Innovate UK

Results of Competition: November 2017 Sector Competition Strand 1: Materials and Manufacturing - Up to 12 Months

Competition Code: 1711_MM_INFRA_R4_ST1_12M

Total available funding is £9.5m in total across 3 streams

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
FLEXCITON LIMITED	Auto-generation of digital twins for optimisation of planning and scheduling in manufacturing	£98,660	£69,062
Project description - provided by applicants			
Flexciton Limited has created and patented a completely novel means of manufacturing optimisation. We have tested the concept in four very different companies from different sectors and found that savings of over 20% can be produced through reduced labour costs, inventory levels, changeovers and boosted production. However, the major barrier to market has been that for each of our solutions we have to build a bespoke optimisation model for each manufacturer. This 9-month long project seeks to change this by automatically constructing a generalised 'one-size-fits-all' optimisation model for new manufacturing plants, in order to produce optimised production plans and schedules. This will be applicable to every sector of UK manufacturing.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
WATTS URETHANE PRODUCTS LIMITED	Snakeskin - A novel Polyurethane and PolyCarbonate Honeycomb Composite Material	£98,970	£59,382

Project description - provided by applicants
Industries such as coal, steel, mining, cement, aggregates, biomass, recycling, manure & fertiliser, smelters & foundries rely on belt conveyors for materials handling; However, carryback of materials that stick to the belt significantly affect the performance and durability of conveyors. These fugitive materials" drop and contaminate rollers increasing clean-up and maintenance costs in addition to reducing the effective capacity of the belt and increasing energy costs due to the high redundant load. The industrywide solution is to use belt cleaners, which are predominantly cast polyurethane (PU) scrapers with the tip held in contact with the moving belt to scrape it. The materials and mechanical requirements of PU scrapers are surprisingly complex as the tip must be relatively soft to conform to the belt surface and have good wear resistance; Conversely, it must have sufficient mechanical stiffness such that it can be clamped and held tightly against the belt without deflecting. There has been little or no innovation since the last generation of scraper blades were developed and they are available from a wide range of manufacturers. A smaller stiffer blade with the same conformability and improved wear properties means that the efficiency of the design of the clamping mechanism can be improved and maintenance is reduced along with overall costs. Watts Urethane Products (WUP), a manufacturer of cast PU belt scrapers, has developed an improved belt scraper material targeting the £400m World market for belt cleaners. This project offers the potential for WUP to become the technology leader in belt cleaner blades."

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
COMPOSITES EVOLUTION LIMITED	Low cost, low environmental impact, fire-retardant sandwich panel for aeroplane interiors (FR-Plane)	£138,702	£97,091
TRB LIGHTWEIGHT STRUCTURES LIMITED		£88,417	£53,050

Project description - provided by applicants
This project will develop a new generation of low cost, lightweight, environmentally friendly sandwich panels for aircraft interior applications. The panels will be based on novel low cost, low environmental impact materials and will be manufactured using rapid, highly efficient moulding and finishing processes. This will lead to simultaneous step changes in productivity and sustainability in sandwich panel manufacturing, whilst meeting the performance requirements for aircraft interiors, including fire, smoke and toxicity (FST). Aircraft interior panels must pass very stringent FST tests which limits the choice of materials that can be used in their construction. Most aircraft interior sandwich panels are made from phenolic composite skins, which contain hazardous chemicals (phenol and formaldehyde), and Nomex honeycomb core which is expensive and also contains phenolic. The panel manufacturing process can be slow, especially if it is necessary to bond the skins and core together using a separate adhesive. Also phenolics give a poor surface finish, which requires costly preparation before applying a decorative finish. Therefore, aircraft interior manufacturers are keen to identify alternative materials and processes, which are safer, faster and cheaper, in order to future-proof their business. In this project, the composite skins will be made from polyfurfuryl alcohol (PFA), a resin derived from biomass waste, which is safer than phenolic and has excellent FST characteristics. The project will identify the most suitable lightweight fibre reinforcement and will develop low cost, sustainable alternatives to Nomex core. The project will develop a rapid, highly efficient process for manufacturing the sandwich panels in high volumes and a novel method for finishing and decorating the panels. If successful, the project will lead to a significant improvement in productivity, reduced costs and a breakthrough in the use of sustainable materials in aircraft. This is expected to generate significant additional revenue for the UK supply chain and many high-value jobs.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
TANGI0 LTD	TG0	£99,997	£69,998
Project description - provided by applicants			
Conventional touch sensor manufacturing technology share the same limitation: the product functionality relies on a large number of the sensors embedded inside. They are rigid, flat, uninspiring to use and complicated to produce. Project TG0 is developing a platform tactile sensing technology based on one uniform material that can be applied in automotive, consumer electronics and various other markets. The project will provide a completely disruptive method of manufacturing 3 dimensional intuitive control interfaces and will prove its industrial readiness specifically to be adopted in automotive interior.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
TPL IP HOLDINGS LIMITED	A new automatic process for over molding and co-injection molding	£99,709	£69,796

Project description - provided by applicants

Multi-material injection molding (MMM) is the process of molding two or more different materials into one plastic part at one time. Multi material injection molding uses materials that are at or near their melting point so that the semi-liquidous (viscous) material can fill voids and cavities within a pre-machined mold, thus taking on the desired shape of designed tooling. The three most widely used methods of MMM fabrication are: multi-component; multi-shot and over-molding. This project aims to extend current state of the art manufacturing processes to enable a step change in productivity and competitiveness, resulting in a novel UK based manufacturing method using an injection process.Think Product Lab IP Holding Ltd are an established innovator of disruptive consumer products, with a number of filed patents, and an established core UK team. The parent group sell consumer goods under the Flint brand name. Since 2008 we have enjoyed success with a novel lint fluff catcher product, which has disrupted the existing lint category in over 30 countries. Products under the Flint portfolio are now sold in over 20,000 stores in the US with listings in Target, Bed Bath, Walmart, Staples, Kroger. We well in the UK through our own website www.meetflint.com. Over 1 million units have been manufactured, sold and shipped in the first 12 months after launch. We have assembled a multi disciplinary team between the company, and UK based contractors to tackle this exciting project.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
THINAIRWATER LTD VERAGON WATER SOLUTIONS LIMITED	Game-changing surface material for optimised water generation from the air	£100,000 £0	£70,000

Project description - provided by applicants
Water is becoming an increasingly scarce resource, particularly in regions such as the Middle East and North Africa (MENA). Unfortunately, this has the greatest impact on the poorest individuals on the planet, in undeveloped countries and in refugee camps. Not only do these individuals lack clean drinking water, but insufficient water results in famine due to the inability to sustain agriculture. However, water scarcity is not an issue that just affects the developing world - drought is also causing long-term economic problems in developed countries. Indeed, studies have suggested that by 2030, 4 out of 10 people will not have access to sufficient water. Existing water generation technologies typically have high energy costs, do not produce great enough yields of water and/or are geographically limited. For instance, cooling condensation and wet desiccation techniques both require considerable energy inputs. Desalination is widely employed in the Gulf Council Countries (GCC) and in Australia but is energy and cost-intensive as well as damaging to the environment. For example, it has increased the temperature and salinity of the Gulf, with the latter rising 2% over the last 20 years, which has had a negative impact on marine life and ecosystems. Whilst digging wells, the predominant method adopted by NGOs, is cheap and effective it is not feasible when drought occurs or where the water table is too low. Thus, providing a renewable source of water is one of the main global challenges facing humanity. At any moment, the atmosphere contains over 140x10^15 litres of water and therefore represents a suitable and sustainable source of water. ThinAir, a startup from Imperial College London, has created a material optimised for the capture of atmospheric water, enhancing the ability of water condensation through the microstructure optimisation of the surface topology. The surface takes inspiration from the African fogstand beetle, with its natural ability to condense its own drinking water from the air. The team have mimicked this structure to produce a scalable, sustainable and deployable synthetic material, which can be implemented within a range of markets to enhance water generation from the atmosphere. The project will fund the continued development and iterations of the prototype material and see the integration of ThinAir's surface technology into their collaboration partners, water generation machine. Enabling the ability to generate more water more efficiently, and allow entry into a wider array of markets and have a larger impact on humanity.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
TEWKESBURY (DIAMOND CHROME) PLATING CO. LIMITED	CHROMEFREE – Chromium-free replacements for hard chrome plating	£88,694	£62,086
J.C. BAMFORD EXCAVATORS LIMITED		£23,098	£6,929
NMB-MINEBEA UK LTD		£156,948	£94,169
PRECISION PRODUCTS (UK) LIMITED		£175,062	£105,037
TWI LIMITED		£133,998	£133,998
University of Leicester		£135,455	£135,455
WEIR GROUP PLC(THE)		£210,169	£105,085

Project description - provided by applicants
Hard chrome plating is widespread through many industrial sectors due to its excellent combination of hardness and low friction combined with corrosion and wear resistance. The manufacturing process however requires the use of hazardous chromium salts which give rise to health and environmental concerns, leading to an uncertain long-term future due to legislative changes such as REACH. Electrodeposited metal matrix nanocomposites (MMNCs) have the potential to make a significant improvement to surface properties such as increased microhardness and inherent lubricity. The development of nanotechnology over the last 25 years means that there are now a multitude of nanoparticles, nanowires and nano-tubes in a wide range materials, hence the scope for new nanocomposite coatings is greater than ever. Recent work at Leicester University has resulted in demonstration of the process across a range of coating compositions. This enables the production of strengthened coatings, with the potential to develop a coating with functional performance equivalent to hard chrome. Working as a consortium, the present project is taking the work forward to validate the capability with partners JCB, PPUK, NMB Minebea and Weir Valves and Controls for a wide range of industrial applications. Additionally, the technology will be made more broadly available through Tewkesbury Diamond Chrome Plating which provides electroplating services to industry, and through TWI with its network of over 700 industrial members.

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AVON POLYMER PRODUCTS LIMITED	Surface Treatment of Recovered Carbon Black (SURECARB)	£95,101	£47,551
MATSURF LTD		£84,317	£59,022
Project description - provided by applicants			
This project will investigate the feasibility of using surface modification techniques to enhance the properties of carbon materials recovered from the recycling of waste tyres and so enable them to be reused in the tyre industry and other engineering applications of rubber.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
INSPRO LTD University of Lincoln	Black Soldier Fly Larvae: Urban, Local, Bio-Conversion Unit	£69,531 £28,596	£48,672 £28,596
Project description - provided by applicants			
* To capture, bio-convert and utilise urban food waste. This project addresses a number of issues; developing a novel manufacturing system for a new source of protein, reduction of food waste and increased productivity from this waste. This project will enable a fundamental change in food waste utilisation and food production by bringing it into the local urban environment where users can re-connect with environmentally responsible waste management and food production. * This project seeks to develop cutting edge technology to develop small scale insect farms which can use urban food waste to grow BSFL to provide a protein source for fish and (subject to legislation) animal feed. These numerous, small scale farms will take current technology employed on a much larger scale and innovate it, to fit into a Bio-Conversion Units (BCU) which can be placed in urban settings to deal with small scale local food waste, currently destined for land fill or anaerobic digestion.			

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PVOH POLYMERS LIMITED	Moisture Barrier Coatings for PVOH Soluble Products to Reduce Packaging and Extend Product Life	£69,999	£48,999
Swansea University		£29,988	£29,988
UNILEVER U.K. CENTRAL RESOURCES LIMITED		£29,750	£14,875

Project description - provided by applicants
Polyvinyl Alcohol (PVOH) is a water soluble non toxic biodegradable polymer which conforms to European composting and biodegradability standards. In its film and injection moulded format it is mainly 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 50% relative humidity. Therefore, expensive protective packaging is required to maintain its physical properties, this is important to maintain child safety regulations when caustic detergents are encapsulated. Due to the hygroscopic nature of PVOH, at present it is not suitable to replace traditional polymers. If a solution could be found to delay moisture uptake then new opportunities would arise for this polymer. The addition of a temporary/ semi permanent hydrophobic barrier to PVOH products is highly innovative and would permit the reduction of protective packaging, ease of recycling of complex multilayer containers/ films, and open up new markets for PVOH to replace traditional polymers. New markets would include single use products (medical) where products are in contact with water during use and when recycling is impracticable or unsafe to do so (Contamination of bodily fluids). In addition to laundry applications there are also opportunities in other unit dose cleaning applications including machine dish wash, automotive, jet wash and other specialist home cleaning applications accessible either through existing brand owners or bespoke new entrants 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 to cause hazards to wildlife.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
ABSTRUSE 3D LIMITED	Productivity improvements for the elastomer part manufacturing industry via the development of novel fluid based functional elastomer systems and processes designed for additive manufacturing technologies.	£99,910	£69,937
Project description - provided by applicants			
Productivity improvements for the elastomer part manufacturing industry via the development of novel, fluid based functional elastomer systems and processes designed for additive manufacturing technologies.			

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BRISTOL AERO LTD	AM SimTools	£98,359	£68,851
Project description - provided by applicants			
Creation of an engineering methodology to predict and optimise anisotropic structural performance of Fused Filament Fabrication (FFF) end use parts incorporating the digital as-manufactured information.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
CNR SERVICES INTERNATIONAL LIMITED	TSAS (Tail Structural Alignment System)	£98,626	£69,038

Project description - provided by applicants

CNR Services International Ltd delivers leading-edge engineering design services to a wide range of industry sectors. From concept generation, through design and optimisation, to the effective integration into the manufacturing process, CNRs dedicated team of specialist engineers, designers and scientists help customers achieve the results they are looking for. CNR has identified a gap in the market to develop an alignment system for the build of helicopter tail structures. We have a customer extremely interested in TSAS and we are confident from patent searches that there is no product out there at present to offer such enormous benefits over current state-of-the-art methods. TSAS will improve upon current state-of-the-art methods by: - greater speed of operation - greater accuracy, 100% of the time, no operator error - automatically collecting and storing data for audit/traceability/trend analysis. - significantly reducing tail vibration for improved crew/passenger comfort/extended component life. CNR will grow significantly through sales of TSAS and offers significant vaue for money for the UK tax payer. It will also safeguard jobs and create new ones. TSAS will make CNR more competitive as our revenues will grow to enable further investment in R&D and we begin to be seen as a one-stop shop for alignment issues with our aerospace customers, old and new.

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SEXTON MATERIALS RESEARCH LIMITED	Novel Graphite Flake production for Li-Ion Battery Manufacture from Steelmaking By-Product	£75,000	£52,500
DARLOW LLOYD & SONS LIMITED		£55,001	£33,001
MATERIALS PROCESSING INSTITUTE		£51,993	£51,993
Swansea University		£33,585	£33,585
TATA STEEL UK LIMITED		£70,001	£35,001

Project description - provided by applicants

This project is aimed at recovering an historically landfilled steelmaking material and turning it into a valuable feedstock for battery or graphene production. Steelmaking kish has the potential to fit these opportunities due to the graphite flake nature of it when generated from the Basic Oxygen Steelmaking Vessel

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MACHINE TOOL TECHNOLOGIES LIMITED	In-Situ Machine Axis Error Monitoring	£69,735	£48,814
University of Huddersfield		£28,876	£28,876

Project description - provided by applicants

Laser interferometry is commonly used to measure machine axis accuracy but has one major flaw in that it cannot be used to monitor axis dynamic performance while the machine is cutting. Laser measurements are typically made in static mode in fixed positions along the machine axis meaning the axis is stationary when each measurement is made so potentially it doesn't reflect the performance of the machine when it's in its working condition cutting components. This low cost in-situ laser monitoring system will measure axis position, velocity, acceleration and angle at all times even when the machine is cutting ensuring the most accurate method for determining the performance of the machine axis. This data will form the basis of more accurate compensations and/or allow an accurate performance/condition monitoring system. Data from the system can be monitored over time to provide machine degradation information and performance data for monitoring of production.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
MO DESIGN & ENGINEERING LTD	Mouldbox – automated composite mould design and manufacture	£99,746	£69,822
Project description - provided by applicants			
Mouldbox will bring automation to the design and manufacture of composite tooling, disrupting this time and cost consuming process so that the customer can order components instantly and receive them in half the normal time.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
OXFORD BIOTRANS LIMITED	Continuous production of nootkatone	£98,294	£68,806

Project description - provided by applicants
The compounds used in the flavour and fragrance (F&F) and agrochemical (such as pesticides) industry today are produced through two main routes. Either through extraction from plant material, much of which is endangered or at very low concentrations, but produces natural compounds, or using synthetic means - multi-step traditional chemistry that typically produces high levels of waste and environmental impact (such as strong acids, heavy metals, high temperatures / energy usage and petrochemical-based feedstock). Industrial Biotechnology provides a third route - using enzymes as biocatalysts to convert natural compounds into products found in enzymes. There is a high level of consumer-led demand for natural, or 'green', environmentally friendly F&F, fine-chemical and agrochemical components, which significantly outstrips the ability of natural sources and indeed conventional synthetic routes to sustainably provide. Oxford Biotrans (OB) is leading the way in creating industrial biotechnology routes to meet these needs. Through the use of enzyme biocatalysts, derived from fermentation (like brewing), the production of these high value chemicals can be achieved, in a green, sustainable manner. However, the state-of-the-art biotransformation methods, batch processes (similar to brewery fermentation), restricts the implementation of this technology to very highly priced compounds. This project aims to innovate OB's current commercial batch process for the production of nootkatone, the scent and flavour of grapefruit, into a continuous flow process, with the aim of increasing the performance of the reaction and reducing the reaction time, thus driving down the cost of production. This is turn will enable the technology to be rolled out across many industries, to meet a host of compounds at economic scale.

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BLOW MOULDING TECHNOLOGIES LTD	Intelligent Inline Temperature Control of the Stretch Blow Moulding Process	£99,948	£69,964

Project description - provided by applicants
Blow Moulding Technologies (BMT) is a micro SME who sell instrumentation and software to the Stretch Blow Moulding (SBM) industry, founded in 2011 as a spin-out from Queen's University Belfast, The world currently consumes 1 million plastic bottles per minute, therefore SBM process **demands high rates of production**. As the world advances towards half a trillion plastic bottle/annum by 2021, **productivity is hampered by large inefficiencies** frequently caused by **temperature variables** such as operator subjectivity, variation in material properties and environment changes, giving rise to material wastage, product defects and machine down-time. Furthermore, **increased public environmental concern** in the mass production and pollution of plastic bottles has instigated a **strong market opportunity for the use of recycled PET resins and bio-based polymers from waste bottles**. Our **vision** for this project is to develop ground-breaking technology to enable the intelligent control of temperature within the SBM process in the production of Plastic Bottles. Working alongside our partners, P&G, Sidel, Sacmi and Beverage Plastics, BMT's proposed solution involves the development of an **automated data-driven inline temperature management system** with advanced infrared sensor technology and control algorithms. Heated preforms will be ejected automatically at regular intervals prior to blowing to provide real-time internal and external temperature data. The temperature data will be communicated back to the SBM ovens through bespoke software to allow a more accurate control of the process temperature. Greater temperature control will lead to a **reduction in production trouble-shooting, reduction in machine down-time** and **greater productivity.** It will optimise bottle production leading to the consumption of **less raw material**, **generate less waste** and **decrease product defects** leading to **greater material use efficiency**. The system will permit a **greater optimisation of products**, in particular it will allow more accurate **production of recycled PET** within a narrower SBM process window. It will lead to **lighter more efficient preforms** which can still reach the **targeted performance standards** such as 'shelf-life' and 'top-load', with greater **ease of manufacture.** Savings on **production efficiencies** will also result in **lower running costs** and a **reduced carbon footprint**. This project represents **cutting edge innovation** through the creation of an inline system which does not require human touch. The ability to minimise all temperature related trouble-shooting within the SBM process through the use of intelligent algorithms communicating the exact measurements of the inner and outer profiles of the heated preforms is **a major step forward in the SBM industry.**

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Innovate UK

Results of Competition: November 2017 Sector Competition Strand 1: Materials and Manufacturing - 13 to 24 Months

Competition Code: 1711_MM_INFRA_R4_ST1_24M

Total available funding is £9.5m in total across 3 streams

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
LUMENISITY LIMITED University of Southampton	Hollowcore Optical Fibre Processing	£491,304 £166,791	£343,913 £166,791
Project description - provided by applicants			
New digital services increasingly depend on real-time interaction with remote data. This project will reduce the latency in modern telecommunication networks by enabling the deployment of hollow core optical fibre over long distances. As the light travels through air in the hollow core, the fibre latency is 30% lower than in traditional optical fibre. The project will deliver high volume coating, joining and termination processes for the next generation of high bandwidth low latency hollow core optical fibres, making them as easy to deploy as traditional optical fibre.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
AGLARIS LIMITED University College London	Improving T-Cell manufacture through automation - scaling out, reducing costs and increasing quality to meet the emerging demand for patient-tailored cancer therapies.	£493,494 £210,751	£345,446 £210,751

Project description - provided by applicants
Objective: Improve scalability, quality, costs, flexibility and efficiency of T cell manufacturing by developing and integrating novel processes and manufacturing technologies. **Need or Challenges**: While T cells have been shown to produce game-changing results by curing previously untreatable cancers in numerous clinical trials, the T-cell manufacturing and production capabilities are greatly lagging, and will not be able to meet the predicted surge in demand unless new technology and processes are developed. T cells are currently produced via labour-intensive, manual culture in flasks, or in bioreactors with limited scaling capabilities. These methods are sufficient to carry out R&D and Phase I clinical trials; however, they are inadequate on a yield, economic, and quality/regulatory level (due to inconsistencies and cross contamination risks) to produce the hundreds to thousands of doses per year that are required for Phase II-III clinical trials and commercialisation. These shortcomings, if not resolved, will hinder these life-saving therapies from reaching the market or from being accessible to all patients. **Approach:** Aglaris (a UK SME) and University College London will collaborate to fully develop and integrate the following technologies which will enable T-cell production to meet the upcoming surge in demand in a few years, as more live-saving T cell therapies (currently in clinical trials) receive regulatory approval: 1. Plug and play T cell culture cartridge: more space efficient, uses up to 14X less cytokine, less labour-intensive processes, and lower cell production costs (up to 35% savings). 2. Cost-efficient, in-line, disposable sensors: measure parameters in real time without extracting samples, resulting in reduced labor and costs, more tightly controlled processes for increased production (more cells in less time by maintaining optimal proliferation settings, quality and GMP regulatory compliance. 3. Modular process: Serial expanding chambers for easy scale up and fully enclosed separate modules to grow multiple lots in parallel for scale out without cross contamination risks. This will help with scaling and logistic problems as well as GMP compliance. **Outcome:** Create a ready-to-launch new system to manufacture T cells in a way that can be scaled up (for allogeneic therapies) and scaled out (for autologous therapies), with the predicted quality and yields that will be necessary to bring these life-saving therapies to the market, both in the UK and worldwide, just in time as numerous T-cell therapies receive regulatory approval (the first 2 received regulatory approval in 2017, and 240 are in clinical trials).

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
KERONITE INTERNATIONAL LIMITED ALCON COMPONENTS LIMITED	RELIABLE: Wear Resistant Lightweight Aluminium Brakes for Vehicles	£273,951 £173,880	£191,766 £104,328
Project description - provided by applicants			
Cast iron brake discs are the predominant brake solution used in passenger cars. These brakes are detrimental to fuel consumption due to their onerous weight. They are also a significant human health hazard because of the metal particulates that are emitted as they wear. These brakes are predominantly used in passenger cars and are the second largest contributor of particulate emissions from a vehicle, a significant contributor to air pollution. Keronite International Ltd and Alcon Components have developed a wear-resistant lightweight brake disc for use in passenger vehicles to overcome the aforementioned problems. We have proven the concept with successful trials and testing carried out with a leading UK University and an expert vehicle systems test house. To take our solution to the next level, we have formed a development collaboration with Alcon Components, who will provide the expert knowledge and skills in the development and manufacture of advanced braking system. Together we will develop an early stage prototyped for an innovative lightweight low wear brake disc for full dynamometer testing and initial in-vehicle trials. By overcoming the limitations of existing coatings and state-of-the-art solutions, our technology will address an urgent unmet market need. In turn, we expect to generate significant exports for the UK economy and in the process create numerous UK based high-skilled jobs.			

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Innovate UK

Results of Competition: **November 2017 Sector Competition Strand 1: Materials and Manufacturing - 13 to 24 Months**

Competition Code: **1711_MM_INFRA_R4_ST1_24M**

Total available funding is £9.5m in total across 3 streams

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
SPINKO LIMITED	Mattress Core Production Innovation with Advanced Materials Inclusion to take Disruptive Product to Market	£1,180,447	£590,224
SONTEX (MACHINERY) LIMITED		£114,661	£80,263

Project description - provided by applicants
Harrison Spinks is the lead applicant in a collaborative research and development project which will bring significant innovation in how mattresses are made. The project will allow for a new generation of product which will change the way the industry works with customers. For some years, the team have been looking at ways to incorporate the innovation and technology of the components within a bed, but also to develop industry leading step change in how those mattresses are made. The aim is to develop a product which adapts to the increasing demands and expectations people place on a good night's sleep, whilst being offered at an accessible price. Harrison Spinks is a fifth-generation family business, established in 1840 and today is a leading high-end, luxury bed manufacturer and supplier of quality components to the furniture, footwear and automotive industries. Innovation is at the heart of Harrison Spinks, and it is the continuous investment in technology which has allowed it to become the most vertically integrated bed manufacturer in the world. Not only does the business manufacture patented pocket springs, it also has a dedicated team of engineers who design and build the machinery on-site in Leeds which produces award-winning springs. The project includes a collaborative partner with an expertise in production innovation and also Sheffield University. In 2014, the business began drawing its own wire from steel rod, which allowed for production of thinner wire than is commercially available within the market and consequently, the business is able to offer a range of springs to a number of markets. The project allows for the further development of spring technology, combining novel manufacturing processes and advanced materials to create a revolutionary new product to market. The project builds on previous research and demonstrates the businesses commitment to continuous investment in technology, which was recognised by HM Queen Elizabeth II in 2013, with two Queen's Awards for Enterprise awarded; one for Innovation and the other for Sustainable Development.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
INTERNATIONAL PAINT LIMITED	Advanced Manufacturing of Polymers (AdMaP)	£355,729	£177,865
CENTRE FOR PROCESS INNOVATION LIMITED		£34,588	£34,588
INOX DESIGN LIMITED		£53,119	£37,183
MARLETON CROSS LIMITED		£120,421	£72,253
TELEDYNE E2V (UK) LIMITED		£114,160	£57,080
University of Nottingham		£239,645	£239,645

Project description - provided by applicants
Organic polymers are used in a range of sectors including composites for vehicles and aircraft; performance coatings and packaging and are difficult to synthesise at industrial scale. The manufacturing performance of industrial polymers is typically undertaken in large stirred tank reactors, heated by oil or steam jackets. These are characterised by long reaction times and are associated with slow heating /cooling cycles and lack of consistency between batches. Volume of production is also limited by capital cost of additional units. This project will develop a unique commercial scale microwave heating system for industrial polymer synthesis which can be retro-fitted to existing commercial reactors, delivering a step-change improvement in both reaction time, process control and volume production. We will then demonstrate the technical and commercial benefits of this technology through retro-fitting the design to an existing pilot-scale facility. Existing work at 5 kg scale has shown resins can be manufactured in half the time with improved colour (less burning) and enhanced specification. Outputs of this project will be the design of a commercial scale system, whose techno-economic performance is validated using a pilot-scale demonstrator. It will enable partner INOX design and Te2v to manufacture, sell and retrofit this technology to key players in the polymer industry and if fully realised would reduce their manufacturing costs by 5.6 bn EUR annually on a market for powder coatings worth 13bn EUR per year whilst at the same time cutting CO2 emissions by 740,000 tonnes per year. A verified supply chain with leveraged support by the Centre for Process Intensification (CPI) with will be used to engage other end users to promote wide adoption of this technology, befitting the UK industrial polymer sector.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
KYMIRA LTD.	Advanced textile-integrated thermoelectric energy harvesting for wearable electronics	£132,159	£92,511
DYCOTEC MATERIALS LTD		£121,765	£85,235
EUROPEAN THERMODYNAMICS LIMITED		£94,444	£66,111
University of Reading		£134,779	£134,779

Project description - provided by applicants

Smart wearables are becoming increasingly pervasive, driven by sustained advances in miniaturisation of electronics, improvements in sensors and connectivity, and growing capability to embed electronics in a variety of products. For example, smart glasses and smartwatches are now widely available. Smart garments are also appearing on the market: OMSignal market garments that monitor heart rate, steps taken and breathing depth, which is washable once the microprocessor has been detached; Athos market a biometric shirt with integrated sensors to measure muscle activity, whereby wiring is encapsulated and docking station enables wireless data transfer for analysis. Wearable energy-harvesting devices first appeared almost 100 years ago, with the self-winding wrist-watch (itself based on the self-winding pocket watch that first appeared in the late 1700s). Given this context, it is perhaps surprising that the uptake of energy harvesting technologies has been slow in the market for wearable electronics. However, we believe this is set to change. The next generation of wearable electronics will include garments whereby the electronics are embedded within the textiles. These will be powered by energy-harvesting technologies that are also embedded into the textiles. Through this project, we will create flexible, durable and comfortable textiles that will power future wearable technologies.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
GLASS TECHNOLOGY SERVICES LTD	Optimising biomass ash to reduce the environmental impact of glass manufacture (EnviroGlass 2)	£246,640	£147,984
ASHWELL BIOMASS LIMITED		£82,785	£57,950
GLASSWORKS SERVICES LIMITED		£29,627	£20,739
POWER MINERALS LIMITED		£61,485	£43,040
Sheffield Hallam University		£187,784	£187,784
TEMPLEBOROUGH BIOMASS POWER PLANT LIMITED		£52,693	£36,885

Project description - provided by applicants
This project, led by GTS and supported by British Glass (representing the 8 main UK flat and container glass manufacturers) and Sheffield Hallam University (SHU), creates a new consortium with Ashwell Biomass, Templeborough Biomass Power Plant, Power Minerals and Glassworks Services. The project brings together three industrial sectors (Glass, Ceramics, Biomass Energy) for the first time to develop new raw materials for the manufacture of more economical, more efficient, lower-emission glasses and ceramics. This project builds upon the outputs from IUK Energy Catalyst Feasibility Study (IUK: 132334) 'EnviroGlass Melting', which assessed a range of wastes as potential new raw materials in glass manufacture to reduce melting temperatures, CO2 emissions and costs. The project proposed here builds upon these findings to address the challenges identified, developing new raw materials and demonstrating suitability for glass (TRL=7) and ceramics (TRL=3-4) industries to improve productivity and reduce: (i) Energy requirements (up to 10%) (ii) Raw materials costs (up to 10%) (iii) UK-landfill (up to 75kT/yr)

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
LUCIDEON LIMITED CERES POWER LIMITED	Field Enhanced Sintering: process development for Steel Cell- Solid Oxide Fuel Cells	£489,937 £119,235	£293,962 £71,541

Project description - provided by applicants
Ceramic bodies, such as those found in steel cell Solid Oxide Fuel Cells (SOFC's), are produced by sintering green parts at high temperatures. This project looks to assess and demonstrate the use of Field Enhanced Sintering (FES) technology as a process to improve the productivity of SOFC manufacture. FES is the application of electric fields to ceramics during their sintering process, it has been shown to dramatically reduce sintering times used in ceramic manufacture, as well as improve the properties of the end material via microstructural control. Fuel cells can be used in Combined Heat and Power (CHP) generators, as range extenders on automobiles, and as power generators for data storage facilities. They are broadly acknowledged to be the most efficient way to generate heat and electricity from renewable sources, however, the commercial challenge lies in their affordability for end application. The limiting factors here are speed and cost of manufacture, this is due to the extensive sintering steps required for each constituent material. This project, via a UK consortium of two SME's, Lucideon and Ceres Power, aims to address this commercial need for mutual benefit, by overcoming this challenge. The application of FES technology to SOFC manufacture is a highly technical and innovate step. Never before has an attempt been made to sinter this combination of materials, using FES, nor in a single step before. The project's objectives is to significantly reduce the sintering time for SOFC ceramics, thus increasing throughput and making steel cell SOFC technology a world leader within this sector. Also, via FES's ability to provide microstructural control, the performance of the materials within an operating environment shall be enhanced and verified. The project will utilise and build upon existing propriety control software (digital manufacturing), to control the field application to the SOFC materials, and ensure efficient sintering joining of dissimilar materials via prototype electrode and furnace design. The project aims to demonstrate FES application for the production of a commercial sized Steel Cell-SOFC part, along with performance verification against the current state-of-the-art. The project provides an opportunity for the consortium to advance a low TRL process to address growing national & international challenges in low carbon technology for energy generation, transport and manufacturing, contributing to creation of world leading reputations for the UK in each area

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Innovate UK

Results of Competition: November 2017 Sector Competition Strand 1: Materials and Manufacturing - 25 to 36 Months

Competition Code: 1711_MM_INFRA_R4_ST1_36M

Total available funding is £9.5m in total across 3 streams

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
IMMATERIAL LABS LTD University of Cambridge	Development and commercialisation of a flexible manufacturing process to produce monolithic metal-organic framework (MOF) materials.	£1,396,300 £538,516	£977,410 £538,516

Project description - provided by applicants
Metal-organic frameworks (MOFs) are an exciting class of porous materials, with added versatility and performance over competing materials such as zeolites, activated carbons, and traditional catalysts. With large internal surface areas acting as sites for molecules to adsorb to, MOFs possess some of the highest gas storage capacities of any known material. At a given pressure, a tank filled with a MOF can store much more gas than an empty tank. The unique ability to tailor their structure to have specific characteristics means MOFs have applications across a diverse set of industries, from gas storage and separation, to catalysis and drug delivery. A major challenge for their industrial use is to shape and densify the powdered materials post-synthesis, without getting a drop in performance. Immaterial Labs Ltd design and manufacture monolithic MOFs in a one-step synthesis which shapes and densifies the materials whilst maintaining performance and delivering world-leading adsorption capacities. Immaterial have applied their enabling pelletisation technology to make a material that has broken all records for the volumetric storage of natural gas, offering a 50% improvement over the closest competitor. This Innovate UK project studies the industrial-scale production of monolithic MOFs, and their subsequent use-cases, aiming to: 1) design and build a flexible manufacturing facility capable of a 100kg/day throughput for 5 different monolithic MOFs, 2) complete application specific testing with key partners to develop materials to TRL6-9 and MRL6-9, and 3) engage new customers in the design of novel monolithic MOFs for additional use-cases.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
JRI ORTHOPAEDICS LIMITED	AM Porous Layer Implant Design with Bioactive Layer of Glass Coating – APLID BioLOGIC	£352,141	£211,285
GLASS TECHNOLOGY SERVICES LTD		£296,347	£177,808
METRON ADVANCED EQUIPMENT LIMITED		£62,289	£43,602
University of Cambridge		£249,975	£249,975
VITRITECH LIMITED		£105,652	£73,956

Project description - provided by applicants
Osteoarthritis (OA), especially of the hip and knee, is one of the leading causes of disability across the world. Every year there are over 3 million surgical replacements of joints -- with over 0.25 million in the UK. This number is growing all the time for two reasons: 1) arthritis is exacerbated by age and body weight and the world population is getting older and more obese, and 2) in countries such as China more of the population are being able to afford this surgery. This consortium are focussing on the next big enhancement in joint replacement through a new and improved manufacturing process for a coating to accelerate the integration of the implant into the host bone. The consortium is led by JRI an SME that is a leading UK manufacturer with over 30 years' experience in making and selling coated orthopaedic implants. They have already shown with GTS, one of the project partners, through a feasibility study funded by Innovate UK that it is possible to manufacture a new combination of implants that combine 3D printing with bio-active glass. In that study they showed that this combination had improved response from bone over existing coatings. They also confirmed that the new manufacturing process should be run at a cost that is commercially viable. In addition bioactive glasses are known to have natural anti-microbial properties, which will help fight infection. In this project two other SMEs join the existing partners (Vitritech and Metron) to optimise the manufacturing processes through novel surface engineering techniques. The SMEs will also form a robust supply chain to ensure confidence for future production. This coating process will then be validated through studies by the University of Cambridge, who will also confirm and evaluate the anti-infective properties of the bio-active glass. The outcome of this project will be the development of a manufacturing process that is ready to be scaled up for the global market as well as generating the supporting regulatory documents. This will lead to a first-in-human study, followed shortly by a global launch -- the partners are targeting: European, American and Chinese markets where JRI already has a significant presence and many years' experience of their regulatory processes.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
CARNAUDMETALBOX ENGINEERING LIMITED	ReDriveN– Revolutionary drive mechanism for novel can making equipment	£1,061,056	£530,528
CROWN PACKAGING MANUFACTURING UK LIMITED		£0	£0
Manufacturing Technology Centre		£239,039	£239,039
Newcastle University		£244,629	£244,629
RENOWN GEARS LIMITED		£283,696	£198,587

Project description - provided by applicants
As part of its drive to stay at the forefront of innovation as a leading Original Equipment Manufacturer in the can-making industry and to build upon previous successful collaborations together with its recent innovative successes leading to awards for export, Carnaud Metalbox Engineering Ltd (CMB) are seeking to develop, test and demonstrate a revolutionary design of their industry leading bodymaker equipment.Additionally through conducting production simulation, supported by the MTC, they will improve equipment production at their Shipley site to make it more efficient and reliable, in order to meet the changing demands of their global customer base. ReDriveN enables a collaboration between a leading OEM (CMB Engineering), a global can maker (Crown), a specialist SME, Renown, the University of Newcastle testing and one of the High Value Manufacturing Catapult centres (MTC). By working with their partners in this project, CMB will accelerate and de-risk their time to market for new and innovative equipment and allow them to continue to grow and gain market share from their global competitors. Benefits to the end user / customer will be extensive and embrace technologies to increase manufacturing capability and output while addressing trends in market driven product formats and materials optimisation. Additionally, the end user will benefit from advanced interfacing to machine and process information, offering further routes to machine and plant optimisation.

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