CARBON CO_2 CONNECTIONS

case study

Energy Efficient Production of Agri-Fibre Insulation

Project Summary

Problem: Agri-fibre insulation is a new product to replace mineral fibre insulation. The production technology currently used involves immersion of agri-fibres in a saturated solution of fire retardants, drying, and then blending with 20 % bi-component polyester fibres for adhesion. This is costly, involves high energy processes and compromises the ecological merit of the product.
Solution: An inline, air-blending fibre treatment method could significantly reduce the processing cost and energy usage by reduced drying and through the replacement of the high cost and high embodied energy synthetic fibres.

Partnership

- Design Unit, Newcastle University
- The BioComposites Centre, University of Bangor
- Hemcore Ltd, leaders in industrial hemp processing

Inspiration

Additional to the inherent energy saving resulting from its insulation properties, agri-fibre insulation has the potential to reduce CO_2 emissions by locking up carbon during crop production and having lower embodied energy in manufacture than the petrochemical and mineral alternatives. The market for agri-fibre insulation is growing rapidly, but is restricted by the high cost (2 to 3 times that of conventional alternatives). It is estimated that the technology proposed would reduce the production cost by 25% and at the same time convert agri-fibre insulation into a product that locks up more carbon than is required for production and distribution.

Innovation

Currently, agri-fibre insulation is produced by first treating the fibres off-line in a fire retardant solution (usually borax or ammonium phosphate) and then drying in a high-energy process. The treated fibres are then blended with up to 20% of an expensive bi-component polyester fibre. The fibre blend is formed into a lofted web on conventional equipment and passed through a thermal bonding oven to plasticize and subsequently cool the polyester fibres to effectively bind the fibre mass into a resilient insulation product. The bi-component polyester fibres are expensive (3 times that of hemp), they compromise the fire performance and they compromise the ecological merit of the product.

• The proposal is innovative in the following ways:
• The air-blending technology enables the production of agri-fibre insulation in a continuous process.
• The technology reduces energy required by eliminating the drying associated with conventional fire retardant treatment.
• The technology eliminates the effluent associated with fire retardant treatment in a saturated solution.
• The technology allows for binding of the product with a simple low cost (and possibly bio derived) binder. It is expected that this binder could be applied in lower concentrations (<10%) and requiring significantly less energy to cure.

Development

The potential of the air blending fibre treatment has been proved at bench scale at the BioComposites Centre, University of Bangor. This new technology will be scaled up, enabling the treatment of agri-fibres with a binder and a fire retardant in an in-line, low-energy, effluent free process. The target is to produce a piece of processing equipment which will demonstrate the potential of this equipment on a commercial scale at Hemcore's processing plant in East Anglia.

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Carbon Connections is HEIF-funded investment project utilising £3 million for carbon reduction activities. Based at the UEA, Carbon Connections supports innovative projects in carbon reduction using a partnership model. The aim is to facilitate knowledge transfer between universities and research laboratories and the business community to speed commercial development of carbon-saving projects, whether technological or behavioural in focus.