

Results of Competition: ISCF Smart Sustainable Plastic Packaging: Demonstrator Projects, Round 1

Competition Code: 1912_ISCF_DEMO_MMM_SSPPDEMOSRD1

Total available funding is £20,000,000

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
RENEW ELP LIMITED	ReNew Wilton Hydrothermal Upgrading Demonstration Plant	£10,663,548	£1,812,803
University of Warwick		£356,008	£356,008
WOOD GROUP UK LIMITED		£13,291,689	£2,259,587

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

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Project description - provided by applicants

The project comprises building and optimising a first-of-its kind 20,000 tpa hydrothermal upgrading demonstration plant (Cat-HTR) at the Wilton International site, Teesside, that will convert end of life plastic in to hydrocarbon feedstock (waxes, oils, naphtha) to be used for the production of new plastic and other chemicals, recycling the chemical molecules contained within plastic.

Chemical recycling of plastic waste promises to create the next generation of reprocessing plants. Traditional mechanical recycling of plastic is limited in respect of the types of plastic that can be recycled, number of times it can be recycled (discolouration), the allowable uses of mechanical recycled plastic, the dislike of multi layered plastics, etc. Chemical recycling methodologies tolerate a wider range of non-homogeneity of plastics, relative to traditional re-processors. Hydrothermal upgrading therefore complements mechanical recycling by processing these other end of life plastics that might otherwise be incinerated or landfilled, making the chemical available for the production of new plastic, including to food grade, and other finished goods.

The process employs supercritical water to heat, and in the presence of a catalyst, to break the plastic polymer into shorter chain molecules. The water plays an important part in providing hydrogen to complete the broken chemical bonds, reducing complexity and cost.

The purpose of this first of a type project, owned and operated by **Renew ELP Ltd**, is to demonstrate the reliable operation of a commercial-scale facility for the CAT-HTR technology platform, establish the optimum reactor conditions for different feedstocks, and confirm product quality and establish markets for the products.

Wood Group based in Darlington is the engineering contractor selected to deliver this first project. Wood's international capabilities means that it is well placed to delivery this technology worldwide following successful completion of the demonstration project.

Warwick Manufacturing Group (University of Warwick - Part of High Value Manufacturing Catapult) is engaged on the project to assist in optimising the plant through the technical analysis of inputs and outputs, alongside environmental analysis and interpretation of results and through Life Cycle Assessment (LCA).

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VEOLIA UK LIMITED	PET full loop - kick starting the UK recycling capability to close the loop on all PET packaging	£33,575,330	£7,722,326
CHARPAK LIMITED		£80,314	£28,110
HSSMI LIMITED		£660,678	£660,678
UNILEVER U.K. CENTRAL RESOURCES LIMITED		£388,210	£77,642

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Project description - provided by applicants

This collaborative project led by Veolia, will result in the development and demonstration of the UK's first dual PET bottle and tray recycling facility capable of recycling 100% of clear rigid PET in a closed loop system. In line with the UK plastics pact, the project and resultant facility will achieve the following innovations:

- * The piloting of the first UK dedicated recycling line for trays and non food bottles, unlocking the UK tray recycling capability and avoiding the downcycling of food bottles into lower grade applications.
- * The development of packaging manufacturing technologies able to include this new rPET grade into new trays and non-food bottles.
- * The delivery of a food grade PET bottle recycling process, implementing the state of the art technology to achieve 100% recycled content in food bottles.
- * The development and deployment of an ai driven 'digital twin' of the facility to support the design, commissioning and operational optimisation of the line.

To deliver the above, Veolia is partnering with Unilever, Charpak and HSSMI in the consortium.

The total project size is £34.7m and will take place over 3 years.

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RECYCLING TECHNOLOGIES LTD	Commercial-scale demonstration of RT7000 distributed chemical recycling machine converting plastic packaging waste into oil that can be used as raw material for making new plastics.	£12,115,010	£3,149,903
Neste Oyj		£490,903	£0
UNILEVER U.K. CENTRAL RESOURCES LIMITED		£433,591	£86,718

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Project description - provided by applicants

Plastic is a material with many beneficial applications; global plastic production reached 388Mt in 2017 and is expected to surpass 1Bt by 2050. Presently 45% of new plastics are used in short life cycle, single use applications (McKinsey) and just 12% of end-of-life plastic is recycled. Recycling rates are forecast not to exceed 60% by 2050. At current rates of growth, it is predicted that by 2050 there will be more plastic in the ocean than fish (Ellen MacArthur, 2016).

Recycling Technologies Ltd (RT) has developed an innovative process that uses thermal cracking to recycle a wide range of plastic waste that cannot be recycled by conventional methods. The process is incorporated into a modular machine, the RT7000, designed to process 7000tpa of hard-to-recycle mixed plastic waste, producing 5200tpa of a new valuable hydrocarbon oil, Plaxx(r), which has multiple uses including replacing crude oil in plastics production, allowing plastic to be recycled an unlimited number of times.

RT's long-term aim is to process mixed plastic waste regardless of type, contaminant or origin and create a circular economy solution. Working together with Neste, the world's leading provider of renewable diesel and jet fuel and the 3rd most sustainable company on the Global 100 list, and Unilever, one of the largest fast-moving consumer goods companies in the world, the project will demonstrate how hard-to-recycle plastics (HTRPs) can be recycled into feedstock for virgin-quality packaging, thereby showing that plastic production can be a circular process. The project will:

- * Establish a collection network for HTRPs
- * Build an RT7000 machine in Scotland by March 2021 with a capacity of 7,000 tonnes per year (roughly 10% of Scotland's existing recycling capacity) of HTRPs
- * Take the output from the refining process and "road map" how the Plaxx can be returned to the market as a feedstock for new, virgin quality recycled packaging material.

This project is critical because plastic is a highly versatile and valuable material with many important applications (prolonging shelf life, medical infection control, durable goods, efficient transport) but plastic waste, especially that generated by single use items, is a current and urgent problem. This project will build capacity for recycling HTRPs and demonstrate how the technology can be rolled out around the world to address this global problem.

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POSEIDON PLASTICS LTD	Enhanced Recycling of Waste PET: Demonstration of the Circular Economy	£10,550,040	£4,747,518
ALPEK POLYESTER UK LTD		£2,057,311	£720,059
BIFFA POLYMERS LIMITED		£777,108	£194,277
DUPONT TEIJIN FILMS U.K. LIMITED		£870,802	£217,700
GRN SPORTSWEAR LTD		£29,057	£13,076
O'NEILLS IRISH INTERNATIONAL SPORTS COMPANY LIMITED		£24,823	£6,206
University of York		£249,781	£249,781

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Project description - provided by applicants

The key objective of this project and demonstrator technology is to create a circular economy for polyester (PET) plastic, remove all types of PET from the current waste stream and prevent environmental pollution: by doing so, the environmental impact is heavily reduced. This is due to the processing of waste that is currently either going to landfill or incinerated and producing recycled products that are currently only available from fossil fuel sources. This will have an invaluable impact on GHG emissions and climate change.

The world is facing a plastic waste crisis because of an industrial and consumer mindset where plastic is viewed as 'cheap' and 'disposable'. However, this issue is not _with_ plastic, it's how _we_ deal with plastic - we must create a circular economy for this reliable and versatile material that has transformed our lives and is a superior material choice for packaging and extending the shelf-life of food. These waste PET products are currently deemed 'single-use' or 'unrecyclable' due to their multi-layer or multi-coloured nature. Our 'enhanced recycling' technology is capable of converting this PET waste into BHET, which is the building block for PET production. Our enhanced recycling can provide an effective and economical solution to the waste plastic crisis, and also has the benefit of carrying out this process whilst producing negligible emissions.

The objective is to initially recycle 10,000 tons per year of waste PET into rPET to displace the conventional PET products. This product will be directly used to create rPET for use in sensible applications. This process supports and enhances 'The UK Plastic Pact' goal for creating a circular economy for essential plastic products, whilst also educating the consumers and brand owners towards optimizing the reuse, recycling and reduction of plastic use and production.

The true circularity of this innovative approach is demonstrated by (i) the fact that low quality 'single-use' PET waste can be processed and upcycled into a higher-quality grade of material, and (ii) since the PET is converted back to the base ingredients, this cycle can be repeated indefinitely without loss of quality or properties. Through construction of this UK-first demonstration facility it is expected that the landscape for PET recycling will be changed forever and the goals of the UK Plastics Pact will be achievable.

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