# Quality Management of the 2013 Crop

St. Louis NGFA  2013

Bob Marlow
Central Region Operations Manager
The Andersons Inc.

# The Andersons,Inc

- Where we operate

- Grain Group operate more than 30 facilities in Ohio , Michigan, Indiana, Illinois, Nebraska ,Iowa, and Tennessee.
- Grain Group  storage capacity over 130 million bushels
- 39 million bushel capacity in the Central Region with > 10 mm bushel in temporary structures, both covered and uncovered piles

# Today's discussion points

- Review what we  have heard of the crop quality  thus far
- Look at "quality" impact on Safety
- Share  my "operations" perspective on the process
- Review the basics of S.L.A.M.

# Why the concern for this crop ?

- Late planting for many areas..
- Cooler than normal temps during development
- Large crop generally = space concerns / dryer issues
- Short 2012 crop.. Early harvest pressures
- Early, elevated CO 2 reading reported around country
- 2009 Crop = 2010 record for Entrapments / Deaths

# What we've learned to date ….

- Overall, most crops have been harvested in a timely fashion with fewer than expected issues..  Some harvesting still in progress
- Late August and September temperatures sped up crop development
- Some micotoxin activity, most I heard from extended storage prior to drying
- Some areas experiencing small kernels and lower test weights
- 2 nd crop soybeans have  / are causing some issues
- Heard of "blue eye" damage already  …due to early mold development / infection

# Blue Eye Damage

- Predominantly caused by aspergillus glaucus
- Naturally occurring , possible carry over from prior year
- Grows best at moistures > 15 %
- Once infected , it can remain dormant until temperatures and moistures improve.. : )

# So , how long can you store wet corn ??

**Maximum Allowable Shelled Corn Storage Time for 0.5% Dry Matter Loss, Days.[a] (ASABE Standards 2005)**

| Corn temp | Corn moisture, % wet basis | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| °F | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 |
| 35 | 1144 | 437 | 216 | 128 | 86 | 63 | 50 | 41 |
| 40 | 763 | 291 | 144 | 85 | 57 | 42 | 33 | 27 |
| 45 | 509 | 194 | 96 | 57 | 38 | 28 | 22 | 18 |
| 50 | 339 | 130 | 64 | 38 | 26 | 19 | 15 | 12 |
| 55 | 226 | 86 | 43 | 25 | 17 | 13 | 10 | 8 |
| 60 | 151 | 58 | 29 | 17 | 11 | 8 | 7 | 5 |
| 65 | 113 | 43 | 22 | 13 | 9 | 7 | 5 | 4 |
| 70 | 85 | 32 | 16 | 10 | 7 | 5 | 4 | 4 |
| 75 | 63 | 24 | 12 | 8 | 5 | 4 | 3 | 3 |

# Not always stored in conventional structures

# Why is Grain Quality Important to us all ?

- Allows us to carry the crop forward to satisfy future need (s)
- Provides the end user with a quality product
- Provides opportunity. Income, premiums, blend
- Reduces risk… financial … Quality shrinks
- And last, but not least, in my opinion, if we address “quality” we can eliminate the need to enter a confined space when the grain is flowing

# The Major cause of grain entrapments

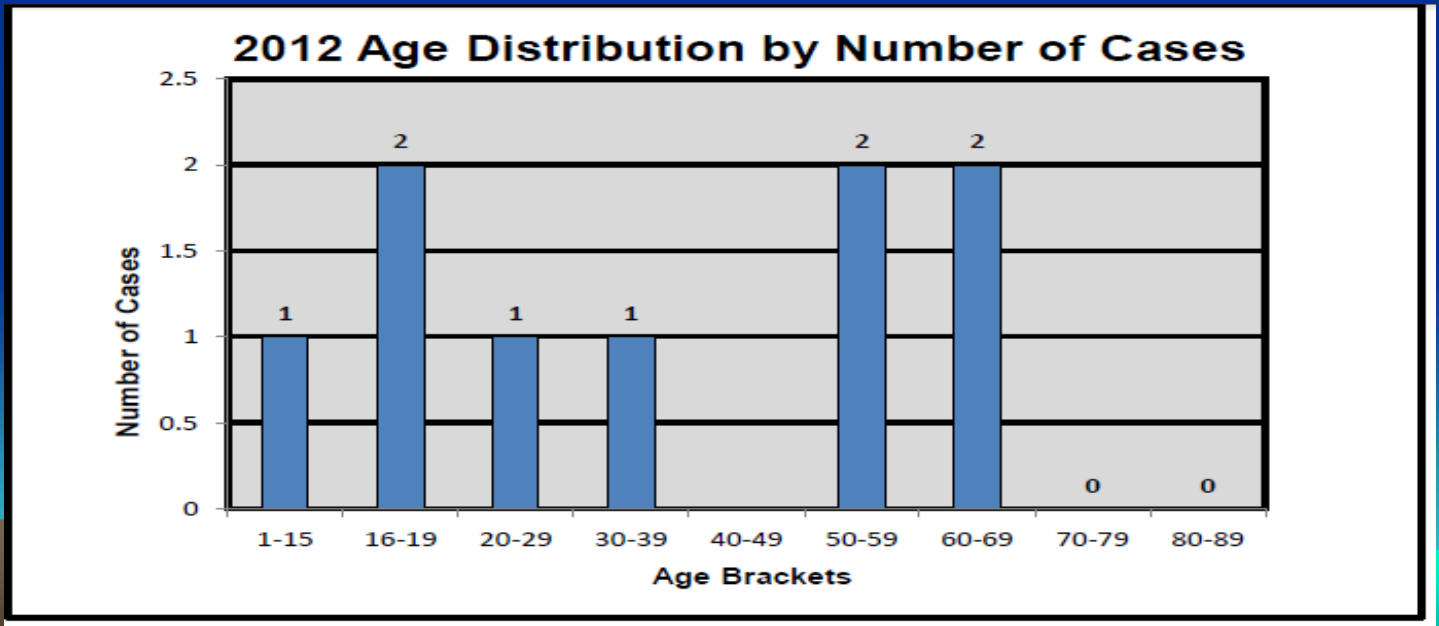
- There continues to be a direct relationship between 'out-of-condition' or spoiled grain, and greater probability of entrapment (Riedel and Field, 2010)

**Source:** Riedel, S and W. Field. 2010. 2010 summary of grain entrapments in the United States. February 9, 2011.

Historically, approximately 70% of all documented entrapments, where the type of work site was known, have occurred on farms or other locations currently exempt from the OSHA Grain Handling Facilities.

While historically, most occur in corn , soybeans were the number 1 commodity in 2012… Over the past thirty years corn has been involved in approximately 45% of the grain-related entrapments where the medium was known.

All the victim  have been male…And just how old ??



# A Sobering Chart…

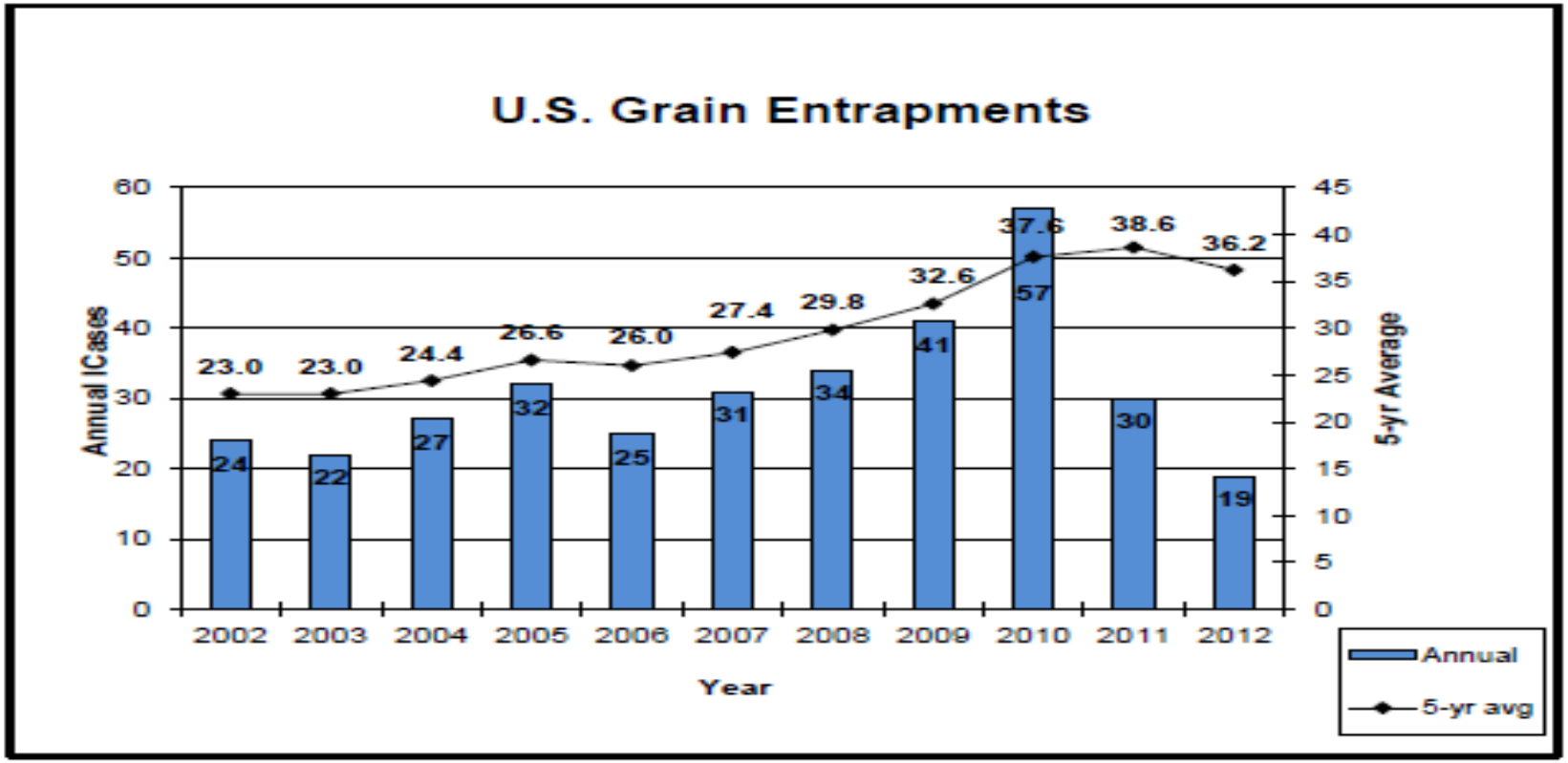



Figure 2: Number of annual grain entrapments recorded and the 5-year average between 2002 and 2012

# And as a result……

May 31, 2013

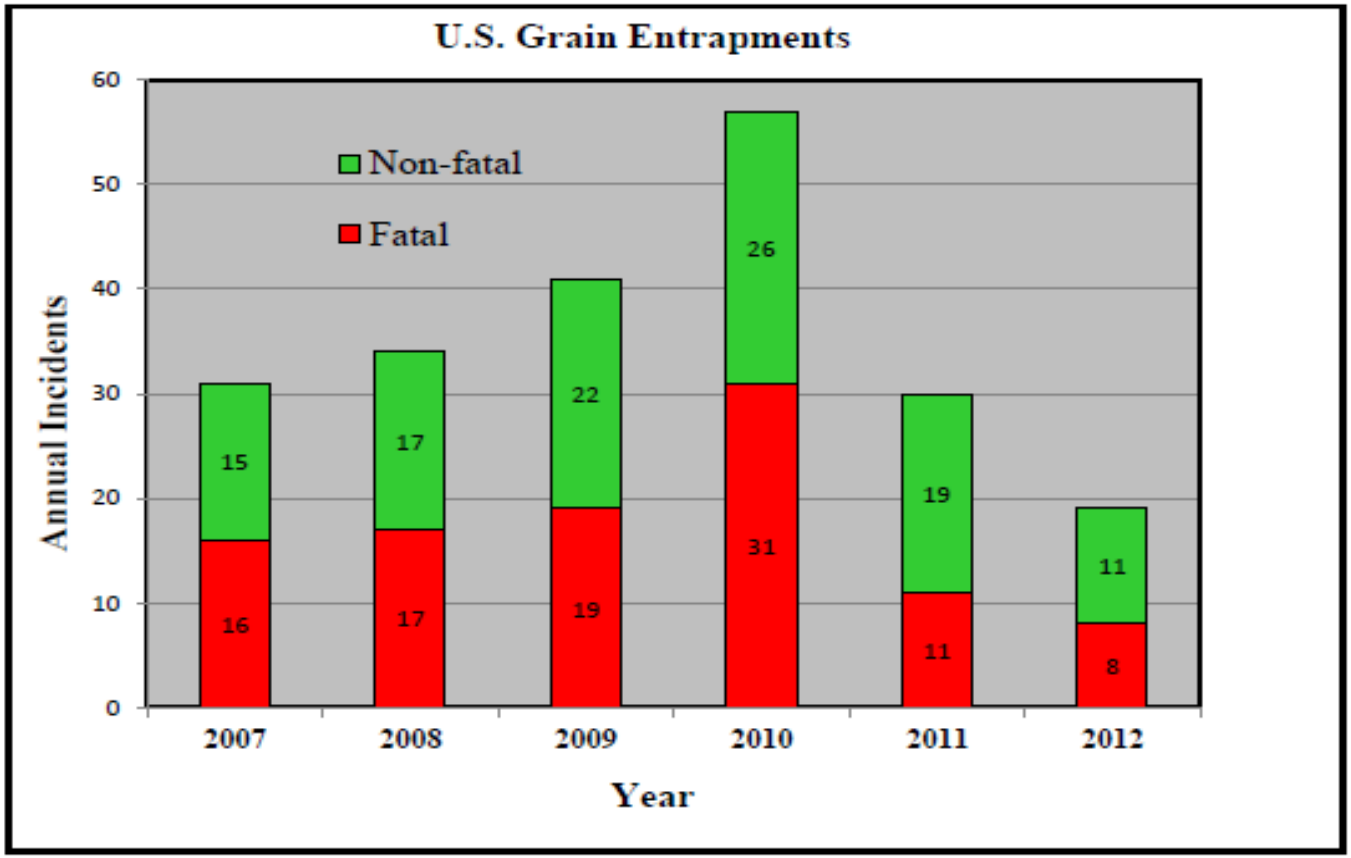



Figure 6: Fatal vs. non-fatal incidents recorded between 2007 and 2012

# What can we do ?? ….I prescribe to S.L.A.M. (Purdue University )

- S.L.A.M. represents these (4) simple steps :

- S= Sanitize, clean, seal
- L= Load, screen , level, core,
- A= Aerate
- M= Monitor

# The “S”

- Clean aeration ducts and piping.. Under floors
- Seal up around all openings , roof, sidewalls, and ductwork
- Clean out conveyor and handling systems from old crop / carry over stocks
- Use residual protectants where possible
- Inspect  / ensure temperature system is operable ..  Identify and replace inoperable cables  if possible..

# The “L”

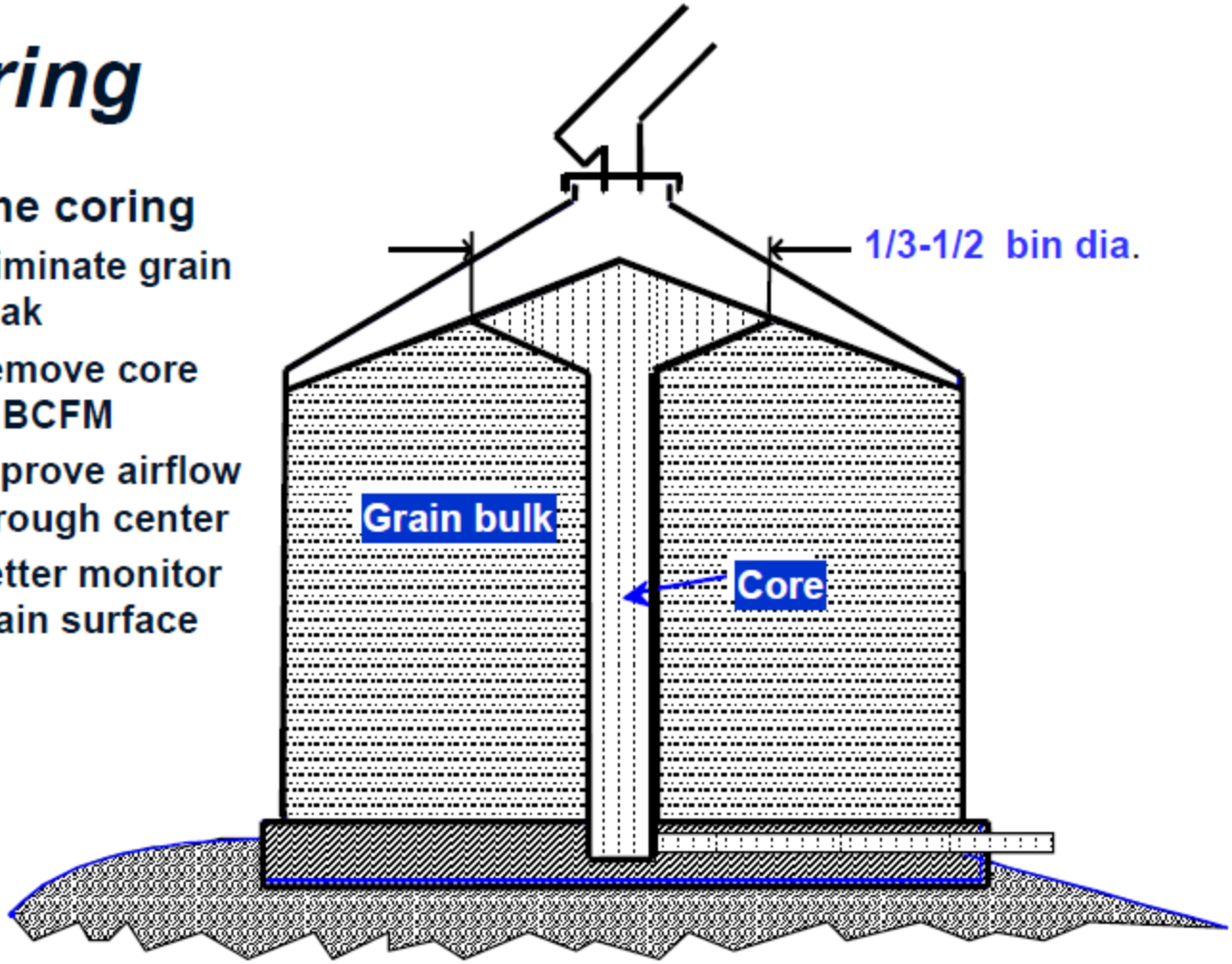
- Clean the grain prior to storage where possible
- Load the bin
- Depending on size, consider multiple cores
- Clean core
- Leave the bin inverted or near level

# Need to core your tank ??

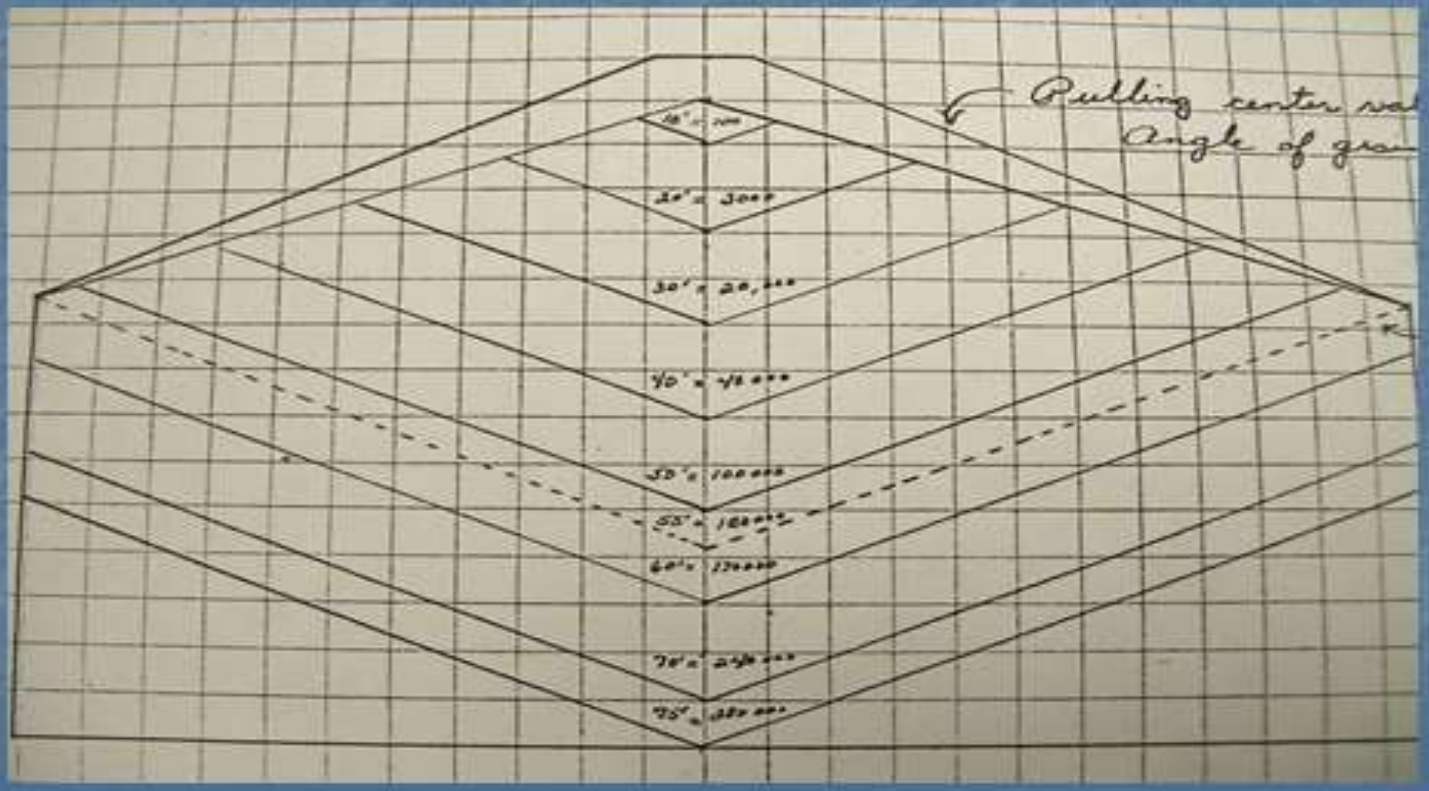
# Coring

**One time coring**

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



# Hearting Tanks



# The “A”

- Phase 1..  Initial cooling. Drop temps in stages … 40 to 45  , 35-40 ,
- Target temperature =  25 - 35  f
- Phase 2..  Maintain temps with intermittent fan operation
- Phase 3 .Keep it cold..  Do not warm up.. Seal your fans…
- Ventilate the headspace

# Approx. aeration times / fan time operation

Times vary depending on amount of fines / Midwestern US

| 56 # per bushel | 60 # per bushel |
| --- | --- |
| Airflow rate per bushel : | Airflow rate per bushel : |
| .10 cfm = 140 hours | .10 cfm = 150 hours |
| .20 cfm = 70 hours | .20 cfm = 75 hours |
| .50 cfm = 28 hours | .50 cfm = 30 hours |

# Soft Red Wheat

Table 3. Equilibrium moisture content of soft red winter wheat (%wb) at different temperature and relative humidity levels.

| Temperature | | Relative Humidity (%) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 10 | 20 | 30 | 40 | 50 | 60 | 65 | 70 | 80 | 90 |
| C | F | Equilibrium moisture content, %wb | | | | | | | | | |
| 1.7 | 35 | 7.3 | 8.9 | 10.2 | 11.3 | 12.3 | 13.4 | 14.0 | 14.7 | 16.1 | 18.2 |
| 4.4 | 40 | 7.1 | 8.7 | 10.0 | 11.1 | 12.1 | 13.2 | 13.8 | 14.4 | 15.9 | 18.0 |
| 10 | 50 | 6.8 | 8.4 | 9.6 | 10.7 | 11.8 | 12.9 | 13.4 | 14.1 | 15.5 | 17.6 |
| 16 | 60 | 6.5 | 8.1 | 9.3 | 10.4 | 11.4 | 12.5 | 13.1 | 13.7 | 15.1 | 17.2 |
| 21 | 70 | 6.2 | 7.8 | 9.0 | 10.1 | 11.1 | 12.2 | 12.8 | 13.4 | 14.8 | 16.9 |
| 25 | 77 | 6.0 | 7.5 | 8.7 | 9.8 | 10.9 | 11.9 | 12.5 | 13.1 | 14.5 | 16.6 |
| 32 | 90 | 5.8 | 7.3 | 8.5 | 9.6 | 10.6 | 11.6 | 12.2 | 12.8 | 14.2 | 16.3 |

Source: ASAE Data D245.4 / Average of two prediction equations.

# The “M”

- Monitor temperature cables
- Check grain for temperatures, molds, moistures, surfaces
- Use CO 2 monitoring where an when possible

# If you keep it cold..

- Ensure fan inlets are sealed
- As daytime temps increase, run roof ventilators to reduce headspace temperatures Critical
- Consider use of thermostat control on roof ventilators

# Power Roof Ventilators

# So, what methods are available to monitor Grain Quality ??

- Periodic inspection
- Transferring / sampling
- Temperature cables
- Checking for odors
- Samples at load out
- CO 2 monitoring

# Limitations of traditional methods

- Human sensory skills vary from person to person
- Temperature cables can detect heat, but only at a relatively close distance to the cable, as grain is an excellent insulator
- Sampling and or transferring may not be possible or economic
- Surface inspection …

# Manual CO 2 Monitoring method

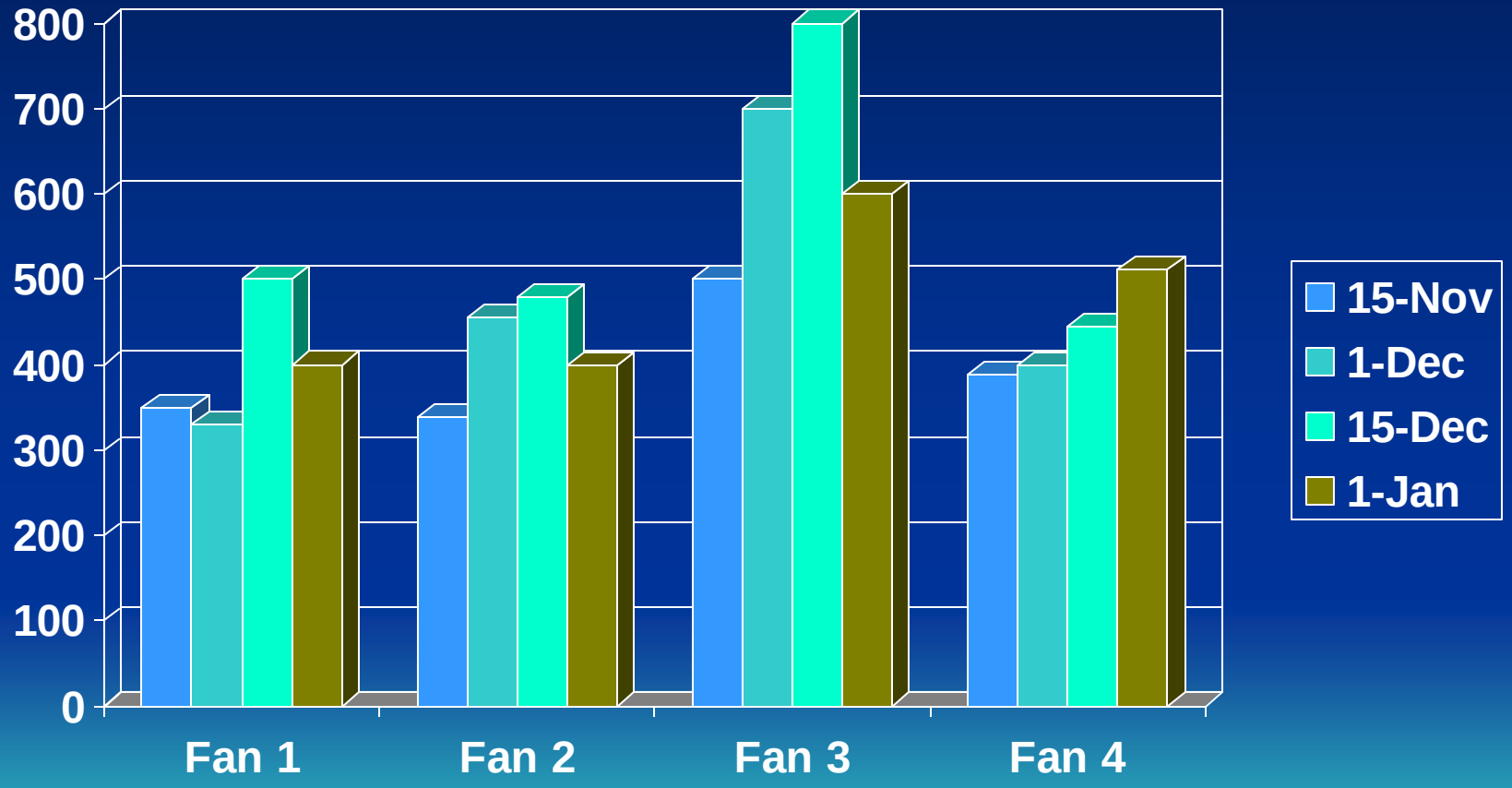
# Hand held Units ( typically less than $500 )

## Telaire® 7000 Series

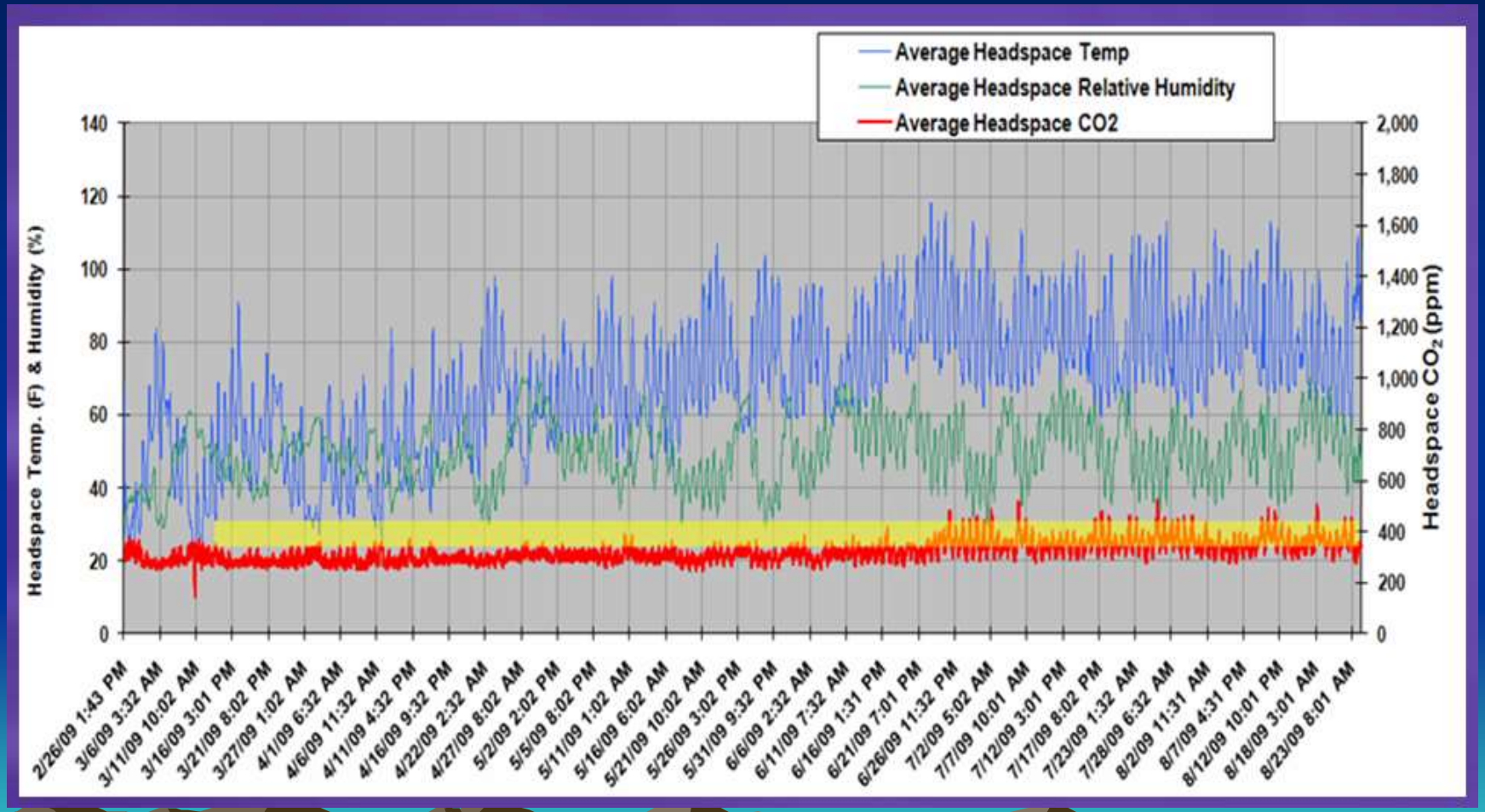
### Handheld Indoor Air Quality (IAQ) Monitors

Telaire 7000 Series are Telaire products. Telaire has joined other GE high-technology sensing businesses under a new name—GE Industrial, Sensing.

# Charting the data

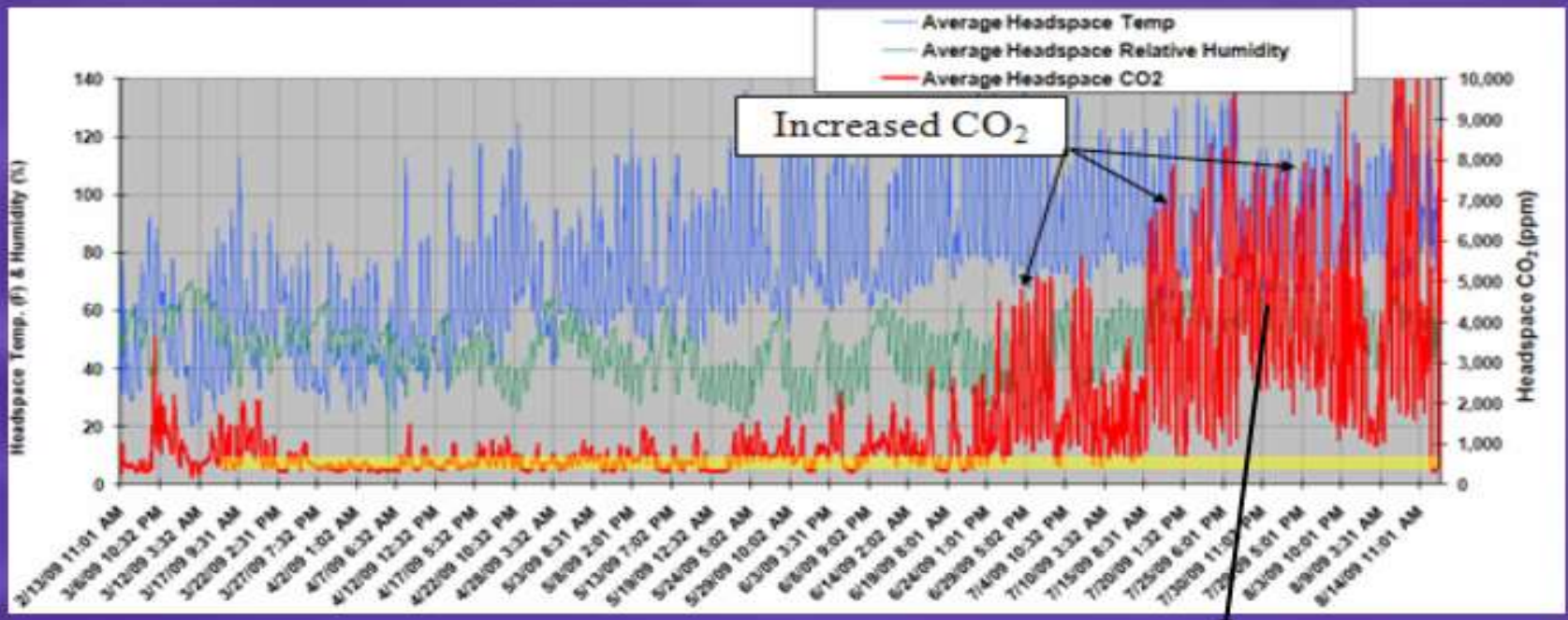


# Normal CO 2 / temps ( Kansas State)



# Stable Temperatures / Unstable commodity

**Figure 1.** Detection of increased $CO_2$ concentration from self-heating maize by a $CO_2$ sensor installed in the headspace of a farm silo (250 metric tons; MT) during Spring and Summer 2009



# I’ve done everything right… How long can I keep it ??

## Storage Life of Grain

| Maximum storage time (months) for corn and soybean* | | | | | | | |
|---|---|---|---|---|---|---|---|
| Corn temperature ° F | Moisture Content Corn *(top %)*, Soybean *(bottom%)* | | | | | | |
| | 13%, 11% | 14%, 12% | 15%, 13% | 16%, 14% | 17%, 15% | 18%, 16% | 24% N/A |
| 40 | 150 | 61 | 29.0 | 15.0 | 9.4 | 6.1 | 1.3 |
| 50 | 84 | 34 | 16.0 | 8.9 | 5.3 | 3.4 | 0.5 |
| 60 | 47 | 19 | 9.2 | 5.0 | 3.0 | 1.9 | 0.3 |
| 70 | 26 | 11 | 5.2 | 2.8 | 1.7 | 1.1 | 0.2 |
| 80 | 15 | 6 | 2.9 | 1.6 | 0.9 | 0.9 | 0.06 |

*Based on 0.5% maximum dry matter loss—calculated on the basis of USDA research at Iowa State University. Corresponds to one grade number loss; 2-3% points in damaged seeds. Soybean approximated at 2% lower moisture than corn.

**Source**: http://www.extension.iastate.edu/CropNews/2009/1015hurburghelmore.htm

# My “intended “ take a ways : ))

- Level / core / heart your bins .. Reduce the fines
- Encourage our producer customers to do the same..
- Cool the grain to improve storability / stabilize
- Monitor temperatures …Ventilate the head space.. seal your fans.. Keep it cool
- Monitor both insect and mold activity
- Use CO 2 monitoring where possible as another tool
- Talk to your employees’ and customers and reinforce the importance of grain quality and SAFETY

# Further educational opportunities

# Distance Education





## GEAPS 520: Grain Quality Management

*Next course offering:* **Jan. 6-Feb. 7, 2014**
*Registration closes:* **Dec. 17, 2013**

**Click here** to register online. **Click here** to download a registration form (PDF) to complete and mail/fax to the GEAPS office.

**Course Description:** This course focuses on the management and maintenance of quality grains and oilseeds. It includes lectures on quality factors of value-added grains and oilseeds; moisture content determination; grain sampling and quality standards; quality assured production of IP grains; relationship between air and grain properties; fan selection and operational management for drying, conditioning and aerating grains; grain storability, deterioration and mycotoxins; insect pest identification; pest management strategies for prevention and control; and Sanitation, Loading, Aeration and Monitoring (S.L.A.M.)-based stored grain management.

**Course Goals:** GEAPS 520 teaches students the basic principles of managing the quality of value-added grains during post-harvest handling, drying and storage. By the end of this course, students will be familiar with different methods of quality control and management systems and understand the grain-grading standards required to maintain quality and prevent potential problems.

**Target Audience:** GEAPS 520 is designed for grain-elevator professionals responsible for assessing, managing and maintaining grain quality, including those involved with storing and conditioning, aeration, drying, pest control and mycotoxin management.

# Acknowledgements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