Quality Grain Management and Safety
Objective of Storage:

Primary:
To maintain QUALITY of stored products after harvest and before end use!

$\textbf{Safety}$
Dilemma of Storage:

Quality *NEVER* improves during storage!
Causes of Grain Spoilage

Solar vs. shaded effect
- moisture migration, condensation, wall caking

Day vs. night time effect
- headspace condensation, surface crusting

Self-heating of stored product
- biological vs. chemical heating

Moisture infiltration
- bolt holes, cracks, spouts, bin sheets, vents
Where to look for answers?

- **Are your roof vents adequate?**
- **Do you have aeration or enough aeration?**
- **Do you need to monitor differently to detect problems earlier?**
How Clean is Your Equipment?

- Handling equipment
- Transportation vehicles
- Storage structures
  - inside and outside
- Pest prevention
  - *Sanitation Controls Pests!*
Sanitation
Over-Filling

- Poor head space ventilation
- Spoiled grain on silo wall
- Impossible to monitor grain surface
Core of fines

- Foreign Material (FM)
- Broken grain
- Weed seeds
Coring

One time coring

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

1/3-1/2 bin dia.
Aeration Airflow Rates – Dry Grain

**Minimum:**
- 0.1 – 0.3 ft³/min/bu (CFM/bu)

**Ideal:**
- 0.5 – 1 ft³/min/bu (CFM/bu)
Approximate/Minimum Grain Cooling Times (60 lb/bu TW)

Doubling the airflow rate halves the cooling time!
Move **Aeration Front** through grain mass as quickly as possible!
Sizing Roof Vents…

An example:

66,000 bu at 0.1 cfm/bu = 6600 cfm

So…6.6 ft² in vent open area…at least

6.6/1.25 = 5.28 vents ….

6 mushroom vents reqd
Exhaust Fans

25% greater cfm than the cooling fan

18”: ½ HP (4,000 cfm)

24”: 2HP (10,650 cfm)

Caution: operation w/o supply fans on requires passive roof venting
Influence of Aeration Cooling on Insect Mortality
Monitoring

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

You can’t manage what you don’t know is there!

- Detection of grain spoilage problems
- Detection of pests
- Determination of population dynamics
- Evaluation of pesticide applications
When things go wrong...

Bridging...Avalanches...

• Key to safety is keeping grain in good condition in the first place
• No reason to enter bin
• Saves dollars....
• Saves equipment and fumigant....
• Saves LIVES
Cofferdam Testing...

Purpose: Allow grain to be removed from around an entrapped victim
Cofferdam Testing

- How much **force** to insert into grain
- Corn (14% MC)...3 feet deep...straight down...steady force
- Six units tested
  - Aluminum Cofferdam from Lambton 4H Farm Safety
  - Birch Cofferdam
  - GSI product
  - Boards built by Okla. State Univ.
  - KC Supply product
  - Liberty Tube
Cofferdam Testing…

**Single Sections:**
Ranged from

700 lbs for Birch and OSU boards
to

1300 lbs for GSI and KC Supply Products

**Two Sections together added 20%**
Cofferdam Testing...

**KS Supply** and **GSI:**

- Handles
- Latches

**KC Supply** lighter and narrower

**GSI** fewer sections
Cofferdam Testing...

Lambton 4H aluminum panels:

- Light weight
- Mid range force required
- Wide
- Need larger hand holes for handling
Cofferdam Testing…

Birch and OSU Boards:

- Light weight
- Less Force Required
- Ease of attachment
- Ropes for OSU
- Channels for Birch makes a square
- Multifunctional
Cofferdam Testing...

Liberty Tube:

- Light weight
- Hard to connect
- Impact driver noise
- Twisted and Collapsed
- Can be curled to get through openings
High Angle Rescue Equipment…
the **Aspen Lift**

- Displayed GEAPS POD…Available from KC Supply…Patent Pending
Training....

Awareness Level I DVD
- Will be available this summer
- grain conditioning
- prevention
- bin entry procedures
- why things go wrong
- what to do ‘til help arrives
- regulations

Mid Level Training...offered now through OK CareerTech

Advanced Level Training...in development...beta class given
Cherokee Strip Connection….

Cherokee Strip Connection Team:
- WB Johnston Grain
- Triangle Insurance
- OSU
- OK CareerTech
- Enid Fire Dept.

Support from Oklahoma Grain and Feed Assoc and Oklahoma Rural Coop Assoc
Grain Conditioning = Safety

Proper Storage and Handling of product + Training + Proper Equipment =

✓ $$$$  
✓ safer work environment  

Saving LIVES
Questions

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