ENERGY EFFICIENT KILNS

LEAD ORGANISATION
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PARTNERS
The other organisation involved in the project is the Forestry Commission acting through its agency, Forest Research.

COST AND DURATION
The Carbon Trust contribution towards this project is £109,382. The project started in October 2003 and is due for completion in September 2005.

PROJECT REFERENCE NUMBER
2002-12-84

CARBON TRUST
Making business sense of climate change

OBJECTIVES

The aim is to reduce CO_2 emissions from industrial timber kilns by 25% through the development of a heat treatment methodology which includes a novel prediction model for determining the temperature rise in different timber species. The results will also help the UK timber industry comply with international legislation being implemented this year that requires all packaging wood (pallets, boxes, dunnage, etc) to be heat-treated for 30 minutes at 56˚C in the core of the wood.

SUMMARY

Innovative energy efficient kiln-based heat treatment (HT) techniques are urgently needed for manufacturers of timber products to comply with new international legislation aimed at the eradication of pests and pathogens. Without these innovations the industry is likely to increase energy use (and CO_2 emissions) or even worse switch to cheaper, yet more energy intensive alternatives, such as plastics.

The project will develop a methodology to predict the optimum heating conditions for a HT chamber (kiln) and the timber materials being heat treated. The method will calculate the rate of heat transfer through timber of different sizes. It will be based on a thorough understanding of the thermal diffusivity of timber (a function of tree species, dimensions, moisture content, densities, initial timber temperatures, etc) gained through data collected from extensive laboratory and industrial experiments.

The work will result in a modelling tool which potentially can be used to optimise the operation of industrial kilns in real time. To achieve this it will need to be integrated within the control technologies of kilns. This integration will be the next step should this initial phase be successful. Armed with this information, and knowledge of the heat flow within a kiln, kiln operators in future will be able to optimise their operations, reducing energy costs and CO_2 emissions by up to 25%.

The specific challenges addressed in this work are: to establish the heat transfer characteristics of a variety of timber species; to then develop a generic predictive model based on data from the small-scale kilns; to carry out measurements on industrial-scale kilns to determine the sensitivity of the HT cycle to kiln operation; to establish scale-up rules for the model; finally, to validate the model by running a kiln using the heating cycle proposed by the model.

Image of Small Test Kiln

This summary is based on information supplied to the Carbon Trust in relation to the project. It does not necessarily represent the views of the Carbon Trust.