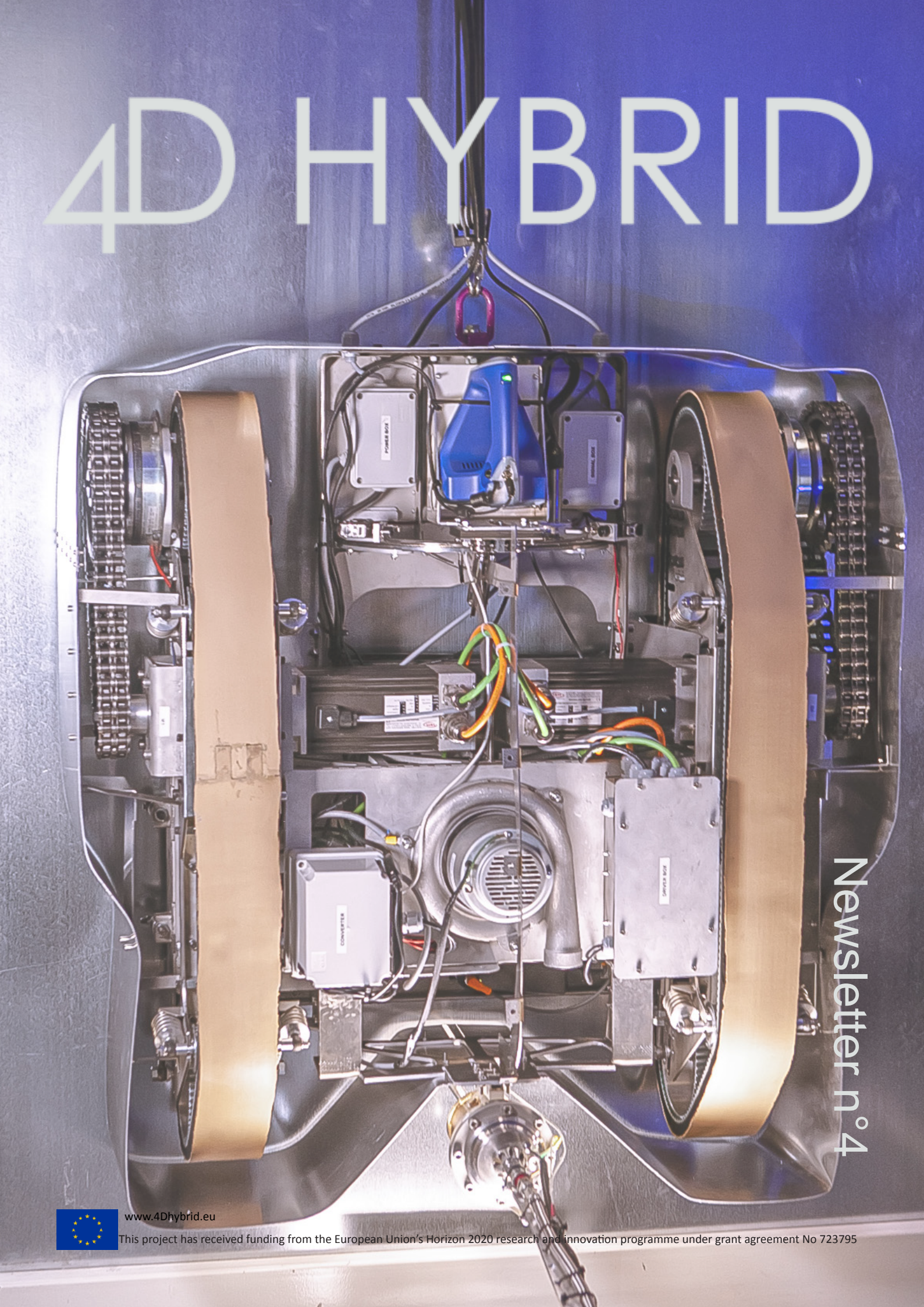
4D HYBRID



Newsletter n°4

www.4Dhybrid.eu

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723795

The Innovative characteristics of 4Dhybrid

The 4Dhybrid project has been funded under the European Commission Horizon 2020 - Call 723795 and involves 20 Partners from 10 different countries. The project is coordinated by Prima Industrie and the consortium involves 12 industrial players, operating as technology suppliers and end users. SUPSI is responsible for the research and technical coordination of 4DHybrid.

The 4DHybrid main objective is to develop a new concept of hybrid additive manufacturing, supporting the Maintenance Repairing Operation (MRO) value chain with particular focus on medium to large size high added value components.

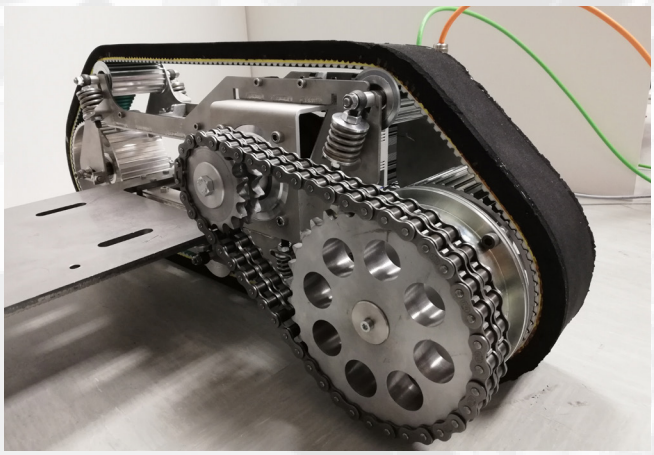
In detail, this entails the development of compact and low-cost modules including laser source, deposition head, sensors and control that can be integrated on robots and machines; such modules embed various technologies to enable additive and subtractive technologies - such as Direct Energy Deposition (DED) and Ablation or Cold Spray (CS) – in addition to technologies for monitoring and inspection.

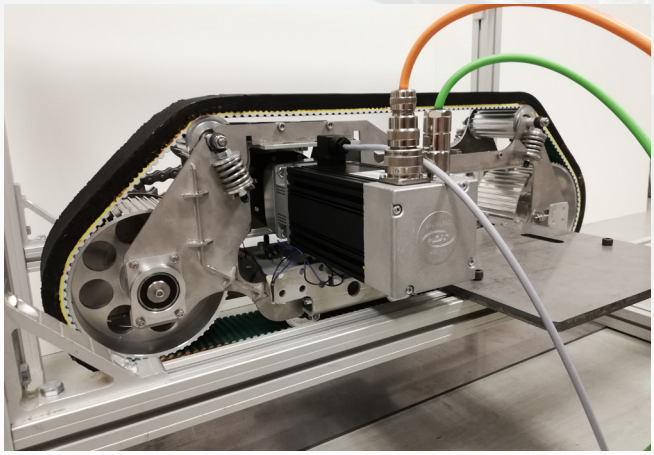
The 4DHybrid equipment portfolio is conceived for running both in a standard production facility and in off-shore harsh environment. This makes the project results suitable for aerospace, oil &gas and power generation industries. The modularity concept together with the adoption of complex sensor-based monitoring systems will enrich the current state-of-the-art hybrid solutions with promising prototypes (Technology Readiness Level - TRL7), aiming to provide new possibilities for production and repairing sectors, where a multitude of technologies and equipment will be flexibly adopted.

The project exploitation strategy: Out of the lab. Into the market

The project exploitation strategy relies upon major industrial stakeholders of the project consortium that are very active in the MRO industry. For example - Prima Industrie will include in the company product portfolio the deposition modules for DED and Comau will launch a new generation of robots for additive manufacturing and milling operations.

With SUPSI, ARM Lab – having the advantage of abundant industrial network of partners - deeply operates in supporting National and European industries to enable the adoption of cutting-edge solutions. 4D Hybrid modules can be integrated in any sort of manufacturing equipment, thus avoiding major overhaul at industrial level. With this regard, a key sensitive aspect for us is to deploy solutions that are frictionless for end-users and demand for a very limited ramp-up time. This should ensure a faster and efficient absorption of project results. Also, 4D Hybrid demonstrators are currently running in ARM physical laboratories to support side activities, such as industrial mandates and equipment commissioning to industrial customers; this boosts our comprehension of advantages and drawbacks during the modules' integration in the overall production infrastructure and industrial value chain. The idea is always to target the realization of reliable and industrially robust solutions.

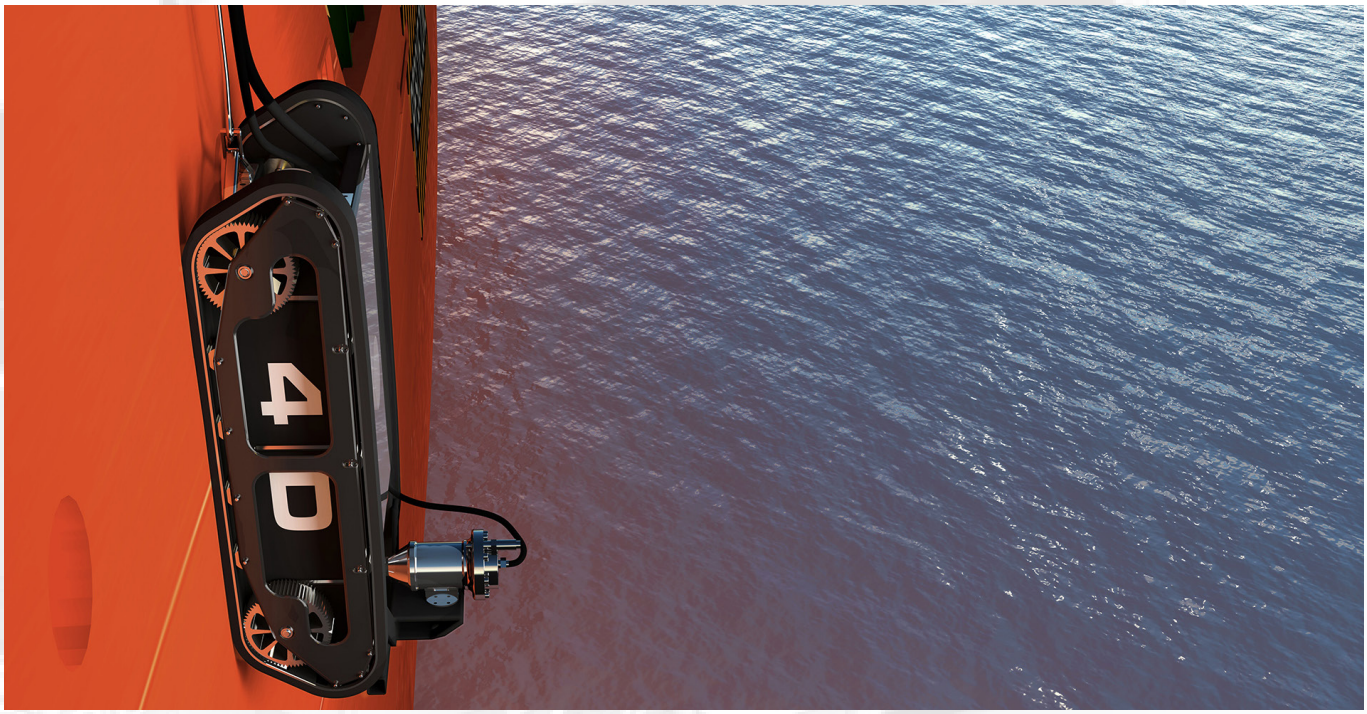




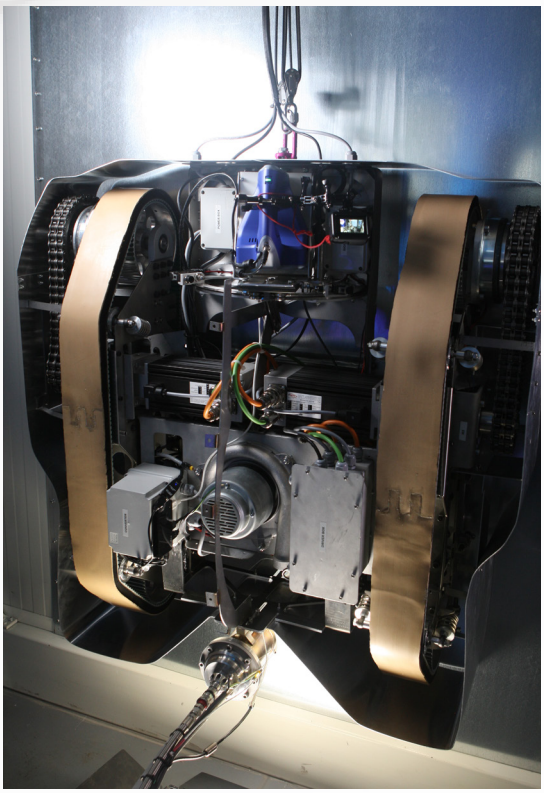
The 4D Hybrid Autonomous robot

In its first two years, 4D Hybrid developed an autonomous robot that can detect and repair vertical metal surfaces, including in offshore environments. The robot includes both a 3D Scanner and a Cold Spray gun. The 3D scanner is an Artec Space Spider commercial scanner able to reconstruct the surface and individuate the corrosion/defects on the metal surface.

The Cold Spray system, developed by SUPSI as part of the 4D Hybrid project, deposits new metal coating stainless steel or aluminium – on the surface. When performing its Cold Spray in open environments, the robot minimises the dispersion of powder thanks to a recovery system that sucks up the powder and carries it to the top of the ship.



The autonomous robot is designed in order to repair all metal surfaces – corroded or not – whether in presence of water and dirt, and with an outside temperature ranging between 3°C and 35°C.
To climb vertically the slippery surfaces, the robot is a tracked vehicle, equipped with two robust rubber belts that adhere to the surface thanks to a vacuum-based adherence system. The robot can move back/forth and rotate on its main axis. Furthermore, PrimaIndustrie will include in the company product portfolio the deposition modules and Comau will launch a new generation of robots for additive manufacturing and milling operations.



SUPSI and the 4D Hybrid project victory of the Overall Prix

On 26 September 2019, the 4D Hybrid project and SUPSI were awarded the Overall Grand Prix of the Innovation Radar Prize 2019, as well as the women-led innovation category prize for 2019 during the European Research & Innovation Days organized in Brussels, by the European Commission Research and Innovation DG.

The Innovation Radar Prize

The Innovation Radar (IR) is a European Commission initiative to identify high potential innovations and innovators in EU-funded research and innovation projects.
Using the radar, 36 among hundreds of the best EU-funded innovators have been identified to compete with their EU-funded innovation for the Innovation Radar Prize 2019. During August, 12 finalists have been selected by an open public poll for four specific categories:

- Tech for Society – recognising technologies impacting society and citizens
- Innovative Science – cutting-edge science underpinning tomorrow's technological advances
- Industrial & Enabling Tech– the next generation of tech and components supporting industry
- Women-led innovations – recognising dynamic women developing and leading great innovations with EU-funding.

4Dhybrid on EURONEWS

As winner of the the Overall Grand Prix of the Innovation Radar Prize 2019, as well as the women-led innovation category prize for 2019 during the European Research & Innovation Days organized in Brussels, by the European Commission Research and Innovation DG, the 4D Hybrid project was broadcasted on EURONEWS on 4 December 2019, with a special reportage

Scan me!

ITI
International TechneGroup

General Information

International TechneGroup Ltd (ITI) has been active in the engineering analysis software market for over 40 years. ITI's CADfix tool is world leading software in the field of complex geometry preparation and pre-processing, with a focus on the re-use of CAD models in engineering analysis applications.

CADfix is deployed globally by many of the world's leading aerospace engineering companies including: AIRBUS, BAE SYSTEMS, Boeing, Ford, NASA and Rolls-Royce. CADfix has benefited from close collaboration with researchers from leading universities in the field of computational geometry, including: Cambridge University Computer Lab, Carnegie-Mellon, Queens University Belfast and Cardiff University. With today's ever increasing dependence on a 3D digital product definition ITI sees 3D geometry processing issues becoming increasingly the weak link. With direct input from cutting-edge industrial users and access to some of the latest academic research, ITI's mission is to develop and deliver game-changing breakthroughs in 3D geometry processing for CAE.

Role in 4D Hybrid

ITI are involved in the development of software to help manage and control the CAD data being processed as part of project. This encompasses both abstract management of CAD geometry files and the implementation of specialized processes used within the manufacturing loop.
In the early stages of the project ITI was involved in the development of the Co-Engineering platform which models potential users' interactions with the 4D Hybrid tools as part of a maintenance cycle for large, hard-to-access metal structures and components.
ITI's tools area also used to process the geometry in preparation for the DED additive manufacturing stage. Here, the CADfix CFI interface is used to develop a custom, standalone geometry processing tool that combines CAD data and 3D scan data as part of a closed-loop manufacturing process.

UNIVERSITY OF BIRMINGHAM

General Information

The University of Birmingham (informally Birmingham University) is a public research university located in Edgbaston, Birmingham, United Kingdom. It received its royal charter in 1900 as a successor to Queen's College, Birmingham. The University was ranked 14th in the UK and 79th in the world in the QS World University Rankings for 2019.

Within the campus in the Interdisciplinary Research Centre (IRC) for Materials Processing, (School of Metallurgy and Materials) the AMPLab (Advanced Materials processing Lab) group is based. The research programme carried out in AMPLab aims at understanding the influence of advanced materials processing techniques (additive manufacturing, powder processing, and solid-state joining) on the microstructure-property development in advanced materials. Simultaneously, the research activities aim at developing new materials, and assessing their processability using a number of advanced manufacturing methods. In particular, the manufacturing processes and materials typically investigated include selective laser melting (SLM), direct laser fabrication (DLF), hot isostatic pressing (HIPping), and friction joining (linear friction, friction stir, and inertia friction welding) for ferrous alloys, titanium alloys, nickel superalloys, and aluminium alloys. The scientific emphasis is on understanding the material-process interaction, utilising electron microscopy, synchrotron X-rays and neutron diffraction, and micro-tomography, to assess the impact of the processing method on the microstructural, structural integrity, and residual stress development.
The facility include also a material simulation department and the research is performed in close collaboration with a large number of industrial end-users in the aerospace, defence, nuclear, and general engineering sectors, including Rolls-Royce plc, BAE Systems, Safran Group (Messier-Buggatti-Dowty and MicroTurbo), TWI ltd, Meggitt, AEC, TIMET, and others). The group works closely with the Catapult's Manufacturing Technology Centre (MTC), providing the academic leadership for the netshape and additive manufacturing theme.

Role in 4D Hybrid

The University of Birmingham as a researcher partner is involved in activities within the 4D Hybrid project that are mainly focused on the deposition and subtraction process design for Round Robin Parts and CAx chain. In detail, depending on the final part requirements and material behaviour, the University of Birmingham and the involved partners have developed the process parameters map concerning the Direct Laser Deposition technology, cold spray, ablation and metal cutting together with the other partners. According to the Round Robin parts defined, the overall processing map scenario for all the manufacturing processes was defined also in terms of the quality of the produced parts. Subsequently, these operations were considered as process steps and the University of Birmingham with the cooperation of the other partners transformed in CAM module in order to became processable file for the CNC machine of 4D Hybrid equipment.

MCI is the global leader in engaging and activating audiences. Since 1987 we have been helping clients harness the power of community by applying strategic engagement and activation solutions to build unforgettable online & offline experiences that enhance business performance for the years to come.

For companies we bring memorable experiences to life, help them connect with their audiences and increase their influence by aligning strategy, technology and creativity. For associations we enhance their strategic and tactical operations, assist them in growing globally and facilitate the integration of technology for achieving key short- and long-term objectives.

MCI began its strategic expansion around the world with a vision to offer client solutions from strategic consulting to execution and delivery of programmes globally and locally. Today, MCI operates in 31 countries worldwide, spanning Asia-Pacific, the Americas, Europe, India, the Middle East and Africa.

We recognize the power of experiences to build stronger people relationships. Our brand portfolio integrates a range of creative and strategic disciplines to offer our clients the best advice to better engage and activate their target communities.

MCI BENELUX was founded in 2003, as a merger between MCI and GIC Management (originally founded in 1991) and services both the institutional and corporate market, building unforgettable online and offline experiences that foster change, inspire, educate and enhance business performance.

Located at the heart of Europe, MCI Brussels, delivers world class PCO, Corporate and AM&C services to clients across the world. We thrive on excellence and we deliver services that reflect our motto that “When people come together, magic happens”. With almost 100 highly-skilled individuals, we boast a multicultural environment right at the heart of Europe’s capital, Brussels. With more than 20 different nationalities and over 22 different languages spoken we take pride in our diversity. We have been doing the heavy lifting for over 30 years, building human connections with brands and associations, who know that with us, they are in good hands. After all, it’s not just the projects that motivate us; it’s the relationships we build along the way.

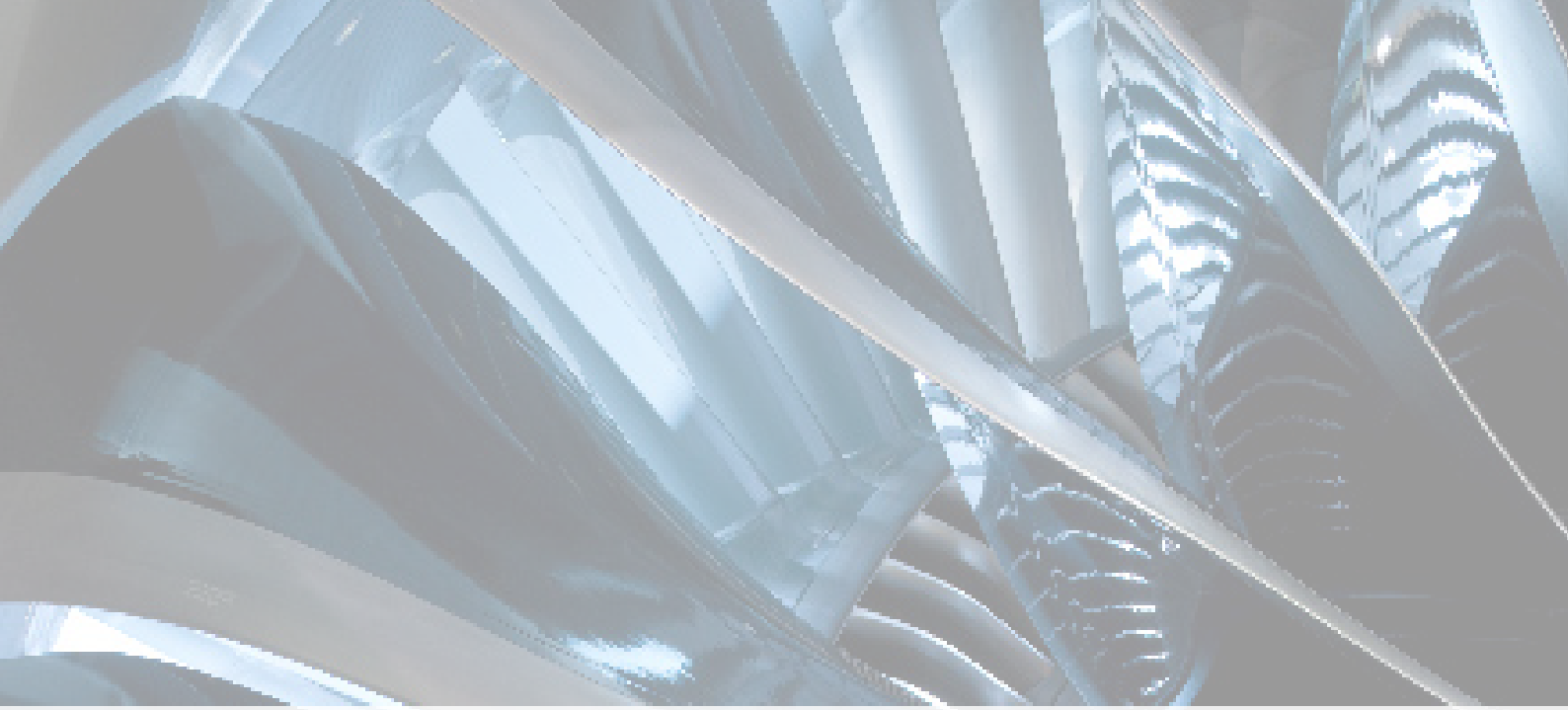
Role in 4D Hybrid

Communications, Dissemination and Industrial promotion

MCI managed all the communications, the traditional and social media. Furthermore, the promotion within the industrial sector included the organization of a number of events specifically tailored to the needs of different audiences across the spectrum of laser based additive and subtractive processes. These events focused on hands-on technology demonstrations, debates and the presentation of emerging scenarios for intelligent industrial automation coupled with user feedback sessions.

Exploitation Program

Together with the industrial and R&D partners, MCI developed the exploitation strategy and plans in view of the commercial exploitation of the results produced by 4Dhybrid, targeting several categories of equipment, services and areas of business, determining new industrial usage scenarios to maximize the benefit from the adoption of this new technology. The final exploitation plan is based on the best scenarios for end-user adoption of the technology in European countries within a period of five to ten years after the completion of the project and incorporates a structured business plan, which states the strategy to support the follow-up, industrialization, commercialization and usage of the 4D solution. The business plan also identifies exploitation strategies for the commercial solution, the market policies for partners as well as potential additional partners to be involved in order to ensure the best industrial impact.



Project Coordinator

Prima Electro
electronics and laser technologies

Technical Coordinator

SUPSI

Project Partners

COMAU

Keen Bull

3D-NT
ADDITIVE TECHNOLOGIES

Technology Transfer System

Prima Power

RAMTEID

LMS
Laboratory for Manufacturing Systems & Automation

mci

IRIS
Playground for new Ideas

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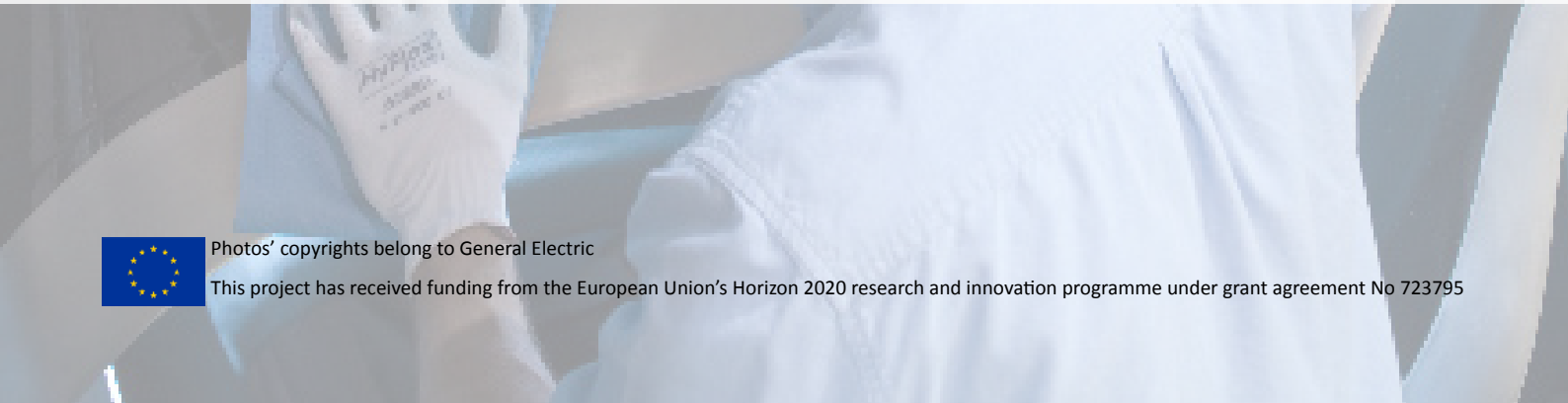

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