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The speedbox – an innovative application device for the degesch plates

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Abstract

The Speedbox achieves within short time an effective phosphine concentration and ensures a total decomposition of the magnesium phosphide in the Degesch Plates within 60 hours.

The Speedbox is intended to be used not only for sealed stacks and warehouses, but also for containers and for space fumigations of stored commodities.

A common application of the Speedbox is the use within a recirculation system. The Speedbox ingests cold air, warms it up moderately and heats the chamber holding the Degesch Plates.

The degassing characteristics and the degassing rates of the Degesch Plates using the Speedbox depend on the outside temperature as well as on the working temperature of the Speedbox as presented further on.

The different fumigations conducted highlight some particular advantages of the Speedbox:

- Continuous degassing of the Degesch Plates
- Quicker gas development
- Faster achievement of an effective gas concentration
- Reduced degassing time
- Good fumigation praxis even at low temperature
- Complete decomposition of magnesium phosphide even at low temperature

Key words: Speedbox, Degesch Plate, magnesium phosphide, fumigation.

Introduction

The release of phosphine from phosphide based formulations depend on the temperature and on the humidity. Therefore on cooler days and/or in colder climates a complete degassing of these products cannot always be achieved within a certain time (Schmitt et al., 2002; Schmitt and Jakob, 2003). This may result in improper fumigations with less concentration and in the development of resistance against phosphine. Now, Detia Degesch presents an application device for the Degesch Plates which works independently from outside temperature and guarantees a constant degassing.

Material and methods

Speedbox

The Speedbox ingests cold air, warms it moderately and heats only the chamber holding the Degesch Plates.

Structures

The field tests were conducted in a 20 m³

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container. The laboratory tests were conducted in a 500 l gastight fumigation chamber.

Fumigation

The structures were sealed with gas-tight plastic sheets (“Sperrfolie”, Detia Degesch GmbH) which were fixed to the structure with a strong adhering tape and the Speedbox was connected to the structures with plastic hose. The phosphine concentration (Dräger tubes and ATI sensor) as well as the climatic conditions (Escort data logger) were monitored at different positions during the complete fumigation. Degesch Plates were used to achieve the target concentrations in the structure.

Results

According to the schematic assembly in Figure 1 the Speedbox was connected to a 20 m³ container. The fan inside the Speedbox ingested the air from the top of the container and relegated the phosphine enriched atmosphere to the bottom of the container.

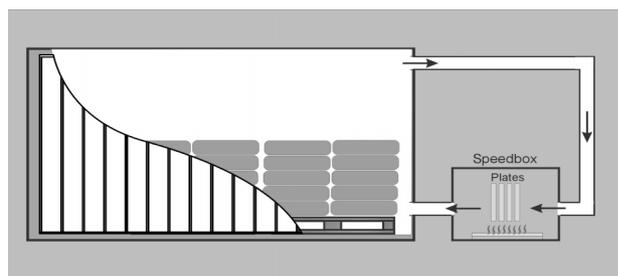


Figure 1. Schematic assembly of the container fumigation with the Speedbox.

Figure 2 shows the result of two different phosphine treatments of the container. The first trial was carried out without the Speedbox and the second one was carried out with the Speedbox at a working temperature of 20 °C. The outside temperature in both cases was 10 °C.

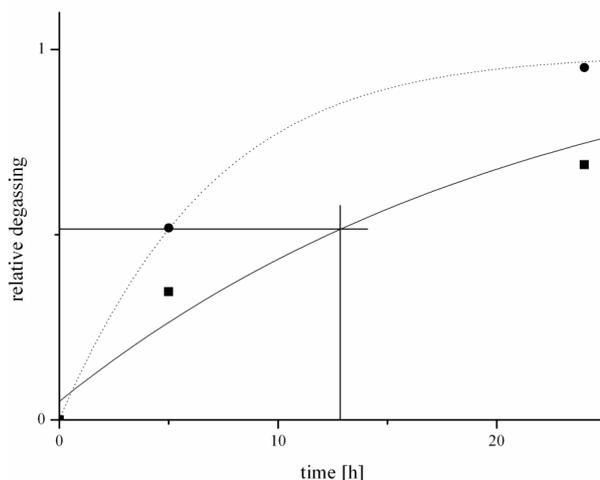


Figure 2. Phosphine concentration in the container with (dotted line, circle) and without (solid line, rectangle) heating the fumigant.

With the Speedbox after 5 h already 52 % of the magnesium phosphide of the heated Plate was decomposed whereas without the Speedbox the same Phosphine level was reached only 7 hours later. After 24 h with the Speedbox 95 % of the Degesch Plates were degassed whereas without the Speedbox the degassing rate was only 60 %.

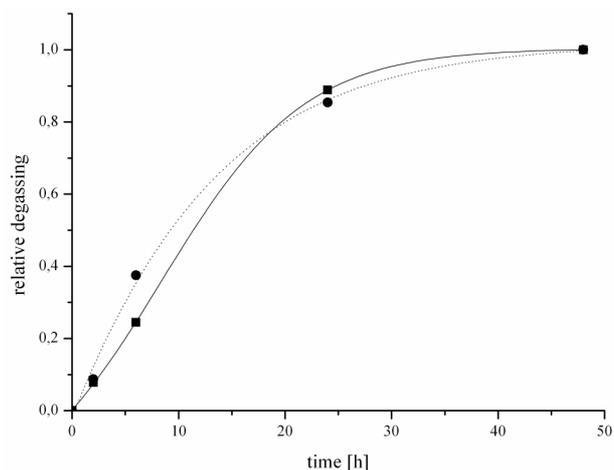


Figure 3. Comparison of the degassing properties of a Degesch Plates in the Speedbox (outside temperature: 10 °C, dotted line, circle) and in the laboratory (20 °C , 60 % r.h.; solid line, rectangle).

A comparison of the degassing rate of the Degesch Plate in a field test with the Speedbox

and in the laboratory is given in Figure 3. As expected, only negligible differences between these two conditions can be observed. After 2 h and after 24 h the progress of the degassing process differed by 1 %. In both cases the release of phosphine was complete after 48 h.

Discussion

The trials carried out at low outside temperatures point out that the Speedbox is a suitable device to ensure a continuous degassing of the Degesch Plates. Additionally, the gas development is much quicker than without using the Speedbox. Therefore an effective gas concentration is achieved earlier and the insects are exposed much longer to a lethal phosphine concentration.

In future the Speedbox will help to adhere to a good fumigation practice and to prevent insect

resistance against phosphine caused by the incomplete decomposition of phosphide based fumigants and thus to insufficient phosphine concentrations.

References

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