Propane-Fueled Thermal Remediation

Environmentally friendly pest management

To protect stored crops from insect damage, farmers must reduce the number of pests that reside in storage facilities. Direct-feeding by insects decreases grain nutritional value, weight, and germination. Infestations may also cause contamination, odor, mold, and heat-damage problems that reduce grain quality and may make it unfit for processing into food for humans and animals.

Farmers often use chemical fumigation to destroy weevils and these substances are extremely hazardous for the user and the environment, requiring specific safety equipment and specialized instruments upon application. In addition, wind, rain, and temperatures below 65°F can degrade insecticide performance. Certain post-harvest applications are even phasing out chemical fumigants, such as methyl bromide, due to more stringent regulations and rising treatment costs.

Currently used to heat large food processing plants, TEMP-AIR's patented propane heat treating process has been very well received as an alternative to chemical fumigation to control insects. This innovative technology offers the agricultural community a safe, effective, and environmentally friendly storage treatment that may be incorporated into a comprehensive pest management program.

Propane-fueled thermal remediation offers an ideal solution for treating bins, silos, and other storage vessels, especially on certified organic farms. If successful, this project has the potential to provide a chemical-free solution to control insects on farms.

Project Description

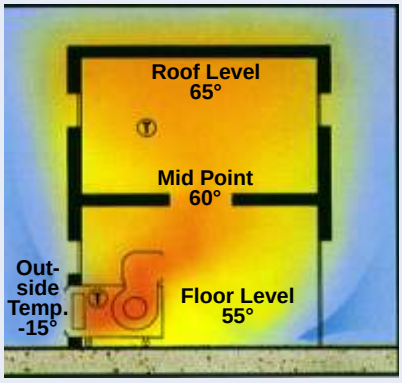
To support the use of propane in pest management, the Propane Education & Research Council (PERC) is funding a research effort, *Testing and Demonstration of Propane-Fueled Mobile "Thermal Remediation" Pest Management System for Farms* (**Docket 11958**). The project will determine the compatibility of existing grain drier systems with heat treating for insect control and will evaluate the efficacy and economics of propane-fueled mobile heat treating systems.

Heat Kills Insects

One of the greatest challenges in pest remediation is heating to a uniform temperature without damaging the storage vessel.

A new propane heat treating system improves on low air-flow designs that can overheat the ceiling and leave live bugs that hide in wall cavities.

Direct-fired heaters use high flow rates to provide uniform temperatures throughout the structure, killing the insects attempting to escape the heat.



Key Benefits

Propane-fueled thermal remediation offers major benefits over chemical fumigation:

- **Process control.** Precision monitoring and control capabilities allow more uniform temperatures than grain dryers with simple on/off controls.
- **Safety.** Personnel can walk through the treated area and inspect the process.
- **Productivity.** Farmers can heat treat about one bin per day, while some fumigants can require evacuation of seven days or more.
- **Effectiveness.** Heat works in all weather conditions and reaches places that fumigants cannot, killing all insects.
- **Environmentally friendly.** Heat is an approved means of pest control for organic production.
- **Low impact.** Heat does not corrode machinery.

Propane Mobile Heat Treating System

The prototype heat treating unit is a trailer-mounted system that incorporates a 1,500,000 Btu/hr propane-fueled direct-fired make-up heater, a propane generator, digital controls, fabric ducts, and on-board propane storage of 150 gallons.

Prior to loading the storage space with grain, direct-fired heaters blow outside air into it to slightly pressurize and heat the structure to a minimum of 122°F (50°C) for at least three hours. Fabric ductwork can place the heat directly in the structure and the high flow rate minimizes the infiltration of cold air and ensures that heat penetrates wall cavities and cracks to kill insects attempting to escape the heat.

The temperature and exposure time will be optimized to kill 100 percent of insects and other organisms, such as mold and mildew, throughout their entire life cycle.

Project Objectives

The project will pursue the following objectives:

- Determine the feasibility of using grain dryers to kill insects, develop cost and efficacy models, and conduct a market analysis
- Fabricate a prototype mobile propane heat treating system
- Test the performance and kill rates of propane heat treating on simulated bins and silos
- Demonstrate propane heat treating on farms, confirm kill rates, and record fuel consumption, run time, and operational costs
- Determine the efficacy and operating requirements of propane heat treating in barns, poultry houses, and swine facilities, and develop demonstration and validation plans for the most attractive markets
- Accelerate the adoption of propane heat treating systems by creating reports and application guides and presenting results at conferences

Project Status: Testing in 2007

Grain dryer feasibility tests are underway at the Purdue University Post Harvest Research Education Center pilot bin facility. TEMP-AIR is developing the mobile heat treating system. Tests on Purdue's neighboring farms will be conducted in 2007.

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