Innovate UK

ReCollect
Efficient Manufacturing of Recyclable Composite Laminates for Electrical Goods

Project Lead: JIVA
▪ An independent provider of services relating to composite materials.

▪ They offer a comprehensive range of capabilities that include materials & process development, pilot-scale manufacturing and prototyping.

▪ Coventive Composites will focus on the development of commercially-viable, scalable manufacturing processes for converting raw materials into substrates. They will also provide support for the testing of the substrates.

▪ A start-up whose aim is to reduce the impact of the fastest growing waste stream in the world using naturally derived products.

▪ The inventor of Soluboard® – a patented, competitively priced and fully recyclable printed circuit board substrate to rival the industry standard.

▪ Jiva will lead the specification and development of the thermoplastic input materials, as well as the conversion of the substrates into working circuit boards.

▪ An independent provider of services relating to composite materials.

▪ The Institute of Circuit Technology (ICT), which promotes the technical aspects of PCB manufacture, will support dissemination and stimulate wider UK industry feedback on the developments.
The project focuses on an alternative way of managing end-of-life circuit boards by removing PCBs made from difficult-to-recycle fibreglass-epoxy from the supply chain.

The primary aim of this project is to demonstrate the feasibility of producing Soluboard® in high volumes within the UK and show that Soluboard® can match the performance of CEM-1 and FR-4.

This will be completed using a novel process in development by Coventive Composites which allows the continuous production of sheet material.

The secondary aim of the project is to investigate the ability to chemically protect Soluboard® and allow it to be used in the existing aqueous processes of PCB manufacture.

Summary

Start Date: 1st October 2019
Duration: 30 months
Budget: £800,000

Partners:
- Jiva Materials
- Coventive Composites
- Institute of Circuit Technology

COMMERCIAL IN CONFIDENCE
WP1 - Commercialisation

Primary Focus – steering of technical, commercial and environmental regulatory requirements

Specifications from potential white goods customer have defined the properties required –
Electrical
Flammability
Mechanical

Several domestic goods manufacturers have shared the PCB designs for products

Matrix of tests designed to optimise formulation against requirements above
WP2 - Raw Materials

Optimisation of the natural fibre reinforcements to meet processing and performance requirements for Soluboard manufacture.

WP3 - Substrate Manufacture

Evaluation of thermoplastic sheet extrusion and fabric impregnation process and testing of the resulting substrates against FR-4.

WP4 - PCB Production

Assessment of circuitry application to the substrate produced using the conventional copper etching process and silver printing.
▪ **WP5 - Case Studies**

Design, manufacturing and evaluation of fully functioning populated PCBs as specified by the end customer.

▪ **WP6 - Project Management**

Overall coordination, administration, monitoring and planning of the project.
- Annual demand for FR-4 glass-epoxy circuit boards is 18.8 billion m², growing at 4.5% per annum.
- The FR-4 market can be segmented into 2.8 billion m² of single/double-sided boards – Jiva’s target market.
- 485 million household appliances were sold globally in 2017. This represents 14.6 million m² of laminates with a value of £220M.
- Jiva will target the markets of Europe and the US. This represents a market of 140 million appliances a year, translating to 4.2 million m² of laminates worth £60 million.
- Jiva predicts a realistic addressable market of 17 million m² (£250 million). This estimate is based on:
  - The overall market opportunity for single/double-sided FR-4 boards;
  - The obligations, willingness and capability to manage white goods at end-of-life;
  - Territorial accessibility considerations;
  - Market inertia in transitioning from an incumbent technology.
- Jiva is targeting a 5% share by 2027, translating to 0.85 million m² of Soluboard worth £13 million.
Environmental & Social

- The UK generates around 1 million tonnes of e-waste annually. Analysis has shown that large household appliances i.e. white goods are the largest contributor at 320 kt.
- PCBs will only be a small proportion of this tonnage, the electronic components they are populated with often contain toxins, such as lead, cadmium and mercury.
- The Global E-Waste Monitor 2016 report states that of the 44.7 Mt of e-waste generated globally, only 8.9 Mt was documented as collected and recycled - less than 20%.
- Jiva will push for the safe recovery of e-waste and address directly the environmental issues it can cause.

Economic

- The current cost of landfill is £91.35 per tonne. This is a significant non-productive cost to the UK economy when dealing with e-waste.
- The UK is now far behind Europe for natural fibre production, with minimal flax grown and only 800 hectares of hemp grown compared to 33,000 hectares in Europe.
- A demand for natural fibre reinforcements for use in PCBs could help invigorate the UK rural economy.