Alternative treatments for wood exports

News

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Scion update

This quarter has been one of consolidation. We have focussed on wrapping up the last of our temperature development experiments, attending to comments and suggestions on our papers from the programme's independent science advisor Jack Armstrong, and winding up the forest insect trapping network.

We are very appreciative of Plant and Food's shipment of 200 *Hylastes* eggs to finalise work on two larval temperature development studies. Plant and Food is also helping with some egg development temperatures.

We have nine papers at various stages of preparation or internal review. Three are currently in review with journals and one has recently been published in the journal Forest Ecology and Management on the effects of elevation and aspect on the flight activity of two alien pine bark beetles (Coleoptera: Curculionidae, Scolytinae) in recently harvested pine forests.

Assessing temperature development of Hylastes *on bark sandwiches.*

A programme close-out meeting was held in August. Participants from MBIE, MPI, MFAT and the EPA, along with STIMBR, were invited to hear research providers give an update on what has been achieved over the last four years. There were extremely positive comments from key stakeholders, particularly by Don Hammond, Chair of STIMBR in his closing address. The programme will continue for a further two years with financial support from STIMBR. The details of that programme are still to be confirmed but the focus will be on advancing adoption of the science at an operational level.

Fumigation chambers used at Plant and Food Research in Palmerston North.

Plant and Food Research:

Verifying new methyl bromide fumigation schedules using infested logs

The disinfestation team at Plant and Food Research (PFR) in Palmerston North have been investigating methyl bromide (MB) fumigation with *Hylurgus ligniperda*-infested logs.

We have now combined the findings of our previous work identifying (1) the most MB tolerant life-stage, (2) modelling toxicity of a combination of fumigation times, durations and doses to the most MB tolerant life-stage and (3) MB sorption characteristics to propose new fumigation treatments with MB at 5, 10 and 20°C. The treatments were tested for their efficacy with *Hylurgus ligniperda*- infested logs. Logs were infested by Scion with *Hylurgus* adults for six weeks, so at the time of fumigation they contained *Hylurgus pupae*, which had earlier been found to be the life stage most tolerant to MB. Infested logs were fumigated with MB for eight and 16 hours at 5, 10 and 20°C.

We found that all proposed fumigation treatments had a 100% mortality rate. This very encouraging result might lead us to propose new fumigation treatments with MB doses lower than current commercial fumigation schedules. Research with infested logs will continue to upscaling trials to an industrial standard scale. This could confirm the efficacy of our new proposed MB treatments and would eventually lead to a proposal of a reduced methyl bromide treatment for New Zealand forestry exports.

EPECentre

Our experimental work has shown that the Joule heating effect causes non-uniform temperature distribution inside the sapwood of green *Pinus radiata* logs. The temperature difference between hot and cold spots can be significant, reaching 10-30°C. The cause of this behaviour is the unique structure of green wood, which affects the distribution and flow of the electrical current.

A simplified heterogeneous experimental model was created to better understand the mechanism (Figure 1a). Electrical current preferentially flows through the graphite block, which has electrical conductivity much higher than the gel's conductivity, and bypasses the plastic block, an electrical insulator.

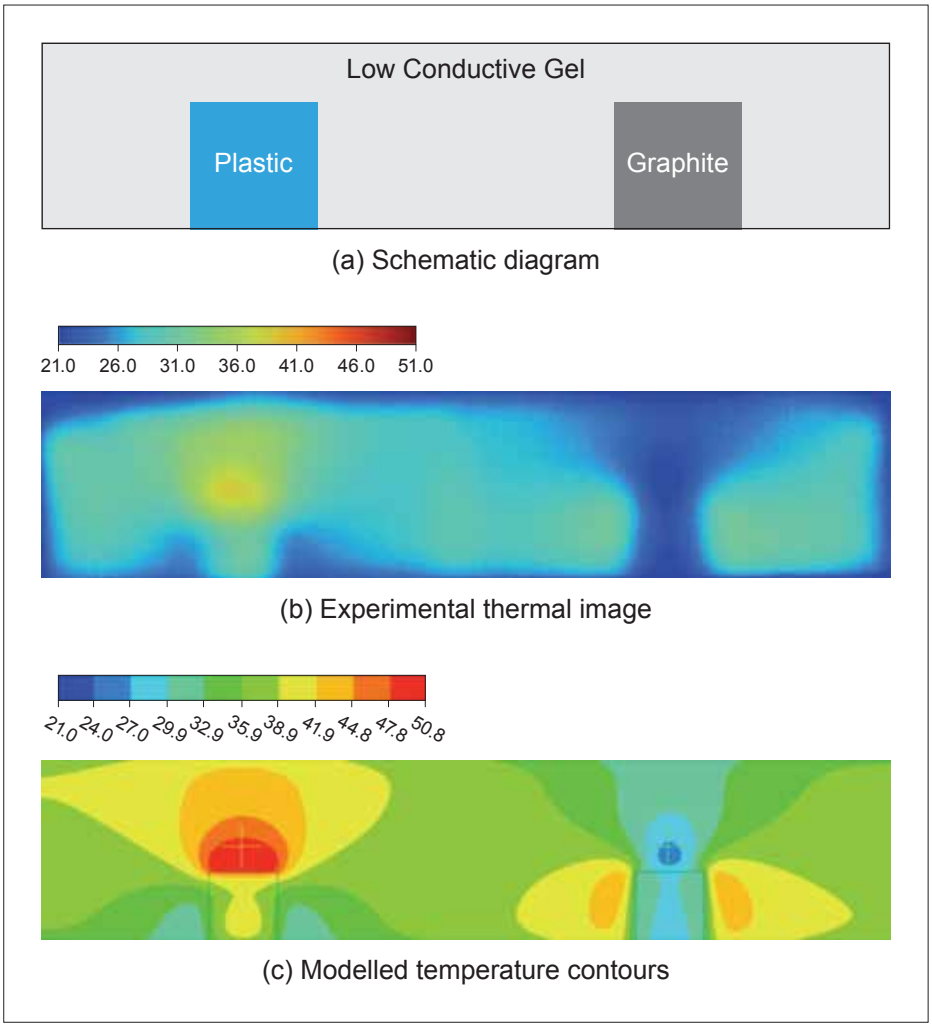

Figure 1. *The simplified heterogeneous structure made from low conductive gel, with submerged plastic and graphite blocks.*

The temperature of the system was recorded using a thermal imager (Figure 1b) and a separate temperature probe above each of the plastic and graphite blocks. The experimental results show that the formation of hotspots at the interface between conductive and non-conductive parts, such as the gel and the plastic block. However, cold spots are formed at the interface between very conductive and less conductive materials, shown by the graphite block and the gel. The experimental set-up was also modelled in ANSYS CFX (Figure 1c).

The temperature difference between the model-calculated and the experimentally measured temperatures above the plastic and graphite blocks, during and after Joule heating, is shown in Figure 2.

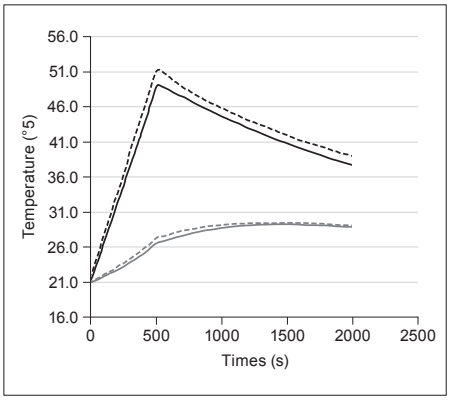

Figure 2. *The temperature of the hot and cold spots, where the dashed and solid lines denote experimental and calculated data, respectively.*

We would like to acknowledge the support of MBIE and STIMBR in the funding of this programme.

For further details on this project go to our website:
http://quarantinetreatment.wordpress.com
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