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Kansas Edition

Areawide Stored Grain IPM

Storage Risk-Analysis

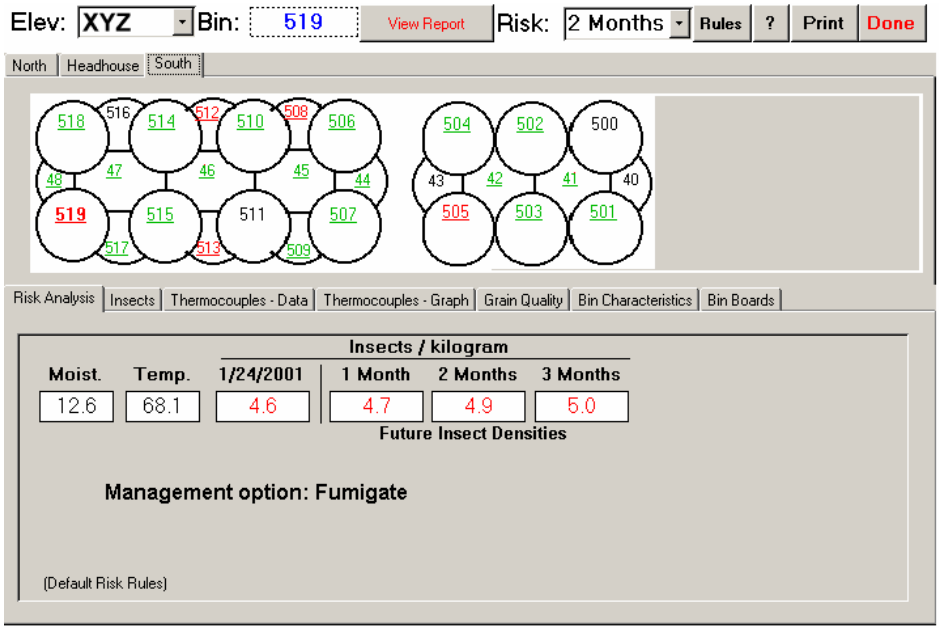
Instead of fumigating all of the bins at your elevator, wouldn't it be great if you had a method that would accurately tell you which bins needed to be fumigated and which bins didn't?

You could save time and money by only turning and fumigating bins that needed to be fumigated. Of course, you would need to be sure that you could depend on the method to give you accurate results. During the last two years of the Areawide IPM project, we have been working on a method to do this.

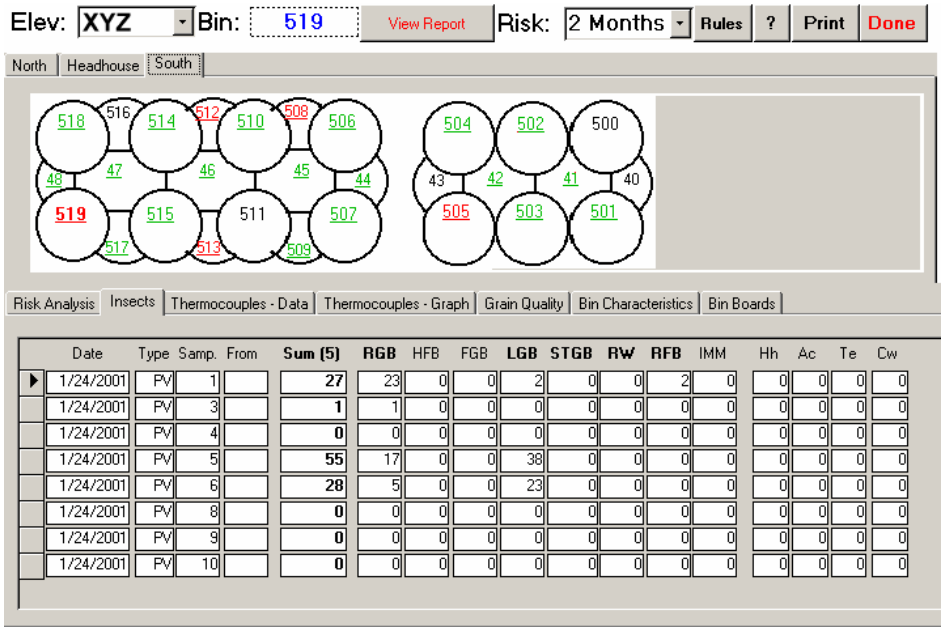
How Does It Work?

We have developed a grain sampling and risk-analysis database program that will show the elevator manager which bins need to be fumigated and which ones don't. The first step in the sampling program is to use a vacuum probe sampler to take 10 grain samples in the top 40 feet of each silo. An inclined sieve is used to separate the grain from any insects that are present in the one-gallon samples. The insects are identified and counted, and the data is entered into a special risk-analysis database.

The software analyzes the insect counts, grain temperatures and moistures, and determines which bins need to be fumigated. The risk-analysis program also



Risk analysis database: bins with red numbers are at risk, those with green numbers are safe for the next 2 months, bins with black numbers weren't sampled. Bin 519 is selected by clicking on it. Current (1/24/2001) and future numbers of insects for bin 519 are shown for 1, 2, and 3 months. The management option is to fumigate this bin.



Clicking on the "Insects" tab changes the screen and shows you the number of insects collected in the vacuum probe samples at different depths for bin 519 (each sample is about 4' down). RGB is rusty grain beetle, LGB is lesser grain borer, STGB is sawtoothed grain beetle, RW is rice weevil, and RFB is red flour beetle.

uses a prediction model based on the grain temperature and moisture for each bin to predict future insect numbers.

Why is this Better?

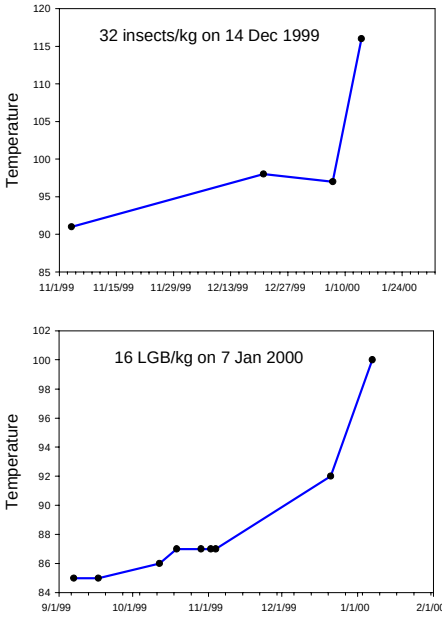
Currently, most elevators use calendar-based fumigations: the grain is fumigated once in the fall and maybe once again before it is shipped. This method works well sometimes, but often insects in some bins reach economically damaging numbers. The reason: because insects often increase much faster in some bins than in others, and calendar-based fumigations don't catch these bins early enough.

The advantage of a sampling-based program is that because the bins are sampled about every two months, the elevator manager knows if there is a problem in his bins. He can then act to fix the problem while it is still small. This is similar to putting out small fires before they become big ones.

What About Thermocouples?

Hot spots are usually detected in stored grain with thermocouples. Hot spots are caused by metabolic heat produced by insects and fungi. So why can't we use thermocouples to detect insect hot spots in silos?

To answer this question, we looked at insect and thermocouple data we collected in the area wide IPM project during the last two years. The graphs above show two bins with high insect densities in December and January, that showed rapidly increasing grain temperatures.



Temperature increases in bins with high numbers of lesser grain borers or rice weevils in winter (insect numbers are an average of 5 samples taken in the top 20' of grain).

In the first case, temperatures went from about 90º to over 115º from November to January. In the second case, it increased from 87º on November 1 to 100º by January 1. In contrast, grain temperatures decreased in bins at the same elevator with low insect numbers during the same time period. These dramatic temperature increases were undoubtedly caused by high insect numbers and/or mold problems in the grain.

Can we use information from thermocouples to detect insect problems in stored grain? The answer is probably yes, *but* you may not be able to detect them until insects reach high numbers. We are still analyzing the data to see if we can use this method in conjunction with grain sampling.

Conclusion

The most accurate and reliable method of estimating insect density in a grain silo, without moving the grain, is probably a vacuum-probe sampler. This method will detect insects earlier, and give the manager time to control the insects before they become a problem. When this sampling method is used in combination with the risk-assessment database, it can alert the elevator manager to target control methods to the silos that need it most.

This coming year, we will be testing the risk-analysis program in some of the elevators in the area-wide IPM project. Approximately every two months, we will be trying to sample most of the grain bins at each elevator, run the risk analysis software, and quickly get the information back to the elevator manager.

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