Innovate UK

Results of Competition: Plastics Innovation: Towards Zero Waste

Competition Code: 1806_ISCF_MM_PLASTICS

Total available funding is £3million

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
ZUVASYNTHA LIMITED	Optimisation and scale-up of a novel bioprocess for commercial production of (R)-1,3-Butanediol	£603,504	£422,453
TDELTAS LIMITED		£14,966	£10,476
University of Kent		£245,211	£245,211

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 future sustainable production of chemicals and fuels from non-petrochemical resources and the reduction of greenhouse gas emissions are two of the greatest challenges facing society. To date, research to address this need has often focused on using microbial cell factories (bacteria and yeasts) to ferment the sugar derived from plants, often targeting the production of key high volume, lower value commodity products. However, the price of sugar, a commodity in its own right, is very often inconsistent with the constrained techno-economics associated with biological commodity chemical production. In addition, utilising sugar for high volume chemical synthesis has raised concerns regarding competition with the use of sugar as a foodstuff. Unfortunately, sourcing sugar from the far more desirable non-food lignocellulosic plants, has also proved economically challenging due to the resistance of these plants to deconstruction. These economic hurdles have constrained the development of many new, sustainable, chemical production technologies which are required to drive the growth of bioprocessing in the UK. An alternative strategy is to target small but high value, meaningful markets to pioneer novel biotechnologies from sugar, while co developing the use of cheap (C1) waste derived non-sugar feedstocks, for application to the much bigger and environmentally more impactful, but cost sensitive, commodity markets. This project seeks to develop a novel bioprocess for commercial production of 1,3-BDO, a highly desirable chemical with diverse applications, initially for application as a speciality chemical.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
RECYCLING TECHNOLOGIES LTD	Recovering value from contaminated plastic wastes	£570,902	£399,631
TOMRA SORTING LIMITED		£145,900	£72,950
University of Bath		£172,151	£172,151
WESSEX WATER ENTERPRISES LIMITED		£17,280	£0

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Project description - provided by applicants
Recycling Technologies' process is capable of chemically recycling plastic waste. We are determined to reduce the amount of plastic that is either landfilled or incinerated. More than a quarter of the UK's 3.2MT (Million Tonnes) of plastic waste is landfilled because of its contamination with organic material or other plastics. The challenge is to find a way and recover the plastic from this waste stream and reduce the ever-increasing plastic pollution. This project aims to take on this challenge! Our technology, RT7000 is capable of processing the recovered plastic via thermal cracking into an ultra low sulphur hydrocarbon product branded as Plaxx. Plaxx is a synthetic equivalent of crude oil. It can be used as a low sulphur fuel or chemical feedstock (naphtha) to make new plastics. Municipal waste at Material Recovery Facilities (MRF), food contaminated plastic packaging waste from Anaerobic Digestion (AD) plants and Recovered Plastic Litter (RPL) in water treatment facilities are some of the largest sources of plastic waste. We can use smart optical sorting techniques to pick up and separate the plastic from streams of waste from a MRF. In doing so, we can divert the plastic away from incineration and reduce its CO2 impact. Enzyme-based biological cleaning system can be used on AD and RPL waste to break down the organic contamination. In addition to its green and sustainable credentials, enzymatic degradation is relatively cheap and it releases soluble and fermentable sugars that can be re-cycled for other processes. The technologies (optical and enzyme) can be combined together to give RT the ability to accept a wide variety of contaminated waste into its core technology. Once the contamination is processed using a pre-treatment module, the separated plastic waste can be processed using the RT7000\. This combined approach will allow UK to reduce landfilling, increase its recycling rates and develop innovative technologies to handle contaminated plastic waste. Furthermore, the diversion of each tonne of plastic waste away from Energy from Waste (EfW) plants and converted into Plaxx fuel creates up to 2.5 TCO2e savings. This saving for 7000 tonnes of plastic waste is equivalent to the emissions of more than 3,500 cars every year!!!!!

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
SKIPPING ROCKS LAB LIMITED	Reducing single use plastic-aluminium packaging for <50ml sachets through development and scale up of the Ooho seaweed sachet	£188,685	£84,908
JUST EAT.CO.UK LTD		£46,898	£11,724

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Project description - provided by applicants
AMBITION: Our aim is to reduce and replace the use of unsustainable, environmentally harmful packaging for sauces and gel sachets through the development, scale up and roll-out of our natural, fully biodegradable plastic alternative technology Ooho - a unique,, seaweed-derived membrane material. **FOCUS**: Having perfected the strength, structure and shelf-life of our membrane technology in 2017, we now need to develop the advanced production hardware and machinery to manufacture and fill single-use sachets on an industrial scale in order to meet demand -- replacing current laminated aluminium and plastic packaging for condiments (sauces, salad dressings), gels (energy gels) and cosmetics (shampoo, conditioner) up to 50mL. Our alginate material cheaper than plastic and aluminium as input material however difficulties in the manufacturing process, requiring significant human intervention, restrict our maximum production capacity to meaning that despite strong commercial interest, we are unable to meet the volume demanded by restaurants, take aways and retailers in a cost-competitive manner. As part of our long-term growth strategy, our goal is to develop an method (hardware and production process) to manufacture Oohos, packaging range of single-use liquids on an industrial scale, in a consistent, high quality, low cost manner required. **APPROACH:** Working with development partner, Just Eat the project focuses on overcoming the technical difficulties associated with designing and developing a unique, automated, machine to manufacture and fill 3000 Oohos sachets/day with a variety of condiments/sauces, without compromising structural integrity or consistence of the packaging membrane. Our alginate packaging is naturally sourced, biodegradable, robust (thanks to the previous IUK project) and is even edible. The only issue holding back its adoption is our ability manufacture and fill the membrane on an industrial scale. **SIGNIFICANCE:** The UK throws away over 300m plastic and aluminium single-use sachets (2ml-50ml) each year (Unilever;2017), with less than 9% ever recycled (National Geographic;2017). due to their disposable nature and plastic-aluminium composition. In line with UK GOVs 'Plastic Pact' 2025 commitment, by developing manufacturing at scale capability, seaweed membrane will be cost-

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competitive with that of plastic/aluminium sachets and packaging, enabling retailers to adopt out technology for single-use liquid items. This in turn will save considerable CO2 in waste, reduced transport costs, plastic production and enable us to take advantage of global interest in the technology, spearheading the use of natural, plastic alternatives.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
GR8 ENGINEERING LIMITED	Development of a technology to produce clear rigid food packaging pots for high temperature applications using Recycled Polyethylene Terephthalate (rPET)	£99,034	£69,324

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Project description - provided by applicants
GR8 Engineering Limited (GR8) is a UK based SME with in-depth experience and knowledge in the production of high quality plastic food packaging. Through our discussions with the market influencers, development partners and early adopters, we have identified a market opportunity for a technology 'rPET-tech' which will enable the use of recycled Polyethylene Terephthalate (rPET) to manufacture packaging for the high temperature food grade applications. We request Innovate UK funding support in order to prove our concept of developing a two-stage injection compression/stretch blow moulding process which will be able to process rPET with Intrinsic Viscosity of 1.15 to produce clear rigid food packaging pot which will maintain their thermo-mechanical performance at temperatures as high as 160degC (suitable for Microwave use). As a result of project success, we will drive growth and innovation into a greener food packaging sector through circular economy and reduce materials wastage, increase production rates; and improve design flexibility.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
IN-CYCLE LTD	Closed loop innovation for fused filament fabrication (CLIFFF)	£90,220	£63,154
EXPRESS GROUP LIMITED		£101,230	£60,738
HSSMI LIMITED		£58,117	£58,117

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Project description - provided by applicants
The Closed Loop Innovation in Fused Filament Fabrication (CLIFFF) project will enable industry and academic 3D print service bureaus to reprocess discarded 3D prints back into high value new 3D printing filaments creating a fully circular business model for the Additive manufacturing (AM) sector. AM and 3D printing is a rapidly growing industrial sector, however, there are environmental concerns around this fast-growing sector. Unlike other plastic products, there is currently no established End-Of-Life (EoL) processing system for 3D printed polymer parts, so the vast majority of discarded prints ultimately end up in landfill. The CLIFFF project will therefore take a proactive approach whilst the industry is still maturing. Main objectives are to create a material identification system for EoL and failed 3D prints using a novel NIR based approach, create new reverse logistics business models and develop a lab-scale processing facility. The facility will shred and extrude the failed prints back into high quality 3D printer filament that will be comprehensively tested on a range of commercial 3D printers. End-user engagement and feedback will help ensure the long term sustainability of the approach. As opposed to a traditional large scale centralized recycling systems, the proposed system would be deployed regionally to reduce transportation costs and associated environmental impacts. The project team consists three organisations. GoPrint3D, a 30-year-old printing company, HSSMI a manufacturing RTO and In-Cycle a materials recycling technology SME and will run for 12 months.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
IMPACT LABORATORIES LIMITED	Efficient plastic size reduction	£99,947	£69,963

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Project description - provided by applicants
CryoCut has been created in order to solve the largest cost in plastic recycling -- size reduction. The process requires huge amounts of energy to drive large metal rotors to tear the plastic apart. Many plastics have been designed and manufactured though to be resilient materials, and instead of shattering as other materials do (for example copper), they slowly are torn into smaller pieces. Plastic is also abrasive, causing damage to the metal rotors, and requiring constant replacement of knives and blades, causing operational cost and downtime on capitally expensive material. CryoCut will not just reduce electrical usage and wear on rotors, but also massively increase throughput by up to 10 times. The CryoCut technology therefore has the potential to be a disruptive technology in the plastic recycling market.

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LUCIDEON LIMITED	Inorganic Sustainable Alternatives to Plastic Microbeads	£90,810	£54,486

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Project description - provided by applicants
Plastic microbeads are widely used in the Cosmetics industry either in rinse-off products such as shampoos and toothpaste or in leave-on formulations such as lipsticks and sun-creams. For example, up to 100,000 plastic microbeads are released from a single shower. A study conducted by Niva in collaboration with the University of Manchester counted more than 75,000 particles/kg of riverbed sediments in the Manchester river network alone. Although plastics have several benefits, the size of these additives is such that the waste water treatment plants cannot retain them efficiently and they are released into the environment. Once released, they enter the food chain either though plankton or worms with negative effects on the environment. Microplastics have now been banned from rinse-off products in the UK and the industry has been voluntarily working on replacing them since 2015\. Although microplastics have almost disappeared from rinse-off products, alternatives for leave-on are lacking due to poor performance, safety issues or high costs. This feasibility study aims at finding an alternative to microplastics for the cosmetic industry, and especially for leave-on products. The target is to achieve spherical beads, smaller than 20?m and at a cost lower than £15/kg based on the metrics given by the industry. We will explore two approaches: one based on silica using Lucideon's iCRT (inorganic controlled release technology) material and the second one based on a clay geopolymer chemistry. Both will make use of emulsion processing to achieve small spheres. Lucideon has developed a geopolymer formulation called MIDAR, mostly used for the nuclear and construction industries but also as a matrix to encapsulate active ingredients for the pharmaceutical industry. The MIDAR approach would cover the low cost bulk product range while the silica approach would suit premium products, both having the ability to introduce additional functionality. In this project we will aim to produce microbeads with the required characteristics at the laboratory and demonstration scale and the deliverable will include cost analysis and scaleability. Current solutions involving silica are either at the right price, but obtained through an energy intensive process and with limited functionalisation opportunities or too expensive. Geopolymers have been turned into spherical beads but usually for applications requiring larger sizes. We believe that the properties of our iCRT and MIDAR technologies have the potential to fill the gaps above and provide a green processed material to replace microplastics in leave-on cosmetics products.

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REED THERMOFORMED PACKAGING LTD.	Project ENVPac	£316,772	£221,740
AVONDALE FOODS (CRAIGAVON) LIMITED		£26,254	£13,127
CENTRE FOR PROCESS INNOVATION LIMITED		£158,705	£158,705
CRANSWICK COUNTRY FOODS PLC		£27,362	£13,681

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Project description - provided by applicants
The issue of increasing ocean plastics pollution over recent years has created an increasing focus on biodegradable alternatives to traditional fossil-based polymers. Plastics have demonstrated many positive benefits e.g. reducing food waste, enabling globalised distribution of goods boosting economic growth, and providing highly recyclable packaging options. However, mismanagement of waste streams has resulted in a growing call for packaging options which will naturally bio-degrade. Project Partners (IPAC, Avondale, Cranswick Plc, together with their customers including major UK retailers) are collaborating as a complete value-chain (supply, manufacturing, retail), with World-Class Polymer-Chemistry Research/Materials Capability (CPI). Developing new product materials for food packaging (e.g. meats/salads) that are comparable to existing plastic packaging but also environmentally compatible, and can be consumed by nature like any other organic polymer on earth.

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INTERFACE POLYMERS LTD	Polarfin-Blue: compatibilization of polymers to enable recycling	£844,721	£591,305
PRESEAL LIMITED		£67,155	£47,008

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Project description - provided by applicants
Interface Polymers Ltd will develop the use of Polarfin material to address the global problem of recycling multi-layer flexible plastic packaging back into high value uses. The approach is totally disruptive, unlike existing adhesion promoters, Polarfin chemistry can be finetuned, making polar and polyolefin block chains of any size, enabling the combination of a wide range of currently incompatible thermoplastics into new polymer alloys which offer unique properties. Being able to produce high-value polymer alloys from recycled packaging will eliminate the need for high-cost/complex/hazardous recycling infrastructure needed to separate multi-layered films and enable new global markets

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Ichthion Ltd	Remora Cobalt - A turbomachinery system to collect micro and macro plastics to clean up rivers and oceans	£498,702	£349,091
Imperial College London		£119,083	£119,083

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Project description - provided by applicants
Ocean plastic pollution is one of the most critical global environmental issues. It is estimated that five trillion pieces of plastic debris are in the oceans already. An additional 17.5 million tonnes of plastic is forecast to enter the oceans annually by 2025, with 80% of this coming from just 10 major rivers. The effects of plastic pollution on tourism and wildlife cost £13 billion a year globally and leads to the premature death of millions of animals, including marine mammals, seabirds and fish. Despite the urgency and scale of the problem, current approaches to collect plastic from rivers and oceans is ineffective. In rivers, manual plastic removal using nets remains the mainstay, but is inefficient (<1% collected) and not economically viable in the developed world. Trash-Wheels as seen in Baltimore, are considered state-of-the-art for removal of plastics in river environments, however they are unable to collect microplastics -- the main cause of premature death for marine wildlife. Efforts to collect plastic from ocean environments are a poor use of resources, with studies showing it is 30x more effective to collect plastic before it has reached deep-water environments. Remora Marine seek to overcome the limitations of current solutions to deliver the first truly scalable technology to reduce the flow of plastics into the world's oceans by developing a novel, versatile turbo machinery system, 'Cobalt', that can unobtrusively attach to a range of static and dynamic fluvial infrastructures to filter and collect approximately 15% of macro and micro plastics passing downstream. Through the collaboration with the Dyson School of Design Engineering at Imperial College London, the approach offers: \[1\] Filters capable of retrieving microplastics down to 1mm in length. \[2\] A revolutionary self-cleaning mechanism to sustain maximum efficiency using the mechanical force supplied by the river flow. \[3\] Versatile axle design allowing Cobalt to be attached to a variety of static rivers infrastructures. \[4\] Additional output of electricity, with the generative power of Cobalt more than that required for collecting the plastics. With Innovate-UK support, a 24-month programme of R&D is required to deliver a prototype validated both in the laboratory and simulated environment. If successful, Cobalt will truly revolutionise the ocean plastic pollution problem -- with the potential to collect 10% of the plastic entering the world's oceans through rivers by 2025\. Cobalt can be exploited globally, with the project delivering significant export led growth, substantial RoI and taxpayer value.

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COLOUR TONE MASTERBATCH LIMITED	Recycling up to 376,000 tonnes of waste per annum that would otherwise have gone to landfill/incineration through a new sustainable multi-life NIR sortable polymer pigment and recycling system	£155,342	£93,205
LUXUS LIMITED		£283,676	£170,206
RPC GROUP PLC		£47,414	£23,707
THE TECHNOLOGY RESEARCH CENTRE LIMITED		£186,750	£130,725

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BLUE CASTLE BUSINESS SERVICES LTD	A new method of recycling PVC; bolstering the circular economy through producing both a purer REACH compliant R-PVC and other new high-value outputs	£89,999	£62,999
MATRIX RECYCLING SYSTEMS LTD		£84,999	£59,499
University of York		£74,969	£74,969

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Project description - provided by applicants
The UK and EU are striving for a circular economy where our precious resources are reused, recycled and repurposed instead of being disposed of. Plastics are an increasingly consumed commodity and Western Europe are amongst the world's highest consumers (WRAP, 2006) - approximately 25.8Mt of plastic waste is generated across Europe annually (EC 2018); therefore ensuring sustainable plastics recycling is paramount to achieving a circular economy for plastics. Polyvinyl chloride (PVC) is amongst the world's most widely used polymers, accounting for 20% of all plastic manufacture (BPF, 2018) but with less than 30% (96kt) of the UK's PVC use being recycled in 2014 (WRAP, 2016) there is much progress needed to achieve the European PVC industry target of 800kt/year recycled by 2020 (VinylPlus, 2010). PVC often contains additives, some of which are considered to be substances of very high concern and are undergoing REACH authorisation which bans their use in new PVC materials, including recycled PVCs (R-PVC). This is leading to limitations on the PVC recycling industry and has already caused the closure of one PVC recycling plant. Our innovation looks to respond to this market need and provide the first method to recycle PVC containing banned additives through removing and re-purposing into new, valuable polymers which can be used in a range of applications, including coatings and composite materials for construction - benefitting the environment and the UK economy through reduced imports of materials and exports of plastics waste and increased revenue generation.

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PVOH POLYMERS LIMITED	Self Removing Polymer Packaging with Active Function	£144,706	£101,294
BRILLIANT BASICS CONSULTANCY LIMITED		£37,250	£26,075
SOLUPAK LIMITED		£157,534	£110,274

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Project description - provided by applicants
Our vision is to develop self removing packaging to perform a secondary cleaning function during its removal from the traditional waste stream thus encouraging customer engagement of this technology. This project is aimed at the detergent sector, multilayer barrier films are currently used to protect highly sensitive water soluble films, these multilayer barrier films contain mixed polymers therefore these are difficult to recycle being recycling class 7 "other". Polyvinyl Alcohol (PVOH) is a water soluble nontoxic biodegradable polymer which conforms to CEN 13432\. In its film and injection moulded format it is predominantly used for detergent and Agrichemical dosing, where the polymer dissolves in water to release the active components. Being Hygroscopic it is susceptible to atmospheric moisture uptake in conditions over 50RH. Therefore, expensive protective packaging is required to maintain its physical properties, this is important to maintain child safety regulations when caustic detergents are encapsulated. Our first key objective is to to design and develop a new detergent format which eliminates the requirement for secondary barrier packaging by the substitution of cast PVOH film with a new less hygroscopic PVOH formulation suitable for injection moulding. Formulation will need to be developed surrounding capsule strength for child safety and product release with no residue observed during a short eco wash cycle and be resistant to atmospheric moisture. Our second key innovative objective is to develop secondary packaging to protect the primary packaged product against atmospheric moisture in the form of a water soluble container to be dissolved when empty in a dishwasher. This container will contain a cleaning agent to be released during dissolution, adding function to the polymer which will either be encapsulated in the polymer or in a self contained tamper proof compartment within the packaging. Polymer products entering water courses has been recently highlighted by Sir David Attenborough (Blue Planet and A Plastic Ocean). PVOH is quickly biodegraded in the natural environment and will not form microbeads or plastic residue causing hazards to wildlife.

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CRALEY GROUP LIMITED	PROMOTE - Advanced pipe relining technology manufactured from plastic waste recyclates	£356,053	£249,237
IMPACT RECYCLING LIMITED		£124,755	£87,328
London South Bank University		£139,875	£139,875
RADIUS SYSTEMS LIMITED		£195,619	£97,810
TWI LIMITED		£145,171	£145,171

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Project description - provided by applicants
The problem of persistent plastic waste and lack of adequate recycling solutions poses a significant challenge to current and future generations. As the amount of plastic placed on market (POM) continues to increase, the amount we recycle is failing to make tangible inroads into curbing the amount of end-of-life plastic POM being disposed (landfill, incineration, lost to the environment) e.g. 62% of plastic packaging (1.3m tonnes per year) annually never gets recycled. Although there is not one main cause or solution to this problem, there are insufficient market applications in the UK suitable for lower grade plastic recyclates. The PROMOTE project will take advantage of lower grade waste plastic as part of a world's first solution capable of exploiting a significant global opportunity: the rehabilitation of deteriorated underground piping and drainage infrastructure, a market worth in excess £7.71billion. Our solution will achieve step-change performance over CIPP (Cure in Place Polymer), the market's current leading solution.

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AXION RECYCLING LTD.	ReCLAIM: Recovery of polymers Containing Legacy Additives in MEP	£536,602	£268,301
CROMPTON MOULDINGS LIMITED		£109,034	£76,324
TROJAN SERVICES LIMITED		£93,659	£56,195
University of Birmingham		£208,685	£208,685

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Project description - provided by applicants
The move to a circular economy is vital for the development of industry and the protection of the environment. One material constantly in the spotlight is plastics. Plastic is a highly engineered, indispensable material used over a wide range of applications. One of the strengths of thermoplastics is the potential ability to recycle the same material many times and make use of it in a circular economy. However, there is still a significant volume of plastic that is not recycled currently, and is destined for landfill or incineration. This material is the residual Mixed Engineering Plastics (MEP), which contains a wide range of less-common polymer types and importantly a significant proportion of legacy additives which are a concern when recycling the material. Within the ReCLAIM project, Axion Recycling, Trojan Services, Crompton Mouldings, and University of Birmingham will address these problems by: developing new processes for greater recovery of polymer fractions from MEP; creating chemical and physical methods for making BFRs biologically unavailable in the recycled polymers and verifying their efficacy; and proving that the polymer is suitable for real end markets. The results from ReCLAIM will boost competitiveness of the partner organisations by adding to their product lines, increasing revenue, and reducing operating costs. The benefits to the UK will be increased economic activity, new jobs, a reduction in waste incinerated or sent to landfill, and significant CO2 savings.

Innovate UK

Results of Competition: Plastics Innovation: Towards Zero Waste

Competition Code: 1806_ISCF_MM_PLASTICS

Total available funding is £3million

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
POLYMATERIA LIMITED	A novel additive-based technology to biotransform polypropylene packaging to be compostable	£412,058	£288,441
CHEMEX ENVIRONMENTAL INTERNATIONAL LIMITED		£188,093	£131,665

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
A throwaway society has spread plastic packaging waste worldwide, polluting every corner of our planet. Each year \>200M tonnes of plastic is produced for 'single-use' with 35% of that sent to recycling rejected due to 'contamination' by remnants of unconsumed food or liquid. Astonishingly, less than 10% of plastic ends up being recycled. Public awareness of on-the-go food packaging waste has increased significantly following the recent "Latte Levy" promoting scientific research/interest into compostable plastic. A key focus of this research has been on additive-based compostable plastic which seeks to retain physical characteristics of conventional plastic throughout its useful life whilst offering accelerated composting under industrial composting conditions, transforming entirely to CO2, water and biomass. This provides alternative capture carbon, as food contamination is inevitable, protecting the environment from accumulating plastic waste. However, current compostable plastic solutions are predominantly biobased/hydro-biodegradable plastics which increase land competition(limited feedstock), are \>6x more expensive and require different manufacturing infrastructure compared to petroleum-based plastics. Current best-in-class additives for polyolefins (polyethylene(PE), polypropylene(PP)) which offer accelerated biodegradation in the open environment require a minimum of 2-years with no solution available to achieve the same within 6-months under industrial composting conditions -- and therefore marketed as compostable. Addressing this gap, Polymateria aim to develop a portfolio of advanced drop-in additive formulations for the manufacture of compostable, biodegradable, cost-effective plastics. In collaboration with ecotoxicology testing experts at Chemex, this project aims to develop the first additive-based biotransforming technology for compostable PP packaging, which will be tested and certified at Chemex's facilities, as the first UK SME with capabilities to meet EN13432 Standard. This will offer a breakthrough technology for the plastic packaging sector, simultaneously providing unique expertise to the UK in compostability testing. Both partners are well placed to exploit this opportunity: Polymateria has already commercialised bespoke biotransforming formulations for PP&PE in the open environment, and Chemex have state-of-the-art testing equipment and experts in terrestrial & aquatic ecotoxicology testing. With InnovateUK support, a 2-year programme of industrial research is required to design and test formulations for physiochemical polymer

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properties and compostability. Project success will support a co-development deal with PP Converters with commercialisation by 2022, to establish:

- Polymateria at the forefront of compostable additives for a plastics market, poised for significant growth and

- Chemex as the only UK testing laboratory capable of specific accredited composting testing, alongside their entire ecotoxology testing suite, plus terrestrial and aquatic biodegradation testing.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
HARLEQUIN MANUFACTURING LIMITED	ROTOCYCLE - Novel use of hard to recycle plastics in rotomoulded applications	£115,290	£69,174
IMPACT LABORATORIES LIMITED		£156,311	£109,418
IMPACT RECYCLING LIMITED		£100,889	£70,622
Queen's University of Belfast		£155,614	£155,614

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Project description - provided by applicants
Although rotomoulding is a well-established processing technique for the manufacture of products from polymers such as polyethylene, the use of post-consumer waste polyethylene is rare due to the problems associated with achieving good interfacial interaction between the base polymer and post-consumer waste polyethylene resulting in products that having poor mechanical properties. These low carbon footprint fillers could however be used to replace a high proportion of the virgin polymer in rotomoulded articles to enable good quality, eco-friendly commercially viable products to be manufactured reducing the the industries reliance on virgin polymers. Enabling post-consumer waste polyethylene materials to be used in rotomoulding would increase the variety of materials that are available to Rotomoulders, demonstrating their effectiveness and open up a new and potentially massive market for recyclers to sell their recyclate into, absorbing the growing supply of post consumer waste plastics. Our project will look to develop a full recycler to manufacturer supply chain for the rotomoulding industry, developing; recyclate grade polymers, the manufacturing processes to use them and confirming through industry standard tests they are suitable for sale into the market.