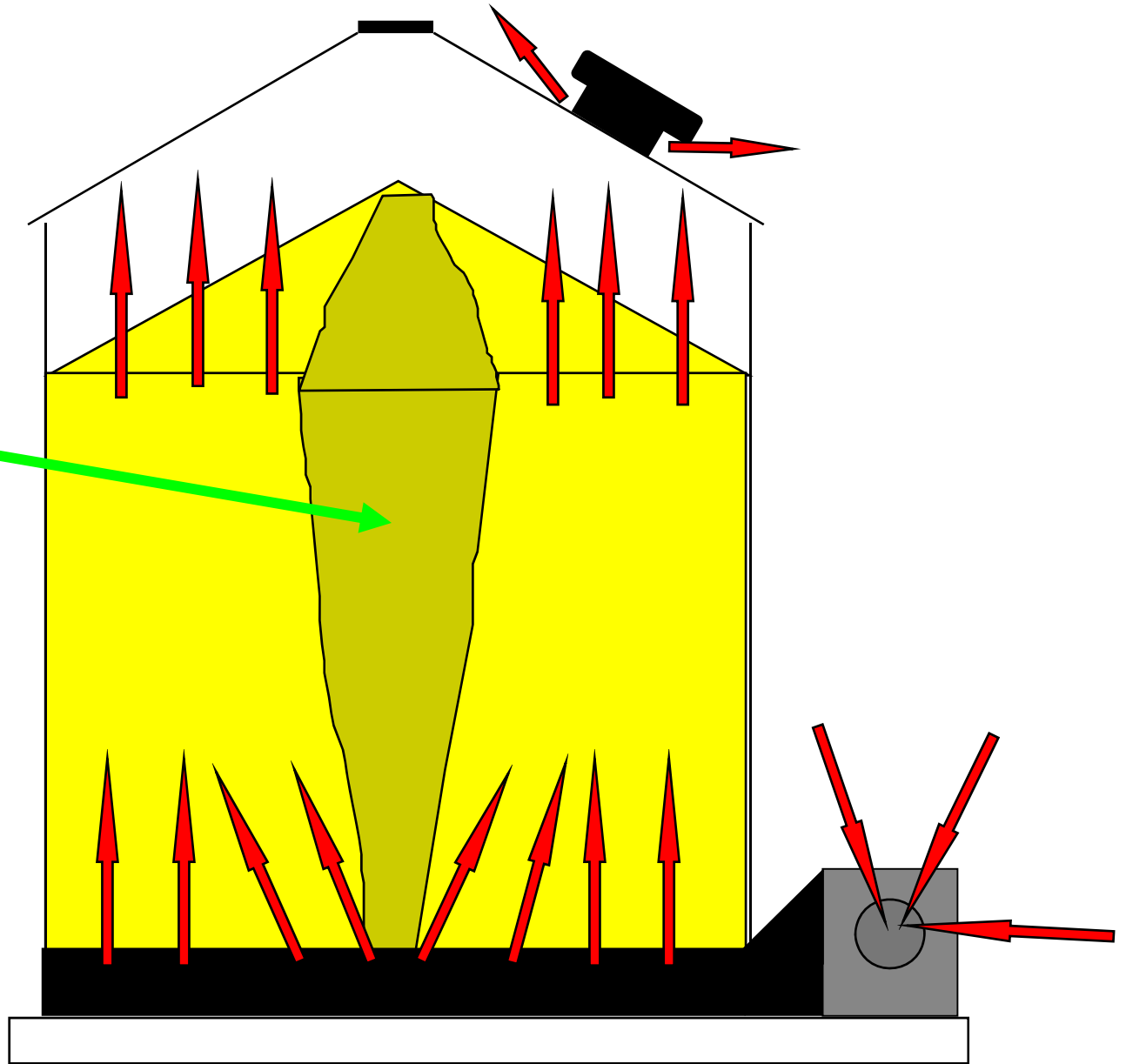


**Aspirated
Cleaner**

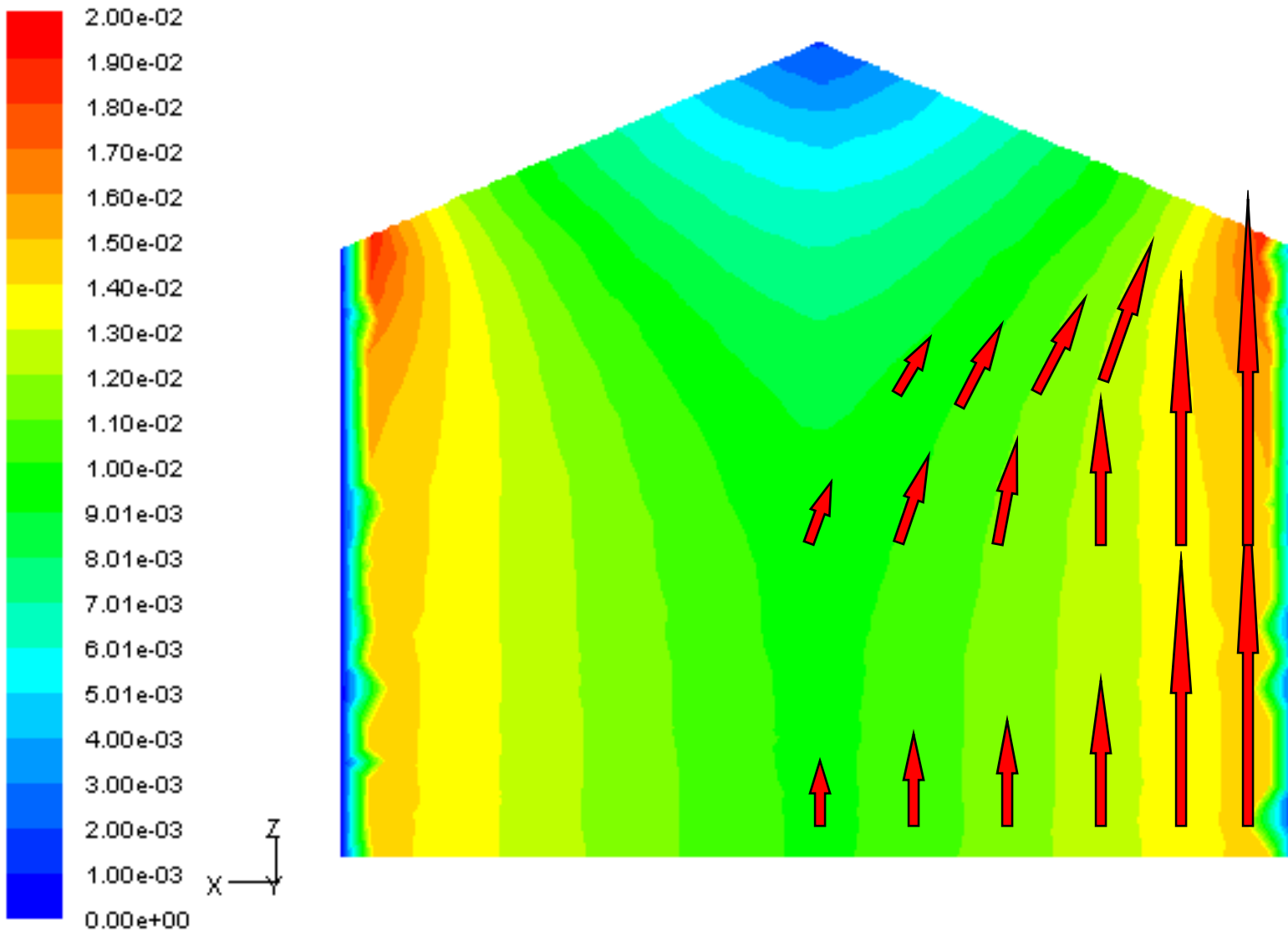


**Rotary
Cleaner**

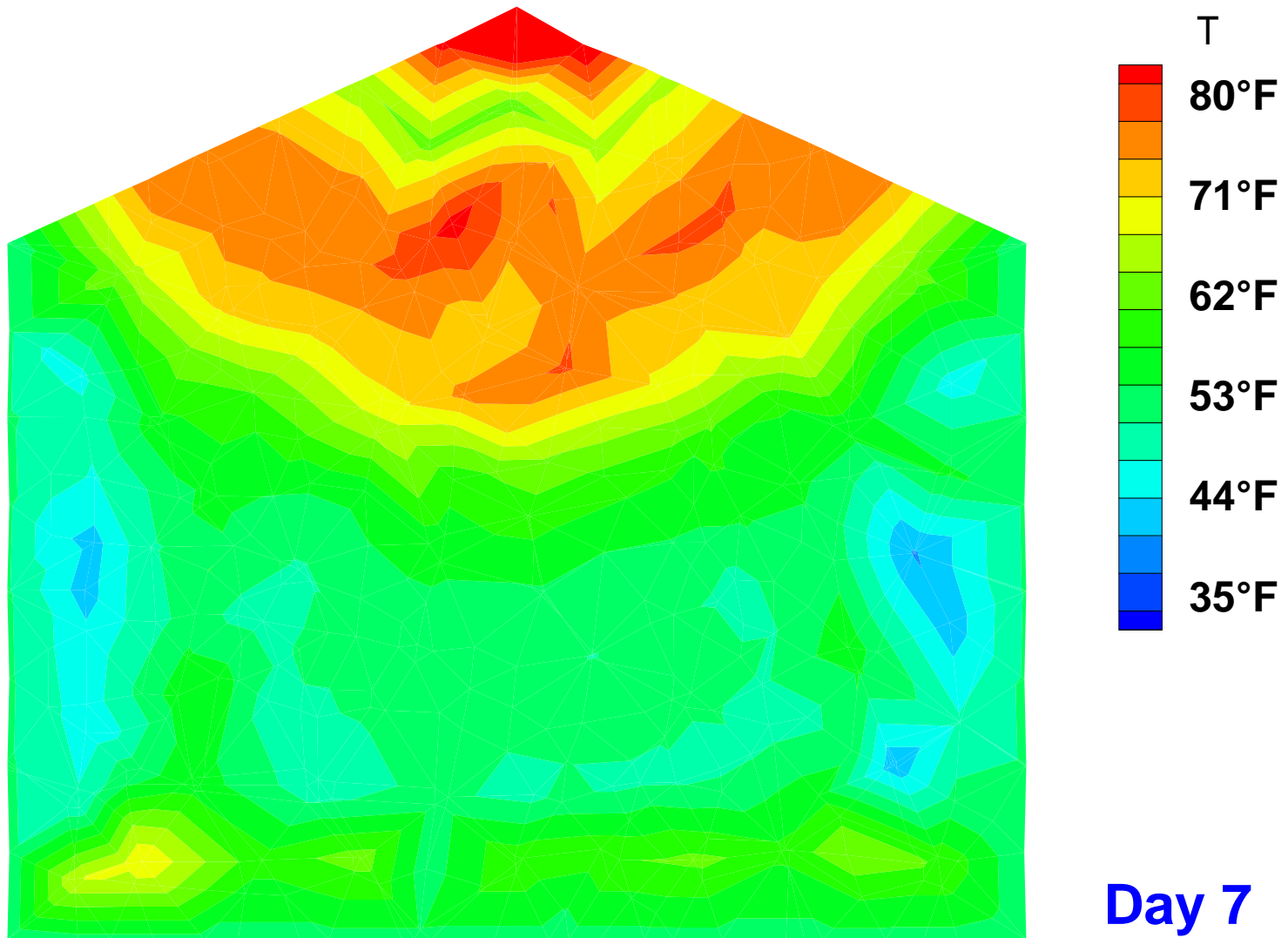
- **Core of fines**
 - Foreign Material (FM)
 - Broken grain
 - Weed seeds



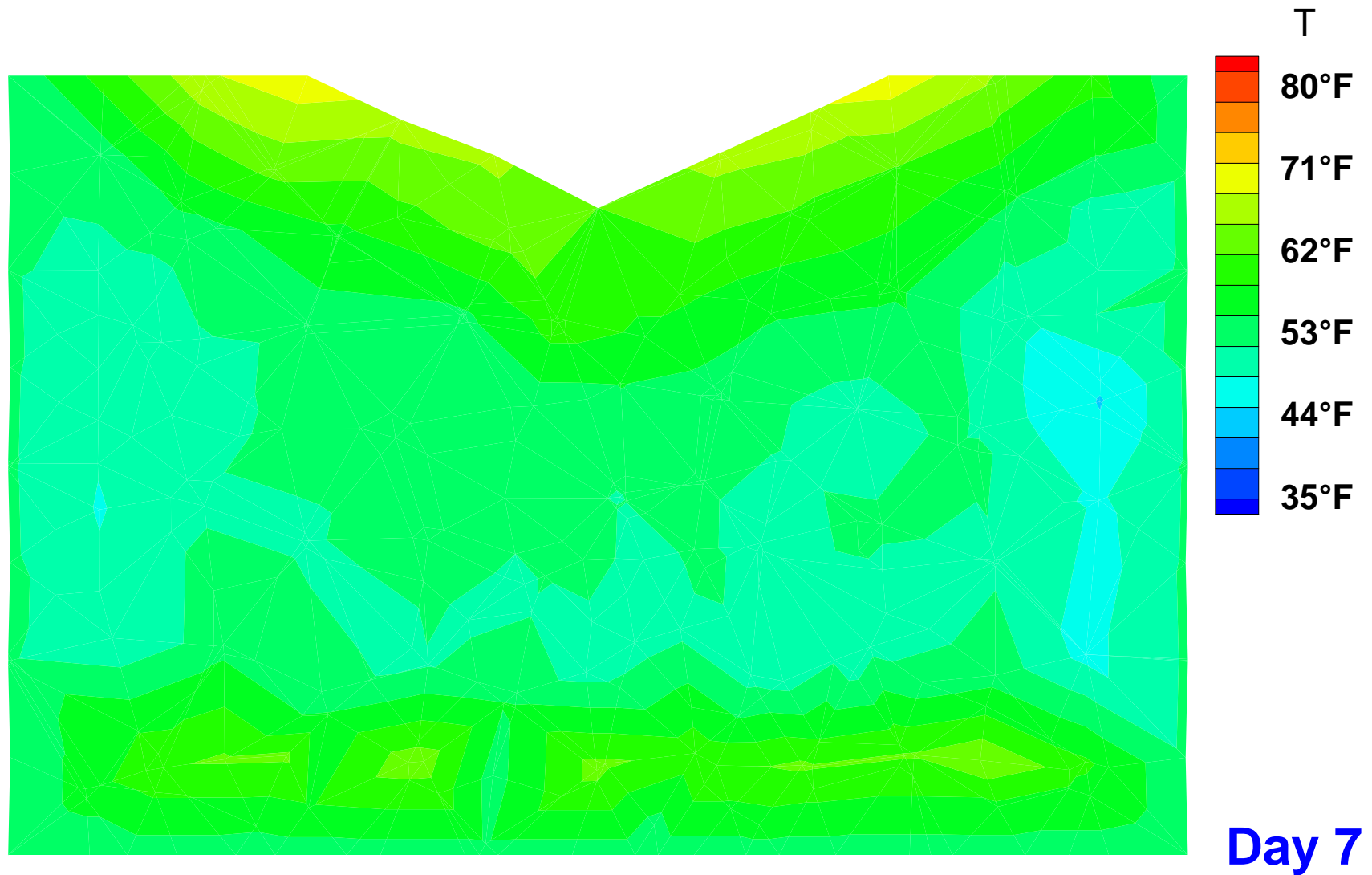
Non-uniform Airflow Effect - Peaked Grain Mass



Aeration Cooling Effect - Peaked Grain Mass



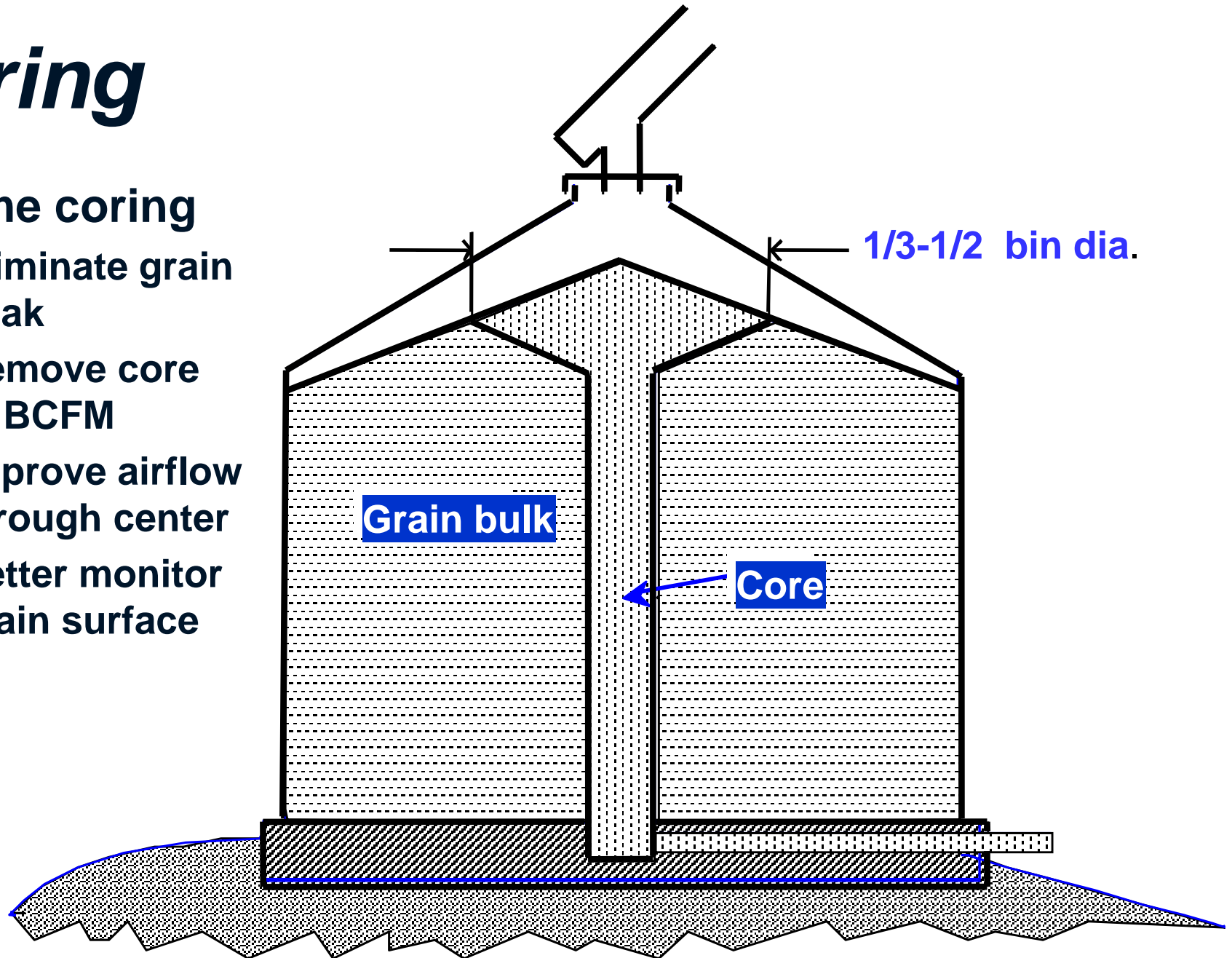
Aeration Cooling Effect - Cored Grain Mass



Coring

One time coring

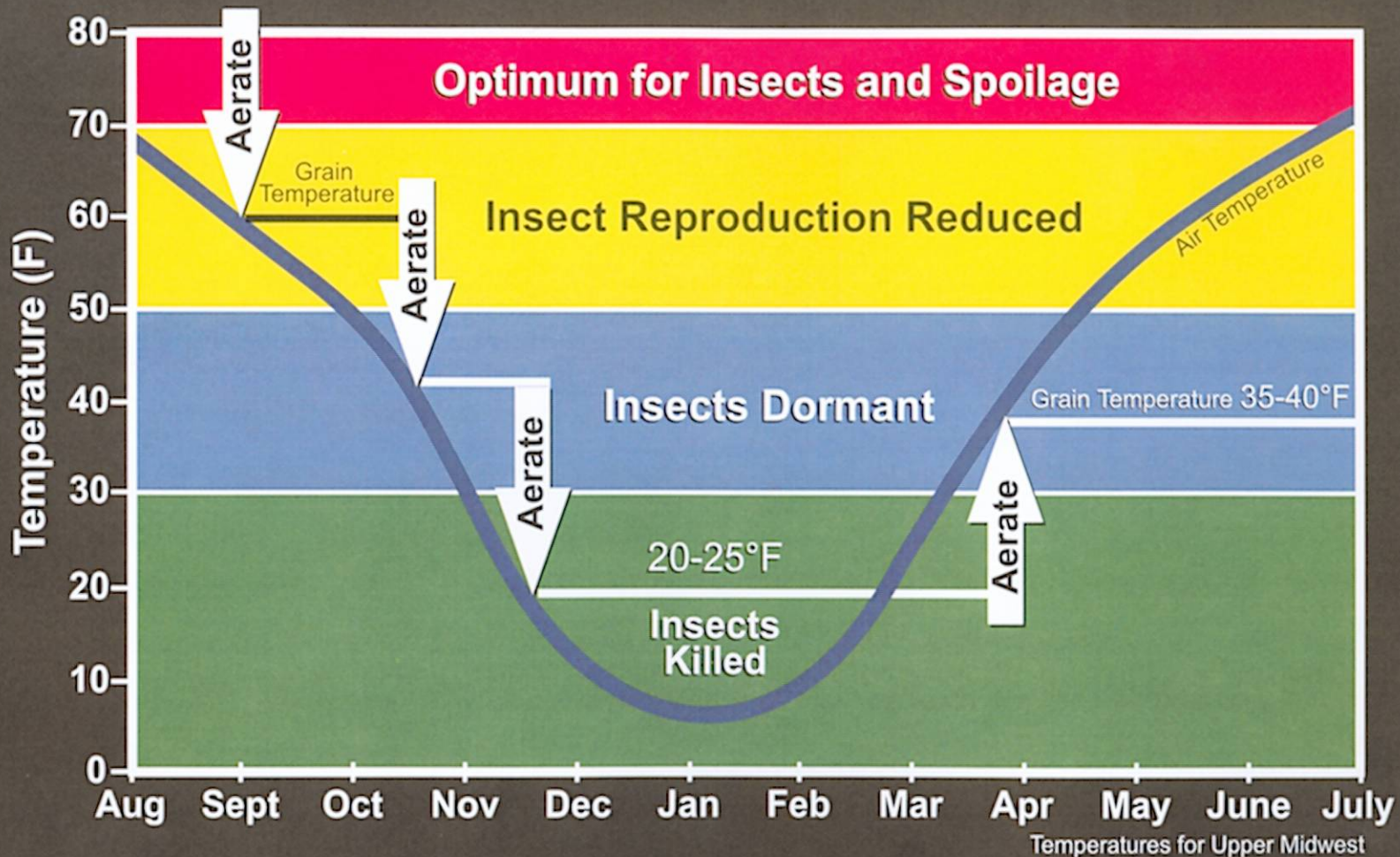
- Eliminate grain peak
- Remove core of BCFM
- Improve airflow through center
- Better monitor grain surface



S.L.A.M. Step 3: Aeration



Cool Grain to Prevent Storage Problems



* Prevent crusting due to moisture migration by cooling grain to within 15°F of average outdoor temperatures.

* Cooling grain by 10°F doubles its allowable storage time

Dr. Kenneth J. Hellevang, F
NDSU Extension Service

Drying and Storing Grain - Klein Ileleji - November 8, 2013



A video player interface showing a man with glasses and a light-colored shirt speaking. The background is a Purdue University banner. A lower-third graphic displays the 'MJ' logo, the name 'Klein Ileleji', and his title 'Purdue University Extension Engineer'. The video progress bar at the bottom shows 0:47 / 6:10. Other controls include play, volume, settings, and YouTube branding.

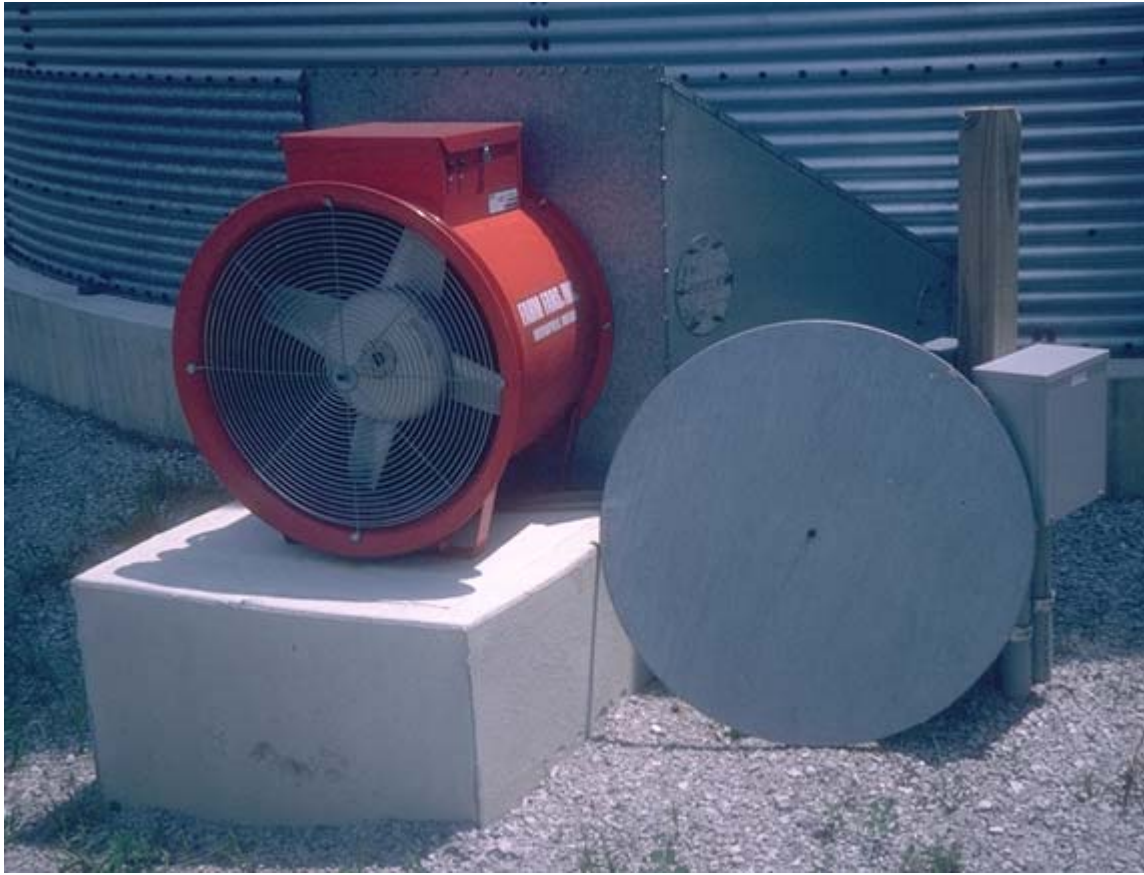
<http://extensiontv.unl.edu/v/2814#vContainer>

www.grainquality.org



Aeration Phases

- Phase 1: Fall Cool Down
 - Lower grain temperatures stepwise
 - October 40-45 F
 - November 35-40 F
 - December 28-35 F
- Phase 2: Winter Maintenance
 - Maintain temperatures with intermittent aeration
 - January, February 28-35 F
- Phase 3: Spring Holding
 - Keep cold grain cold
 - Seal fans
 - Ventilate headspace intermittently

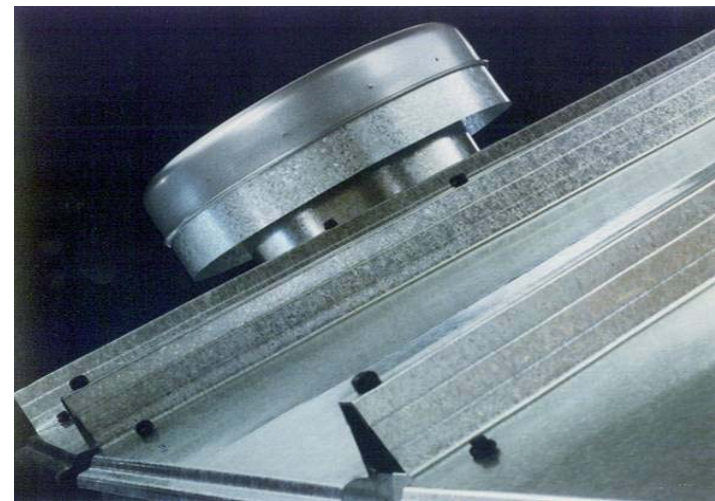


Open Fan

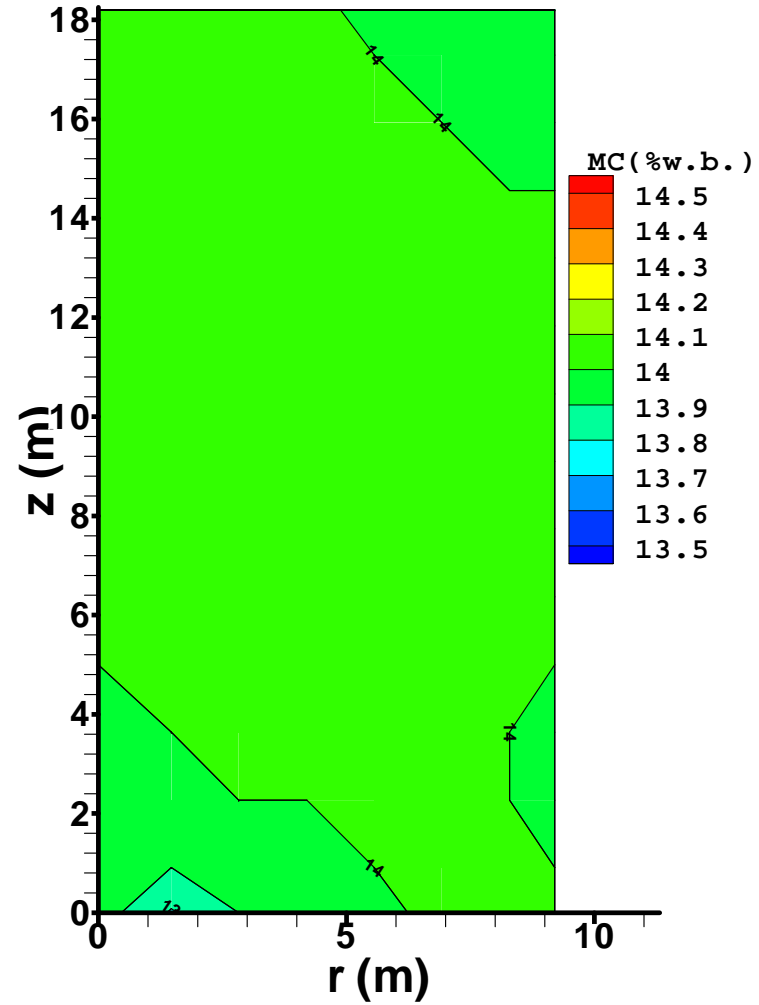
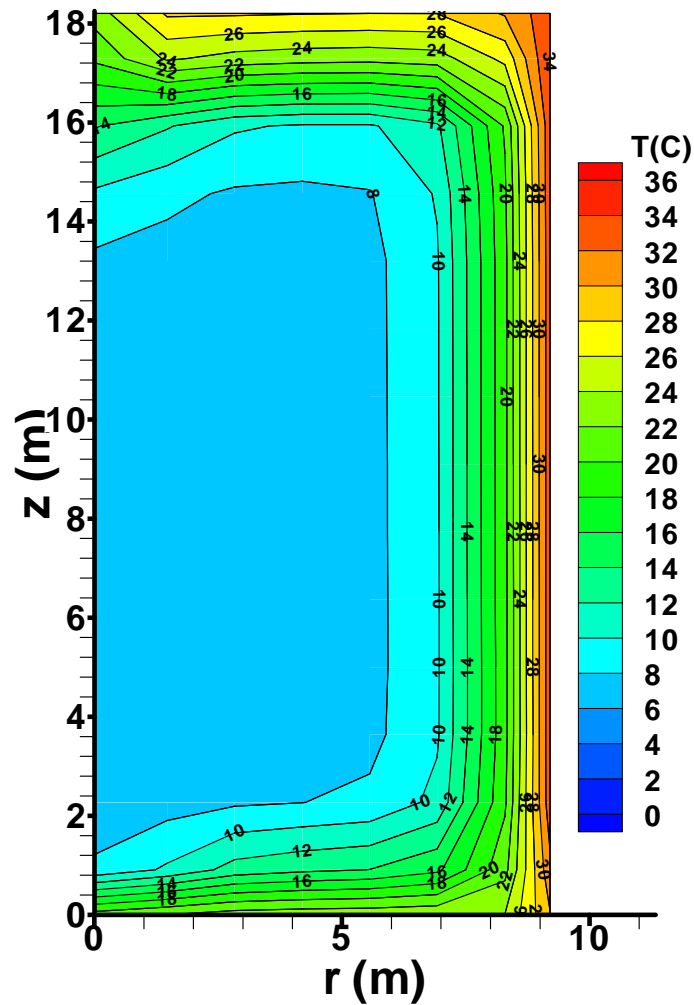
Sealed Fan



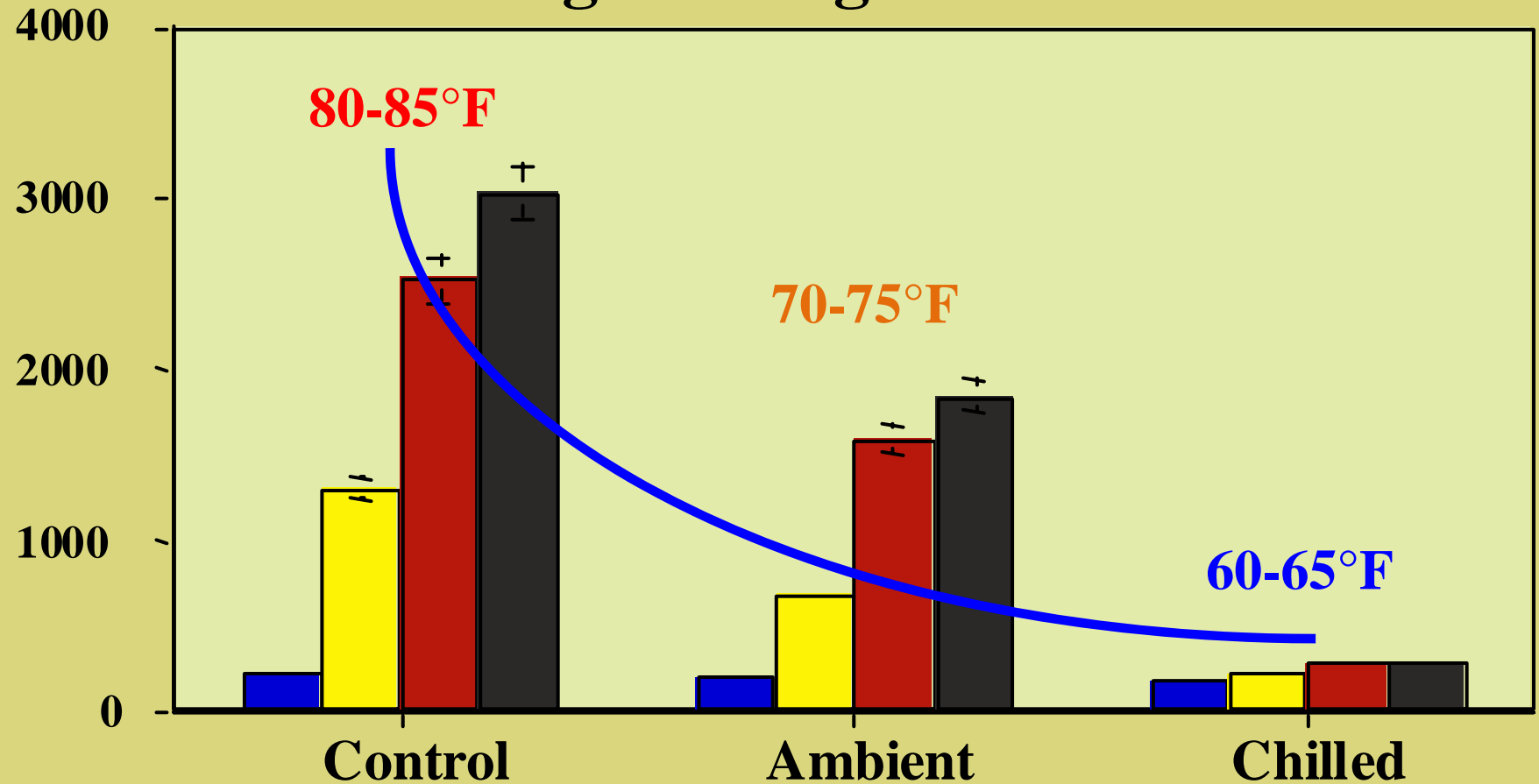
Headspace Ventilation



135,000 bu Bin of Corn during Summer Storage in Indiana – Non-aerated on 7/28/89



Insect Cage Emergence - Field



■ Month 1 ■ Month 2 ■ Month 3 ■ Month 4



Summer Aeration

Should cooled grain be warmed
up again?

NO!

University of Minnesota Fan Selection for Grain Bins

Background

Show Background

Settings

Print

Bin and Crop Inputs

Select a crop:	<input type="text" value="Barley"/>	Bin Diameter, feet:	<input type="text" value="21"/>
Floor Type:	<input checked="" type="radio"/> Full <input type="radio"/> Duct	Grain Depth, feet:	<input type="text" value="20"/>
		Desired airflow (cfm/bu):	<input type="text" value="1"/>

Estimated Fan Requirements

Show Table

(to get desired airflow when bin is full)

Bin capacity (bushels):	5,542
Total airflow (cfm):	5,542
Estimated static pressure (inches of water):	7.12
Estimated fan power needed (hp):	10.34

Fan Selection

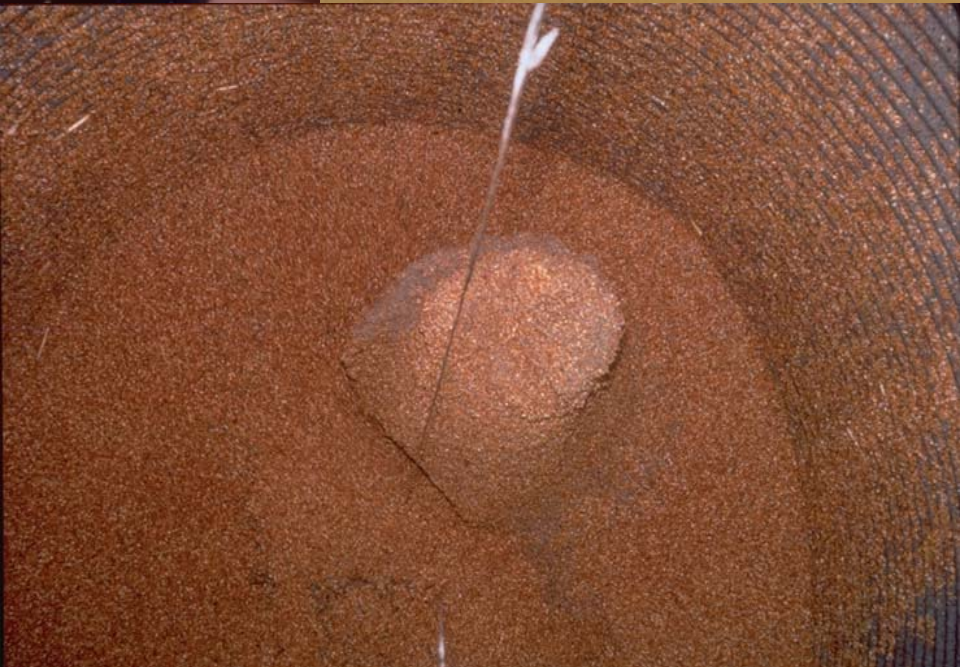
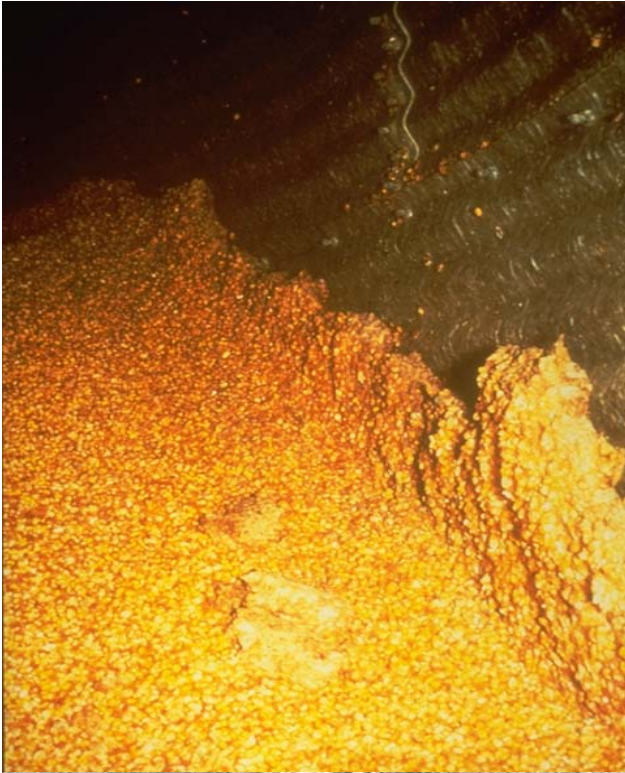
Show Fan Data

Select a fan:	<input (axial)"="" type="text" value="0.33 hp AEROVENT 1240-DW 12"/>	<input type="button" value="Add a New Fan"/>
Fan arrangement:	<input checked="" type="radio"/> Parallel <input type="radio"/> Series	Number of fans on bin: <input type="text" value="1"/>

<http://webapps.bbe.umn.edu/fans/>

S.L.A.M. Step 4: Monitoring

- Temperature
- Moisture
- Molds
- Insects
 - present or absent
 - population growth
 - pest control (fumigation)
- Rodents





Handheld CO₂ sensor
Telaire 7001 ~\$400
www.telaire.com

Use of handheld CO₂
sensor (Outdoor pile)





Pitfall Probe Traps





Foreign Grain Beetle

**Mold
Feeders**

Hairy Fungus Beetle





Stored Grain Management Implications for 2013 Harvest

- Store grain at safe moisture content
- Core & level grain after loading bins
- Cool grain then seal fans
- Manage headspace conditions with intermittent ventilation
- Monitor grain regularly for insect activity and mold development

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<http://www.ag.ndsu.edu/graindrying>

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