

TECHNICAL SUMMARY

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NO 22 – EFFICACY OF THERMOKIL HEAT TREATMENT TECHNIQUES.

Heat treatment has been an accepted form of control of biological organisms for hundreds of years, and heat treatment for insect control has been practiced around the world for most of the last century. The trick has always been to get enough lethal heat to the insect without causing damage to the area in which the insect is living.



Dead Cocoa moth larvae following heat treatment of Redler conveyor 1999

This Technical Information summary has been produced to answer the question *How effective is heat treatment at controlling insects ?*

We hope this discussion document will allow the reader to understand the issues involved without giving away too many commercially sensitive answers:

Phone Thermokil Ltd on 0845 129 9974 (or (44) 1353 698662 outside UK) for further information or e mail us at heatinsect@yahoo.com to be sent an information pack leaving full contact details.



The effectiveness of heat treatment using the Thermokil system is a function of the following components:

- i) The maximum temperature achieved where the insects are living.
- ii) The time for which you hold this temperature
- iii) The distribution of the heat
- iv) The substrate on / in which the insects are living
- v) The species of insect concerned
- vi) Local geographical differences.
- vii) Humidity and time of year have a minor effect.

Given enough time, a temperature of 47 C will kill all life stages of all pest insect species that we have come across by a combination of denaturing proteins and inhibiting enzyme activity, or for adult insects pure dehydration / “heat stress”.



100 % kills are easily achieved using heat alone - *given enough time*, but in many cases eg where floor or wall areas have to be heated, additional supplementary treatments with pyrethroid insecticides are used to make the technique commercially acceptable, as these areas can take a long time to heat up.

In food production facilities there is often a commercial trade off between time (due to contractor costs or downtime of bins or machinery) verses temperature

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achieved in the coldest spot. From a practical point of view we instruct that “going the extra hour” at the end of the treatment will have a disproportionately beneficial effect on the eventual success of the treatment

Choosing exactly the right time to cease heating may be difficult to judge at lower temperatures (47 C to 50 C), and ensuring that all areas have come up to temperature is down to operator experience and machinery structure. Technicians are trained and have a reference manual to refer to which remains confidential for commercial reasons, but unforeseen cold spots can develop in the most unexpected places which can allow some insect survival in shorter treatment times.

Reasons for insect survival

- i) The most common reason is lack of time and failure to measure temperature in coldest place. Even temperatures as low as 45 C can be lethal if given long enough. Extra time allows heat to penetrate all cold spots and small (up to 6cm) food residues.
- ii) Lack of temperature – in these cases the surveyor has underestimated the amount of energy required to heat up the structure concerned – or the external temperature has changed drastically from when the job was surveyed leading to high rates of heat loss. This can be rectified by increasing insulation, introducing re-circulation or using additional power units.
- iii) Lack of proper heat distribution. This can be rectified by altering the distribution system during the course of the heat treatment, or by targeting heating resources to those areas that have not achieved the required temperature or time exposure during the course of the treatment.
- iv) Lack of cleaning. Insects can survive in hidden deep residues of product that have not been cleaned out. Deep “fluffy” deposits are more heat resistant than hardened solid deposits.
- v) Water – standing water eg in coolers or the aftermath of a wet wash absorbs huge amounts of energy. The area to be treated should be as dry as possible.
- vi) Unforeseen exhaust or air movement – If a dust collection system is left attached and running, this can suck out hot air away from where it is needed.



Heat treatment is an excellent tool for controlling insects in certain situations, particularly where health & safety of staff and pest control workers is an issue or where treatment is needed to inaccessible areas and fumigation is inappropriate or not possible.

It is not a panacea and is best used in conjunction with good cleaning as best possible, with residual insecticidal treatments around the treatment area and most importantly, in conjunction with a fully integrated pest management system.

With the Thermokil system and techniques, we are constantly finding new and innovative ways of dealing with ever more complex situations, and as each treatment is written up and centrally collated, all users of the system learn lessons from previous treatments.

Please contact David Hammond at Thermokil Ltd for more technical advice.

For more information phone +44 (0)1623 624637 or e mail us at info@thermokil.co.uk for more information about the Thermokil heat treatment system,

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