KOTZUR
DESIGNING THE FUTURE

Fumigation Box Operating Instructions

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1 System Overview

The Kotzur Fumigation Box has been developed to address a number of problems with traditional phoshpine fumigation practice. Incomplete control and selecting for resistant strains of insects has been the result of fumigations where the required concentrations or fumigation times have not been achieved. Safety and convenience are also important features of this system. To summarise, the key features of the Kotzur System are:

1.1 SAFETY

(See Yellow Warning Label)

When used correctly, this system allows for the fumigation tasks (including placement of the phosphine generating tablets) to be carried out at ground level rather than on top of the silo structure. This minimises the risk of falls but also means that it is easier to implement safe handling systems for the chemical ingredients.

1.2 FUMIGATION CONCENTRATION/TIME

Low concentrations/times are the primary cause of poor/failed fumigations and the increasing levels of insect resistance (in particular to Phosphine). In larger structures the distribution of the gas is quite slow (eg; in silos over 200T capacity it can take weeks to fully distribute throughout the grain during which time the concentration of gas is already decaying in poorly sealed silos). Fumigation failures are mostly the result of inadequate fumigant concentrations, gas being lost from the silo before the fumigation is complete (ie: not killing all stages of the insect life cycle) and/or poor distribution (ie: parts of the silo not treated).

It is important that this fumigation system only be used in correctly sealed grain storage (the sealing requirements are outlined in AS 2628), most notably, the silo must pass the five minute pressure half life test. The Kotzur Fumigation Box used in a sealed grain storage allows for rapid introduction of the gas, high gas concentrations and rapid distribution of the gas.

1.3 ONE SYSTEM FOR MULTIPLE SILOS

The Kotzur Fumigation Box rapidly activates and distributes the gas through the silo – usually about 4 days. This means that once the gas is distributed in the grain, the system can be disconnected, cleaned of the residual “ash” and then moved to the next silo for fumigation.

1.4 MULTIPLE FUMIGANT OPTIONS

The system was primarily designed for Phosphine gas dispensing and fumigation. Alternative gases are being considered and further development is planned to allow the fumigation system to dispense and distribute these gases.

2 Safety Considerations

It is a legal requirement and important for the safety of people in any workplace, that risks be identified and safe systems of work be employed.

There are risks associated with the operation of grain storages, grain handling equipment and the fumigation system. This document does not cover the grain storage or grain handing risks – these should be addressed separately by the site operator. The risks of the fumigation system are detailed in the risk assessment in the Appendix 1 to this manual. THIS RISK ASSESSMENT MUST BE REVIEWED AND TAILORED TO SUIT THE SPECIFIC SITE BY THE OWNER/OPERATOR. The hazards and risks are summarised as follows:

- Use of toxic fumigant gases can be fatal if it comes into contact with humans.
- High concentration of some fumigants can be explosive. The fumigation box is provided with an explosion vent which must be kept clear at all times. When there are tablets in the box, the fan must be running at all times with both valves into the silo open and clear. This prevents high concentrations of gas forming which can lead to an explosion. When the fumigation is complete, the box must be immediately cleared of residue.
- Fumigant gases should not come into contact with certain materials eg: aluminium phosphide tablets, pellets or powder should not be allowed to contact water. Phosphine gas should not be allowed to contact copper or its alloys.
- The system employs an electrically driven fan. Care needs to be taken to avoid electric shock due to damaged cables or wet connections.

3 Setting Up and Running the Fumigation Cycle

The key goal is to safely achieve an effective fumigation to eliminate insect pests from stored grain. The Kotzur fumigation box, used correctly, will provide reliable insect control. To achieve this level of control the following steps should be taken;

A. Confirm that the grain temperature and moisture content are suitable for fumigation. High moisture grain in a sealed silo (eg: wheat > 12% moisture content) can spoil, while very cool grain (eg: less than 15ºC) cannot be effectively fumigated due to dormant insect activity.

B. Confirm that the silo is sealed to the fumigation standard required. See Appendix 2. Ensure all hatches/vents are correctly closed for the fumigation cycle. Check the relief valves for correct operation (in the case of oil bath relief valves, confirm that they are filled with the correct, clean oil to the correct level).

C. Check the fumigation box and hoses to ensure they are sound and free from damage, holes and potential leaks.

D. Locate the fumigation box in a secure, open location, close enough to attach hoses to silo, within reach of power and away from other enclosed structures.

E. Attach the hose (two hoses for larger silos) from the fan outlet to the connection points at the bottom of the silo. If in doubt, please contact Kotzur Pty Ltd at 02 60 294 700. Please note that the different silo configurations have different connection points to ensure reliable distribution. Ensure that the valve(s) are fully open

F. Connect the suction hose between the pipe connected to the silo headspace (downcomer) to the inlet point at the bottom of the fumigation box. Ensure that the valve is fully open .

G. Connect fan to power and confirm its operation.

H. Secure the area around the fumigation systems and storage to be fumigated. This may include signage, barricading and informing people who may be around not to enter the area.

I. When the preceding steps have been completed, the box is ready for dosing. This is carried out as follows;

i. Carefully read the chemical label instructions.

ii. Calculate the active ingredient to fumigate the intended silo. Note that for Phosphine, it is necessary to fumigate for the total silo volume. Kotzur advise that only full or near full (90%) silos should be fumigated as the daily “breathing” of the silo can cause excessive gas loss and may compromise the silo structure if the relief valves cannot cope with the resulting air flow. Purchase tablets on per silo basis as containers should not be resealed.

iii. Turn on the fumigation box fan. This removes the gas from the box during the dosing operation.

iv. Ensure that appropriate Personal Protective Equipment is worn during the dosing (see risk assessment).

v. Place the active ingredient on the trays in the box. Start from the top tray and work down. In the case of aluminium phosphide tablets, ensure that they are evenly spread. Only a single layer of tablets should be placed on any one tray.

vi. As soon as the ingredient is placed in the box, close and seal the front door.

J. Having completed dosing, the fan is then left on until the fumigation period (refer to Phosphine Label) is attained. When the fumigation is complete, the fumigation box can be disconnected from the silo (all valves must be closed) and the residual removed from the trays in the box. TAKE CARE WHEN REMOVING THE RESIDUAL. There will still be gas in the box and small amounts of gas may still be released from the tablets. Dispose of the residual as noted on the chemical label. In some cases (eg; highly resistant flat grain beetles) longer than label fumigation times may be required for adequate control.

4 Appendix 1 – Risk Assessment

	Consequence		Likelihood or Probability				
			A	B	C	D	E
	People	Environment	Almost Certain	Likely	Moderate	Unlikely	Rare
1	No Incident or First Aid Injury	Negligible Impact or Waste Discharge	3	2	2	1	1
2	Medical Treatment	Minor impact or Minor Quantities of Discharge	3	3	2	1	1
3	Alternate Work or Lost Time Injury	Moderate Breach of Environmental Statutes	4	3	3	2	2
4	Serious or Permanent Injury	Major Breach of Environmental Statutes	4	4	4	3	2
5	Fatality	Shutdown of Project Due to Environmental Breach	4	4	4	4	3

Probability Ranking	Probability Description
Almost Certain	Is expected to occur
Likely	Will probably occur
Moderate	Might occur - has happened
Unlikely	Could occur – known to happen
Rare	Practically impossible

Risk Ranking	Risk Score	Risk Description
Low	1	Monitor, manage and carryout activity in accordance with identified controls.
Medium	2	Implement control measures to reduce risk to as low as reasonably practical. Documented.
High	3	Implement control measures to reduce risk to as low as reasonably practical. Safe Work Method (SWMS) Statement required.
Extreme	4	Stop. Activity must not commence. Eliminated hazard or introduce controls to reduce risk to as low as reasonably practical. SWMS required.

Risk Assessment Record

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Activity: Fumigation Box Operation	Assessment conducted by:
	Assessment reviewed by:
	Date of Assessment:

Hazards Identified	Risk Assessed	Risk Controls Implemented	Reviewed Risk	Notes
Electric Shock	4	Ensure RCD Protection of electricity supply. Check and confirm good condition of all electrical equipment. Ensure that plug connections are protected from moisture. Leads to be kept off the ground	3	
Mechanical Injury	2	Ensure fan and motor guards are in place	1	
Poisoning	4	Handling active ingredient accordingly to label. Wear appropriate protective equipment. Work upwind when gas present. Placard and possibly barricade site to prevent access. Train all personnel in the vicinity about the risks.	2	
Explosion	4	Fan to run at all times Ensure all valves to silo open Clear box immediately after fan is stopped. Keep explosion vents clear	2	

5 Appendix 2 – Sealed Silo Test

PRESSURE TESTING THE SILO

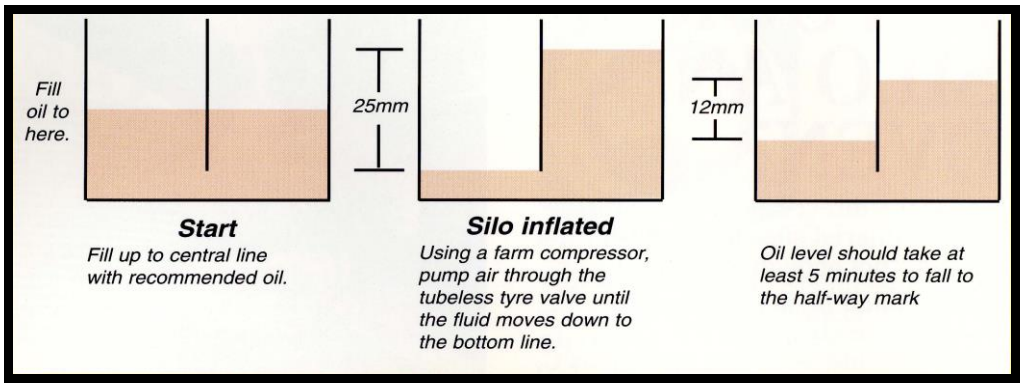
The silo is tested by pressurising the silo and timing the pressure drop. If the silo loses pressure too quickly, it is "too" leaky, and any attempt at fumigation has a high probability of failure. The steps are as follows:-

1. Testing should only be carried out under stable weather conditions. The best time to test is just before sun rise on a day when there is no wind. Windy or days of fluctuating cloud/sun will result in erratic pressure test results.

2. Inflate the silo until the oil bath shows a 25mm (1") difference in pressure (ref: diagram). "KOTZUR" silos can be inflated in one of two ways. Smaller silos are fitted with a tubeless tyre valve and require an air compressor. Larger silos are fitted with a 25mm ball valve and require a blow gun or a reversible vacuum cleaner. Silos fitted with aeration systems may be inflated using the aeration fan. **Take extreme care not to over-inflate if using an aeration fan as major damage to the silo may result.**

3. When the silo is inflated, remove the inflating device (and close ball valve on larger silos) and commence timing.

4. If the pressure has dropped to less than 12mm after 5 minutes, the silo is not sealed to the required standard. Leaks may be found by spraying soapy water over suspect areas or allowing the silo to pressurise itself at sunrise. The second method involves sealing the silo (including the relief valve inlet inside the silo) prior to sunrise. As the sun comes onto the silo, it will pressurise and a leak can often be heard providing there is not background noise. **Take extreme care not to over pressurise the silo**. Pressure will build up very quickly and too much pressure will cause major structural damage.



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