Grain Quality Management for the 2013 Harvest

Grain Journal Webinar

November 18, 2013

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Grain Science & Industry Department

Kansas State University

www.grains.k-state.edu

Preharvest Outlook for Grain Quality:

Iowa Grain Quality Initiative

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.iowagrain.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.

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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)

Dryer Type	*Average MC (%)*		*MC Range (%)*		*Point Differential*		*Standard Deviation*	
	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

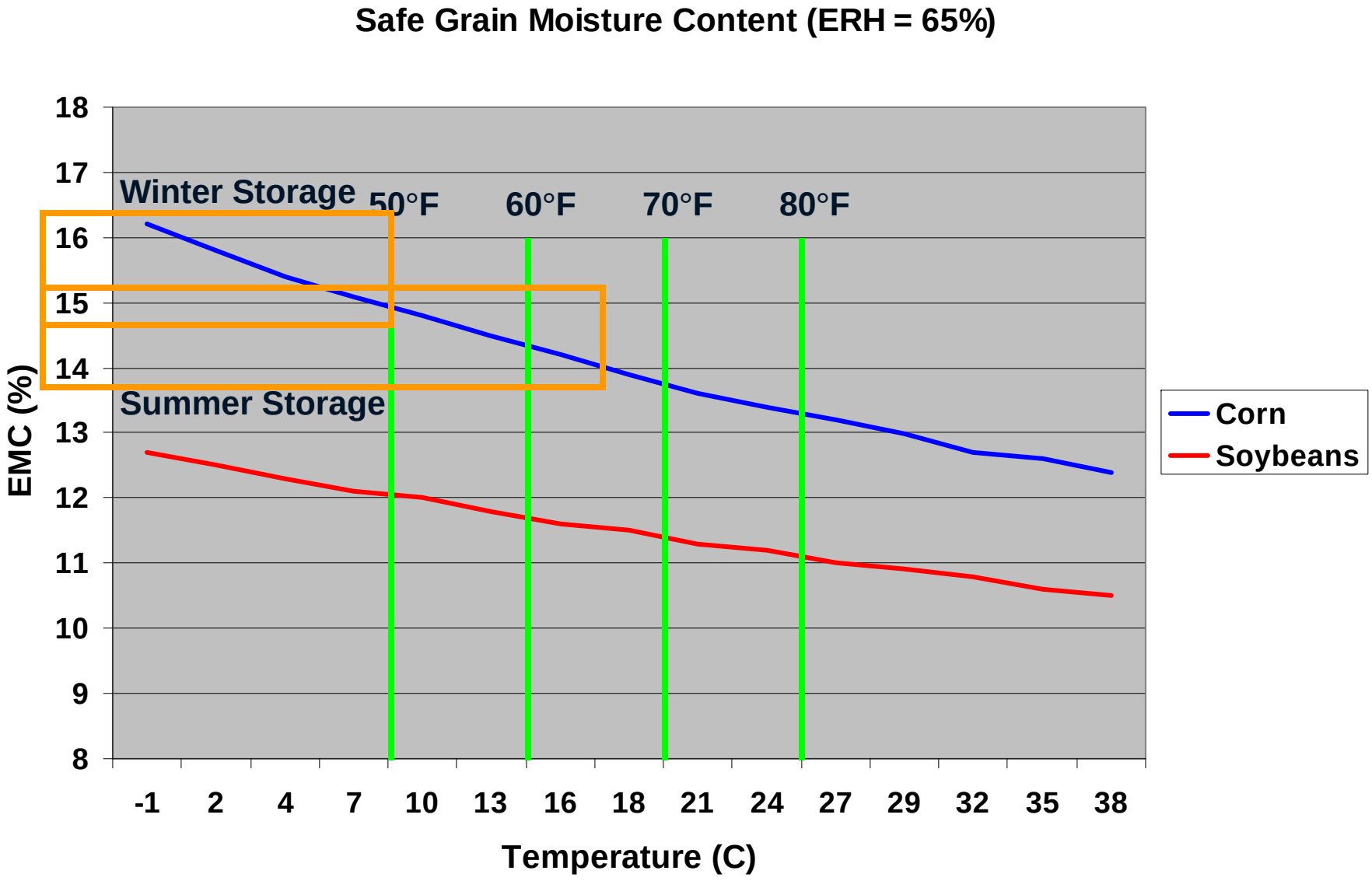
- **Hot and Dry: Most Likely Now**
  - Small beans, dry beans?, low protein
  - So late in planting…may still have some frost risk
- **Hot and Wetter: Not Likely Now**
  - Bigger beans, wetter beans, frost risk, composition?

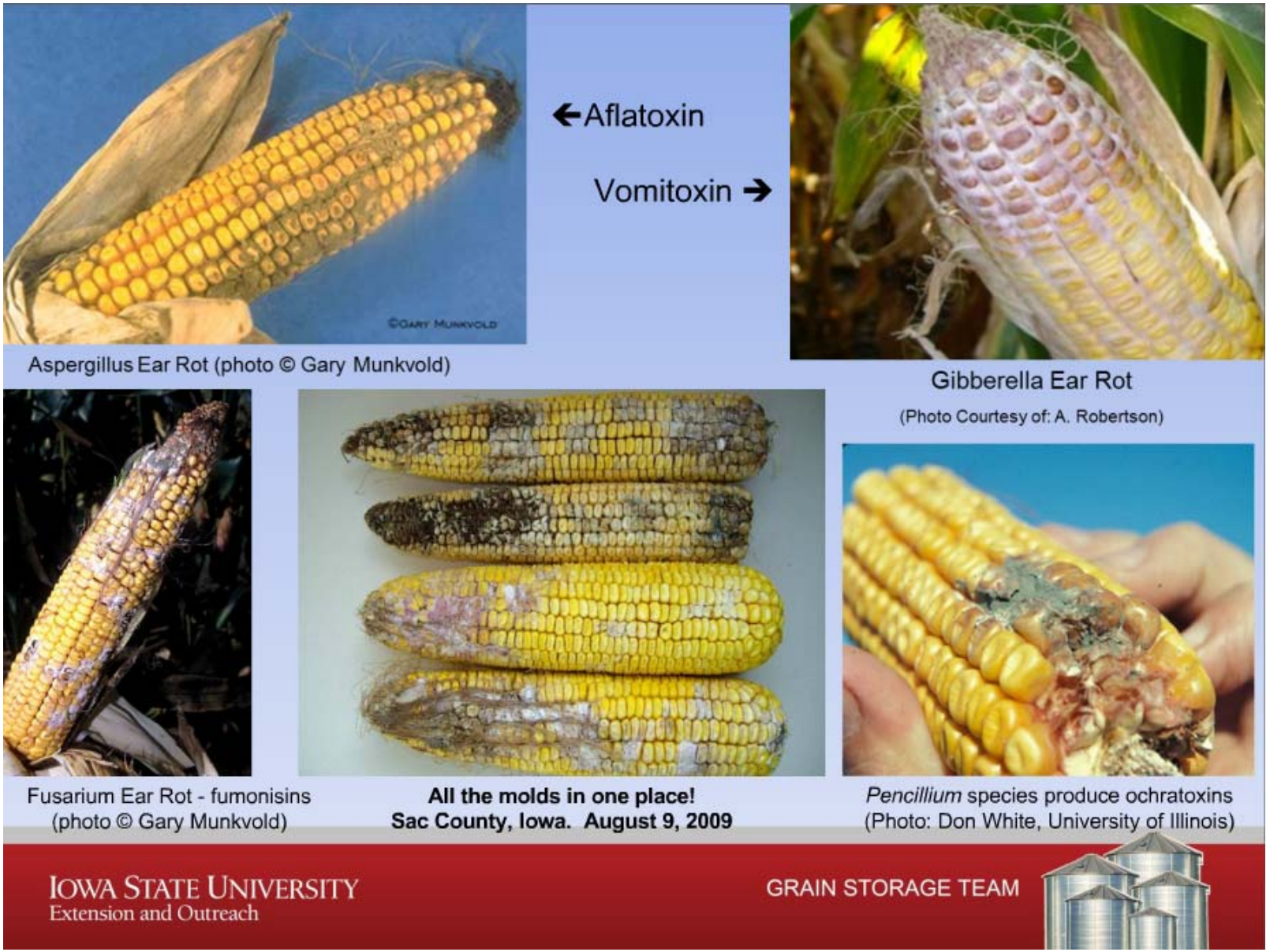
Late growth:	**Green stems and mixed quality**
New moisture meter:	**+1-2% on green beans**
Frost:	**Aerate for 2-4 weeks.**

http://www.abe.iastate.edu/extension-and-outreach/grain-quality/

www.iowagrain.org

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

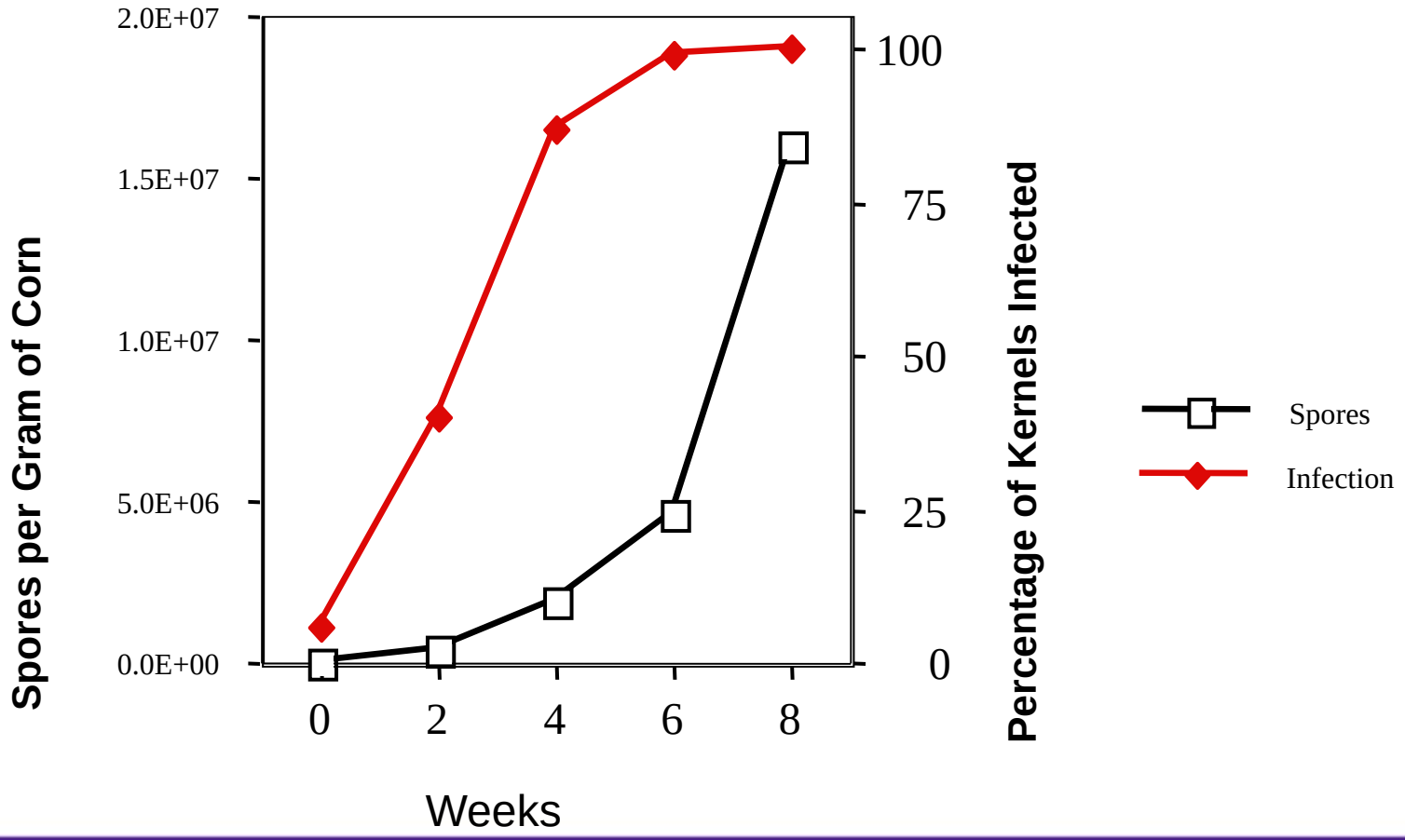

Safe Grain Moisture Content (ERH = 65%)
Winter Storage
Summer Storage
50°F
60°F
70°F
80°F
EMC (%)
18
17
16
15
14
13
12
11
10
9
8
-1
2
4
7
10
13
16
18
21
24
27
29
32
35
38
Temperature (C)
Corn
Soybeans



http://www.abe.iastate.edu/extension-and-outreach/grain-quality/

www.iowagrain.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

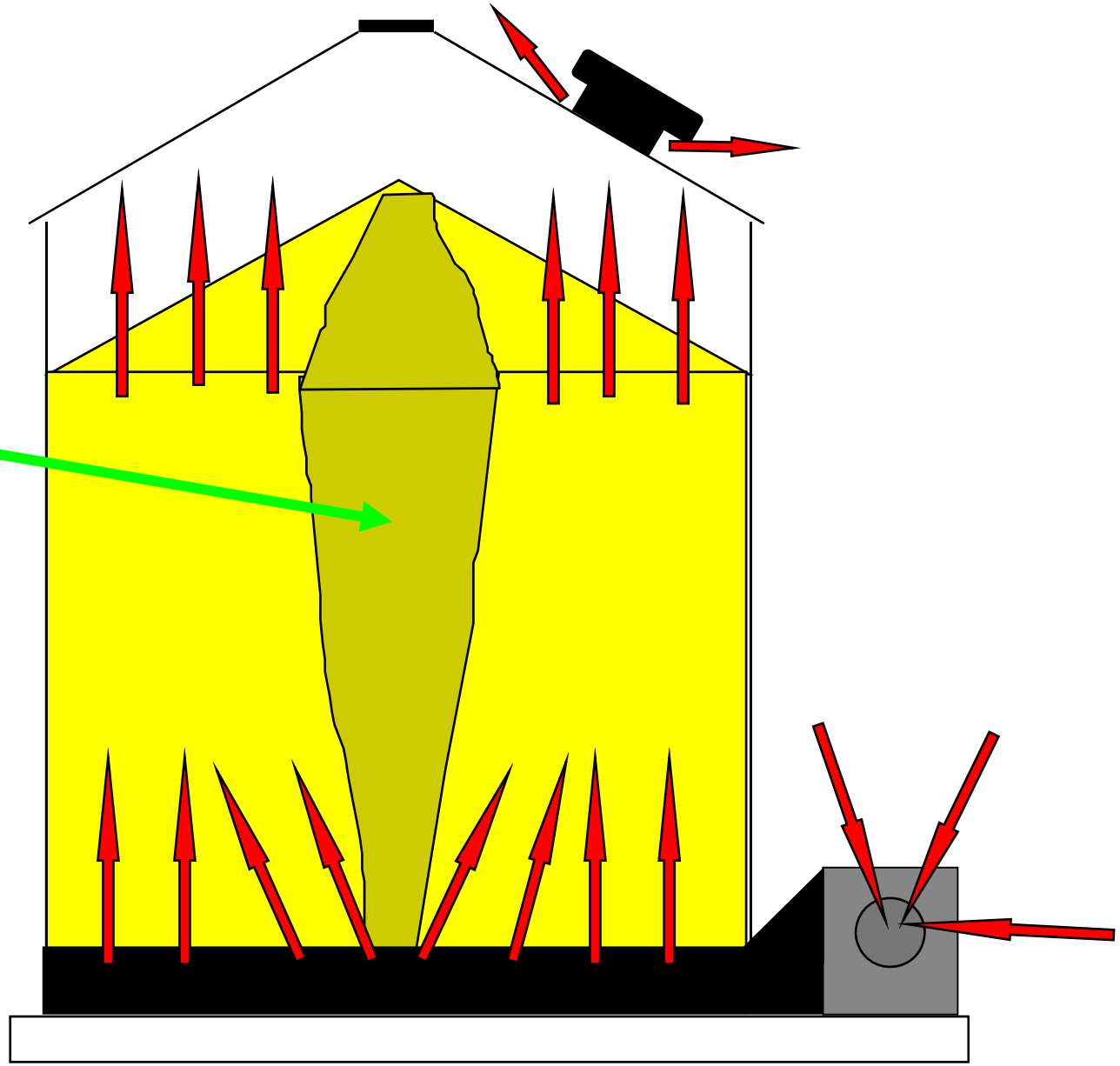
Pre-Cleaning

Gravity Cleaner

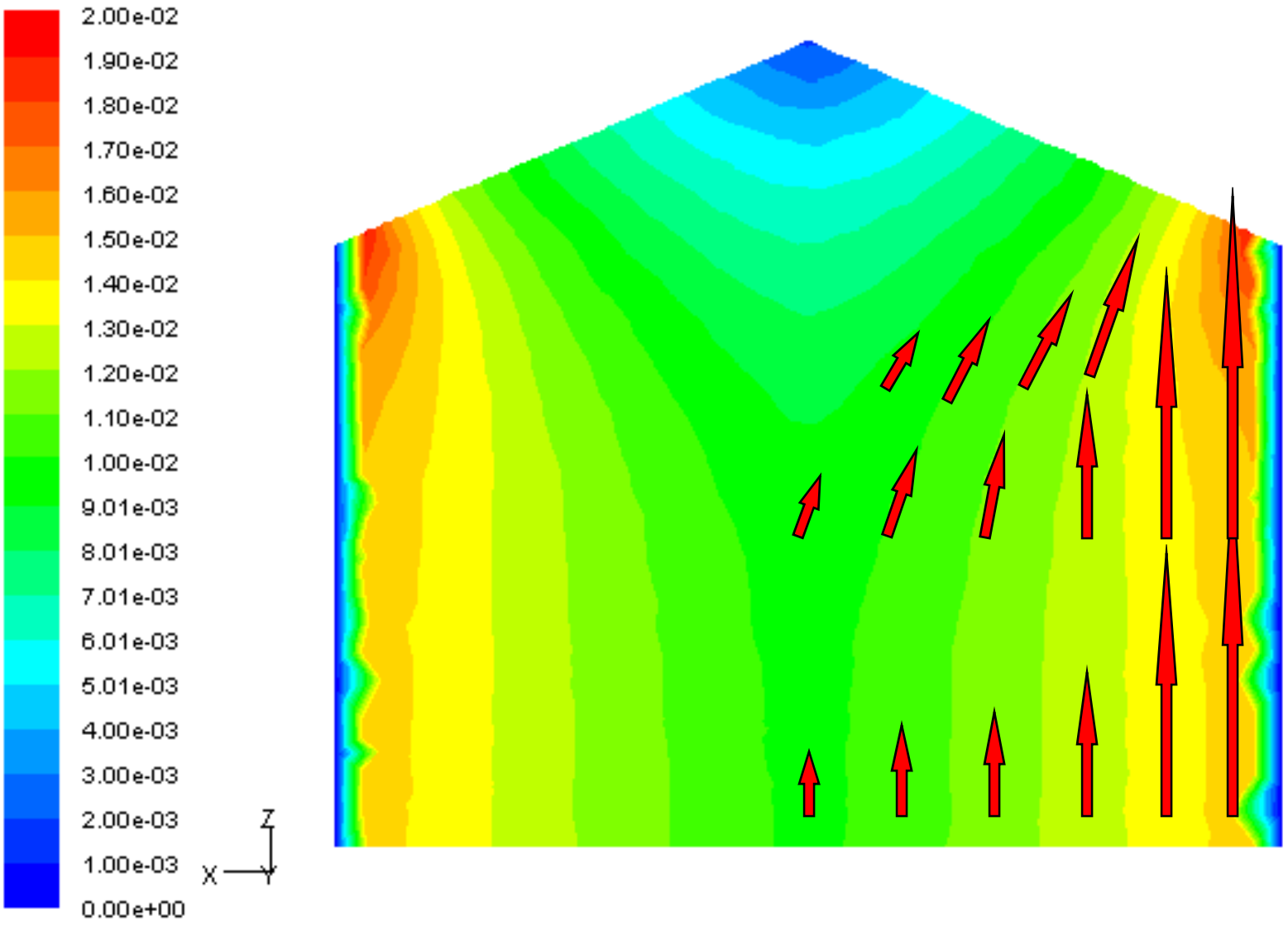
Aspirated Cleaner

Rotary Cleaner

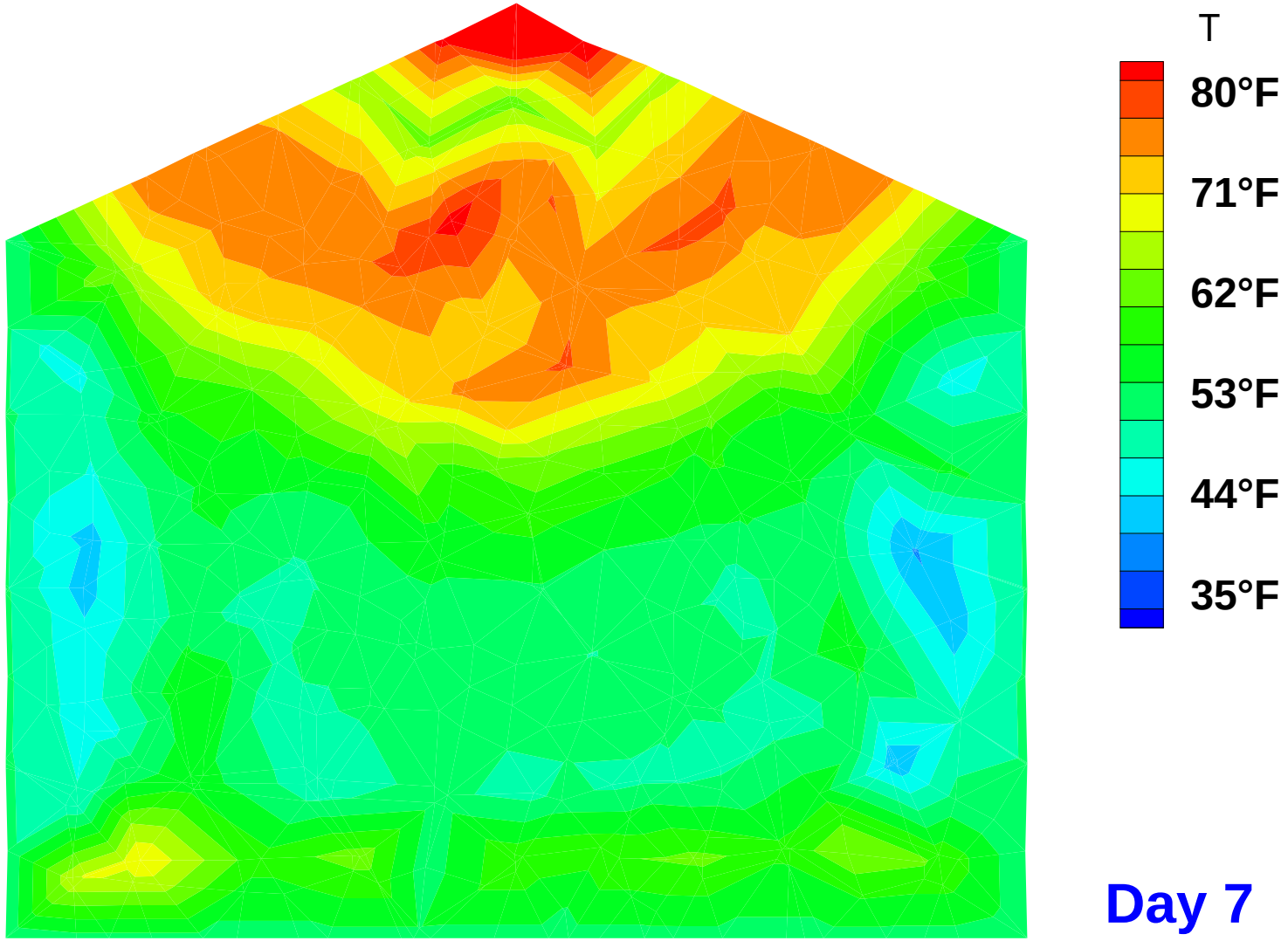
- **Core of fines**
  - Foreign Material (FM)
  - Broken grain
  - Weed seeds



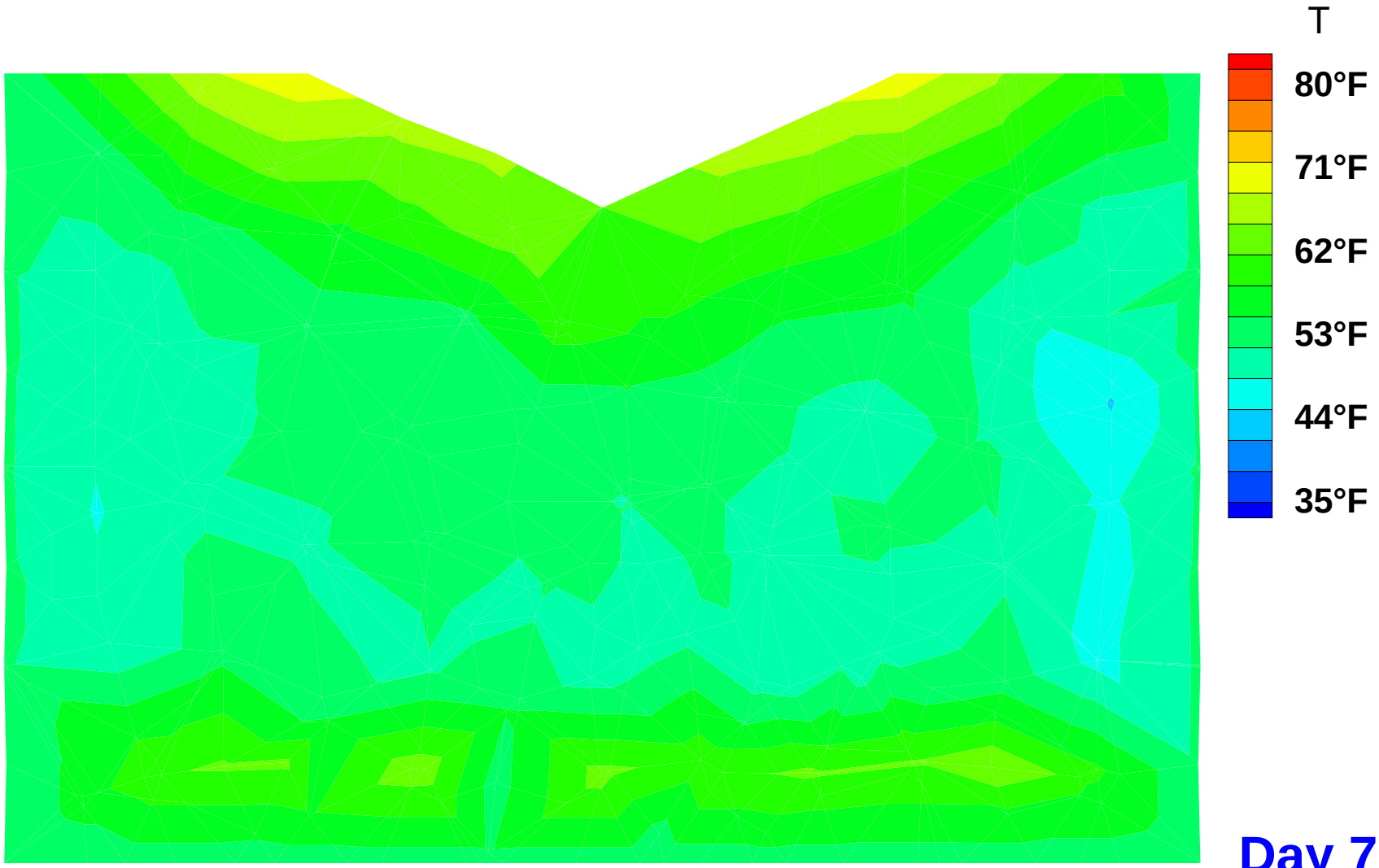
Non-uniform Airflow Effect - Peaked Grain Mass



Aeration Cooling Effect - Peaked Grain Mass



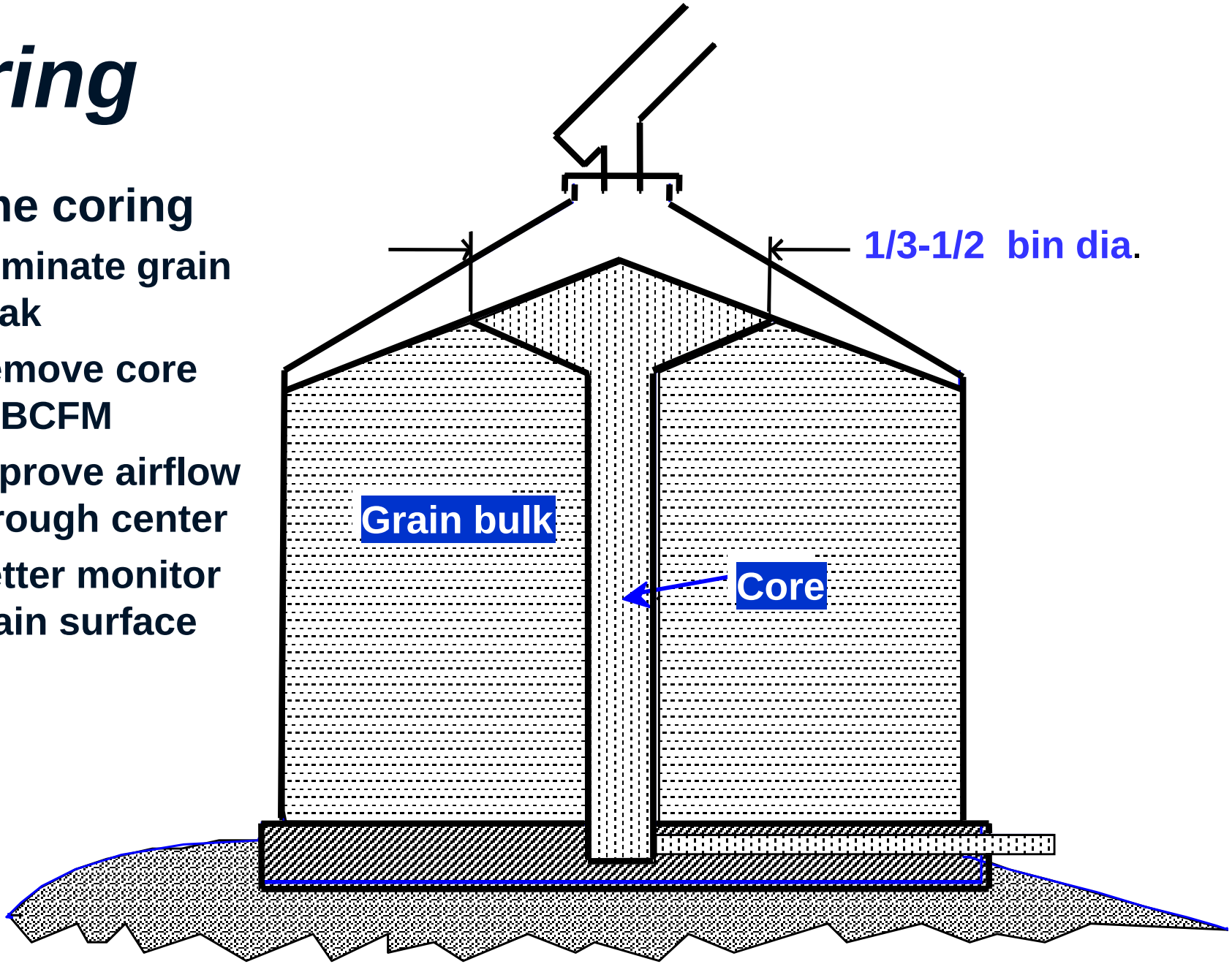
Aeration Cooling Effect - Cored Grain Mass



Coring

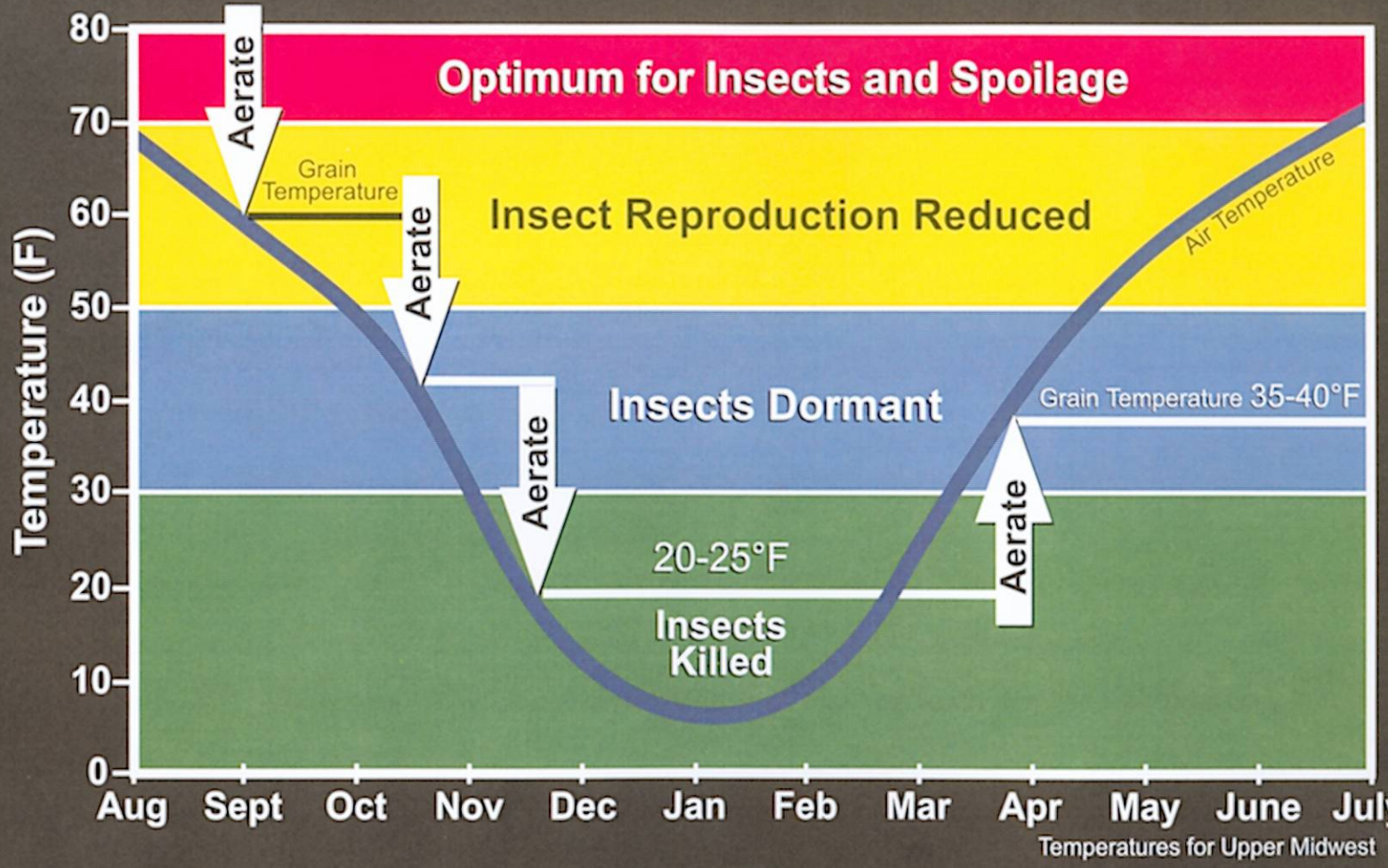
One time coring

- **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, P
NDSU Extension Service

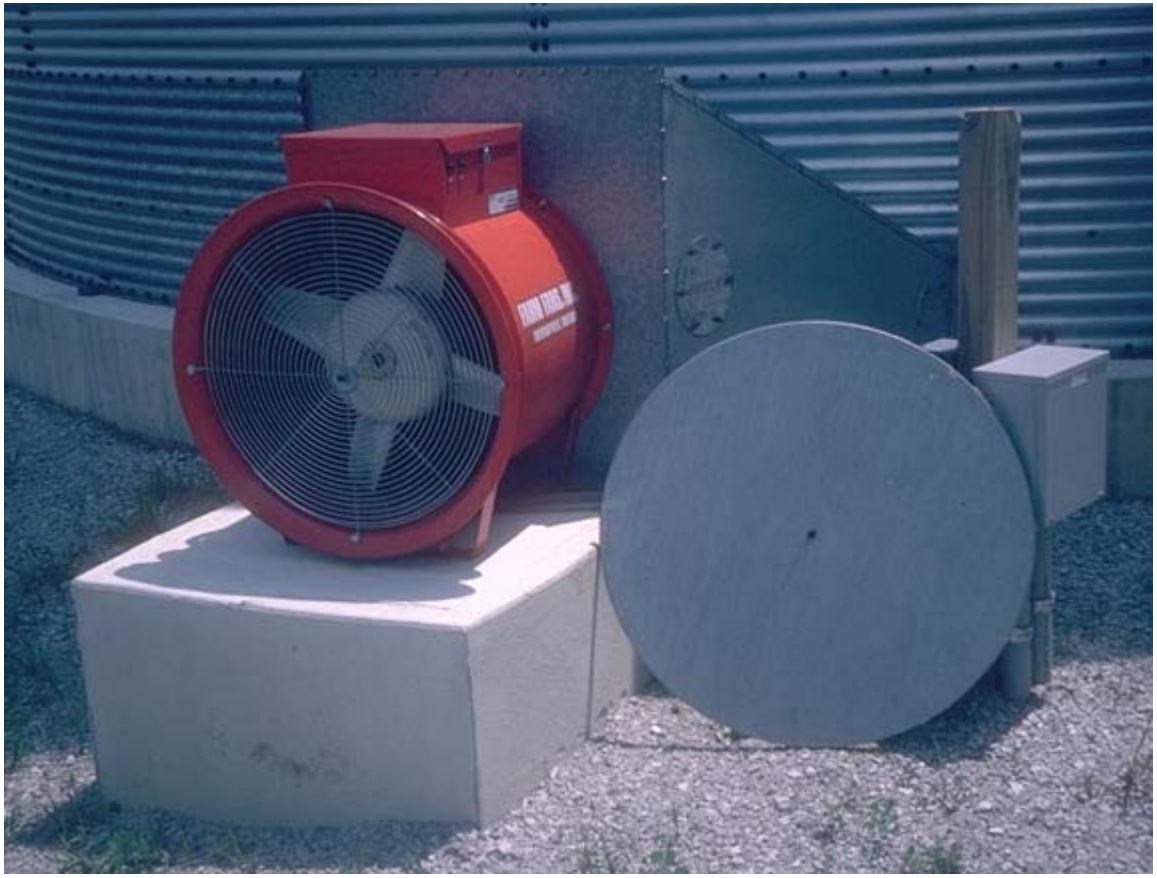
http://extensiontv.unl.edu/v/2814#vContainer

www.grainquality.org

Aeration Phases

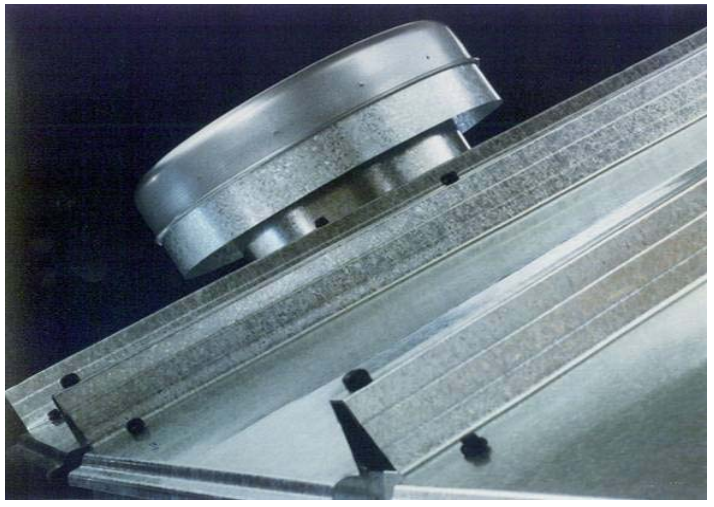
- Phase 1: Fall Cool Down
  - Lower grain temperatures stepwise
    - October 40-45 F
    - November 35-40 F
    - December 28-35 F
- Phase 2: Winter Maintenance
  - Maintain temperatures with intermittent aeration
    - January, February 28-35 F
- Phase 3: Spring Holding
  - Keep cold grain cold
  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

Sealed Fan

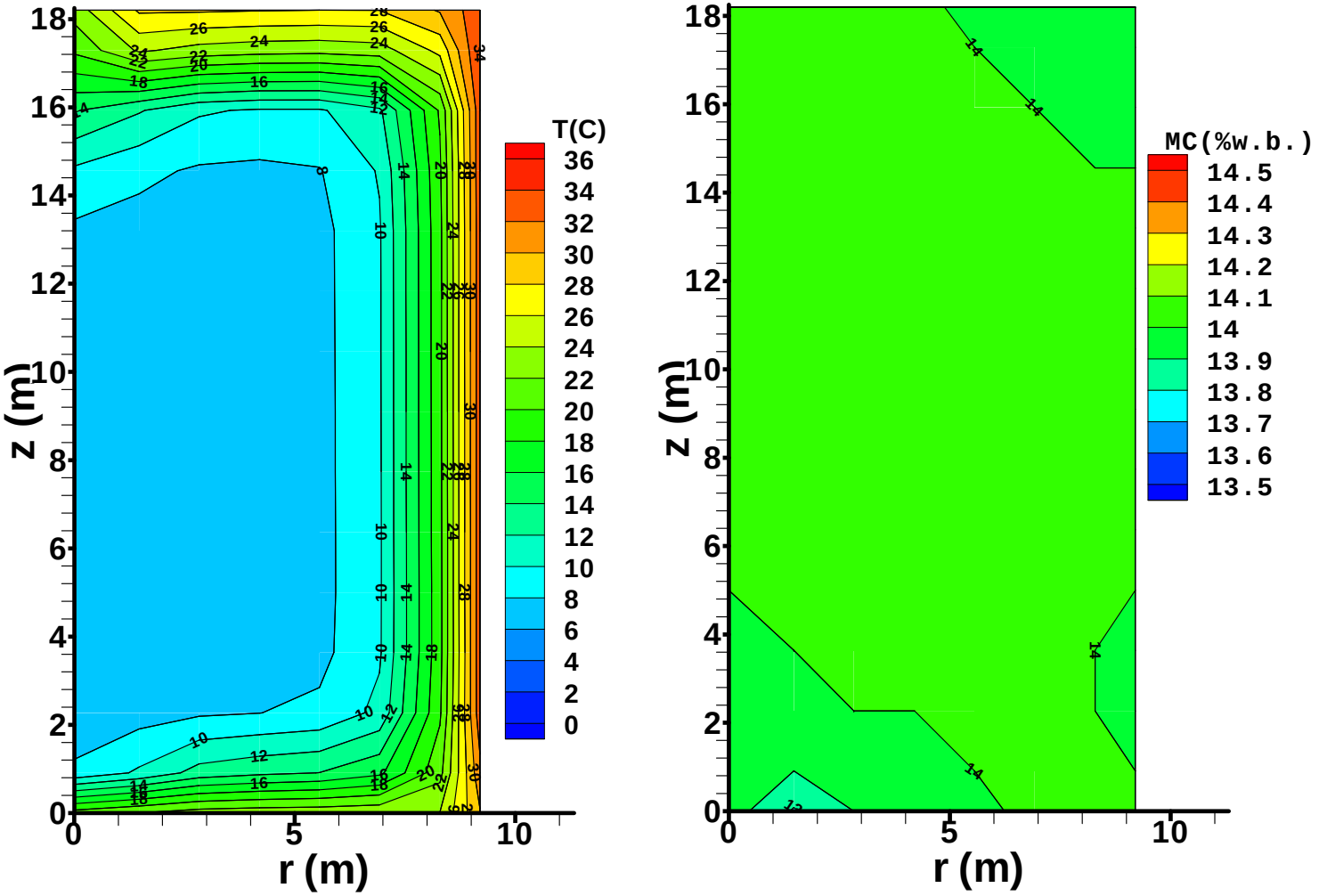


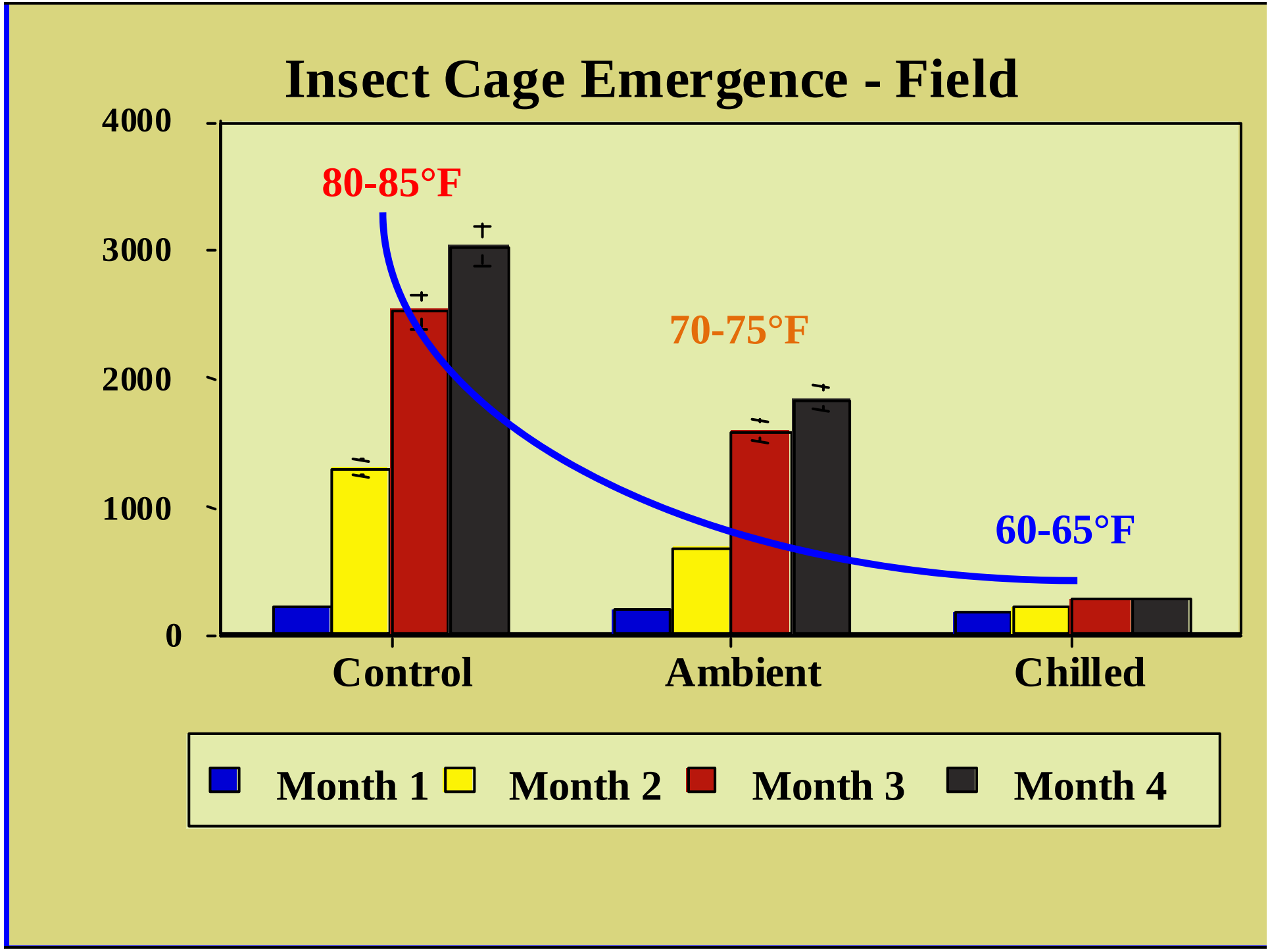
Open Fan

Headspace Ventilation



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




Insect Cage Emergence - Field
4000
3000
2000
1000
0
80-85°F
70-75°F
60-65°F
Control
Ambient
Chilled
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:	Barley	**Bin Diameter, feet:**	21
Floor Type:	(•) Full ( ) Duct	**Grain Depth, feet:**	20
		Desired airflow (cfm/bu):	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

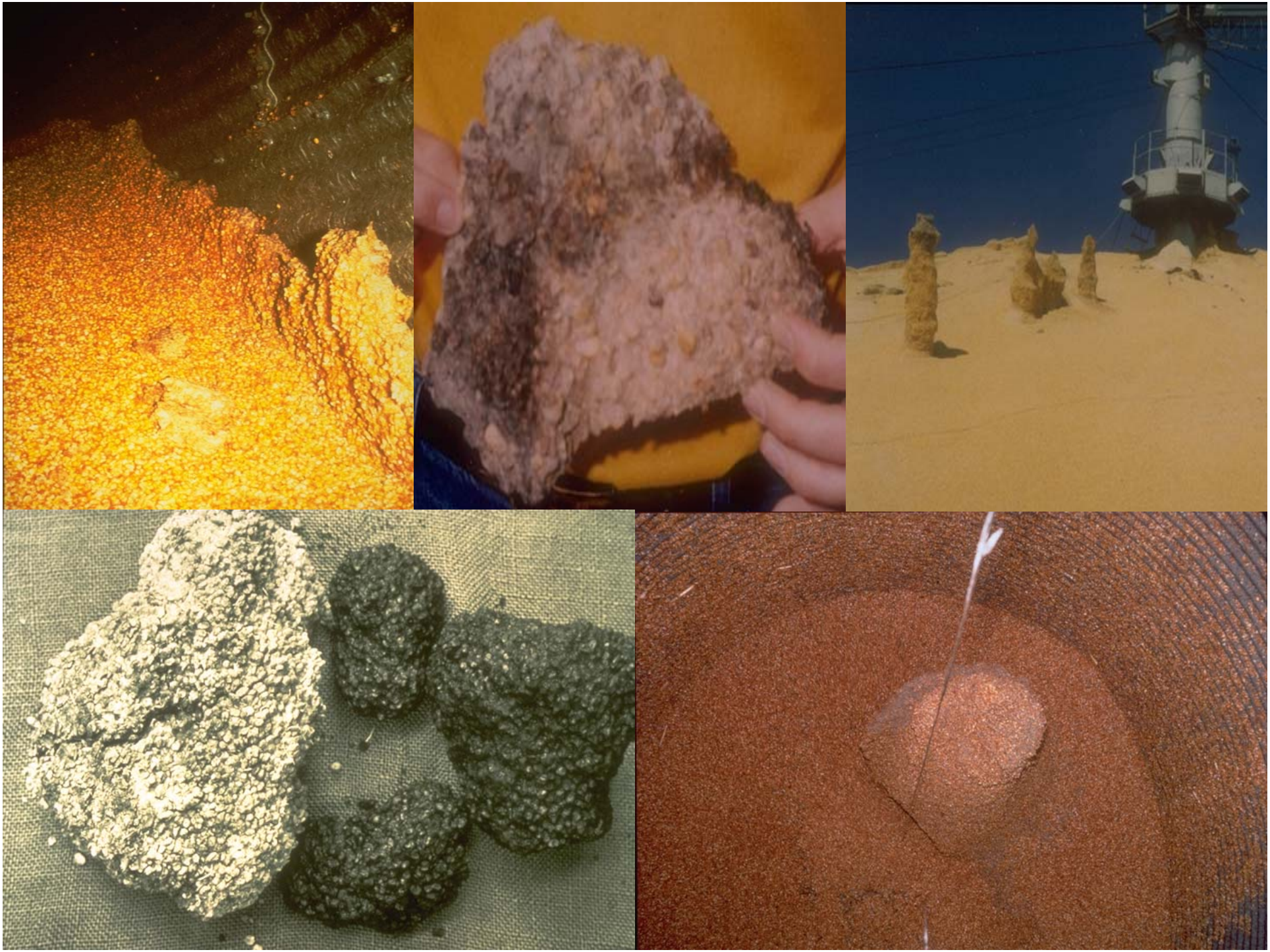
Show Fan Data

Select a fan:	0.33 hp AEROVENT 1240-DW | 12" (Axial) Add a New Fan		
Fan arrangement:	(•) Parallel ( ) Series	**Number of fans on bin:**	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 CO_2 sensor

Telaire 7001 ~$400

www.telaire.com

Use of handheld CO_2 sensor (Outdoor pile)

Pitfall Probe Traps

Foreign Grain Beetle

Hairy Fungus Beetle

Mold Feeders

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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Extension Ag & Biosystems Engineering

ABEN Department

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

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