

# GRAIN STORAGE FACT SHEET

## HYGIENE AND STRUCTURAL TREATMENTS FOR GRAIN STORAGES

When it comes to controlling pests in stored grain — prevention is better than cure. Grain residues in storages or older grain stocks held over from last season provide ideal breeding sites. Meticulous grain hygiene combined with structural treatments, such as diatomaceous earth (DE), can play a key role in reducing the number of stored grain pests.

### KEY POINTS

- ▶ Effective grain hygiene requires complete removal of all waste grain from storages and equipment.
- ▶ Be meticulous with grain hygiene – pests only need a small amount of grain for survival.
- ▶ Structural treatments, such as diatomaceous earth (DE), can be used on storages and equipment to protect against grain pests.
- ▶ Check delivery requirements before using chemical treatments and avoid using with pulses and oil seeds.

### Keep it clean

A bag of infested grain can produce more than one million insects during a year, which can walk and fly to other grain storages where they will start new infestations.

Meticulous grain hygiene involves removing any grain that can harbour pests and allow them to breed.

It also includes regular inspection of seed and stockfeed grain so any pest infestations can be controlled before pests spread.

### Where to clean

Removing an environment for pests to live and breed in is the basis of grain hygiene, which includes all grain handling equipment and storages.

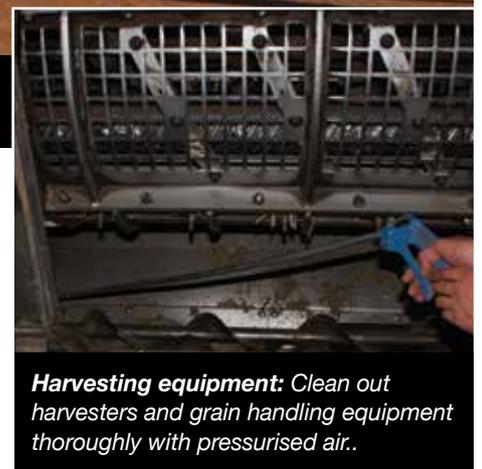
Grain pests live in dark, sheltered areas and breed best in warm conditions.



**Prevention:** Successful pest management starts before grain goes into storage.

Common places where pests are found include:

- ▶ Empty silos and grain storages
- ▶ Aeration ducts
- ▶ Augers and conveyers
- ▶ Harvesters
- ▶ Field bins and chaser bins
- ▶ Left-over bags of grain
- ▶ Trucks
- ▶ Spilt grain around grain storages
- ▶ Equipment and rubbish around storages
- ▶ Seed grain
- ▶ Stockfeed grain



**Harvesting equipment:** Clean out harvesters and grain handling equipment thoroughly with pressurised air..

Successful grain hygiene involves cleaning all areas where grain gets trapped in storages and equipment.

Grain pests can survive in a tiny amount of grain, so any parcel of fresh grain through the machine or storage becomes infested.

PHOTOS: CHRIS WARRICK, KONDININ GROUP

## When to clean

Straight after harvest is the best time to clean grain handling equipment and storages, before they become infested with pests.

A trial carried out in Queensland revealed more than 1000 lesser grain borers in the first 40 litres of grain through a harvester at the start of harvest, which was considered reasonably clean at the end of the previous season.

Discarding the first few bags of grain at the start of the next harvest is also a good idea.

Further studies in Queensland revealed insects are least mobile during the colder months of the year. Cleaning around silos in July – August can reduce insect numbers before they become mobile.

## How to clean

The better the cleaning job, the less chance of pests harbouring. The best ways to get rid of all grain residues use a combination of:

- ▶ Sweeping
- ▶ Vacuuming
- ▶ Compressed air
- ▶ Blow/vacuum guns
- ▶ Pressure washers
- ▶ Fire-fighting hoses

Using a broom or compressed air gets rid of most grain residues, a follow-up wash-down removes grain and dust left in crevices and hard-to-reach spots.

Choose a warm, dry day to wash storages and equipment so it dries out quickly to prevent rusting.

When inspecting empty storages, look for ways to make the structures easier to keep clean.

Seal or fill any cracks and crevices to prevent grain lodging and insects harbouring.

Bags of left-over grain lying around storages and in sheds create a perfect harbour and breeding ground for storage pests.

After collecting spilt grain and residues, dispose of them well away from any grain storage areas.

## Structural treatments

After cleaning grain storages and handling equipment treat them with a structural treatment.

While most grain buyers accept small amounts of residue on cereal grains from chemical structural treatments, avoid using them or wash the storage out before storing oilseeds and pulses.



**Silo sweep-out:** An extended broom handle makes sweeping out silos easier.



**All-over clean:** Clean silos, including the silo wall, with air or water to provide a residue-free surface to apply structural treatments.



**Trucks:** Grain left in trucks is an ideal harbour for grain pests to breed. Keep trucks, field bins and chaser bins clean.



**A clean site:** A concrete slab under silos makes cleaning easier.

It is always safer to check with the grain buyer's delivery standards for maximum residue level (MRL) allowances before using grain protectants.

Diatomaceous earth (DE) (amorphous silica), commonly known as Dryacide®, can be applied either as a dust or a slurry to treat storages and handling equipment for residual control.

DE acts by absorbing the insect's cuticle (protective exterior), causing death by desiccation (drying out).

If applied correctly with complete coverage in a dry environment, DE can provide up to 12 months protection — killing most species of grain insects and with no risk of building resistance.

## Applying diatomaceous earth dust

DE requires a moving air-stream to direct it onto the surface being treated.

Throwing it into silos by hand will not achieve an even cover so will not be effective.

For small grain silos and bins a hand-operated duster, such as a bellows duster, is suitable.

If compressed air is available it is the most economical and suitable option for on-farm use — connected to a venturi duster such as the Blovac BV-22.

The application rate is calculated at two grams per square metre of surface area treated. See table 1.

Although inert, breathing in excessive amounts of dust is not ideal, so use a disposable dust mask and goggles during application.

## Silo application

If safe, apply the DE dust from the top of the silo, otherwise open all outlets and apply via the ground access door. Moving the Blovac gun quickly, coat the roof, walls then base of the silo. Finish by closing all outlets top and bottom to capture the remaining suspended dust and keep moisture out of the silo.

If silos are fitted with aeration systems, distribute the DE dust into the ducting without getting it into the motor, where it could potentially cause damage.

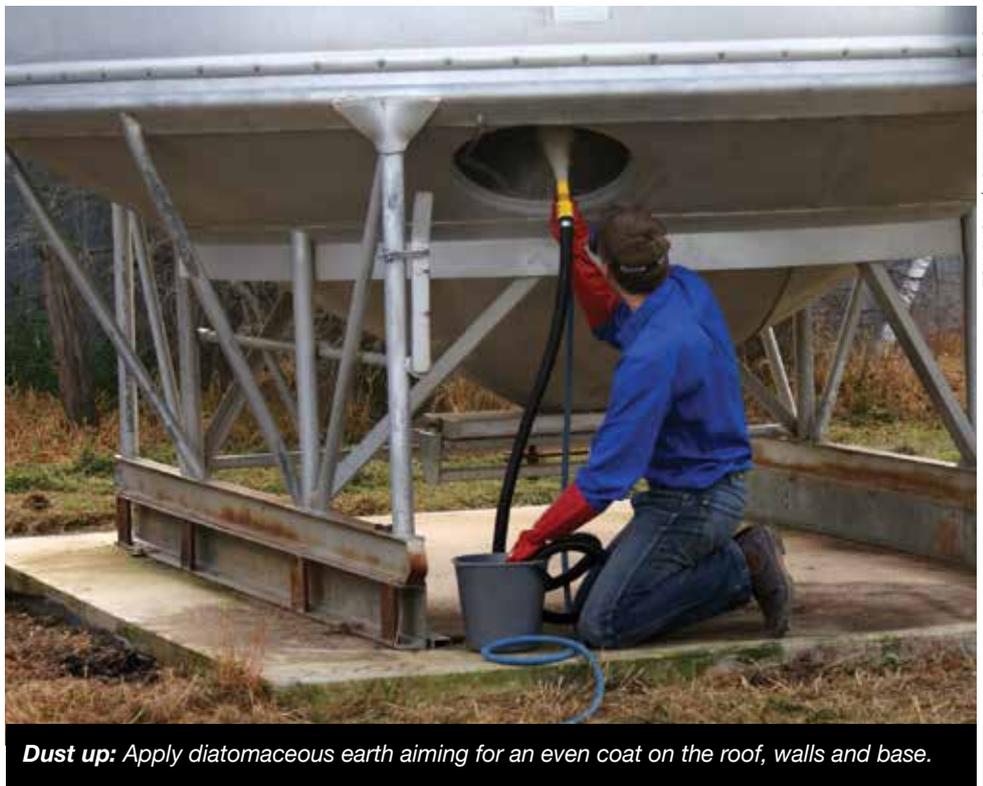
## Machinery application

Calculation of surface areas of machinery is not normally possible.



**Harbouring pests:** Air ducts provide a perfect harbour for grain pests so thorough cleaning is essential.

PHOTO: CHRIS WARRICK, KONIDININ GROUP



**Dust up:** Apply diatomaceous earth aiming for an even coat on the roof, walls and base.

PHOTO: CHRIS WARRICK, PROADVOC

**TABLE 1 INERT DUST (DE) APPLICATION GUIDE**

STORAGE CAPACITY (T)	DUST QUANTITY (KG)
20	0.12
56	0.25
112	0.42
224	0.6
450	1
900	1.7
1800	2.6



**Ready, aim, fire:** A Blovac or air venturi gun is the best applicator for diatomaceous earth dust.

PHOTO: CHRIS WARRICK, KONIDININ GROUP

For augers, conveyors and grain handling equipment, use a Blovac to apply a steady dust stream into accessible openings, coating all the internal surfaces as much as possible.

Continue until a dust stream emerges from the exit/discharge points of the equipment.

For an average harvester the recommended quantity of inert dust is about 2.5 kilograms.

## Applying diatomaceous earth slurry

With the right equipment, DE can also be applied in a slurry form.

A little more involved than applying dust, the slurry needs to be mixed in a mixing tank then sprayed on through a flat fan nozzle capable of at least five litres per minute. Mix the DE with water at a rate of 10-20 per cent to form a slurry and apply at six grams per square metre (dry basis).

The aim is to apply the slurry to give complete coverage but ensure it doesn't run off the walls of storages and equipment.

An inline filter with 1000 micron (one millimetre) mesh and a recirculation hose will help prevent nozzle blockages and keep the slurry mixed during application.

Impeller pumps are most suitable — typically a fire-fighting pump with a 3.7 kilowatt (five horsepower) motor.

Do not use positive displacement pumps, such as gear or piston pumps, as they will block easily.



PHOTO: CHRIS WARRICK, PROADVICE

**Preparation:** *Diatomaceous earth (DE) is available in more than one brand and may need to be ordered in from your local rural supplier.*

If applying a lot of slurry regularly, use a designated, older pump as pumping slurry will reduce a pump's working life.

Apply the slurry in the same order as the dust — start at the top of the silo or storage and work down the walls applying an even coat, avoiding runs from spraying too close or too much slurry.

A solid pipe extension on the application hose will enable a more even coating on hard-to-reach areas such as silo walls.

## Monitoring storages

Grain kept for seed or stockfeed is a common breeding ground for pests so monitor all grain storages every two weeks during warmer periods of the year and at least monthly during cool periods of the year.

Use grain insect sieves and traps to monitor for pests in all stored grain and regularly check grain handling equipment during the off season.

Finding grain pests early allows them to be identified, treated appropriately and removed before they spread and become a much larger problem, which may be more difficult to treat. See Fact sheet, "Stored grain pests — identification" for more information.

## Useful resources

**GRDC Grain storage extension project**  
[www.storedgrain.com.au](http://www.storedgrain.com.au)

**Grain Trade Australia**  
02 9235 2155  
[www.graintrade.org.au](http://www.graintrade.org.au)

## FURTHER READING

**Stored grain pests — identification (GRDC Fact sheet)**  
[www.storedgrain.com.au](http://www.storedgrain.com.au)

## GRAIN STORAGE SPECIALISTS

**QLD and northern NSW,**  
**Philip Burrill**  
0427 696 500  
Email [philip.burrill@daff.qld.gov.au](mailto:philip.burrill@daff.qld.gov.au)

**Southern NSW, VIC, SA and TAS,**  
**Peter Botta**  
0417 501 890  
Email [pbotta@bigpond.com](mailto:pbotta@bigpond.com)

**WA, Ben White**  
08 6189 2457  
Email [ben@storedgrain.com.au](mailto:ben@storedgrain.com.au)

## GRAIN BIOSECURITY CONTACTS

**Plant Health Australia**  
02 6215 7700  
Email [biosecurity@phau.com.au](mailto:biosecurity@phau.com.au)  
[www.planthealthaustralia.com.au](http://www.planthealthaustralia.com.au)

## GRDC PROJECT CODE

**PAD00001**

**Acknowledgements:** Philip Burrill, DAFF QLD. Peter Botta, PCB Consulting. Chris Newman, Stored Grain Services. Ben White, GIWA. Chris Warrick, ProAdvice.

## Post-harvest checklist

- ✓ Sweep or blow out all empty grain storages and equipment.
- ✓ Wash down with water on a warm, dry day.
- ✓ If not storing oilseeds or pulses, apply structural treatment.
- ✓ Monitor all stored grain fortnightly during summer, monthly during winter.

## DISCLAIMER

Any recommendations, suggestions or opinions contained in this publication do not necessarily represent the policy or views of the Grains Research and Development Corporation. No person should act on the basis of the contents of this publication without first obtaining specific, independent professional advice. The Corporation and contributors to this Fact Sheet may identify products by proprietary or trade names to help readers identify particular types of products. We do not endorse or recommend the products of any manufacturer referred to. Other products may perform as well as or better than those specifically referred to. The GRDC will not be liable for any loss, damage, cost or expense incurred or arising by reason of any person using or relying on the information in this publication.

## CAUTION: RESEARCH ON UNREGISTERED PESTICIDE USE

Any research with unregistered pesticides or of unregistered products reported in this document does not constitute a recommendation for that particular use by the authors or the authors' organisations. All pesticide applications must accord with the currently registered label for that particular pesticide, crop, pest and region.

Copyright © All material published in this Fact Sheet is copyright protected and may not be reproduced in any form without written permission from the GRDC.

PRODUCED BY: [WWW.PROADVICE.COM.AU](http://WWW.PROADVICE.COM.AU)