

ADVANCED VACUUM FUMIGATION AND ITS APPLICATIONS

Philippe Villers*, President, GrainPro, Inc.

In the last two years, GrainPro, Inc., in cooperation with its partners, Oklahoma State University, the Agricultural Research Organization, and Haogenplast, Ltd., and with funding provided, in part, by the United States - Israel Science and Technology Foundation, has developed a new rapid and pesticide-free vacuum fumigation technique with broad application. In response to the need to find practicable alternatives to methyl bromide, which will be phased-out in many countries by 2005, this team has been developing two complementary methods for pesticide-free fumigation.

The team has done so using flexible structures for modified atmosphere-hermetic storage, as well as hermetic storage with unmodified atmospheres. Modified atmosphere applications include vacuum-hermetic fumigation (V-HF), which involves sealing commodities in a hermetic enclosure, and drawing a vacuum down to 35 mmHg, and CO₂-hermetic fumigation, which involves applying 99% CO₂ to commodities in hermetic enclosures.

In the novel context of flexible hermetic storage structures made of strong, lightweight UV-resistant PVC, laboratory and field data confirm that both processes at room temperatures typically kill relevant insect pests within three days. To date, laboratory and field tests have been performed on cocoa, coffee, and dates, with experiments planned for nuts, other dried fruit, and spices.

Although these tests have been performed using existing enclosures known as Cocoons or Volcani Cubes[®], it is anticipated that this technique can be expanded to large scales, such as liners of ships, barges, trucks, rail cars, and silo-like structures using loose commodities. We also believe that it is well-suited for custom-designed structures for handling multiple skid-loads of commodities, and also for structures designed to handle entire containers. This patent-pending system, called the PITS (pesticide-free integrated transport and storage) system, has been proposed to integrate fumigation and storage at three different levels: 1) in the country of origin before shipment; 2) during transportation; and 3) in the country of destination. If quarantine treatments and subsequent transport or longer-term storage is necessary, PITS accomplishes the task in a cost-effective manner using mechanized loading and unloading.

This paper reviews experimental results from field and laboratory, and discusses the above new techniques of application. In some cases, this is being done with existing partners; in others, new partners are being solicited.