

Fumigation is defined as the act of introducing a toxic chemical in an enclosed space in such a manner that it disperses quickly and acts on the target pest in the gaseous or vapor state.

Fumigation is one of the methods for controlling pests in stored products and is the most effective measure of disinfection strategy.

Fumigants are a unique valuable and to a large extent irreplaceable group of pesticides that can kill insects where no other form of control is feasible. Unlike aerosols and other contact insecticides, fumigants at a required temperature and relative humidity can exist in the gaseous state and in sufficient concentration and time be lethal to a given pest organism. The unique property of fumigants is that as gases they diffuse as separate molecules, which enables them to penetrate into the material being fumigated and to diffuse away afterwards.

The goal of fumigation is to confine enough gas for sufficient time to eradicate the target pest, which in normal conditions is achieved in a static chamber under control of one qualified fumigator. Normally the process of fumigation is complete when a clearance certificate is issued. The latter can only be issued when tests show that all residual fumigant has been dispersed and any residual fumigant material has been removed.

In marine fumigation in order to avoid idle time of ship in port of loading a clearance certificate can be issued at discharge and fumigation takes place in transit.

Aerosol

A suspension of liquid or solid particles of a chemical in the air. Unlike gases, these particles penetrate commodities. Aerosols are often referred to as smokes, mists, or fogs.

Aluminum Hydroxide

Residue remaining after the decomposition of the fumigant aluminum phosphide. Small amounts of unreacted aluminum phosphide may also remain in the gray-white aluminum hydroxide dust. Aluminum hydroxide is a clay-like compound that is nonpoisonous.

Aluminum Phosphide

A chemical that reacts with moisture to release the fumigant, phosphine, or hydrogen phosphide. The aluminum phosphide fumigant formulation contains approximately 55 percent aluminum phosphide and 45 percent inert ingredients to regulate the release of the fumigant and suppress flammability. Inert ingredients may include ammonium carbamate, ammonium bicarbonate, urea, and paraffin.

Application Method

The process used to administer a fumigant formulation.

Concentration

The actual amount of fumigant present in the airspace in any given part of the structure being fumigated at any given time.

Dosage

The amount of fumigant formulation applied, often expressed as the weight of the fumigant per volume of space treated or the weight of chemical per weight of commodity.

Efficacy

The power to produce a desired effect; i.e., a satisfactory kill of infestation in the egg, pupae, larval, or adult stage.

Fumigant

A chemical which, at the required temperature and pressure, exists in the gaseous state in sufficient concentrations to be lethal to a targeted pest.

Fumigant Formulation

The chemical or mixture of chemicals comprised of all active and inert (if any) ingredients which releases a fumigant. Fumigant formulations may exist in any of the three physical states: liquid, gas, or solid.

Fumigation

The action of releasing a toxic chemical in the gaseous state to control a targeted pest.

Gas

The state of matter distinguished from the solid and liquid states by very low density and viscosity, relatively great expansion and contraction with changes in pressure or temperature, the ability to diffuse readily, and the spontaneous tendency to become distributed uniformly throughout any container.

Gas Permeable Separation

One that is porous enough to allow air and water vapor into the fumigate pack and the release fumigate out of the pack but which will keep the residue created in the pack.

Granule

Finely divided chemical formulation as small particles. A granular formulation of aluminum phosphide is packaged in moisture permeable envelopes or sachets.

Hydrogen Phosphide

Another name (state) for phosphine.

In-transit Fumigation (FGIS)

A procedure used to fumigate qualifying shipments whereby the carrier may sail before the results are verified. Based on prior USDA research, efficacy of the treatment is assumed to be accomplished; provided, all the carrier criteria and treatment requirements are met and verified by FGIS personnel.

Magnesium Phosphide

A chemical compound that reacts with moisture to release the fumigant, phosphine, or hydrogen phosphide. These formulations contain magnesium phosphide as the active ingredient.

Metal Phosphides

A generic term when referring to aluminum or magnesium phosphide formulations. Metal phosphides are solids that react with moisture and temperature to liberate hydrogen phosphide. These fumigants can contain either aluminum or magnesium formulations. There are other metal phosphide compounds, however, they are not used for fumigation.

Parts by Volume

The relative number of gas molecules present in a given volume of air, such as parts per million (ppm) or parts per billion (ppb). These values are frequently used in human and mammalian toxicology and in applied industrial hygiene to indicate concentration.

Pellets

Aluminum phosphide formulated as a spherical-shaped mass 3/8 of an inch in diameter, weighing about 0.6 grams that release 0.2 grams of phosphine.

Phosphine (PH₃)

A colorless, odorless gas having a low molecular weight, low boiling point, and specific gravity of 1.21 in relation to air. The gas diffuses rapidly and is capable of penetrating deeply into materials, such as bulk grains. Phosphine is flammable at concentrations above 1.79 percent by volume in air.

Recirculation

The act of moving a fumigant throughout a space being fumigated to prevent stratification and provide an even distribution of the fumigant. Usually accomplished with fans located inside the fumigated space.

Restricted-Use Pesticide

A pesticide that is classified for restricted use under the provisions of Section 3(d)(1)(c) of the Federal Insecticide, Fungicide, and Rodenticide Act, as amended (Pub. L. 92-516, 86 Stat. 973). Statements indicating that a pesticide is classified, as "restricted use" must appear on the EPA approved label. Aluminum phosphide is classified as "restrictive use." Restricted use pesticides can only be used by or under the supervision of a certified applicator.

Residue

The active ingredient(s), metabolite(s), or degradation product(s) that can be detected after the use of a pesticide.

Residual Pesticide

A pesticide that is active only at or near the point of application and persists for extended periods in sufficient concentrations to be lethal to targeted pests. An example of a residual pesticide is Malathion. Residual pesticides are often referred to as contact insecticides.

Sachet

A moisture permeable envelope containing aluminum phosphide in a granular formulation. Each sachet weighs approximately 34 grams and will release about 11 grams of phosphine. The envelopes may also be placed in cloth strips referred to as bag blankets or belts.

Separation

A permeable or impermeable partition(s) between two or more distinct lots of grain within a specific stowage space.

Specific Gravity (gas)

The weight of a gas compared to the weight of an equal volume of air under prescribed conditions of temperature and pressure. The specific gravity of phosphine gas is 1.21 with the value of air being 1.0. Therefore, phosphine is slightly heavier than air.

Static Fumigation

A method of fumigation in which the carrier/cargo must remain stationary for the EPA-specified exposure time period and the treatment efficacy verified before being allowed to move into commercial channels.

Tablet

Aluminum phosphide formulation in a spherical or flat and round shape weighing approximately 3 grams that release approximately 1 gram of phosphine.

Witness of Fumigation (FGIS)

A service whereby the verification of a fumigant's application to a specified cargo is provided.