Methods for Optimizing Structural Heat Treatments: A Case Study

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The use of heat for disinfesting food-processing facilities is an old technology. Heat treatments are now becoming more popular because of the methyl bromide phaseout. Despite recent interest in using heat treatments, this technology has not gained widespread acceptance by the food industry because it costs several fold more than a methyl bromide or sulfuryl fluoride fumigation. Heat treatments are effective in killing all life stages of pest insects. In order for heat treatments to be cost-competitive with fumigation, methods for optimizing how heat treatments are used should be developed and implemented. At Kansas State University, we have explored four such methods aimed at optimizing heat treatments. One method includes estimating amount of heat energy required for raising the ambient temperature of food-processing facilities to 50 to 60^{o}C. The second method includes determining survival of the most heat tolerant stage of pest insects associated with food-processing facilities (*Tribolium castaneum* and *Tribolium confusum*). The third method involves using bioassays as an indicator of treatment effectiveness, and the fourth method involves monitoring resident insect populations several weeks before and several weeks after a heat treatment to determine degree and duration of insect suppression following an intervention. All four methods were used to assess the effectiveness of a heat treatment of a pasta plant in the United States. This paper will focus on how each of the methods employed helped in optimizing heat treatments. The costs of conducting such a heat treatment are also presented, along with notes on limitations of conducting heat treatments and methods for improving future heat treatments.