Aerosols for Managing Insects

These materials have been used a long time and are still economical.

This is the first in a two-part series offering a brief overview of the use of aerosols in managing insects.The phaseout of methyl bromide in the United States has led to exploring alternative treatments for managing insect pests associated with flour mills. The alternative fumigants available in the United States for use in food-processing facilities include phosphine as ECO_2FUME and sulfuryl fluoride.

Phosphine reacts with copper in electrical equipment causing corrosion, and resistance has been documented in almond moth, lesser grain borer, and red and confused flour beetles, among other species. It is well known through research that sulfuryl floride is less effective on the egg stage of a few stored-product insects.

Heat treatment is another nonchemical alternative for disinfesting mills. Heat treatment, of course, is not suitable in facilities that are old and have a lot of wooden construction. The type of heaters used such as forced-air gas heaters vs. steam or electric heaters also can influence effectiveness against insects.

Aerosols Are Economical

In addition to these alternatives, application of insecticides as an aerosol or fog is garnering attention among pest management professionals for controlling stored-product insects in food processing and storage facilities. The main advantage is that the use of aerosols or fogging is relatively inexpensive.

Pest Management

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Application of insecticides as aerosols for stored-product insect control is not a new technique and has been investigated since the late 1960s, mainly with an organophosphate insecticide, dichorvos, synergized pyrethrins, and synthetic pyrethroids.This technique also is known as space spray, fogging, or ultra-low-

volume (ULV) application, depending on the equipment and insecticide formulation used, and the particle size dispersed.

The concept is to have the aerosol particles settle on exposed flying or crawling insects and poison them with little residual activity or significant residual activity based on the product used. This method also involves insects coming into contact with settled particles.

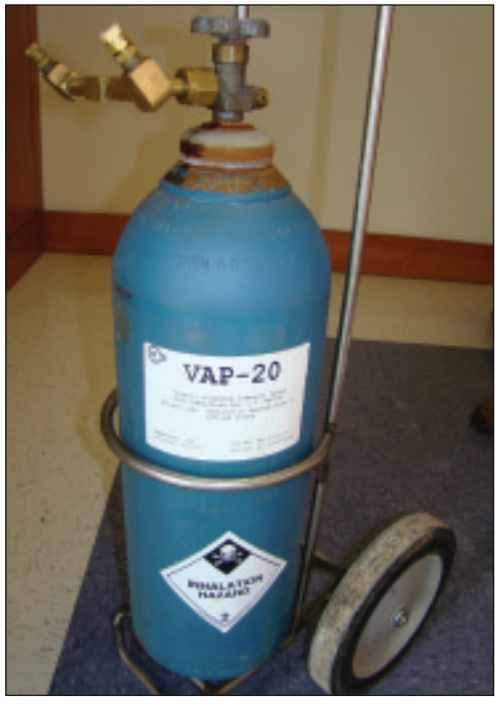
History of Using Aerosols

The application of insecticides as aerosols for controlling stored-product insects is an old technique. It was used initially for controlling tobacco pests such as cigarette beetle in tobacco warehouses.

Later during the 1960s and 1970s, researchers started working on the use of dichlorvos aerosol for controlling insects other than those associated with stored tobacco.

In the late 1970s, some researchers evaluated various synthetic pyrethroids and organophosphates as aerosols for controlling stored-product insects in transport vehicles such as tractor trailers and transport trailer vans.

Then in late 1980s and early 1990s, some studies focused on evaluating synergized pyrethroids as alternatives to dichlorvos for controlling stored-product insects in laboratory settings, with artificially constructed airtight chambers.



Shown here is a typical pressurized cylinder that is holding the aerosol dichlorvos (Vapona). Photo courtesy of Dr. Bhadriraju Subramanyam (Subi).

From the beginning of this technology, several types of application devices have been used for delivering aerosol insecticides for controlling stored-product insects.

Current Trend In Aerosol Use

The current trend in aerosol applications is to evaluate efficacy of aerosols such as dichlorvos, synergized pyrethrins, and pyrethroids alone or combined with insect growth regulators (IGRs) such as methoprene, hydroprene, and pyriproxyfen, in laboratory and field conditions (e.g., air-tight chambers in flour mills, warehouses, and other food-processing facilities) using portable application devices or permanently installed systems within the facilities.

In a typical aerosol/fogging application, the formulated insecticide is dispensed as a fog or mist of fine particles of 5-50 μm through an atomizer.

In addition to dichlorvos, synergized pyrethrins, early generation synthetic pyrethroids, newer synthetic pyrethroids and insect growth regulators (IGRs) recently have been registered for use as aerosols for insect management in mills.

Dr. Frank Arthur at the U.S. Department of Agriculture's Center for Grain and Animal Health Research Center in Manhattan, KS has done much of the work in the last decade on the distribution and efficacy of aerosol insecticides such as synergized pyrethrins, synthetic pyrethroids, and IGRs either alone or in combination under laboratory and field conditions.

Aerosol Application Devices

From the beginning of this technology, several types of application devices have been used for delivering aerosol insecticides for controlling stored-product insects. These include pressurized cylinder-based automatic aerosol dispensing systems and pressurized cans that are manually dispensed.

In the manual operations, a person with proper protective apparel can make application from within or outside an area to be treated.

A window or door can be used as the introduction point if treating from outside. Some researchers used resin pellets impregnated with insecticide, mainly dichlorvos, for releasing insecticide in vapor form either by a dispenser for providing large quantities of vapor or by placing pellets in a wire mesh tray to release the vapor into a confined space of a facility.

Researchers also have used portable devices or equipment to release aerosols into a facility such as a Devilbiss sprayer equipped with an air-atomizing nozzle; a 'Tifa' generating thermal aerosol machine; a Dyna-Fog 70 thermal aerosol machine; a 6-nozzle McGill Fog-Trol pneumatic aerosol machine; a rotary-whip ULV applicator; a Micro-Gen S1W-5E unit dispenser, and a hand-held ULV applicator.

The rotary-whip ULV applicator or vapor dispenser has a built-in fan or blower for dispersing the aerosol particles within a facility more efficiently.

All the aerosol application devices described above are either hand-held or portable and can be moved within and between facilities.

Nevertheless, the growing need for repeated applications of aerosols for controlling insects in food processing facilities necessitated the installation of an overhead permanent and automatic dispensing system or aerosol/ULV compressed air application systems, either to the ceiling or some other permanent structures in the middle of rooms within a facility.

The installation of such permanent aerosol dispensing systems reduces the aerosol treatment costs in the long run.

Freon 11/12 in 50:50 ratio and carbon dioxide (CO_2), for example, are the two most common propellants used in aerosol formulations. They are available as pressurized cans or cylinders for use with permanently installed dispensing systems, because these propellants aid in aerosol dispersion when released.

The next article in the series will discuss the efficacy and advantages of using aerosol products.

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