Two factors play important roles in a fumigant's efficiency for stored product pest control – the fumigant's ability to penetrate pest harborage and the right dosage reaching the target site. ProFume® gas fumigant is an effective product for stored product pest control due to its highly penetrative qualities and its dosage flexibility. These qualities help fumigators and millers across the country conduct successful fumigations. Fumigators and millers know they can rely on ProFume to get the job done.

Fumigant penetration

A critical factor in an effective fumigation is whether or not the correct fumigant dosage reaches the site of the pest. Fumigant penetration is important in controlling stored product pests, which commonly live within equipment, bulk-stored kernels, flour, processed product, and cracks and crevices filled with spilled products. An effective fumigant must penetrate and reach the site of the pest to ensure control. Fumigant penetration is important in controlling stored product pests, which commonly live within equipment, bulk-stored kernels, processed products, and cracks and crevices filled with spilled products. An effective fumigant must penetrate and reach the site of the pest to ensure control. ProFume® gas fumigant excels at penetrating air spaces, commodities and products and therefore can reach target pests buried deep in harborage areas.

Early trials by Kenaga (1957) with several commodities representing a range of pH and particle sizes as well as chemical and sorptive properties indicated that sulfuryl fluoride, the active ingredient in ProFume, penetrates food commodities more efficiently than methyl bromide. Recent studies demonstrated that ProFume penetrates 10 times faster than methyl bromide through wheat flour (Bell, et al., 2002). In these trials, the mean speed of penetration for ProFume was 10.6 cm/hour; whereas the mean speed of penetration for methyl bromide was 0.92 cm/hour. It should also be noted that due to the organic nature and high sorption of methyl bromide, as much as 70% of the methyl bromide could bind to commodities and may not reach the target site where pests are hiding (Bell, et al., 2002). (Fig. 1.)

Because ProFume penetrates faster than methyl bromide, optimum dosage is delivered to the target pest more quickly. The lower dosage for ProFume penetrated to nearly four-fold greater depth than commercial methyl bromide rates (Bell, et al., 2002). The higher dosage penetrated nearly four-fold deeper than commercial methyl bromide rates (Bell, et al., 2002). As a result, ProFume reached the target pest faster, penetrated the harborage for a longer period of time, and provided the control needed.

Maximizing fumigant dosage

Every fumigation has unique variables that affect its outcome, including a customer’s needs, environmental conditions or even the site’s structural conditions – and all these variables are subject to change. Fumigators need to consider customer desires as well as technical variables when planning a fumigation. Used with ProFume® gas fumigant, Precision Fumigation® tools and techniques allow a fumigator to incorporate these variables into their methods, thus optimizing any fumigation for maximum results, with minimal disruption to operations. With Precision Fumigation, fumigators can develop a customized fumigation plan for each job and make decisions regarding the fumigation based on desired goals. The result is a precise dosage of ProFume that offers effective and efficient control of the target pests.

Precision Fumigation is rooted in four interrelated factors – pest biology (insect species, life stage, population size, etc.), exposure time, temperature and Half-Loss Time (HLT) – that help determine the appropriate dosage based on the desired outcome, whether it’s a quick return to production or a reduced fumigant use. The Fumiguide™ program for ProFume gas fumigant takes these variables into account and accurately calculates the amount of fumigant needed. By modifying one factor, others can be changed to meet specific goals, allowing the flexibility to optimize the fumigation with ProFume based on customer needs.

Choosing the right dosage

The Fumiguide™ program for ProFume® gas fumigant offers two dosages that fumigators can use to calculate the amount of fumigant needed for a particular job. The low dosage was designed to control larvae, pupae and adults, and as such, this rate is sufficient for control of pest populations. (Campbell, Prabhakaren, 2004.) The high dosage provides clean out of infestations from mills and processing plants. It requires an exponential dosage increase to kill the last minute percentages of the insect population (Fig. 3). This dosage is recommended when other control measures are ineffective.

Managing the pest factor

ProFume® gas fumigant is effective on all key stored product insect pest species and can control all life stages of these insects. However, different pest species and life stages require different dosages. Knowledge about the target pest species and populations gives the fumigator power to maximize fumigation in an IPM program and helps them choose the appropriate dosage to achieve the expected results.
Understanding the time factor
Time also plays a critical role in fumigant dosage and its effect on the target pest: The longer the exposure period, the less fumigant needed to control the target pest; the shorter the exposure period, the higher the dosage.

Therefore, customizing the exposure period can be one of the most cost-effective fumigation practices. On one hand, doubling the exposure time in a well-sealed structure can decrease the amount of fumigant needed by up to 50 percent, saving on fumigant costs. On the other hand, increasing the fumigant dosage can alleviate downtime by reducing the exposure period, thus returning operations to production sooner.

Other factors
Temperature and Half-Loss Time are two other factors of Precision Fumigation that help maximize fumigant dosage.

Insects’ respiration is directly related to temperature. Therefore, increasing the temperature at the fumigation site decreases the amount of fumigant needed to achieve desired pest control. Fumigators may consider modifying the temperature at the site with portable or existing heating systems.

Fumigators can also maximize fumigant dosage by capitalizing on enhanced sealing techniques because a better seal will improve the HLT. HLT is the measurement of how well a fumigated space holds the fumigant – the time in which half of the fumigant is lost (in hours). All fumigants leak, but by using Precision Fumigation™ techniques to monitor the ProFume® gas fumigant concentration over time, fumigators can be assured that the target dosage is achieved, resulting in an efficacious fumigation.

While ProFume offers faster and better penetration than methyl bromide, it also offers effective, flexible and reliable stored product pest control that fits with millers’ operational needs. It’s the intelligent solution that fumigators and millers count on to get the job done.