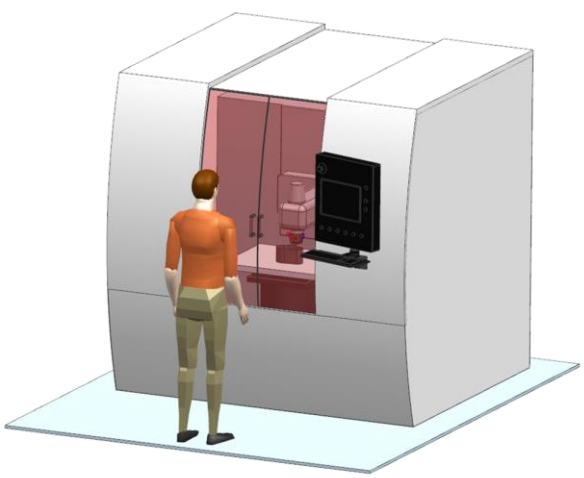
SYMBIONICA

Issue	Date
1	July 2016

Dear SYMBIONICA newsletter readers,
Welcome!
This is the first issue of ***Symbionica*** *project newsletter which will be issued every 3 months and will deal with relevant results, achievements and events related to this cutting edge technological project.*
To receive our newsletter please subscribe at project website ***www.symbionicaproject.eu*** *or send an email to* ***info@symbionicaproject.eu***

Symbionica is intended as a **reconfigurable machine for the new Additive and Subtractive Manufacturing class of products for the next generation of fully personalized bionics and smart prosthetics**. It aims to develop a new technological platform, integrating cutting edge solutions in design and manufacturing in order to make available to people better **med-tech products and services for an improved quality of life**.
The core of the Symbionica architecture will be represented by the Redundant Deposition Head, which is composed by two modules: the upper one will host a **multiple nozzles system** and the entire laser module while the lower revolving one will give not only an additional rotational movement, but also will host a secondary powder transportation system. In addition, the head will be equipped with a gas shielding system able to produce a controlled atmosphere in the processing area.
The Symbionica solution will integrate **two different laser beams**: the first one is a CW source for laser melting, while the second is an ultrafast pulsed laser source to precisely ablate the surface of the workpiece.
The laser head will incorporate an **ultrafast galvo- and rotating prism scanner** to target very high throughputs.
The Symbionica solution will be equipped with a **3D vision system constituted by multiple mobile and fixed vision spots**, loaded on the machine head and on the support portal . Together with a **spectrometer and a 3D infrared laser** scanner, geometrical dimensions and physical/chemical data are kept monitored, as well as the laser beam and melt pool parameters.
This in-line persistent process monitoring relies upon a CAx chain bridged to the machine's CNC in a closed loop to adapt and optimize the manufacturing strategy on the actual state of the process.

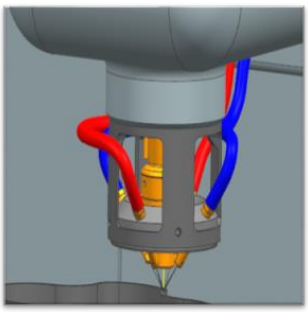


SYMBIONICA

Innovation

Several key innovation action are pursued:

- Innovation for **products**:
  - Handling of different materials (Ti, Co-Cr, CC, Peek) with complex shape and surface patterns;
  - Functionally graded internal structures;
  - Superficial micro-texturing.



- Innovation for **processes**:
  - Combination of different technologies in one machine;
  - Closed loop process control with an in-line CAx chain;
  - High throughput rate (up to 500 cm^3/h) with an unprecedented surface quality.

- Innovation for **equipment**:
  - Variable working cube from 100x100x100 mm up to 1500x2000x2000 mm;
  - Hybrid 3D laser scanner for CW and pulsed laser;
  - Innovative flexible revolver head that will enable blending multiple powders and extruding different materials.

- Innovation for **value chain**:
  - Support the co-engineering process across the supply chain;
  - Manufacturing of final products on demand to reduce excess inventory;
  - Synchronized logistics between players of the manufacturing chain.

Symbionica Through life Sensing System

The advanced sensing systems designed for Symbionica implants will be constituted by a cluster of sensors that not only will gather information about the prosthetics performance and about the human functionalities during patient's life, but it will also track data over time and analyze them to build a set of updated information that:

- enhance the product conception and design;
- assess the prosthetics geometrical and mechanical performance;
- evaluate the performance of the prosthetics across its lifecycle;
- enable the prosthetics function adaptation and settings.

Symbionica Through life Sensing System will suggest corrections and adaptation to be implemented to enhance the prosthetics performance and provide useful reports to the patient and medical staff.

SYMBIONICA

Use cases

➢ **Exo-prosthesis: Prosthetic foot**

It is an assembly with multi material composition. Osseo-conductive materials, represented by Titanium or Titanium alloys are employed, together with glass fiber reinforced resin, PEEK and stainless steel. This prosthetic foot from **Ottobock** will benefit of the Symbionica solution because it can have customized sizes, a reduced amount of components and a lower weight

➢ **Endo-prosthesis: DSC**

The identified use case is a Dorso-Lumbar Somatic Cage (DSC) from **Sintea Plustek**, component that will prove the Symbionica's possibility of customization in order to achieve, in this case, the best spine curvature reconstruction that modular cages cannot assure. This component will be completely redesigned to exploit all the capabilities and opportunities offered by the Symbionica machine

➢ **Endo-prosthesis: Hip Implant**

This use case identified by **Medacta** wants to prove the capability to solve some possible clinical criticalities, such as leg length discrepancy and instability of the joint, by customization of the acetabular cup and of the femoral stem on the patient's specific anatomy

Output of the project

At the end of the project, Symbionica will produce five remarkable outputs:

- A **novel certified machine for Multi Material Additive Manufacturing** for med-tech devices characterized by significant complexity in shape, functionality and material;
- Four **demo certifiable prosthesis**, specifically re-designed and re-engineered for AM in order to reach an unprecedented level of customization on the patient's requests,
- Four **CAD parametric templates** to generate automatically and in less than 8 hours the required geometry prosthesis starting from patient specific medical data, such as Computer Tomography;
- A novel **Cooperative design platform** including the above-mentioned CAD templates and interfaces with medical diagnostics (CT), with CAD/CAM and CAPP system of suppliers involved.
- A novel device, "**Bionic Through-life Sensing System"** to monitor and analyze the performances of the prosthesis through the patient's life.

OFFICIAL DATA

- Start month: 1st October 2015;
- End month: 31st September 2018;
- Project duration: 36 months;
- Project reference: 678144;
- FoF-10-2015 - Manufacturing of custom made parts for personalized products;
- Call for proposals H2020-FoF-2015;
- 12 partners coming from all Europe;
- 5 countries represented;
- Coordinated in Italy.

CONSORTIUM

sintea PLUSTEK
IMPROVING LIFE LONGEVITY

ottobock.

Medacta
International

Prima Power

IRIS
Playground for new Ideas

SUPSI

The University Of Sheffield.

ITI
International TechneGroup

Globotics Industries®

FRAMOS

OPI Photonics

IRIDA LABS