

GRAIN STORAGE FACT SHEET

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 silo' needs to be pressure tested to be sure it's gas-tight.
- ▶ It is strongly recommended that growers ask the manufacturer or reseller to quote the AS2628 on the invoice as a means of legal reference to the quality of the silo being paid for.
- ▶ Pressure test sealed 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 silo?

Just because a silo is sold as a sealed silo, **does not automatically mean it's suitable for fumigation.**

To some people a sealed silo may be one that keeps rain out or one that is sold labelled as a sealed silo.

A silo is only truly sealed if it passes a five-minute half-life pressure test according to the Australian Standard AS2628. Often silos are sold as sealed but are not gas-tight — rendering them unsuitable 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 on construction will deteriorate over time so needs annual maintenance to remain gas-tight.

Why do I need to do a pressure test?

In order to kill grain pests at all stages of their life cycle (egg, larvae, pupae, adult), phosphine gas concentration levels need to reach and remain at 300 parts per million (ppm) for seven days or 200ppm for 10 days.

Trials show that these levels of gas concentration are impossible to achieve in silos that are not pressure tested and gas-tight, so insects will not be killed at all life stages. The fumigation may appear successful when the adults die but the surviving eggs and pupae will continue to develop and reinfest 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 gas-tight before paying the invoice or filling with grain.
- 2 Importantly, a silo also needs to be pressure tested when full, before fumigating grain. If the silo has a slide plate outlet that has been tested empty, retest when full to make sure the pressure of the grain doesn't compromise the seal.

The weight of grain can break the seal on the slide-plate outlet where it is not well supported by cams or bolts etc. For older, poorly-designed cone-bottom silos, gentle pressure from a jack may assist the seal. If the weight of grain on the slide plate stops it from sealing, some added pressure from a jack under the silo will assist the sealability.

- 3 Pressure testing silos needs to be part of the annual maintenance. It is much easier to replace seals and carry out repairs when silos are empty.



Performing under pressure: Sealable silos must be pressure tested to confirm they are gas-tight in order for fumigation to be successful.

PHOTO: CHRIS WARRICK, KONDININ GROUP

CARRYING OUT A PRESSURE TEST

If regular silo maintenance is undertaken to keep seals in working order, pressure testing is easy by following these seven simple steps.

1. Choose the right time to pressure test

Consider the ambient conditions of the day before pressure testing.

The best time to pressure test silos is in the morning within an hour of sunrise or on a cool, overcast day — when the ambient temperature is stable and the sun is not heating the silo.

Air inside a silo heats and expands as the daily temperature rises and the sun warms the silo walls.

If a pressure test is done when the ambient conditions are changing, air inside the silo expands and gives a false reading.



PHOTOS: CHRIS WARRICK, KONDININ GROUP

2. Check seals

Before performing a pressure test check seals around the lid, access hatch, hopper or boot and make sure the aeration fan seal is in a sound condition.

Check to ensure all latches on lids are locked down firmly.



3. If there is no aeration fan – install an air valve

If the silo doesn't have an aeration fan, install a tubeless tyre valve to pressurise the silo using an air compressor. Unscrew the centre of the valve to get higher air-flow into the silo.

Alternatively for larger silos or if the air compressor is too small, install a PVC male fitting that can connect to a venturi gun (Blovac) that fits on the end of the air line.



4. Check oil levels

Some sealable silos do not have a gauge on the oil relief valve. If this is the case mark the start and finish oil levels with a pen.

Oil relief valves can be bought and fitted, or a piece of clear tube connected to a second air valve fitted to the silo will suffice.

Before pressurising the silo, check the oil levels are equal on both sides of the gauge and are at the middle indicator mark as shown below.



6. Time the half life

Wait until the pressure drops and the oil levels are 25mm apart (aligned with top and bottom marker).

The time taken for the oil to drop from 25mm to 12mm apart must be no less than five minutes on new silos.

For older silos three minutes is acceptable.

Whether it is three or five minutes, this process is known as the half-life pressure test.



5. Pressurise the silo

If fitted with an aeration fan, pressurise the silo by turning the fan on for a few seconds, then sealing the inlet on the fan.

This job is easier with two people — one to operate the fan and the other to watch the oil gauge and look for leaks, see step 7.

As soon as the oil levels are more than 25mm apart, or the oil is bubbling, stop the aeration fan and close off the fan inlet immediately. Be careful — there is potential for damage if fans are left running for extended periods while the silo is sealed or with the inlet blocked off.

If the silo doesn't have an aeration fan, use the tyre valve and an air compressor to pressurise the silo. An air-operated venturi gun, such as a Blovac, with connection fittings to the silo can also be used.



7. Looking for leaks

If the the half-life pressure test on a new silo is less than five minutes, there is a leak that needs fixing. If an existing silo does not meet a three minute half-life pressure test, it as a leak that needs fixing.

To find leaks, pressurise the silo again and use soapy water in a spray bottle to check for air leaks around seals.

Common places for leaks are: bottom outlet, aeration inlet seal, damaged lids (caused by the auger when lining it up to fill the silo), stretched springs on latches, between the bottom cone or base and the silo wall joint, the roof and wall joint and where the lid ring joins the roof.

Cone-bottom silos with a slide plate outlet can be sealed by adding a small amount of pressure to the slide plate with a jack.

Older silos may require more extensive maintenance to achieve a gas-tight seal. When the leak has been fixed, pressurise the silo again and redo the half-life test — steps five and six.



AUSTRALIAN STANDARD FOR SEALED SILOS



Seal the deal: An Australian standard sets a benchmark for sealed silos.

A benchmark for sealing grain silos has been developed to boost the effectiveness of pest control.

Standards body SAI Global published an Australian standard for gas-tight sealed silos in response to industry concerns that phosphine fumigation performed in improperly sealed storages was not killing off the full life cycle of pests.

Resistance to phosphine has increased over the past 10 years with many grain silos failing to meet the gas-tight standard required for effective fumigation.

Resistance to phosphine in target insect pests has increased in frequency and strength threatening effective control.

The standard is based on a new silo meeting a five-minute half-life pressure test. When a pressure test is undertaken, oil levels in the pressure relief valve must take a minimum of five minutes to fall from 25mm to a 12.5mm difference if the silo is sufficiently gas-tight.

The standard allows growers to refer to an industry benchmark when choosing to buy a sealable silo. It is strongly recommended that growers ask the manufacturer or reseller to quote the AS2628 on the invoice as a means of legal reference to the quality of the silo being paid for. Ultimately, this gives growers confidence they have invested in a silo that will perform in the way it is intended. That is, work as a gas-tight chamber and hold a lethal concentration of gas for the time specified on the label, for control of insects at all life stages.

This will prolong the life of phosphine rather than add to the already increased level of resistant insects.

USEFUL RESOURCES

GRDC Grain storage extension project

www.storedgrain.com.au

Grain Trade Australia

02 9235 2155
www.graintrade.org.au

Graintec Scientific Pty Ltd

07 4638 7666
www.graintec.com.au

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