Innovate UK

Results of Competition: Materials and Manufacturing Round 3 - 13-24 Months

Competition Code: 1705_MM_R3_24M

Total available funding is £15m

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
PPG INDUSTRIES (UK) LIMITED	UV-curable Basecoat for the Food Metal Packaging Industry	£190,294	£95,147
EMBALLATOR (UK) LIMITED		£60,834	£36,500
LAMBSON LIMITED		£153,802	£92,281

Project description - provided by applicants

The project will deliver a step-change process innovation for the manufacture of metal food packaging. Food can manufacturers coat flat metal sheets with three coating layers before the sheets are formed into a can. While the second (inked design) and top layer (varnish) are UV-cured, the first layer (basecoat) which protects the sheet from rusting and provides a good surface for printing on, still relies on traditional 200Â°C gas oven-curing.

The project responds to the specific demand by the food metal packaging industry to eliminate the time, footprint, energy consumption and emissions associated with the practice of oven-curing of basecoats. The partners will develop a new UV-curable basecoat formula and integrate the basecoat into the manufacturing process of a food can maker. A prototype system will be built to allow partners to test the innovation in real-world conditions and validate performance expectations.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
NUVISION BIOTHERAPIES LIMITED University of Nottingham	Optimised production system for Omnigen: An innovative regenerative therapy for in-clinic management of wound care	£756,436 £283,438	£529,505 £283,438
Project description - provided by applicants			
Amniotic membrane or amnion (the inner layer of the sac a baby grows in) has been used to treat wounds in eyes, skin and internal organs since the 1940s. NuVision(r) Biotherapies Ltd is a company spun out from the University of Nottingham Ophthalmology department to commercialise Omnigen(r). Expectant mothers who have planned caesarians can donate their amnion, which is then delicately dried (patented by NuVision), and cut by a manual process into Omnigen discs of variable sizes. Omnigen has been available since April 2016, and has been used to treat eye problems in 30 NHS hospitals including Moorfields Eye Hospital. It's easy to use and store, and has been applied to indications affecting the cornea. The volume of patients, means that we need to be able to automate accurate high volumes of 'units' to meet demand. To achieve this we need funding to investigate the technical challenges involved in this. In the USA, amnion is also routinely used in wound care, especially diabetic foot ulcers (DFU), leg ulcers and non-healing wounds. Dried amnion has been clinically proven to speed up healing times in these type of wounds. NuVision wants to meet the growing demand, and expand the ophthalmic and would care market in the UK and worldwide, to help preserve and save sight and also offer treatment for the 86,000 people in the UK living with DFU.			

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ULTROMEX LTD TANDOM METALLURGICAL GROUP LIMITED	Scale-up and demonstration of Recyclamet, a novel system for the closed loop recovery of metal and value added residues from waste aluminium slag and drosses	£1,013,257 £179,317	£455,966 £62,761

Project description - provided by applicants

With global aluminium consumption set to reach 120M tonnes by 2025, aluminium production and recycling are large and important global industries. Slag and drosses are hazardous residual wastes from the aluminium smelting industry; historically, after treatment for metal recovery, the residue was landfilled but landfill is no longer permitted by EU waste regulations. While some metal can be recovered at specialist processing plants, it is extremely expensive with very high-energy burden and requires hazardous and toxic waste to be transported across Europe, making recovery uneconomic, but necessary. Closed-loop processing is a key driver and an industry-strategic objective of aluminium smelting, enabling maximum metal recovery, cost savings, efficiency gains, greater materials control, minimisation of hazardous outputs and a reduced carbon footprint.

This project will scale up and demonstrate a novel system developed and patented by Ultromex Limited to radically improve the resource efficiency of aluminium production from aluminium dross (a major constituent of aluminium recycling) by the closed loop upgrading of dross, recovery of metal and salts from the greatly reduced volumes of slag waste and conversion of residual solids into product-grade material (cement aggregates and asphalt in tarmac). This is a front-running technology with confirmed interest and demand from many of the large aluminium smelters including project partner Tandom Metallurgical Group.

The Recyclamet system offers a solution to the industry's waste disposal challenge and a radical economic enhancement of the overall metal production process. The technology is aimed to have a relatively low CAPEX/OPEX requirement and moderate physical footprint which will allow for plants to be built in situ with the smelters. This will allow for speedy recycling and recovery of \>90% of available metal (of known alloy) and furnace salts, removing the need for transporting hazardous material across the EU, minimising landfill and reducing transport, storage and processing costs, and producing safe solid materials (non-metallic particles - NMP) for other value added applications.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
PIRETA LIMITED CENTRE FOR PROCESS INNOVATION	Developing Conductive Textiles for Antennas ~ TexANN	£94,692 £94,787	£66,284 £56,872
Project description - provided by applicants			
There is a need to develop better processes for manufacturing conducting textiles. Textiles have properties which give them many advantages for clothing, medical devices, shelters but if we want to make them "smart" by connecting them to the internet or a satellite, powering them up or hiding them to certain frequencies, current approaches compromise these properties. There is a proprietary process for making thin, controllable and highly durable conducting layers or tracks on a wide range of textiles. The coating retains the feel and mechanical properties of the original textile (unlike, say, textiles made by incorporating wires), it works on a wide range of surfaces and it is resistant to washing (unlike printed coatings). This project will optimise the process to give the ability to make consistent highly conductive textiles at medium volume (tens of m2 per day) at a price which makes them applicable to a wide range of uses.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
JELLY PRODUCTS LIMITED	Optimising materials and manufacture of an in-wheel suspension system.	£201,886	£141,320
COMPOSITE BRAIDING LIMITED		£58,577	£41,004
STRATEGIC SIMULATION AND ANALYSIS		£68,556	£47,989

Project description - provided by applicants

Loopwheels are wheels with integral suspension, which we manufacture in the UK and export to markets around the world for use on wheelchairs. The suspension is provided by carbon composite springs, which replace rigid spokes, providing an easier and more comfortable ride for the wheelchair-user. Working together with our expert partners Strategic Simulation and Analysis Ltd, and Composite Braiding Ltd, the project seeks to develop the innovative Loopwheels in-wheel suspension technology further, using new lighter-weight materials and introducing additional performance benefits. The project seeks to introduce new more efficient processes and methods of manufacture which would be offered by introducing a very innovative composite braiding methodology to manufacture key components within our product. Through this project we aim to develop further our state-of-the-art in-wheel suspension system to enable it to be used in a range of new transport applications, in addition to providing a better experience for people who use a wheelchair.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
CYBER-WELD LIMITED	AutoTIG	£329,669	£230,768
GRAHAM ENGINEERING LIMITED		£50,594	£30,356
Loughborough University		£115,259	£115,259
ROLLS-ROYCE PLC		£175,008	£87,504
TWI LIMITED		£157,014	£157,014

Project description - provided by applicants

TIG welding is a commonly used joining technique for fabricating metal structures across a range of industries. However, it currently has a number of limitations, principally (i) it's heavily reliant on highly-skilled manual welding experts (which are expensive and in very short supply) and (ii) it lacks flexibility to automate the welding of complex geometries.

Adaptive AUTOmated TIG welding (AutoTIG) aims to develop an adaptive and automated closed loop controlled TIG welding system. The project will take state-of-the-art knowledge in welding and adaptive control, and combine this with a process head with a range integrated sensors. Sensors will be used to establish welding paths and vision systems will collect and analyse images of the weldpool for real time adaptive control. Combining sensor data and process knowledge is an innovative approach which we believe will provide a solution to overcome the barriers to robotic TIG welding This will enable a demonstration system to address, monitor and control: the full welding process leading to a high-productivity and low-defect rate TIG welding process.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
OXMET TECHNOLOGIES LIMITED University of Oxford	OptAM: Optimisation of superalloys for additive manufacture using computational methods	£502,180 £214,605	£351,526 £214,605
Project description - provided by applicants			
The use of additive manufacturing (AM) for metallic components is moving from research to commercial application. However, to date, methods for alloy development have not managed to consider the complex relationship between alloy composition and ease of processing by AM. Instead, legacy alloys, developed for established manufacturing processes, have been manufactured in powder or wire form to fit AM applications. However, long-term success of AM will demand new alloys are designed to alleviate manufacturing issues whilst delivering performance beyond legacy alloys. OxMet Technologies Ltd and its partner, University of Oxford, have developed proprietary 'Alloys-by-Design' software for genomic inspired design of engineering alloys. This project focuses on the application of the Alloys-by-Design technology to accelerate the optimisation of new alloys for metal AM.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
PHOTOCENTRIC LIMITED	Development of a novel metal 3D printer using visible light	£488,268	£292,961
HIETA TECHNOLOGIES LTD		£25,284	£17,699
L.P.W. TECHNOLOGY LIMITED		£152,516	£91,510
TWI LIMITED		£163,306	£163,306

Project description - provided by applicants
This project will create an innovative approach to additive manufacturing of fully functional metal components, providing both large scale and low cost to the user. The approach is based 3D printing of parts from a liquid which contains a very high metal content in an organic binder which is photo-curable under visible light. This forms a green body which is then fired to remove the organic content and sintered to full density. This combines the advantages of processes such as metal injection moulding (e.g. excellent resolution of true net-shape parts and removing the need for post-processing to achieve a suitable surface finish for engineering parts) with the flexibility of mass customisation achievable in additive manufacturing, since mould tooling is not required. Over the last 3 years, Photocentric, an established UK manufacturer of photo-curable resins, has developed a new type of 3D printing process using light in the visible range of the spectrum to cure the polymer instead of UV. This enables normal LCD screens as found in iPads and televisions to be used as the image creation device in the 3D printer, reducing costs by an order of magnitude in comparison to laser-based systems. A range of innovative printers has been successfully brought to market for creating plastic objects at lower costs and in larger formats than previously possible, taking advantage of the wide array of high resolution screens available. Now, with the aid of InnovateUK, this consortium will extend the technology to develop a process to deliver custom parts for all industrial sectors in many different metals. LPW, a leading provider of metal powders and TWI, one of Europe's largest research and technology organisations, will work with Photocentric to develop the process. The consortium will develop the ink, the metal 3D printer and the printing process. Industrial direction and process validation will be achieved through the involvement of Hieta, one of the UK's leading exponents of additive manufacturing. The process will enable rapid production of low cost custom metal parts in many different metals supplying them to a variety of industries- all made without tooling direct from a digital file.

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DATA ANALYTICS LABS LTD	The development of a dynamic analytics software platform, which explains the key core dependencies of the vast multifaceted metrology problems within volume manufacturing through a highly visual interactive interface	£384,902	£269,431
SEAGATE TECHNOLOGY IRELAND		£259,621	£129,811

Project description - provided by applicants
This project seeks to develop a dynamic analytics software platform, which explains the key core dependencies of the vast multifaceted metrology problems within volume manufacturing through a highly visual interactive interface where final product performance is determined by the degree of conformance to a 'sameness' metric. This innovative approach pioneered by Belfast-based SME, Data Analytics Labs (DAL) will initially be deployed in one of the critical process blocks at the Seagate Technology wafer fabrication site in Springtown, Northern Ireland. This capability will enable improved productivity through faster cycles of learning for new product introductions, reduced scrap and faster time-to-volume ramps. The project brings together a world-class interdisciplinary UK team. Data Analytics Labs is an ambitious SME with strong growth projection through both collaborative industrial research and independent R&D. DAL has expertise in advanced modelling, machine learning, big data analytics and data engineering. DAL will be able to exploit commercial benefits of a new novel diagnostic and visualisation algorithm application in other technological areas, such as semiconductors, for which commercial exploitation is a viable short or medium term goal. Seagate Technology is a world leader in data storage technology, with approximately 40% share of the global hard disc drive (HDD) market. The Springtown facility produces around 25% of the total global demand for recording heads, the critical sensor in a HDD. As one of only five comparable wafer fabrication sites in the world and the only site in Europe, Seagate is ideally placed to demonstrate commercial viability of the analytics platform in Northern Ireland. For DAL the benefits of grant funding will be significant. This project will enable DAL to prove the viability of a dynamic analytics software platform technology in the data storage field, opening up many business opportunities within the semiconductor industry, an industry which DAL has yet to penetrate.

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C4 CARBIDES LIMITED	Zero radius' laser forming of tungsten carbide/superabrasive cutting edges and teeth	£451,507	£316,055
University of Hertfordshire		£106,678	£106,678

Project description - provided by applicants

We will use innovative additive manufacturing to radically update the process for forming hard teeth on saw blades. The most commonly used tooth tip material is tungsten carbide. In a typical tipped blade less than 1% of the high value wear material is used. The rest is machined off during the manufacturing process or left on the base and discarded when the sharp edges are worn.

State-of-the-art tungsten carbide tipped (TCT) teeth are currently formed by welding pre-formed tungsten carbide inserts to steel strip and then grinding these to a sharp edge. The need to manipulate individual inserts means that fine-toothed metal-cutting blades (\>6 Teeth Per Inch) cannot currently be manufactured. The grinding process is environmentally wasteful - of materials, energy and coolant.

Our new process uses micro laser metal deposition (micro-LMD) of the tip material to form the hard cutting edge, thus avoiding the need to manipulate and weld TCT inserts. In LMD, a jet of powder (eg tungsten carbide) is directed at a surface while being simultaneously melted into the surface by a focused laser beam. We have obtained two patents on tooth-making via LMD. With our subcontractor ManuDirect we have experimented with micro-LMD in a test rig and have been able to achieve hard surfaces on teeth and proved their ability to cut.

The edges of these teeth are still rounded; we are not yet able to form a sharp 'zero radius' cutting edge. However, once we are able to do so, we will have created a near-net-shape tooth, reducing or eliminating the need for subsequent grinding, or even permitting laser sharpening.

Our process should also be applicable to all types of blade and other metal-ceramic combination. However as tungsten carbide is the most widely used abrasive it is our initial focus. The greatest opportunity will be in fine-toothed metal-cutting blades (\>6 TPI) where there is currently no possibility of using TCT inserts and conventional bimetal blades blunt easily. In addition, we see an opportunity for a wood cutting saw blade that sits in the gap between bimetal and TCT in terms of cost and performance.

The lead partner is a manufacturer and exporter of abrasive saw blades and will exploit the process through its customer base. The consortium includes a powder supplier, the UK's leading university in this area and a subcontractor that is expert in micro-LMD equipment.

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QIOPTIQ LIMITED	Multifunctional PAEK nanocomposites for Additive Manufacturing (F4 PAEK)	£31,400	£15,700
2-DTECH LIMITED		£154,747	£108,323
AIRBUS OPERATIONS LIMITED		£4,248	£0
HAYDALE LIMITED		£198,400	£119,040
HOSOKAWA MICRON LIMITED		£44,300	£22,150
THALES UK LIMITED		£51,923	£25,962
University of Exeter		£242,246	£242,246
VICTREX MANUFACTURING LIMITED		£135,399	£67,700

Project description - provided by applicants

The aim of F4 PAEK is to produce novel nano-composite materials for additive manufacturing. These new materials will offer multifunctional capabilities including lightweighting, thermal and electro-magnetic properties. The initial target applications are focussed on the defence and aerospace industry but the developments have potential implications and benefits that are far reaching, bringing together the advantages of improved material properties with the design freedom and lightweighting potential of additive manufacturing.

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INTENSICHEM LIMITED	Catalytic Materials Supporting Novel UK Based Continuous Redox Reactions for the	£96,460	£67,522
JOHNSON MATTHEY PLC		£41,518	£20,759

Project description - provided by applicants
Chemical manufacturing has historically been a strength of UK industry. "The manufacture of modern medicines is one of our leading manufacturing sectors worth over £20bn," George Freeman, Minister for Life Sciences. It is recognised by government that UK's global position will only be sustained by innovation and advanced manufacturing. The societal and political need for medicines to be brought to market as fast and cheaply as possible must be met, at least in part, by the manufacturing sector. A revolution in manufacturing is seeing a move from traditional batch modalities to continuous processes, the benefits of which include: capital reduction; manufacturing lead time reduction; working capital reduction; footprint reduction; reduction in solvent use; reduction in water use; carbon footprint reduction; and reduction in development time. Hydrogenation is an important process in chemical manufacturing; it has been proposed that 10% of manufacturing reactions are catalytic hydrogenations. Hydrogenation in batch reactors on a manufacturing scale is limited by large volumes of hazardous materials. With the promise of considerable savings of time and money, better performance and significant safety advantages, continuous hydrogenation is a substantial unmet need. By bringing together two ideally suited UK-based partners, this project aims to solve the problem. IntensiChem -- an SME based on Discovery Park Kent -- has made substantial advances in developing large-scale continuous flow hydrogenation technology. Johnson Matthey is a global player in the catalyst market, and is synonymous with batch catalyst. The Cambridge-based group has already begun to collaborate with IntensiChem on the challenge of designing new catalysts specifically for flow reactors. Both companies see this as key to unlocking the full potential of the technology. The production of a new generation of catalysts and the optimisation of manufacturing process will transform the market for continuous flow hydrogenation, and make the two UK companies key players in the field.

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MCLAREN AUTOMOTIVE LIMITED	Advanced Lightweight Preform Automation 2	£610,138	£305,069
DES COMPOSITES LIMITED		£937,800	£656,460
Manufacturing Technology Centre		£416,036	£416,036
Project description - provided by applicants			
A consortium, led by an automotive OEM, with partners including a composites specialist and a high value manufacturing catapult centre, aim to develop technologies that will significantly reduce the cost of utilising advanced composite materials in automotive applications. Through a combination of reduced material wastage and automated pre-form manufacture, these technologies will have a significant impact on the cost of resin transfer moulded composite components. Not only will they be of benefit to the automotive industry, but also to other industrial sectors such as wind energy, sporting goods and aerospace.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
FORD MOTOR COMPANY LIMITED	High Volume Additive Manufacturing	£532,897	£266,449
HSSMI LIMITED		£303,071	£303,071
QUICK RELEASE (AUTOMOTIVE) LIMITED		£193,111	£115,867

Project description - provided by applicants
Additive Manufacturing (AM) has been used in prototyping and manufacturing one-off parts. The overall objective of the program is to deploy High Speed Sintering technology (HSS) in a high-volume production environment in series production. Our vision for the High Volume Additive Manufacturing (HVAM) program is to lead in deploying AM technology in a high-volume production environment to deliver outstanding value and knowledge for sustainable manufacturing. The project aims to develop HSS technology suitable for series production. The project aims to develop a decision-making tool will be used to compare and contrast AM against conventional manufacturing techniques. A systematic process of material selection to develop materials suitable for HSS, along with identifying the right process parameters and a test strategy for validation and benchmarking will be the followed. The project is unique as it will focus on developing a design for integrating the HSS technology in series production. In addition, a data driven approach will be taken in decision making which is a key focus of the program. The key objectives include 1\. Reduction in tooling costs 2\. Quality improvement for high value parts (Part Geometry) 3\. Improving Resource Efficiency (raw material use reduction) 4\. Faster demand fulfilment 5\. Secure and create high skilled jobs and attracting new investment. The project is novel as it aims to develop proprietary materials suitable for HSS. The program will also focus on creation of a bespoke tool to identify parts that are suitable for AM. This will provide valuable knowledge to manufacturers and designers to ensure readiness for digital manufacturing processes. In addition, the HVAM project is unique as it will focus on generating a design for integrating HSS in high volume production environment.

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NISSAN MOTOR MANUFACTURING (UK) LIMITED	FELDSPAR Flexible Die-less Panel	£270,821	£135,411
CHASESTEAD LIMITED		£79,336	£47,602
Manufacturing Technology Centre		£147,128	£147,128
PRIMETALS TECHNOLOGIES, LIMITED		£103,814	£51,907
University of Bath		£45,284	£45,284
Project description - provided by applicants			
The FELDSPAR project will combine efforts from University of Bath, Primetals Technologies, MTC, Chasestead and Nissan to take an immature UK developed die-less forming technology and develop its application in automotive body panel manufacture			

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