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## Sealed silos make \$ense

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Congratulations on your purchase of a sealed silo. You have made an important investment for better insect control.

Insects must be controlled in stored grain because they excrete moisture that can migrate to the headspace on thermal currents of air and cause moulding. This moulding downgrades the entire contents of the silo when it mixes during outloading. Grain insects can also consume large amounts of grain and taint it with their excretions. Regulations prohibit the sale and handling of infested grain.

### Fumigation chamber

A sealed silo will not control insects on its own. It is a fumigation chamber, designed to retain a lethal concentration of gas for a specified time.

This will achieve 100 per cent control of insects at all stages of their life cycle, preventing phosphine resistance.

Sealed silos save time at fumigation. Place tablets on top of the grain in trays; there is no need to probe them in. The gas will circulate on air currents moving through the silo and control insects without having to move the grain.

### Fumigation needs time and concentration

Grain insects pass through four stages in their life cycle from egg to larvae to pupa to adult. The most phosphine-tolerant stages are egg and pupa (Figure 1).

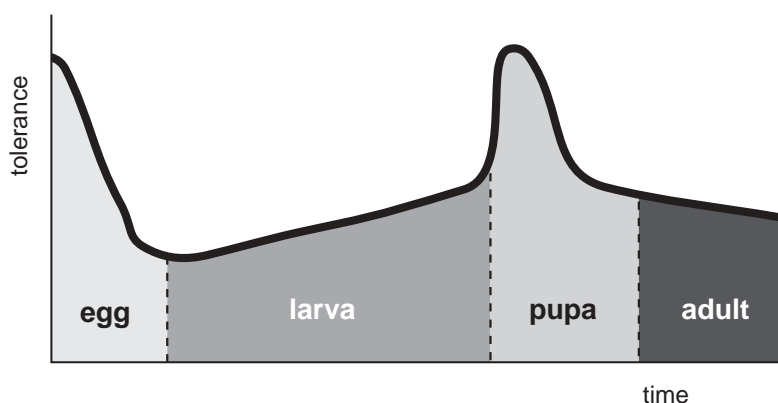


Figure 1. Insect susceptibility to phosphine

The concentration of phosphine needed to control all stages of the insects is 100 ppm throughout the silo. Control will not be achieved unless this concentration is held for at least seven days.

A seven to ten-day fumigation period is recommended to allow time for the tablets to fully liberate their gas followed by a ventilation period of three days.

Fumigation will fail if the silo leaks. When wind blows against a leaky silo, the chimney effect caused by the pressure differences draws the gas out of the silo. Adult insects may be killed, which can give the illusion of a successful fumigation but some eggs and larvae will survive because they are more tolerant of phosphine.

Grain temperature must also be taken into account. Above 25°C, an exposure period of seven days is enough. Between 15 and 25°C, a period of 10 days is needed.

Do not fumigate when grain temperatures are below 15°C, or when grain moisture content is below 9 per cent.

### Use recommended dose rates

In a silo sealed to Department of Agriculture standard, a dose rate of two tablets per tonne of silo capacity is recommended (refer to Farmnote No. 68/03 "It makes \$ense to maintain your sealed silo").

For example, a 2000 bushel silo will need a dose of 100 tablets based on the tonnage of wheat it could hold (50 tonnes). If the same silo was partly full and held 20 tonnes of grain, the phosphine dose would be the same.

### Fumigating unsealed silos

Effective fumigation is impossible to achieve in an unsealed silo (or any unconfined airspace). In unsealed storage areas Department of Agriculture recommends the use of Dryacide® or malathion (refer to Farmnote No. 65/03 "Grain storage: maintaining grain quality").

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## Fumigating grain trucks

Insect control should only be carried out in a sealed structure where the required concentration and time of exposure can be achieved.

### **It is illegal to move any commodity during the exposure or ventilation period of fumigation.**

Deliveries to receival bins found to have traces of phosphine will be rejected.

It is difficult to achieve gas tightness in a truck bin.

## Plan ahead

If you plan to sell grain off your property later in the season it is important to ensure you have controlled the insects. Department of Agriculture regulations require you to control all insects in the grain before it leaves the property. All grain merchants now have a policy of nil tolerance of grain insects.

Fumigation of grain in a sealed structure is the most economic option in the long term. Investment in one sealed silo will give you over 10 years of efficient insect control provided the silo is regularly tested and seals replaced.

Fumigation under gas-proof tarpaulins in an emergency fumigation is a cheap short-term option. Refer to FN 65/03 "Grain Storage: Maintaining grain quality." The tarpaulins are vulnerable to damage and will not remain gas-proof for as long as a steel structure.

## Be careful with phosphine

Even low concentrations of phosphine are lethal to humans. Read the label and follow the manufacturer's instructions carefully.

Open the phosphine container in the open air, not in a shed or silo. Stand upwind and hold the container away from your face when opening it or applying the tablets.

It is recommended the applicator wear PVC gloves and a full face respirator fitted with a dust and gas cartridge, when handling phosphine tablets. Have another person standing by when you are fumigating.

Do the job from the outside. Never enter the silo after phosphine has been applied. Clearly mark all areas under fumigation with 'DANGER – UNDER FUMIGATION' signs. Warn all people on the property, particularly children, of the dangers.

A full-face respirator fitted with the appropriate filter cartridge must be worn when removing the sheeting from a grain pile or bag stack. After removing fumigated grain and before entering an empty silo, ventilate for seven to ten days, depending on wind conditions and the size of the silo.

Use a tray to apply phosphine tablets or use sachets. This enables the retrieval of phosphine residue. This residue is toxic: dispose of it by burying or immersing in water.

Take care when entering a silo that has been treated with phosphine even if it has been ventilated. Phosphine has a distinctive garlic or fishy odour. Australian Standard 28651986 requires that operators must not work unprotected in an atmosphere containing more than 0.3 ppm phosphine. Check phosphine levels with gas indicator equipment.

## Final note

Do not expose vehicle electrical components to phosphine gas as it is very corrosive to copper.

## Further reading

Farmnote 64/03 "Grain storage : design and installation"

Farmnote 65/03 "Grain storage : maintaining grain quality"

Farmnote 66/03 "Grain storage : Handling and maintenance."

Farmnote 68/03 "It makes \$ense to maintain your sealed silo"

Farmnote 69/03 "Effective fumigation needs a properly sealed silo"

Farmnote 70/03 "Underground storage of grain"