

PRACTICAL JOULE HEATING FOR PHYTOSANITARY LOG TREATMENT

Bill Heffernan, Electric Power Engineering Centre, University of Canterbury
Ryan van Herel, Nurzhan Nursultanov, Thomas Smart and Ian R Gear*

A team at the University of Canterbury's Electric Power Engineering Centre (EPECentre) has developed a laboratory machine and process that can rapidly and reliably Joule heat the sapwood of softwood timber. This treatment, initially intended for phytosanitary purposes, has been demonstrated on multiple full-sized, New Zealand (NZ) grown, *Pinus radiata* logs.

The team has been working with Scion (NZ's Forest Research Institute) and Canterbury University's Departments of Forestry, Chemical & Process Engineering and Electrical & Computer Engineering, with funding from NZ's Ministry of Business, Innovation and Employment (MBIE) and industry organization Stakeholders in Methyl-bromide Reduction (STIMBR).

A publications search shows that the Joule heating idea was trialled as a veneer log pre-treatment by the US Department of Agriculture Forest Service, Madison, Wisconsin in 1953. More recently some computer modelling work has been done in France for the same purpose, but the idea has not been commercialized, seemingly due to insufficient understanding of the process to overcome the problems of uneven heating profile.

The EPECentre team has studied the electrical and thermal behaviour of freshly harvested *P. radiata* in sufficient depth to create both a full Computational Fluid Dynamics (CFD) model and a simplified computer model. The simplified model is sufficiently robust to generate control parameters enabling the machine to successfully heat all sapwood parts of every log tested to above 60°C, for ISPM-15 type compliance over a half hour period.