ProFume Gas Fumigant…The Technical Foundation for Precision Fumigation

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Dow AgroSciences, in cooperation with academic, industry, and government researchers, as well as fumigators and millers has been developing ProFume* gas fumigant (99.8% sulfuryl fluoride) for several years to control stored product pests in milling, food processing, and food storage facilities. Sulfuryl fluoride possesses many positive fumigant qualities, including: efficacy in controlling a broad spectrum of insect pests, a low boiling point, excellent penetration qualities, low reactivity potential, limited sorption, and rapid aeration.

Sulfuryl fluoride prevents insects from metabolizing the stored fats they need to maintain a sufficient source of energy for survival by disrupting the glycolysis cycle. Sulfuryl fluoride is effective on all life stages of post-harvest insect pests. Larvae, pupae and adult insects are highly susceptible to sulfuryl fluoride while eggs are more tolerant. Research has indicated that the lower activity on eggs is primarily due to reduced penetration through the eggshell. Effective dosages for all life stages can be obtained by varying concentration and exposure time. Lower dosages are necessary at higher temperatures due to the insects' increased metabolism.

Sulfuryl fluoride is inorganic, and is essentially non-reactive with materials found in structures. Over 15 wheat flour and rice mill fumigations have been conducted with no effects on computer, electrical, or mechanical systems. Sulfuryl fluoride has been used under the tradename Vikane* gas fumigant for over 40 yr in structures containing sensitive electronic equipment. Sulfuryl fluoride is not combustible and has no flash point, but in temperatures exceeding 400^{o}C it will degrade to form weak acids that can tarnish smooth surfaces such as metal, glass, and ceramics. Heaters can be very useful in raising temperatures at the site of the target pests to reduce required lethal dosages. However, caution must be taken to prevent sulfuryl fluoride exposure to heat sources which can cause chemical breakdown.

Food residue studies have been conducted on a variety of commodities. With some limitations, tolerances and MRLs for sulfuryl fluoride and fluoride (the two terminal food residues of interest) will be established to support the fumigation of a wide variety of grains, dried fruits, tree nuts, and processed foods. Country registrations are anticipated in the United States in 2002 and in the European Union in 2004.

Taste and quality trial results indicate that dried fruit and tree nuts are not adversely affected by ProFume. Wheat kernel quality trials showed that ProFume exposure did not affect the nutritional characteristics or the rheological properties of the milled fractions of Hard Red Winter, Soft Red Winter, and Durum wheat kernels.

Dow AgroSciences has developed the ProFume Fumiguide*, a PC based software program useful in refining precision fumigation techniques and maximizing fumigant efficiencies, while achieving a very high stewardship standard. The ProFume Fumiguide calculates dosages based on the target pest and conditions of the fumigation, and then refines the gas introduction instructions based on gas monitoring data collected during the exposure period. The Fumiguide can be an educational tool, allowing the fumigator to consider multiple fumigation scenarios prior to deciding on the optimal fumigation plan. Also, by helping the fumigator apply only the fumigant necessary to control the target pest, use of the ProFume Fumiguide promotes good stewardship and responsible use of this product.

Dow AgroSciences has a long history of responsible stewardship with gas fumigants, and particularly with sulfuryl fluoride for the structural fumigation market. As with Vikane, Dow AgroSciences will deliver comprehensive ProFume training and implement a stewardship program emphasizing worker, bystander, and environmental safety.

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