

ModuLase

Development and Pilot Line Validation of a Modular Re-Configurable Laser Process Head



ModuLase

Introduction to the Project

Background to the Proposal








- Despite the unrivalled versatility of fibre-delivered laser sources to perform a wide range of processes, the potential flexibility is currently limited by the need to change the processing head for the different processes to be performed (eg welding, cutting and cladding)
- The majority of industrial laser systems are employed to perform low-variety and high-volume manufacturing operations
- Current manufacturing trends (such as increased automation, individualisation and next-shoring) are driving the need to develop manufacturing systems which are capable of performing a higher variety of manufacturing operations and product mixes
- Need to maximise equipment utilisation rates, by eliminating downtime associated with changing of laser processing heads and equipment stoppages
- Increasing need by industry to reduce capital investment costs

ModuLase Call

- H2020-IND-CE-2016-17, FOF-13-2016 call
- Factories of the Future: Photonics Laser-based production
- Start date: 1st September 2016
- Duration: 36 months
- Received EC funding: €2,458,465 (€2,184,565 Grant)
- Programme directly focused on “Rapid individualised laser-based production”

Consortium

- 8 participants from 4 countries
- 50% RTO, 25% SMEs and 25% LEs
- End users within the power, aerospace and automotive sectors

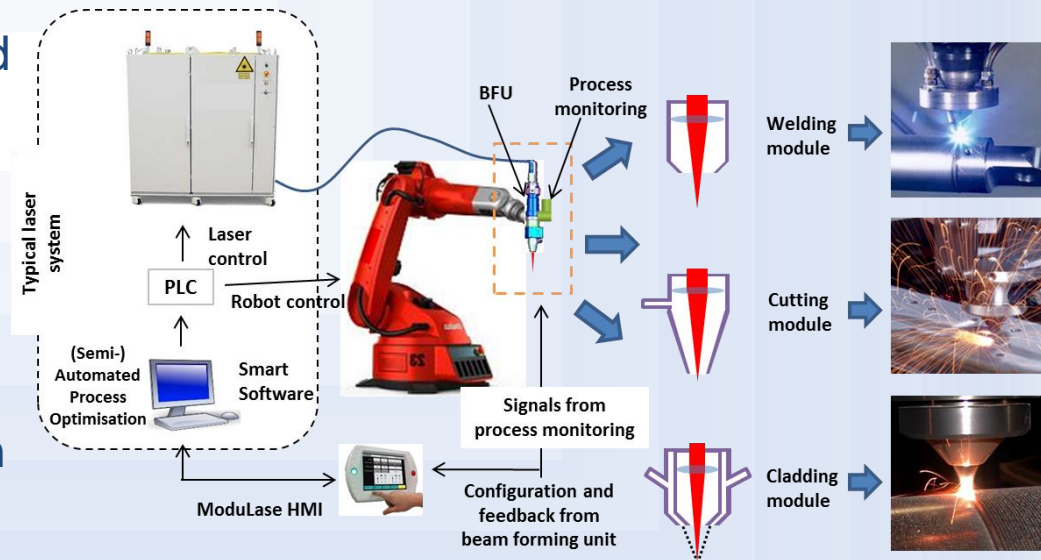
Activities	Consortium
Beam Forming Unit	
End Effectors	
Process monitoring and quality control	
Laser processing development and validation	
User friendly Operating/User interface	
Representing needs of European Industry	
Automotive, power and Aerospace applications	

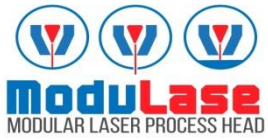
ModuLase Overall Objectives

The ModuLase project will develop a re-configurable highly flexible processing head system, capable of covering welding, cladding and cutting

The ModuLase process head system will:

- Be capable of welding, cladding and cutting, through the use of three modular end-effectors
- Include intelligent sensor technologies for in-process monitoring
- Be linked to an intelligent system, in order to achieve adaptive process control, quality assurance, and semi-automated process parameter configuration





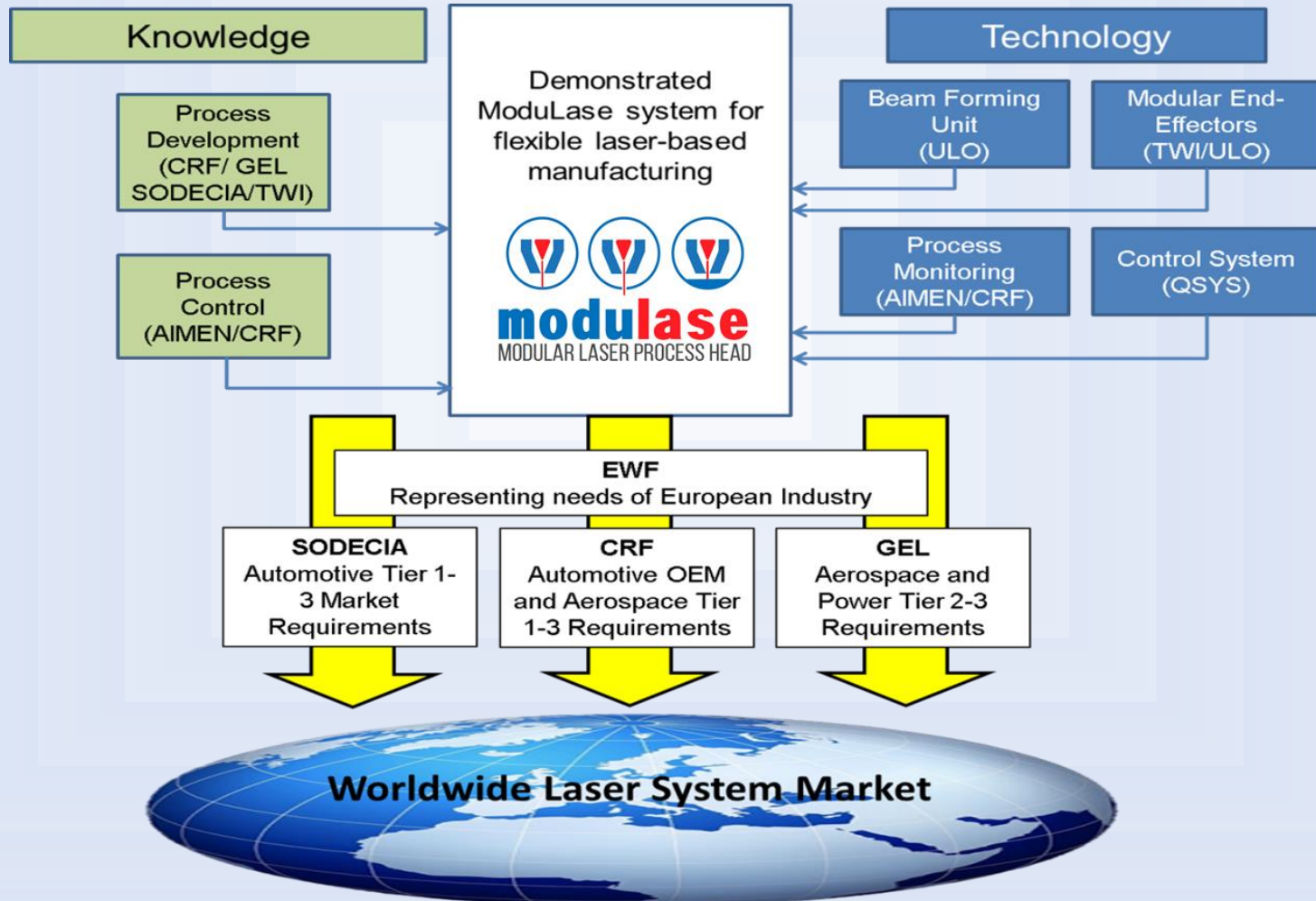
Modulase Key Features

- **Reduced capital investment costs:**
 - End- users will save as much as 59% when installing the ModuLase head (with three end-effectors considered in this project)
 - Higher savings possible for organisations adopting more end-effectors
 - Further savings may be realised when replacing end-effectors due to wear or damage
- **Maximise laser equipment utilisation rates by reducing down-time:**
 - Anticipated changeover time of <1 minute for the proposed ModuLase process head
 - Improved utilisation rates
 - The ModuLase system will allow manufacturers to adopt parallel process cell layouts, rather than sequential process cell layouts; reducing the risk of production-line stoppages

ModuLase Key Features

- **Reduced running costs:**
 - Modular end-effectors easily and cheaply replaceable
 - Reconfiguring the BFU to match the required beam configuration will save time and cost.
 - The integrated process control and monitoring system also helps minimise, if not eliminate, defects and therefore save on re-work or scrappage.

ModuLase Technologies & Industry Focus



Beam Forming Unit (BFU):

- The adaptable optical elements of the BFU will be capable of delivering a wide range of laser beam energy distributions, suitable for welding, cutting and cladding applications.
- A range of high-value goods, e.g. those made from advanced materials (advanced alloy steel, titanium, aluminium, etc.) will be covered.

End-effectors:

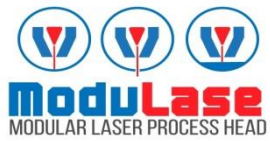
- Three rapidly interchangeable end-effectors will be developed to cover welding, cutting and cladding applications.
- The end-effectors will have a plug and play system to allow them to be changed on the end of the process head within a time of 1minute.

Process monitoring and quality control:

- A process monitoring system suitable for welding, cladding and cutting processes will be developed.
- It will be embedded into the ModuLase system, in order to assure process stability and also enabling to reduce additional time and costs involved in the process.

User friendly Operating/User interface:

- The ModuLase system will comprise an user friendly HMI interface, enabling to input the material grade, its thickness and the laser process required.
- Both the Quality Assurance System and BFU shall adjust vision and optical configurations and deliver the beam accordingly with minimal user contact.



ModuLase Technologies

Adaptability for Industrial Applications:

The ModuLase system will be able to cover cutting, welding and cladding applications

Summary of Key Deliverables

- Three end effectors manufactured for cutting, welding and cladding
- BFU manufactured
- Embedded Process Monitoring assembled
- Laser process parameters for assembly and testing of process head (BFU + end effectors + process monitoring)
- System and software integrated with new knowledge gained from TWI trials
- Final system developed from its initial specification, testing of requested settings with actual beam settings and embedded monitoring system included
- Final Demonstration of the ModuLase system in industrial environment and to an industrial audience