Innovate UK

Results of Competition: Materials and Manufacturing 24 - 36 Month Projects
Competition Code: 1605_LO_MM_R1

Total available funding for this competition is £8.2M from Innovate UK

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
LabXero Ltd AlgaeCytes Ltd 42 Technology Ltd University of Cambridge Unilever Central Resources Ltd	ProFlow – Advanced downstream bioprocessing for sustainable microalgal product manufacture	£831,580	£625,534

Project description - provided by applicants
Innovative techniques for manufacture of materials, chemicals, food & fuel are needed in the face of a growing global population, climate change & depletion of fossil fuel resources. Biomanufacturing exploits biological systems to manufacture these products & is currently responsible for thousands of products across a range of sectors, including; food, animal feed, fuel, pharmaceuticals & cosmetics. However, for many bioprocesses scale-up & downstream processing costs are too large for commercial exploitation. This project aims to solve this by using innovative low cost, low energy acoustic techniques to replace energy intensive & expensive cell separation/extraction processes. This will result in a step change in many biomanufacturing processes, reducing energy requirements & processing costs. This enabling technology will have significant economic benefits to the UK biomanufacturing sector, making the commercial exploitation of biotechnology advances possible. The initial project focus in the manufacture of omega-3 oils from micro-algal biomass. There is a strong & growing market for omega-3 oils, which have been shown to have many health benefits such as reducing heart disease & symptoms of Alzheimer's disease. Current omega-3s production is mainly from fish oils, which impact the environment & deplete fish stocks. Microalgae omega-3 is a vegetarian, environmentally friendly option with significant societal & environmental benefits. After the initial focus on micro-algal products, this acoustic separation/extraction platform will then be employed across different biomanufacturing sectors.

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Four04 Packaging Ltd IG Industries PLC	Fresh Solutions -A Fresh Approach to Packaging Material	£893,619	£365,348

Project description - provided by applicants

Within the UK post-production supply-chain, > 15 Million tonnes of food & drink waste is created p.a, with 6.7Mt generated specifically by households. ~60% of household food waste arises from products 'not used in time' with a value of nearly £6.7bn. A significant focus of efforts to address this global challenge have centred around innovations in material and manufacturing processes particularly when attempting to prevent product deterioration & prolonging shelf life. To address the need for a low cost technology which extends the shelf life of food, this project will advance Fresh Solutions (from TRL4 to TRL6); a unique approach to the packaging of perishable food which utilises novel material to increase shelf life by 2-10days over state of the art technology whilst at the same time decreasing initial cost by 25%. To fully exploit the commercial opportunity available, a series of challenges need to be overcome to bring the cost of material manufacture to an acceptable market price. A step change in the manufacturing process is required to improve efficiencies, eliminate steps in the process and further develop the material itself. By reducing the final sale price of the material & extending market application, rapid penetration will be possible upon project end, with ~700tonnes (417.9million packs) of material to be sold by yr 5. For Four04 as lead applicant, the project will give at ROI on project costs of 5340% & deliver profit boost of 500% & revenue boost of 270% compared to without funding (see finance form). An ROI of 348% is expected for IG.

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Jaguar Land Rover Ltd Axion Recycling Ltd Novelis Automotive UK Ltd Norton Aluminium Ltd Innoval Technology Ltd Brunel University London University of Warwick	REALITY Recycled Aluminium through Innovative Technology	£1,982,421	£1,316,055

Project description - provided by applicants

The 36 month REALITY project will enable the development and industrial deployment of sensor-based scrap sorting technologies to separate wrought and cast alloys and then to further separate wrought alloys into alloy types for the first time. Full scale recycled scrap based sheet and castings will be produced and evaluated. End-of-life vehicles will be shredded and automatically sorted using state of the art sensing and sorting technologies. The recovered wrought and cast scrap will be alloyed, melt conditioned to remove or tolerate impurities and then supplied for either coil production or for the commercial scale shape casting production by high pressure vacuum diecasting. Materials evaluation and characterisation will be carried out on both the resultant sheet and cast product forms. Cost effective automated separation processes for shredder scrap will enable the closed-loop recycling of end-of-life vehicles back into high performance product forms for new vehicle body manufacture in the UK, providing significant CO2 savings (less or no primary metal) and major cost savings. The UK, the major exporter or the more than 1Mt of aluminium scrap from the EU each year, will be uniquely placed to use rather than export this precious scrap based secondary aluminium alloy resource.

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Composite Metal Technology Ltd M. Wright & Sons Ltd	Next generation, low cost aluminium matrix composite inserts for the emerging global market.	£1,382,271	£930,120
Project description - provided by applicants			
Composite Metal Technology (CMT) and M.Wright &Sons (MWS) are collaborating on an Innovate UK funded project to accelerate the take-up of continuous fibre reinforced aluminium matrix composite materials (AMCs). The project is targetting a significant reduction in the piece cost of AMC inserts, and a shorter product development time for new component applications. AMC material, when used in the form of inserts cast within an aluminium component, is an efficient means of providing localised reinforcement and facilitating weight reduction. The work will involve the development of a new, standardised set of AMC inserts, with pre-determined mechanical properties, manufacturing feasibility and piece costs, available in short lead times. These inserts will incorporate novel 3D woven preforms produced by MWS, utilising a reduced proportion of alumina fibre but maintaining existing levels of strength and stiffness, through the exploitation of geometrical properties and advanced weaving techniques. In parallel, CMT and MWS will optimise manufacturing process parameters to reduce production costs and fibre wastage. A new mathematical model will enable the development of optimised infiltration process parameters for new designs. Taken together, these developments will address the remaining inhibitors to widespread adoption of AMC reinforcements for aluminium components and unlock the technology potential for customers in a broad range of industrial sectors.			

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Unto This Last Ltd HSSMI Ltd Siemens PLC A.T.Kearney Ltd	The Distributed Factory	£1,390,429	£958,754

Project description - provided by applicants

This project will build on the prototype technology and processes that Unto this Last have built to enable CNC rapid manufacturing technology to be utilised to produce furniture on the High Street, at mass production prices. Unto This Last have developed and tested a business model of production at the point of demand, with a production unit at the shop location in the city centre. The CNC manufacturing technology is utilised to enable flexible digital manufacturing, using software to manufacture customised furniture to order at a competitive cost.
This project will develop these prototypes to enable the Distributed Factory, a flexible manufacturing model with manufacturing units co-located with retail on the high street. Each unit would have the flexibility to manufacture the whole range of products, and if there is variable demand the flexibility to deliver orders placed at another location. The project will develop the IoT connected hardware, and the control software and processes that will enable this model to scale. We will demonstrate this working across three locations in the timeframe of the project.
The project brings together a team that can develop this prototype to enable the business model to scale: Siemens (manufacturing / smart city), AT Kearney (lean manufacturing design, business process), HSSMI (technology integration) and Unto-This-Last who will exploit the commercial opportunity as a business.

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Oxford Genetics Ltd University of Oxford	Computational and synthetic biology approaches for optimised mammalian bioproduction	£1,613,127	£1,195,835
Project description - provided by applicants			
Many modern therapeutic treatments require products and drugs that must to be manufactured in human cells for them to work effectively. At present, the human cell based manufacturing industry is dominated by a few standard systems (normally CHO or HEK-293). These systems were first established for research use only, in some cases as far back as 1957 (CHO) and were eventually adapted for large scale manufacture in the late 1980's. Consequently, these systems are far from optimal, and were created at a time when genetic engineering was in its infancy. Hence, there are many areas of potential improvement in these systems that would significantly increase their productivity, also thereby decreasing the manufacturing costs of one the most expensive classes of new drugs. This project aims to take a whole systems approach to optimising these production approaches by improving the DNA that is used to encode the protein drugs, the cell lines used for their production, and develop predictive algorithms that can help to make key strategic decisions before a manufacturing process is initiated e.g. based on the protein drugs sequence, should we expect production problems? And how can these be mitigated before they are encounted in the manufaturing process? This proposal incorporates the state-of-the-art, and a range of innovations that use machine learning, gene editing, DNA analysis, and cell manipulation, to collectively improve the productivity of mammalian biology.			

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Travan Precision Engineering Ltd Expert Tooling & Automation Ltd OneSubsea UK Ltd Queens University of Belfast Technovative Solutions Ltd TWI Ltd	Development of Low Energy, High Strength Corrosion Resistant Nickel Alloy Fasteners and Bolts - NOVA-FAB	£1,631,103	£1,185,080

Project description - provided by applicants

Precipitation-hardened nickel super alloy fasteners and bolts are crucial components in a wide range of areas that requires high strength in demanding and corrosive environments, for example aerospace, nuclear power stations, wind turbines, offshore oil & gas, and shipping. They are often exposed to hydrogen created by cathodic protection systems or by coupling to incompatible dissimilar alloys, which leads to hydrogen embrittlement (HE). The current state-of-the-art production is either forging or machining. With forged bolts, the forging process can drastically reduce the HE resistance, which has been the root cause for several recent unexpected costly and dangerous failures. While machined bolts can overcome this, they are often prohibitively expensive and also inefficient (material usage, energy). In this project we will use Linear Friction Welding (LFW) combined with advanced computational simulations & optimizations as well as experiments & data analysis to develop an innovative and much more efficient manufacturing method. Compared to machined fasteners and bolts, we expect significant materials savings, increased productivity, and significantly reduced energy consumption, which together will lead to much lower total costs. In this project, we will gain crucial insights on a new efficient manufacturing method, its tooling, and advanced simulation & optimization, which will lead to a step change in competitiveness for the partners.

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Innovative Technology and Science Ltd Cambridge Nanomaterials Technology Ltd Carrs Welding Technologies Ltd TISICS Ltd KW Special Projects Ltd NquiringMinds Ltd Cedar Metals Ltd Brunel University London	Power ultrasound as a generic tool for micro/nanoscale processing of materials	£1,996,648	£1,573,979

Project description - provided by applicants
The project goal is a novel generic technology (UltraMAT) for materials processing of fluid and semi fluid phases that are widespread in manufacturing e.g. in the welding and adhesive joining of components, the manufacture of bulk composite components and in traditional, PM (HIP) and semi solid casting. The key purpose of UltraMAT is to enable production of manufactured components with step improvements in specific strength (yield/ fatigue/ impact) and modulus, fatigue life and thus lightweighting; driven by economic and environmental needs to reduce energy consumption and emissions in manufacture and transport. The enabling tool is power ultrasound with purpose shaped force fields for controlled movement and size creation of uniform nano structures to enable: (1) Production of homogeneously distributed and shaped nanoscale particulates, fibres or grains). (2) Enhancement of interlayer and filler-matrix adhesion bonds.UltraMAT will be validated through the fabrication and testing of samples of a number of key structure/joint types of growing importance especially in aerospace or automotive bodies/engines: (i) Ti/Al fibre laminates (ii) Ti/Al metal matrix composites with fibre/ particulate (ceramic TiC/SiC), Ti/Al laser welding and (iv) Al semi solid casting. Homogenisation performance will be studied using graphene (G) and carbon nanotubes (CNT) because the strong agglomeration tendencies of G and NT is impeding their ability to realise commercially, components of ultra high specific strength. In short pulse echo mode, UltraMAT will self evaluate its performance on line aided by predictive big analytics.

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