

OpenHybrid successfully develops two hybrid machines addressing manufacturing and repair applications

The machines have proven the ability of hybrid (additive and subtracting) manufacturing technologies by developing working parts addressing the needs of mining, automotive and power generation companies while collaborating with standardisation bodies

Combining laser-based Additive Manufacturing (AM) and Computer Numerical Controlled (CNC) machining in a hybrid approach is increasingly popular, with Directed Energy Deposition (DED) being the most commonly used AM process. As it reaches its conclusion, the OpenHybrid project (coordinated by the MTC) has shown the effectiveness of DED Additive Manufacturing in a broad set of usage scenarios, ranging from mining, automotive and power generation industries.

A key aspect of the OpenHybrid approach is the use of a standardised docking system. This patented approach developed by Hybrid Manufacturing Technologies Ltd provides unrivalled flexibility enabling new processing heads for DED AM to be automatically changed during the hybrid AM process.

The consortium has developed two hybrid platforms: one for medium parts and another one for large parts, in both cases for manufacturing and repair uses, which were demonstrated for repair applications although the approach can be used for new part manufacture. The first one uses a Powder head feed system, developed by HMT, while the latter uses a wire head feed system developed by Fraunhofer IPT and HMT. To ensure that both applications are widely accepted, the project has also worked to ensure that it supported the development of additive manufacturing standards by engaging the most relevant standardisation bodies: ISO, CEN, ASTM and AWS. The project has also been able to develop the following extended system capabilities from the consortium members:

- CAD/CAM Adaptive Software by BCT and Picasoft
- Process simulation Tools by ESI
- Laser Measurement Head
- Laser Ultrasonic NDT inspection for defect analysis by TWI
- Enhanced gas shielding by TWI & MTC
- In-process inspection utilising thermal and optical imaging as well as advanced laser ultrasound technology MTC & TWI

One key achievement of OpenHybrid was to ensure that integrating the hybrid system onto any machine tool platform would perform as easy as possible. As a result, the ability of a machine tool to be hybridised will be termed hybrid ready. The flexibility of the new approach allows powder and wire feedstock to be processed and the system to be combined with machine tool (GF Machining Solutions) as well as large scale automation platforms (Gudel).

The challenge for widespread use of hybrid machines

It is not commonplace to undertake a wide range of processes in a seamless automated operation with a single manufacturing system. The OpenHybrid project has been designed to address the technical and commercial limitations of current hybrid manufacturing systems by developing a single manufacturing system which can achieve this goal. The new systems developed aim at providing additional competitiveness to some of the most demanding and important industries in Europe, which in turn have validated the approach through the production of industrial demonstrators. This new all-in-one hybrid additive and subtractive multi-tool platform using DED Additive Manufacturing has been achieved for both medium and large-scale platforms.

The success of one project can be better perceived by its ability to provide for an effective technology transfer, made available through technology services at affordable costs and, as an end result, facilitating the collaborating with EU SME and large industries, and the rapid deployment and commercialisation of the new technology. This was also another important goal of this project that has been achieved by connecting all partners.

Creating the groundwork for a more widespread adoption of Additive Manufacturing

By creating new hybrid machines, equipped with both subtractive and additive manufacturing technologies, OpenHybrid is a game changer for faster creation of new opportunities and applications for Additive Manufacturing. This new solution increases the level of robustness and repeatability of such industrial processes, optimises and evaluates the increased performance of production lines in terms of productivity and cost-effectiveness and, finally, provides an effective assessment on the sustainability, functionality and performance of the produced new materials. Beyond new parts production, this new manufacturing method also allows for a very effective repair technique.

Project partners

The partners of this project include a relevant set of international organizations with field experience with these technologies. Partners include THE MANUFACTURING TECHNOLOGY CENTRE LIMITED (United Kingdom), SIEMENS AKTIENGESELLSCHAFT (Germany), WEIR GROUP PLC (United Kingdom), FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV (Germany), GF Machining Solutions (Switzerland), ESI GROUP (France), HYBRID MANUFACTURING TECHNOLOGIES LIMITED (United Kingdom), GUDEL AG (Switzerland), TWI LIMITED (United Kingdom), BCT STEUERUNGS UND DV-SYSTEME GMBH (Germany), CENTRO RICERCHE FIAT SCPA (Italy), ESI SOFTWARE GERMANY GMBH (Germany), PICASOFT (France).

About the European Federation for Welding, Joining and Cutting

EWF is a pioneer in implementing a harmonized qualification and certification system for joining professionals. Through European projects EWF has been innovating in training methodologies and involved in the development of new technologies and uses for joining. Through its member organisations, EWF has established a firm link to the local industry, providing knowledge and training as well as participating in research initiatives that address the most pressing questions and challenges in the field of joining technologies.



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