Australia’s On-Farm Grain Storage Extension Project – a national initiative improving stored grain pest management and maintaining phosphine fumigation efficacy on-farm for the Australian grains industry.

The Science Protecting Plant Health Conference

Peter Botta PCB Consulting
Judy Bellati PIRSA
Catherine Botta PCB Consulting
Phil Burrill DPI&F
Chris Warrick Primary Business
Ben White BW Consulting
Paper discusses an integrated approach used in a Grain Storage Extension Project in Australia to improve the efficacy of Phosphine Fumigation and management of On-farm Storage

The Project is a National project funded through the Grains Research and Development Corporation (GRDC)
Grain Storage Landscape

• Estimated up to 40-50% grain is now stored on farm – so clearly has an impact on the supply chain and market expectations.
• Expected to keep increasing for a variety or reasons.
• On-farm storage is a range of systems.
• On-farm system is increasingly sophisticated, silo based, sealed-gas-tight, aerated.
• Grain stored on-farm is as much about export as domestic markets.
National extension project developed in partnership with Grains Research and Development Corporation.

Project focusses on a range of best management practises – Grain hygiene, insect identification, chemical treatments, sealable gas tight storage, moisture and temperature management, aeration etc.

Phosphine application in gas-tight sealable storage was an integral part of the project.
An Integrated Approach to Achieve Practise Change

The project applies an integrated approach.

When conducting workshops and field days applying adult learning principles ensures farmers have a positive learning environment.

Using hands on training, experience, discussion, case studies and demonstrations.

Workshops and field days are typically conducted on farm at a storage site.
Stakeholder Engagement
The project consults and works with a variety of industry stakeholders.

Many are involved with development of resources and events and provide invaluable networks for information and knowledge transfer.

These include:
State Departments Agriculture, Research Institutes, Regulators, Private Agronomists, Resellers, Consultants, Chemical registrants.

Farmer Representative Groups and Cropping Systems Groups.
Farmer and Cropping Systems Groups
Resellers, Private Agronomists and Consultants
Stakeholder networks provide a variety of avenues for information dissemination and workshop and field day activities.
Stakeholder networks provide a variety of avenues for information dissemination and workshop and field day activities.
Stakeholder networks provide a variety of avenues for information dissemination and workshop and field day activities.
“Hands on” and participant involvement.

Explaining pressure test

Identifying grain insects

Farmer conducting pressure test
“Hands on” and group discussion.
A variety of media is used to deliver best practise phosphine and grain storage messages

Radio
Print media
Industry journals, magazines and newsletters
Television
Youtube
Information resources developed
Why is There a Need to Improve On-Farm Fumigation Practises?

On Farm fumigations are the only way to eradicate an insect infestation – frequently done in unsealed storages (not gas-tight).

Grain is often fumigated when grain is inspected during storage or prior to delivery.

Growers do this as in most cases they achieve their desired outcome – NO LIVE ADULTS WHEN THE GRAIN IS DELIVERED.
Incorrect use (unsealed storages, incorrect application rates and procedures) leads to an increase in resistance.

Incorrect use increases exposure risk to phosphine for the user and or receival operators/endusers.

Farmers are under increasing scrutiny as to how they use chemicals, particularly ones such as phosphine (classed as a dangerous good and hazardous substance).
Maintaining Phosphine Fumigation Efficacy

• Best practice fumigation key message and platform.
• Emphasising fumigation in Gas-tight sealable storages.
• Pressure testing silos.
• Australian Standard for sealed silos.
• Collaborating with silo manufacturers and builders in meeting the standard
Australian standard for Sealed grain storage silos, developed through industry and stakeholder consultation.
5 Minute half life pressure test, the benchmark for sealed gas-tight silos to meet the Australian Standard

Pressure testing a gas-tight, sealable silo – required for effective phosphine fumigation.

The Australian Standard (AS2628) states that sealable storage must perform a five-minute, half-life pressure test.

Refer to page 4 for more information on performing a half-life pressure test.
The Australian Standard provides farmers with a benchmark to determine the suitability of silos for best practice fumigation.
Information Packages Developed for Fumigation

Pressure testing sealable silos

Fumigating with phosphine in unsealed silos does not kill pests at all stages of their life cycle. Repeat fumigations in unsealed silos increases resistance levels and selects for insects with a higher phosphine tolerance. Pressure testing a silo ensures it can hold gas concentrations sufficient to kill all insects at all life stages.

**KEY POINTS**
- A silo sold as a “sealed skin” needs to be pressure tested to be sure it is dry.
- Check new sealable silos for Australian Standard pressure sealing compliance (AS/NZS).
- Pressure test sealable silos upon erection, annually and before fumigating with a five-minute half-life pressure test.
- Maintenance is the key to ensuring a silo purchased as sealable can be sealed and gas-tight.

**What is a sealed skin?**
To some people a sealed skin may be one that keeps rain out or one that is solid labelled as a sealed skin.

Technically, a silo is only truly sealed if it passes a five-minute half-life pressure test according to the new Australian Standard AS/NZS. Often silos are sold as sealed but are not gas-tight – rendering them useless for fumigation.

Even if a silo is sold as “sealed” it is not sealed until it is proven gas-tight with a pressure test.

The term “sealed” has been used loosely during the past and in fact some silos may not have been gas-tight from the day they were constructed.

However, even a silo that was gas-tight to the Australian Standard in construction will deteriorate over time and will not remain gas-tight without maintenance.

**Why do I need to do a pressure test?**
In order to kill grain pests at all stages of their life cycle, egg, larva, pupae, adult, phosphine gas concentrations need to reach and remain at 300 parts per million (ppm) for seven days or 200 ppm for 10 days.

Tests show that these levels of gas concentration are impossible to achieve in silos that are not pressure tested and gas-tight, as insects will not be killed at all life stages.

The fumigation may appear successful when the adults die but the surviving eggs will continue to develop and restart the grain.

A pressure test is a measure of how well a silo will seal to contain fumigation gas.

When to perform a pressure test
- If silos are properly maintained pressure testing does not take long and should be done at three distinct times:
  1. When a new silo is erected on farm carry out a pressure test at a suitable time of day to make sure it’s gastight before filling with grain.
  2. Importantly, a silo also needs to be pressure tested when full, before fumigating grain. If the silo has a leak the gas will be lost and the fumigation will be tested empty, wasted when full to make sure the pressure of the grain does not compromise the seal.
  3. The weight of grain can break the seal on the slide plate outlet that is not well supported by come or bolts etc. For older poorly-designed silos, gentle pressure from a jet may seal the seal. If the weight of grain is inadequate to make the seal, then airing the silo and sealing some added pressure from a pack under the silo will assist the sealability.

**Sealable silos must be pressure tested to confirm they can seal for fumigation to be successful.**
Some Outcomes So Far

Intended Practice Change

- Doing more or better monitoring of grain in storage
- Expanding on-farm storage
- Using structural treatments
- Taking an IPM or whole systems approach
- Adding or better utilising aeration
- Improving grain storage hygiene
- Checking, improving or adding sealable storage

Detailed outcomes for different regions:

- **Southern #451**
  - Doing more or better monitoring of grain in storage: 34%
  - Expanding on-farm storage: 29%
  - Using structural treatments: 16%
  - Taking an IPM or whole systems approach: 7%
  - Adding or better utilising aeration: 14%
  - Improving grain storage hygiene: 29%
  - Checking, improving or adding sealable storage: 33%

- **Western #56**
  - Doing more or better monitoring of grain in storage: 29%
  - Expanding on-farm storage: 20%
  - Using structural treatments: 16%
  - Taking an IPM or whole systems approach: 7%
  - Adding or better utilising aeration: 14%
  - Improving grain storage hygiene: 20%
  - Checking, improving or adding sealable storage: 20%

- **Northern #107**
  - Doing more or better monitoring of grain in storage: 25%
  - Expanding on-farm storage: 20%
  - Using structural treatments: 14%
  - Taking an IPM or whole systems approach: 7%
  - Adding or better utilising aeration: 14%
  - Improving grain storage hygiene: 23%
  - Checking, improving or adding sealable storage: 29%
Have You Improved your Phosphine Application Practices

- Yes: 63%
- Not yet but plan to: 14%
- I advise growers to: 12%
- No: 10%

Southern:
- Yes: 61%
- Not yet but plan to: 6%
- I advise growers to: 24%
- No: 12%

Western:
- Yes: 61%
- Not yet but plan to: 9%
- I advise growers to: 6%
- No: 9%

Northern:
- Yes: 72%
- Not yet but plan to: 12%
- I advise growers to: 7%
- No: 8%
An integrated approach, using adult learning principles achieves practise change on farm

Thankyou

Questions?