COMMERCIAL EGPIC INSECT MONITORING SYSTEM FOR MANAGEMENT OF BULK STORED GRAIN

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Pitfall grain probes are commercially available traps that are used for detecting and estimating adult insect populations in stored grain. The Electronic Grain Probe Insect Counter (EGPIC), Patent No. 5,646,404 (Shuman et al. 1996, Litzkow et al. 1997) is an automated system that incorporates this grain probe methodology with the use of infrared-beam sensors to display, at a remote site, real-time data indicative of the insect population distributions throughout the stored commodity (Shuman and Epsky). EGPIC provides information about the presence and extent of insect infestations in bulk-stored agricultural products, without the necessity of entering the bin, by using a number of perforated tubes distributed throughout the stored product. Insects wandering in the stored grain crawl into the tubes and then drop down past electronic sensors that send counts back to a central computer. Insect counts are analyzed and off-site displays indicating insect population level and distribution are produced. Automated data collection can provide an early warning, allowing a manager increased control options, such as the use of a minimal amount of pesticide or a non-toxic alternative control measure (controlled atmosphere, aeration, etc.). The real-time data will also provide immediate feedback on the effectiveness of applied control measure and will provide the user with a safe, effective tool for monitoring insect populations, which is an essential component of an integrated pest management program.

Prototype EGPIC systems have been produced by small-scale manufacturing processes (Epsky and Shuman 2000) and preliminary field trials conducted with these prototype systems have been very promising. Technology transfer in the form of a Cooperative Research and Development Agreement (CRADA) and license negotiations have been entered into with OPI Systems, Inc. of Calgary, Canada, a company that produces automated stored-product management systems. OPI Systems, Inc. produces monitors, alarms, and control systems for grain storage management. The basis of the control system is an array of temperature cables located throughout the bin that transmit data to a plug-in monitor unit or to an off-site PC. We report herein on system refinements that will further improve the EGPIC electronic probes and facilitate commercial availability by combining the EGPIC insect monitoring with OPI Systems, Inc.'s StorMaxPro system. System refinements include (a) the efficient production of the sensor head or main probe body, (b) the optimization of the upper probe body entry hole array, and (c) the modification of the EGPIC electronics to interface with the existing OPI Systems data transmission architecture.

The prototype sensor head contained an upper and a lower funnels, which were milled as separate pieces and then precision force-fit into the main probe body. The commercial sensor head will have the upper funnel only, and the entire unit will be milled as a single

piece (Fig. 1). Laboratory tests conducted with sawtoothed grain beetles and rice weevils, two species that are very good at climbing, found that the angle of the lower probe tip was sufficiently steep to prevent insects from reentering the main probe body from the bottom receptacle, thus the lower funnel in the sensor head was eliminated. The prototype upper probe body used a commercial probe trap that had a 14-cm-long trapping surface with 180 holes. The commercial upper probe body has a 40-cm-long trapping surface with 210 holes. Thus, the trapping surface area in the commercial upper probe body has been increased to provide greater coverage in the grain and the total number of holes slightly increased. By making these modification, the commercial probe trap will be much more cost-effective than the prototype probe trap.

The prototype EGPIC system employs a detection/ computer interface circuit box that connects to eight probes and sends sensor output signals to a dedicated computer via its parallel ("printer") port. Thus, the prototype system was limited to eight probes per unit. The commercial EGPIC system will interface with the existing OPI Systems data transmission architecture. This will allow an increased number of sensor probes to be used in storage facility and the system can be custom designed per application.

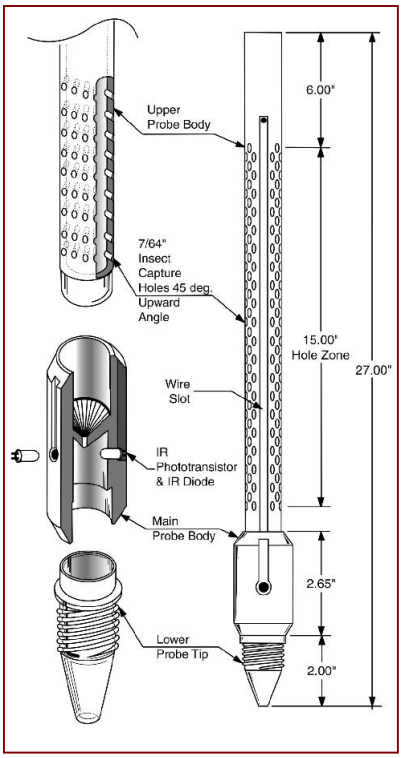

Figure 1. Electronic sensor probes for the commercial EGPIC system

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