INSULATION FROM WOOD SHAVINGS

A Technology Strategy Board supported feasibility study to assess the feasibility of using wood shavings to produce thermal insulation for use in closed loop timber building systems such as Tŷ Unnos.

Collaborative Research

BACKGROUND

Natural insulation has many technical, social and environmental advantages but is rarely specified in the UK due to their higher price. The benefits include, high thermal mass, vapour open and moisture buffering, high durability and healthy in production and use.

This project is significant in that a closed loop production process for both wood fibre insulation and off-site insulated components (such as Tŷ Unnos) could lower production costs and begin to unlock both the natural insulation market in the UK and have wider advantages for the UK forest products sector and society (carbon storage, energy efficiency and resource efficiency).

LITERATURE REVIEW

Wood sawdust and shavings have been used historically to insulate timber buildings in the US, Scandinavia and Germany. Studies in Norway concluded that there was no more chance of rot than for solid wood, that there was no evidence of increased rodent infestation and no increased danger of fire in wooden houses. We also found that work in Germany showed similar thermal conductivities from wood residues and man-made insulation. German house builder, Baufritz currently use wood shaving insulation in their closed panel wall system.

METHODOLOGY

Stage 1

The optimum type of wood residue was determined by selecting a variety of residues and then measuring thermal conductivity (W/m.K) using a special method develop by Plant Fibre Technology to allow for rapid screening of multiple samples (‘Screening Conductivity’). The screening results were then correlated with measurement of thermal conductivity taken in a laboratory at Bangor University (‘Fox Conductivity’) using an industry standard method to determine thermal conductivity.

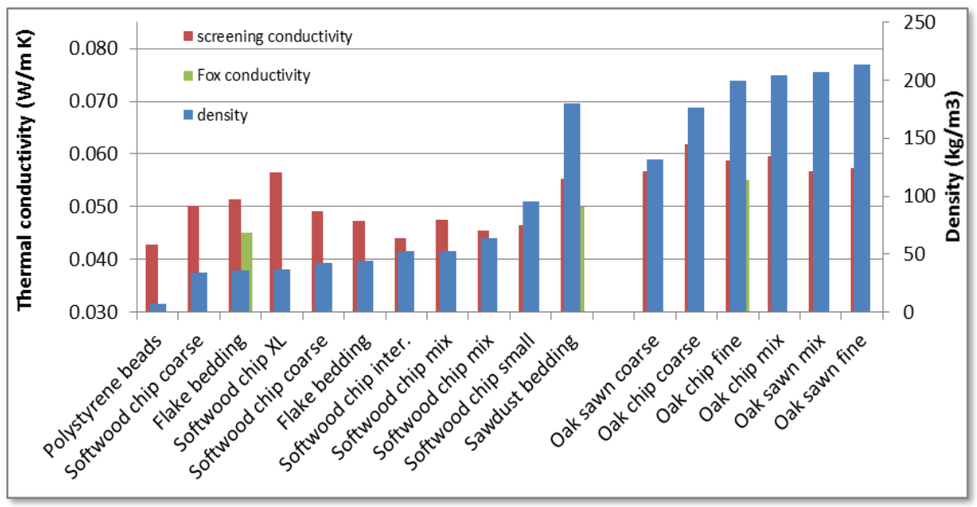

Figure 1: Thermal conductivity and density of wood residues. Polystyrene beads were used as a control. Laboratory based thermal conductivity data was collected for three samples. Softwood and hardwood samples shown in this graph.

Stage 2

The best performing residue was then fractionated (using sieving and hammer-milling) and recombined in different proportions, and tested for thermal performance to determine the optimum particle geometry.

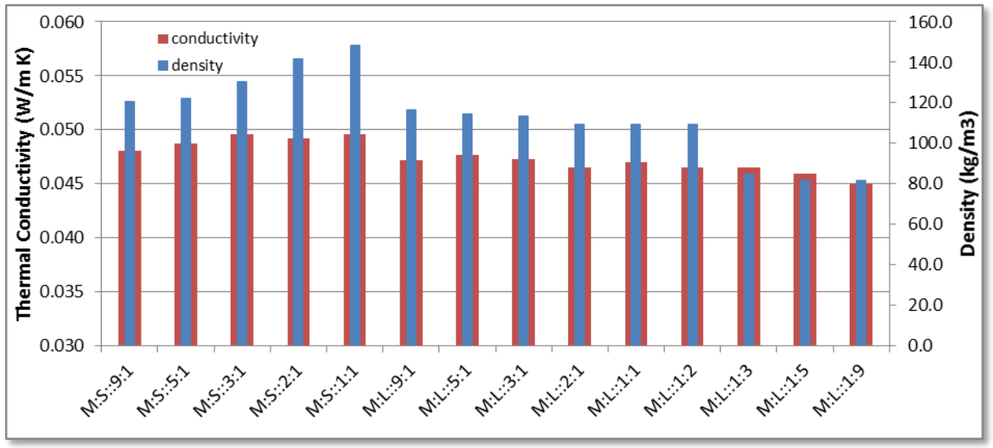

Figure 2: Thermal conductivity and density of wood residues, hammer-milled and sieved and re-combined to show the effect of particle size (Small < 1mm. Medium 1mm to 2mm. Large 2mm to 5mm)

Stage 3

The best performing product was selected for a ‘blown-in’ installation trial at Pen y Coed insulation.

RESULTS

- Softwood shavings were found to give the best thermal conductivity values
- Optimised particle geometry it was possible to achieve values of thermal conductivity similar to that of low density mineral fibre
- Optimum density was found to be around 100kg/m3 although further work is required to determine installed density
- Wood shavings can be installed using a blown-in technique similar to that used for cellulose insulation, although further work is necessary to determine whether it is possible to use this method to achieve the required density.

CONCLUSION

Wood shaving can be used to insulate timber frame housing systems such as Tŷ Unnos. Further work is required to determine optimum installed density, installation method, fire performance and dynamic thermal performance (to evaluate the benefit of the high thermal mass).

Plant Fibre Technology Ltd.

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