Technology Strategy Board
Driving Innovation

Results of competition: Design Challenges for a circular economy

Total available funding for this competition was £1.5m from the Technology Strategy Board.

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
C4 Carbides Limited (lead) University of Hertfordshire	Linear edge superabrasives	£280,734	£194,621

Project description (provided by applicants)

C4 Carbides currently manufactures linear edge tungsten carbide and diamond coated strip for cutting and drilling products. Tungsten is high on the list of 'at risk' minerals so there is an incentive to substitute tungsten carbide for other minerals. Diamond is a good alternative in many applications but is not suitable for ferrous materials. Cubic Boron Nitride (cBN) is an alternative - but the technologies to braze cBN on to flexible strip are not yet developed.

The purpose of this project is to develop the coating and braising technologies to enable cBN to be applied to strip for many ferrous cutting and drilling tasks. If the project objectives are achieved, C4 will be able to offer a range of linear edge superabrasives to the estimated $2bn linear edge market. The resulting products should last up to 20 times longer than tungsten, bi-metal or carbon steel blades and C4 will be in a position to pioneer the complete removal of tungsten from linear edge blades.

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ES Global Limited (lead) Sir Robert McAlpine Limited Ecobond (Cymru) Limited Alliance for Sustainable Building Products	Reusable construction components - a sustainable design approach	£249,201	£144,051
Project description (provided by applicants)			
The objective of the project is to improve both the whole life impact of demountable structures and to transfer elements of demountable design across to main stream construction projects to facilitate a step change in the recoverability of components for re-use at the end of a building's life. This project brings together the skills and experience of ES Global, global leaders in demountable temporary structures; Sir Robert McAlpine Ltd, a leading UK building and civil engineering company; Ecobond (Cymru) Ltd, a company providing consultancy and product development services across the low carbon and sustainable construction sectors and developers of the RE-Fab House concept, and the Alliance for Sustainable Building Products, a not-for-profit organisation committed to accelerating the transition to a high performance, healthy and low-carbon built environment with unparalleled access to sustainable construction product manufacturers and other industry stakeholders.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
In2tec Limited (lead) Gwent Electronic Materials Limited National Physical Laboratory Limited	ERICE- Electronics Recycling In A Circular Economy	£297,550	£168,543

Project description (provided by applicants)

With the predicted move from electronics ownership to leasing style, many equipment suppliers are searching for technologies to allow easier in-house recycling. ERICE will develop a full commercial, easy-to-disassemble, sustainable electronics assembly technology suitable for the circular economy, using recycled materials from an initial demonstrator.

The project will develop, manufacture and test materials and techniques for low temperature fabrication using a series of special polymer layers and binders which will allow straightforward, end-of-life unzipping of the constituent parts. After disassembly, the materials and components from this demonstrator will be recovered and subsequently reused to fabricate and test a further demonstrator. Building on an earlier successful concept project, the aim is to reuse or recycle over 90% of the materials from the first demonstrator into the second with minimal energy usage.

It is anticipated that this level of recovery and reuse will represent a world first for the electronics manufacturing industry. Techniques will be developed to allow component assemblies on both sides, significantly increasing the technologies potential markets.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Morphy Richards Limited (lead) Sentec Limited	Sustainable capillary iron project	£299,518	£158,775

Project description (provided by applicants)

Morphy Richards (MR) will work with Sentec and IDC to create a more sustainable, energy efficient, longer life iron, where new design, manufacturing, in-use and business aspects are all strategised, with the aim of transference of aspects to other small appliances by MR.

This project aims to reduce carbon footprint, metal, plastics and water use four-fold by reducing energy consumption by 50-80% and water consumption by 50%, making it lighter, modular, with less thermal duty and thus no limescale and longer product life. The objectives are to reduce lifelong product energy consumption and increase product life by challenging design and lowering thermal duty.

The proposed new iron will consider relocating manufacture to the UK, and use: standard/modular components, designed to last and for disassembly, energy efficient ways of heating the soleplate, recycled materials, alternative manufacturing technologies, and new business models and reverse logistics and cascades. All changes result in a move to a circular economy for the iron, and thus other appliances. The project will last 18 months and cost £300k.

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Orangebox (lead) Ecodesign Centre (EDC)	Office Chair for Life	£942,823	£211,757

Project description (provided by applicants)

The UK's first "office chair for life" – whose design is truly optimised to facilitate a circular economy approach. Our ultimate aim is to ensure that the materials invested in our products can maintain their value for longer and over multiple cycles of use; to significantly reduce the resource intensity per product.

The project will focus on three core areas:

1) The design and construction of the product and how this can be optimised through Eco design strategies, specifically design for durability; to allow us to significantly extend the possible life of the product by a factor of three.

2) The materials used within the product; how these choices affect the overall environmental impact of the product and how they can be optimised to reduce the overall impact per chair by 25%.

3) Commercial research looking at the business impacts of longer product life spans and opportunities for a new sales and distribution channel to develop and exploit a market for 're-use' product.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Sundeala Limited (lead) Building Research Establishment Limited Shanks Waste Management Company	Low environmental impact fibre board products for the construction industry: new designs and commercial delivery for a circular economy	£291,340	£153,043

Project description (provided by applicants)

This project will design new composite low density fibreboard (LDF) products that meet the requirements of a large segment of the UK board market whilst incorporating waste/by-product materials including end-of-life LDF. These will be based around a 'closed loop' manufacturing process for LDF.

LDF is used in high volumes in the UK (e.g. as floor protection and screening through to furniture). Existing LDF board products are imported into the UK and are manufactured from wood fibre, often with the inclusion of synthetic adhesive binders. Difficulties in recovery, recycling and combustion mean that most waste LDF ends up in landfill after a single use.

The project will build on a manufacturing process for LDF from waste and by-product materials to address design, commercial and materials processing barriers to the recycling of LDF product at end of (multiple) lives. It will develop innovative commercial models (e.g. leasing) enabling the recycling/reuse of product at scale. It will also develop design approaches to enable incorporation of cellulose fibres from low quality sources such as treated black bag waste, enabling them to be incorporated into the board manufacturing process.