Innovate UK

Results of Competition: Jiangsu-UK Industrial Challenge Programme - Open

Competition Code: 1704_EE_JIANGUK_EE

Total available funding is £10M

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
Materials Processing Institute	SUPERSLAB: Novel Uni-directional Casting Technology for Manufacturing Super Extra-thick Offshore Steel Plate	£349,924	£209,954
University of Leicester		£128,472	£128,472
TWI Limited		£19,668	£19,668

Project description - provided by applicants

The project aims to develop a transformational technology for the production of extra thick and higher strength 'SUPERSLAB' steels required for the growing needs of the off-shore wind, oil, renewable energy and other thick plate using sectors in the UK, China and Europe. These materials are required to meet the requirement for infrastructure development in these growing sectors, to secure the energy needs of the 21st century. There are problems in meeting the need for the thicker, higher strength materials envisaged. The required properties for the thickest plates require rolling from cast slab initially at least four times thicker. Due to the nature of solidification, there is a tendency for the alloys required for increasing strength to segregate towards the centreline. In conventionally cast product this may be trapped at that point. This limits development of higher strength, thicker material and constrains the casting process limiting production rate and requiring significantly bigger, stronger casting machines for which economic justification is difficult. No supplier in the UK or China is currently capable of addressing this need and the thickest slab cast in Europe is limited to 400mm. This project will develop a new casting technology based upon unidirectional solidification which will overcome the issue of centre segregation, opening the way to a step change in both quality and thickness for high strength plate. In doing so it will also open opportunities for producers and machine builders in both countries to develop this growing new market.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Innova Integra Limited Loughborough University	AgriRobot: Autonomous agricultural robot system for precision spraying	£373,594 £126,370	£261,516 £126,370
Project description - provided by applicants			
The AgriRobot project will extend and apply the cutting-edge technology developments from driverless vehicles, robotics, and AI to develop a highly innovative agricultural robot system to deal with the current challenges in agriculture that include the shortage of farm workers in China, UK and other countries and regions; lack of efficiency in orchards and farms; risks to operators; environment pollution; and pesticides residue in fruits. The developed agricultural robot system can automatically travel in a row in orchards or farms without collisions with trees/plants/people, and also can intelligently manoeuvre to change from one row to another; The developed sensor-based variable-rate air-assisted sprayer can analyse the presence, size, shape, and density of target trees/plants, providing a unique and precision spraying operation applying only the necessary amount of pesticide when needed, leading to more efficient spraying while reducing the demand of human operators.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
MAP IP Holding Limited	Development of the first low cost, mass market, non-invasive prenatal diagnostics test for Down Syndrome	£498,745	£349,122

Project description - provided by applicants

The global market for non-invasive prenatal testing for Down Syndrome and other birth defects is expected to reach $7.2bn by 2022 (28% CAGR). Despite this rapid growth, the high cost ($500+) associated with the leading blood based DNA testing and issues regarding sex-determination compliance has meant in 98% of pregnancies in developing countries, including China, prenatal testing is either conducted i) invasive ii) late (3rd trimester) or iii) not at all - putting patients at risk, resulting in cultural stigma and leading to uninformed, underprepared healthcare decisions and provision. To address this, partners MAP IP Holding Ltd (Leading prenatal test experts) and Jiangsu Skyray Instrument Co., Ltd. (Global microbial hardware developers) are to develop the world's first low cost, mass market, non-invasive prenatal diagnostic test for birth defects that can be taken in the first trimester of pregnancy - 4 weeks earlier than the leading DNA test. The project is based upon the spectral analysis of urine using a MALDI mass spectrometer and machine learning algorithms to identify the spectral signatures of particular birth defects. Earlier, cheaper, urine-based testing will increase the ease and availability of prenatal testing in developing countries, enabling better informed healthcare decisions earlier in a pregnancy. This not only will reduce the healthcare risk to patients but will support better state provision for and help reduce the stigma around Down Syndrome & other manageable conditions. With receptive markets in China, India, MENA as well as the UK, the project represents a joint £16m opportunity for Y1 -> £127m by Y5.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Porvair PLC Swansea University	Automated Epigenetics Stratification	£350,757 £71,871	£175,379 £71,871
Project description - provided by applicants			
Epigenetics is a biological process that controls how genes are expressed. If the process goes wrong this can lead to disease including cancer, dementia and even developmental abnormalities in children. Scientists are unravelling the mechanisms controlling epigenetics, and have discovered that chemical modifications to proteins and DNA that occur when the epigenetic process goes wrong can be changed or reversed using medicines. Like the genetics revolution where the human genome was decoded, our epigenome (controlled by epigenetic processes) also offers a way of diagnosing disease and monitoring response to drugs. However, unlike the genome, the epigenome is very dynamic and underdoes constant changes, and this can be monitored using special tests. This project brings together Porvair (UK) and Tianlong (China), two companies that have complementary technologies to analyse epigenetic processes. Together, and in partnership with Swansea and Xian Jaotong (Suzhou) universities, they will develop new products to speed up and simplify the study of epigenetics. Ultimately this will allow researchers and diagnostic labs to deliver significant advances in this exciting and important area in the UK and China.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Environmental Process Systems Ltd	A Novel Thermoelectric Heat Pump/Heat Recovery System for Low Carbon Buildings (EcoPump)	£159,334	£111,534
University of Nottingham		£150,000	£150,000
P.A.K Engineering Limited		£99,678	£69,775
Thermo Electric Devices Limited		£89,831	£62,882

Project description - provided by applicants

The project main aim is to address the disparity in the market of energy saving technologies, by developing a novel thermoelectric heat pump/heat recovery system for low carbon buildings (EcoPump). The EcoPump will offer a unique solution to the scope requirement 'œto stimulate economic growth in China (specifically Jiangsu province) and the UK. The project presents an innovative integrated window heat recovery unit (WHR) with a thermoelectric (TEC) heat pump and eco-aerogel air filters for removal of particle pollution or particulate matter (PM) pollution including PM 2.5. The EcoPump can provide efficient heating (or cooling), and clean filtered fresh air ventilation depending on the occupant's requirements. The latter will contribute significantly in addressing energy supply-demand in buildings through the use an efficient heating load management system. Successful project implementation will benefit the whole community, industry, the customers and the UK and China economy.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Adelan Limited Conrad Anderson (Midlands) Limited	Extending battery storage by fuel cell in solar home	£357,481 £114,194	£250,237 £79,936
Project description - provided by applicants			
This project is to develop a 'SOFcSOLar' (SOFSOL) home power system combining the solar battery infrastructure of the Jiangsu partner ZNB with the solid oxide fuel cell (SOFC) knowledge of the UK company Adelan, with manufacturing expertise from Conrad Anderson. Renewable energy is increasingly used in China homes, but is limited by energy storage. Batteries are traditionally being used to store the intermittent renewable energy but the problem is battery weight, volume and cost. We have shown that fuel cells can enhance the battery storage to give many times more storage and back-up capacity for the same weight/volume/cost, while also providing hot water from the gas grid. Therefore the proposed new solar/battery/fuel cell product to be developed in this project will be beneficial in solar house applications, with large market demand. The project is led by Dr K Kendall FRS, Adelan Ltd in the UK and by Mr Guo Junping, assisted by SOFC expert Dr Liang Bo, in Jiangsu. The UK and China partners have a strong track record in the fuel cell, battery and solar fields and have visited each other many times over the past 3 years. The outcomes will be:- A new joint company to commercialise the results in China markets; New product prototypes for market application in China; New IPR for inventions; New publications in Scientific Journals.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Birmingham High Performance Turbomachinery Limited	A Turbo Range Extender (TREx)	£554,418	£388,093

Project description - provided by applicants

Electric vehicles (EVs) are featured with zero emission and excellent driveability, but the travelling range per charge has constrained their wide adoption by public. Adding batteries is one of the current solutions to extend the range, but the weights and costs of these vehicles increase considerablly. Some companies have employed a small piston engine with an electric generator, but the emissions and thermal efficiency are worse than those of bigger piston engines measured in per unit power output. This project is proposed to develop a turbogenerator with a radical configuration as the future range extender for EVs. Compared with the current microgas turbine engines, the proposed engine has much higher thermal efficiency. Compared with current piston engines, it cuts NOx by 85%. Apart from applications in EVs, the new turbopower system can also be used in marine vessels, UAVs, heavy duty vehicles, distributed power generators, and portable power sources. In the proposed project, Birmingham High Performance Turbomachinery Limtied will be working on developing the engine until it is fired and tested. The new engine will be fitted with patented new hybrid air bearings to reduce friction and wear. The Chinese company Wuxi Yuanchang will develop a high speed electric generator to be installed on the engine. The proposed turbogenerator has the possibility to be the future drivetrain for EVs and impacting a European light vehicle market estimated to be worth half a trillion Euros.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Disulfican Limited University of Wolverhampton	Formulation and testing of PLGA-DS as an anti-cancer therapy for FDA and EMA new drug	£210,117 £90,000	£147,082 £90,000

Project description - provided by applicants

Due to the cost ($1.5 billion), time (15 years) and high failure rate (up to 95%) of novel drug development from new compounds, there is a global trend towards the repositioning of known drugs for the treatment of cancer. We have demonstrated that Disulfiram (DS), a long-established anti-alcoholism drug, possesses excellent anticancer activity with low toxicity to normal cells. However, the effectiveness of DS as a cancer treatment has previously been limited by its bio-instability (~4 min half-life in the bloodstream). We have demonstrated that we can substantially improve the half-life of DS in the bloodstream by encapsulating it in certain nano-particles. Furthermore, we have conducted both in vitro and in vivo trials in a wide range of cancer types (based upon laboratory scale encapsulated DS product) that have produced encouraging results. In order to translate our laboratory results into cancer clinic, we propose to set up a collaborative study with Suzhou Bank Valley Ltd in Jiangsu province, China. In this project, Suzhou Bank Valley Ltd will develop nano-encapsulated DS at GMP quality and transport it to Disulfican Ltd. We will use laboratory facilities in the UK (the University of Wolverhampton and elsewhere) to examine the in vitro and in vivo anticancer activity of the newly developed nano-DS in animal cancer models. The goal of this proposal is to verify the anticancer efficacy of the GMP qualified nano-DS and provide preclinical data prior to scaling up manufacturing and embarking upon phase I clinical trials.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
AIXTRON Limited	Scaling up nano-carbon deposition layer for high-power lithium ion battery (LIB) current collectors	£401,591	£240,955
Project description - provided by applicants			
This innovate UK-Jiangsu project aims at developing an unique nano-carbon coating technique on LIB current collectors. This can offer higher capacity and faster charging rates for high-power LIBs, which are essential for electric vehicles. The technique is based upon a roll-to-roll manufacturing strategy, and capable for high volume mass production. The project will be able to provide manufacturing equipment and nano-carbon coated current collector as products on the market. It will not only help UK to accelerate its development in the high-tech nano-carbon and related industry, but also it contributes to the LIB high-end accessory market in Jiangsu, China.			

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Oxford MEStar Limited Cell Therapy Catapult Limited	A closed automatic modular cell culture system for personalised autologous cell therapy	£345,300 £154,400	£241,710 £154,400
Project description - provided by applicants			
Recent advances in cell therapy and immunotherapy are changing the face of modern medicine. In particular a new type of treatment '" CAR-T therapy '" made from the patient's own immune cells is offering new hope to cancer sufferers. The drawback of these treatments is that they are extraordinarily expensive to produce using current methods and hence are unaffordable to public healthcare systems. The aim of this project is to develop a new type of manufacturing system that dramatically reduces production costs through the use of automation and modular design. By developing and commercialising this technology the project partners ambition is help make CAR-T therapy accessible to everyone and to become world leaders in equipment for cell-therapy manufacturing and in cell-therapy manufacturing services. **** Lead in Jiangsu Province: Aokai (Suzhou) Biomedcial Ltd. Application Reference: SBZ2017000276 ****			

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Arrayjet Limited	Connected point-of-care diagnostic platform for fast, responsive healthcare provision	£123,878	£86,715
Postulate Ltd		£374,500	£262,150

Project description - provided by applicants

Point-Of-Care Testing (POCT) allows the rapid diagnosis of disease and delivers the test results whilst the patient is present. This is in contrast to centralised testing where a patient has a sample taken (e.g. blood) which is then sent to a laboratory for analysis. POCT is becoming increasingly used due to the benefits of delivering diagnostic results at lower cost and with greater speed, allowing more responsive and effective healthcare decisions to be made by the healthcare provider and improving communication and engagement with the patient. This approach is particularly beneficial for patients living in remote rural areas for whom the transport of samples to a central laboratory is difficult. Those living in urban areas can also benefit as the burden on centralised clinics and laboratories can be reduced (especially for routine tests). In this project we aim to deliver improved POCT devices based on innovative bio-deposition techniques developed at ArrayJet, UK, combined with advanced microfluidic cartridge technology developed by Nanjing Kensington Diagnostic Technology in Jiangsu province, China. ArrayJet will develop key manufacturing processes and assist Kensington Diagnostic setup a dedicated manufacturing facility in the UK. This will provide core components for Kensington's POCT system which will be marketed in China in the first instance. Hence the project will provide substantial benefit to the UK economy through employment, manufacturing and export opportunities to the largest market for POCT and will also generate significant revenue opportunities for ArrayJet through the sale of custom manufacturing equipment.

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RadMod Research Ltd	Low Cost High Reliability Radiation Hardened Electronics System	£279,138	£195,397
Kallisto Consultancy Limited		£175,121	£122,585

Project description - provided by applicants

Robotic systems, including satellites and flying robots, or drones, are becoming increasingly widespread. One of the benefits of autonomous or semi-autonomous robots is that they can go to places where people can't go. For example, the radiation environment in space, due to cosmic radiation, or close to nuclear reactors, is dangerous for people - but also for microelectronic systems. Space-technology companies have well-established expertise in making satellites that can cope with space radiation, but the solutions are mostly very expensive and suited only to medium and large spacecraft. This means that they are not practical for widespread adoption in large numbers in other industries with similar radiation challenges. If the opportunities afforded by advanced microelectronic systems are to be exploited in low-cost space systems - so-called "nano-satellites" - or in other fields, for example nuclear protection, we need "radiation-hardened" electronics that are smaller, lighter - and cheaper. This project will combine space-systems expertise from the United Kingdom with microelectronics design and manufacture capability from China, to achieve that. The project will deliver a prototype of a generic electronic system, containing key elements required by all mobile robots, exploiting expertise radiation hardening by design validated by testing against each of the types of damaging radiation the system might receive. It will deliver a capability that can be exploited in a wide range of harsh environments.

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