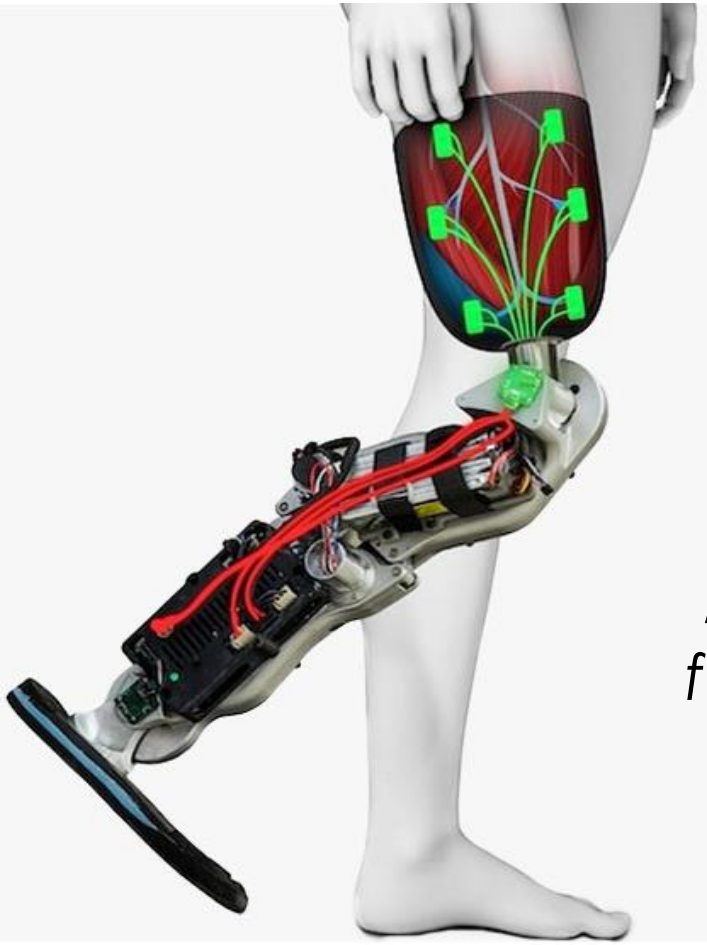


SYMBIONICA

«Reconfigurable Machine for the new Additive and Subctractive Manufacturing of next generation fully personalised bionics and smart prosthetics»

Simona Tusacciu

IRIS

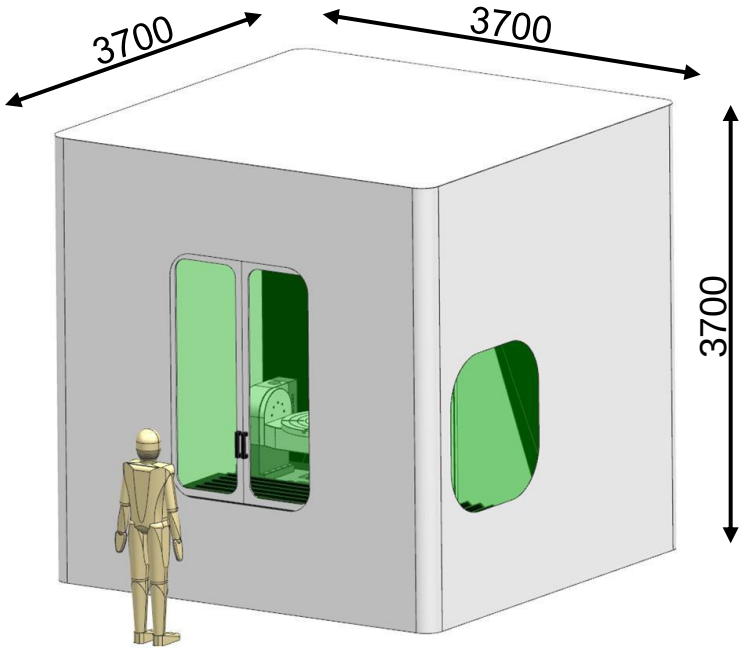
19° AM Platform Meeting

June 14th, 2017

PROJECT GOAL

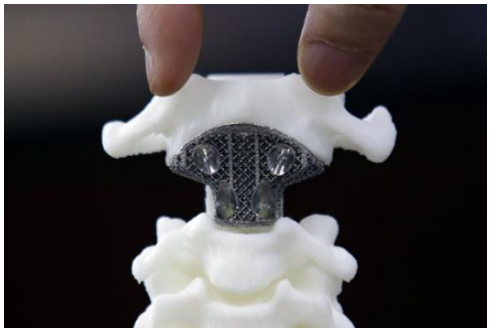
Reconfigurable Machine for the new **Additive and Subtractive Manufacturing** of next **generation fully personalized bionics and smart prosthetics**

Symbionica objective is to make **technically feasible and economically sustainable** the production of **smart implants/prosthesis** with a level of customization never seen before



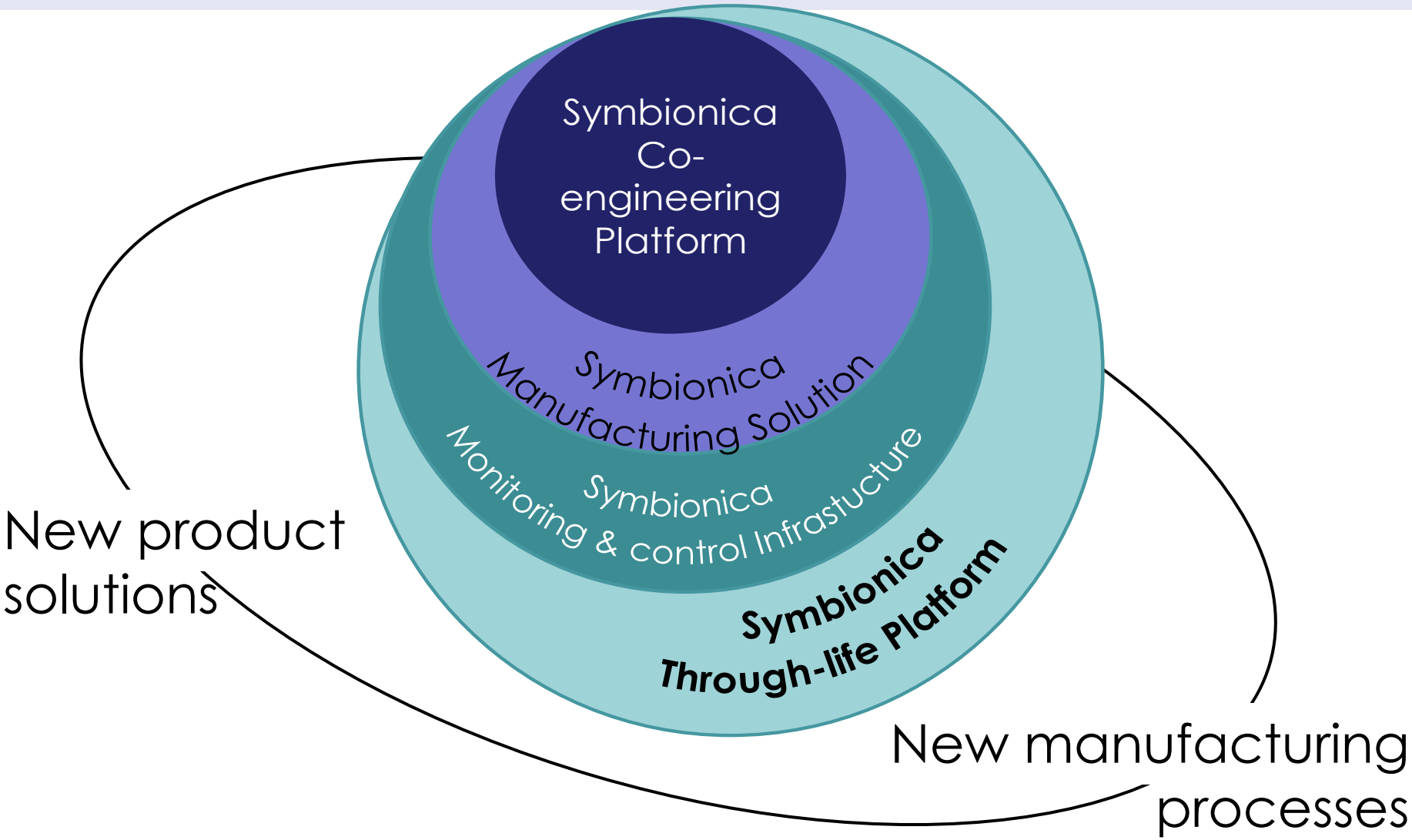
REFERENCE PRODUCTS

- Complex geometries
- Multi-material parts
- Fast commissioning
- High accuracy of parts
- Smart implants
- Personalized products one-of-a-kind
- High structural and dynamic performance with reduced weight
- Superficial micro-texturing
- Functionally graded structures

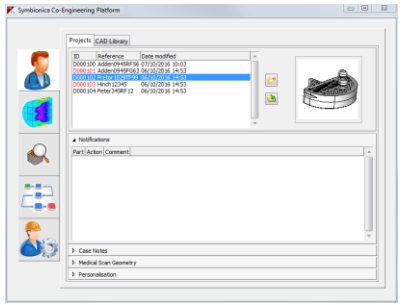


SYMBIONICA

SYMBIONICA CONCEPT

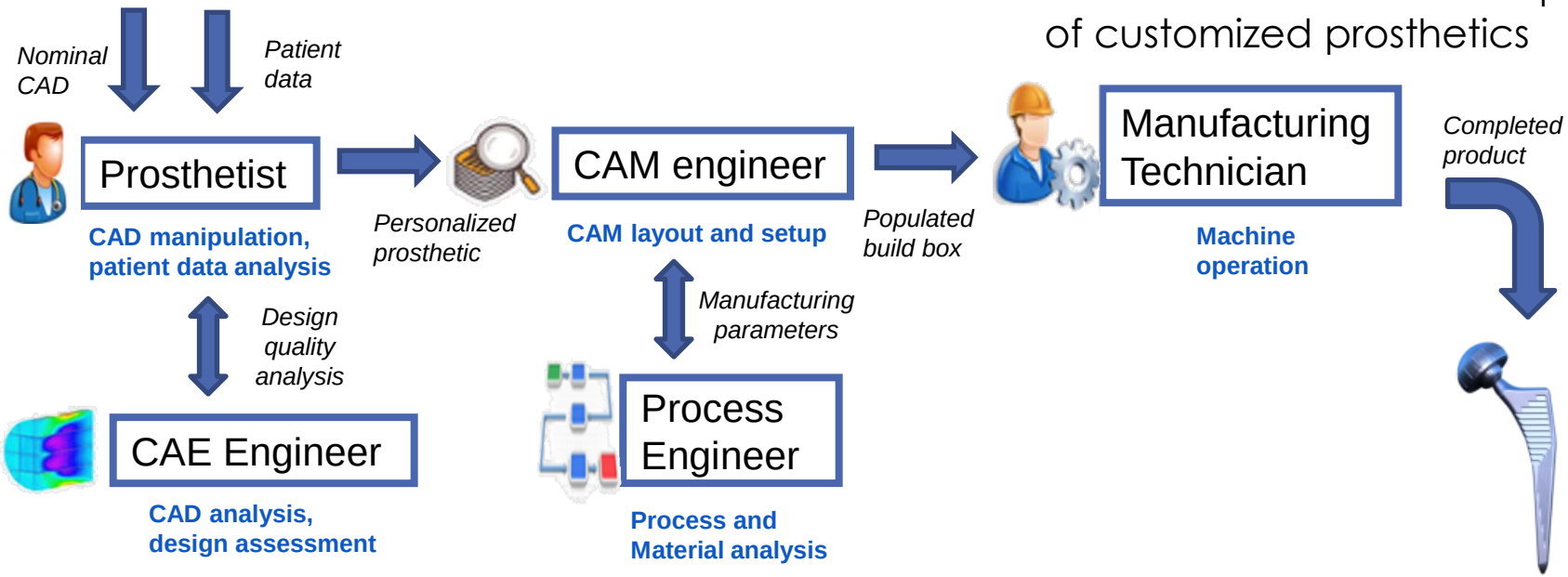


SYMBIONICA Co-Engineering Platform



Co-Engineering Platform: Stand-alone tool managing medical images, CAD files, customized designs, build volumes, tool paths and manufacturing files

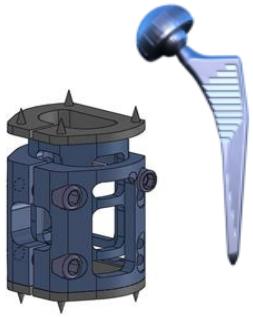
Objective: facilitate the seamless exchange of Information between all the actors involved in the development of customized prosthetics



SYMBIONICA

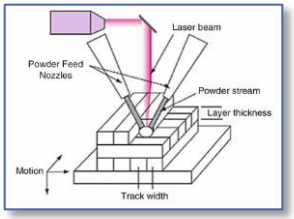
SYMBIONICA Process Technologies

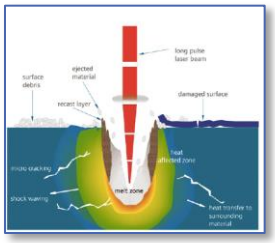
Titanium
Aluminium
Cobalt-chrome
Stainless steel



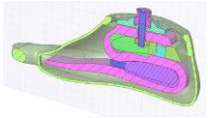
METAL PARTS

Direct Energy Deposition → **Ablation** → **Other processes** → **FINAL PRODUCT** → END USER REQUIREMENT



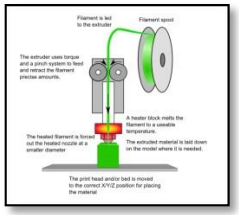


PEEK



PLASTIC PARTS

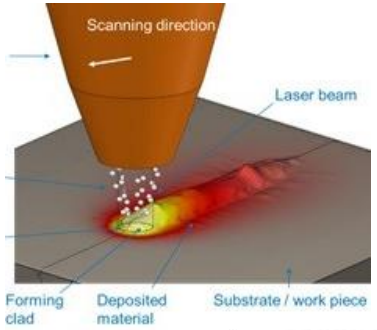
Fused Deposition Modeling → **Other processes** → **FINAL PRODUCT** → END USER REQUIREMENT



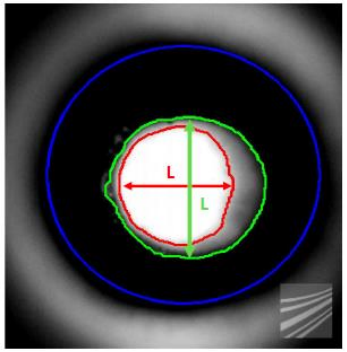
SYMBIONICA

SYMBIONICA Vision System

- An **interoperable vision system for process control** consisting of an optical camera integrated on the scanner head for monitoring size and shape of the melting pool, and an external high speed camera for the supervision of the powder jets

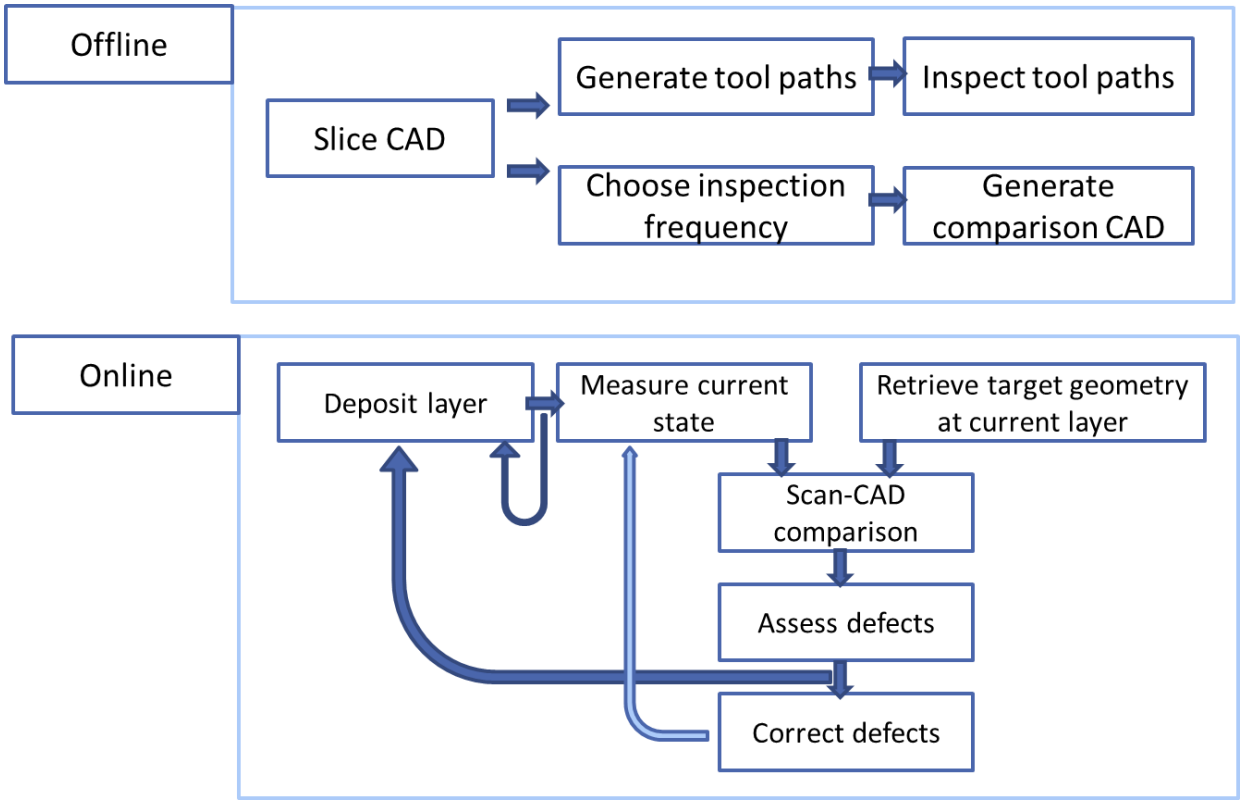


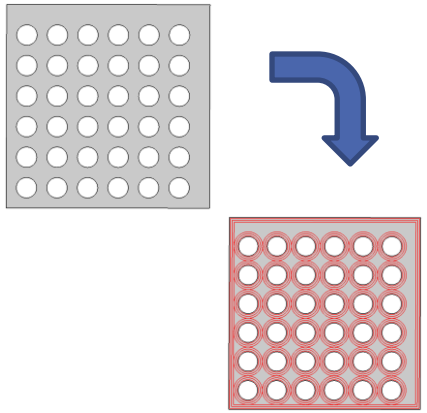
- An **interoperable vision system** composed by a set of cameras **for the 3D reconstruction of the part** in a cloud of points for closed loop control of the process

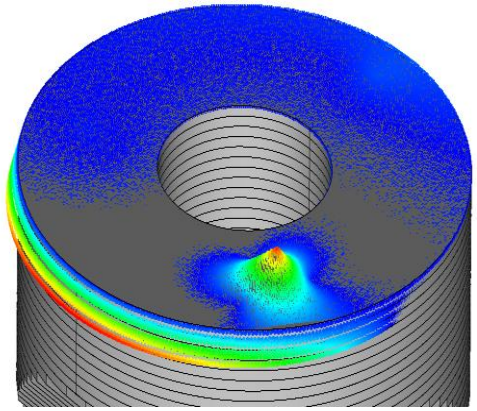


- An **interoperable vision system** composed by a set of cameras **for monitoring the product properties** consisting of 3D laser scanner to perform surface inspection and an IR cameras for thermal characterization

SYMBIONICA Process Control







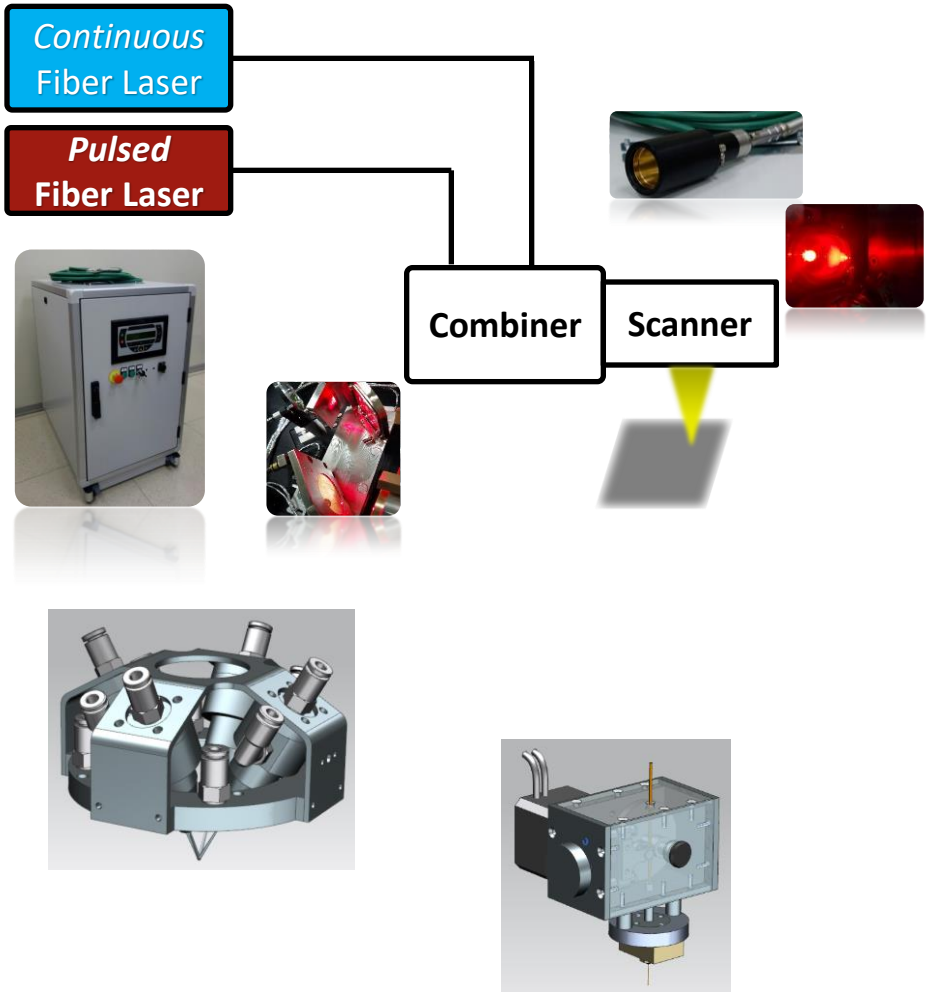
SYMBIONICA Head

• A**dvanced hybrid optical chain** for delivering both the 1 kW CW laser source for DED process and the ultrashort pulsed laser beam for subtractive applications

• A **high speed 3D scanner head** customized for high power and high accuracy processes allowing innovative and improved efficiency strategies for AM, ablation and patterning. The scanner integrates a closed loop monitoring system composed by a ccd camera in the monochromatic spectral sensitivity.

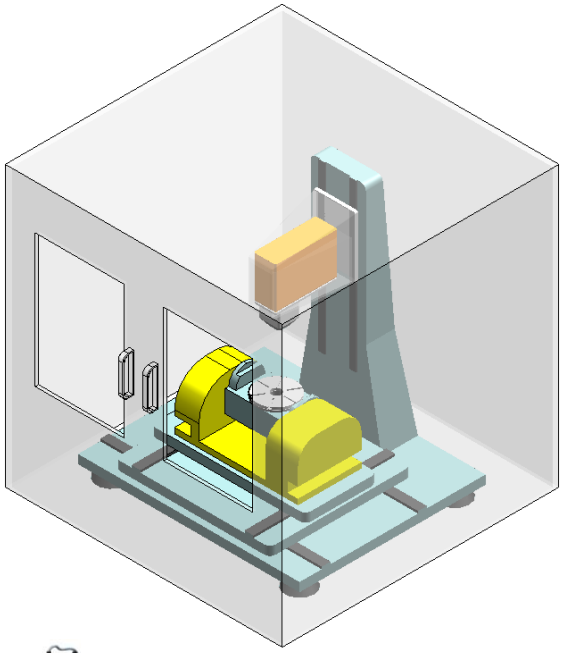
• A **multi-nozzle system** for high precision deposition multi-material applications

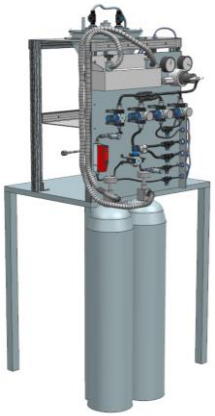
• **FDM system** for PEEK extrusion (500°C)

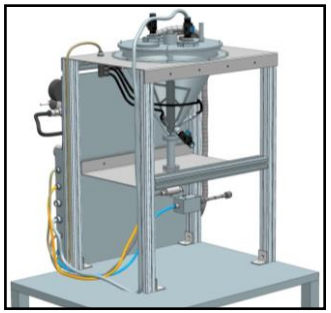


SYMBIONICA Machine

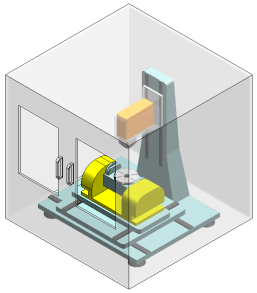
- Volume: **800x800x1200** mm
- **5 DoF** Machine embedding **3 techs**
- An **innovative deposition head** equipped with independent nozzles for multi-material applications
- A **high flexibility gas-powder feeding system** allowing the real time control of the powder flow rate required for the realization of functionally graded internal structure and surface
- **Controlled atmosphere**



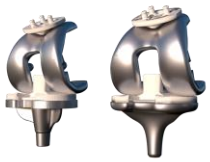




SYMBIONICA Exploitable Results

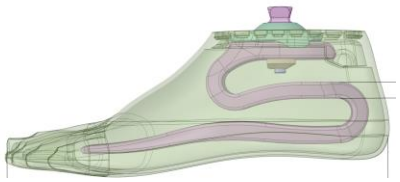


SYMBIONICA MACHINE

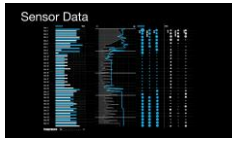


KNEE IMPLANT

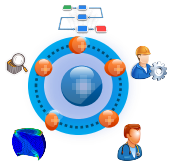
HIP IMPLANT



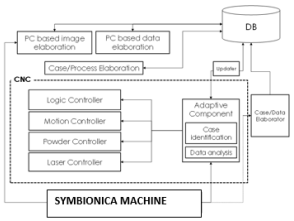
PROSTHETIC FOOT



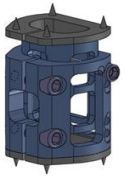
THROUGH LIFE SENSING SYSTEM



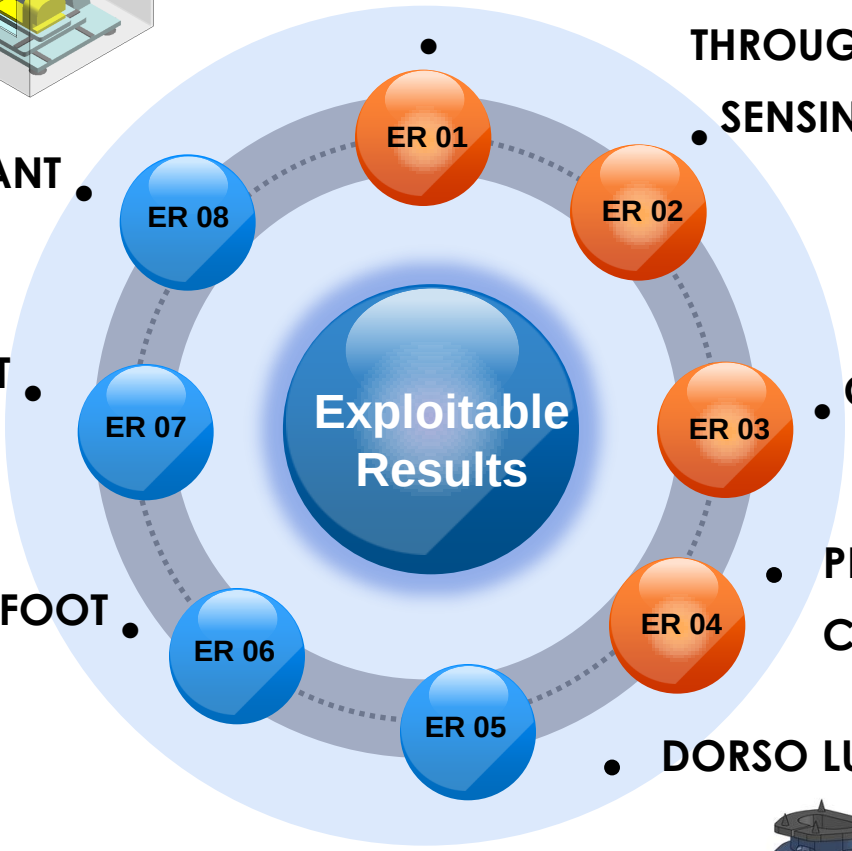
CO- ENG. PLATFORM



PROCESS CONTROL



DORSO LUMBAR BODY CAGE

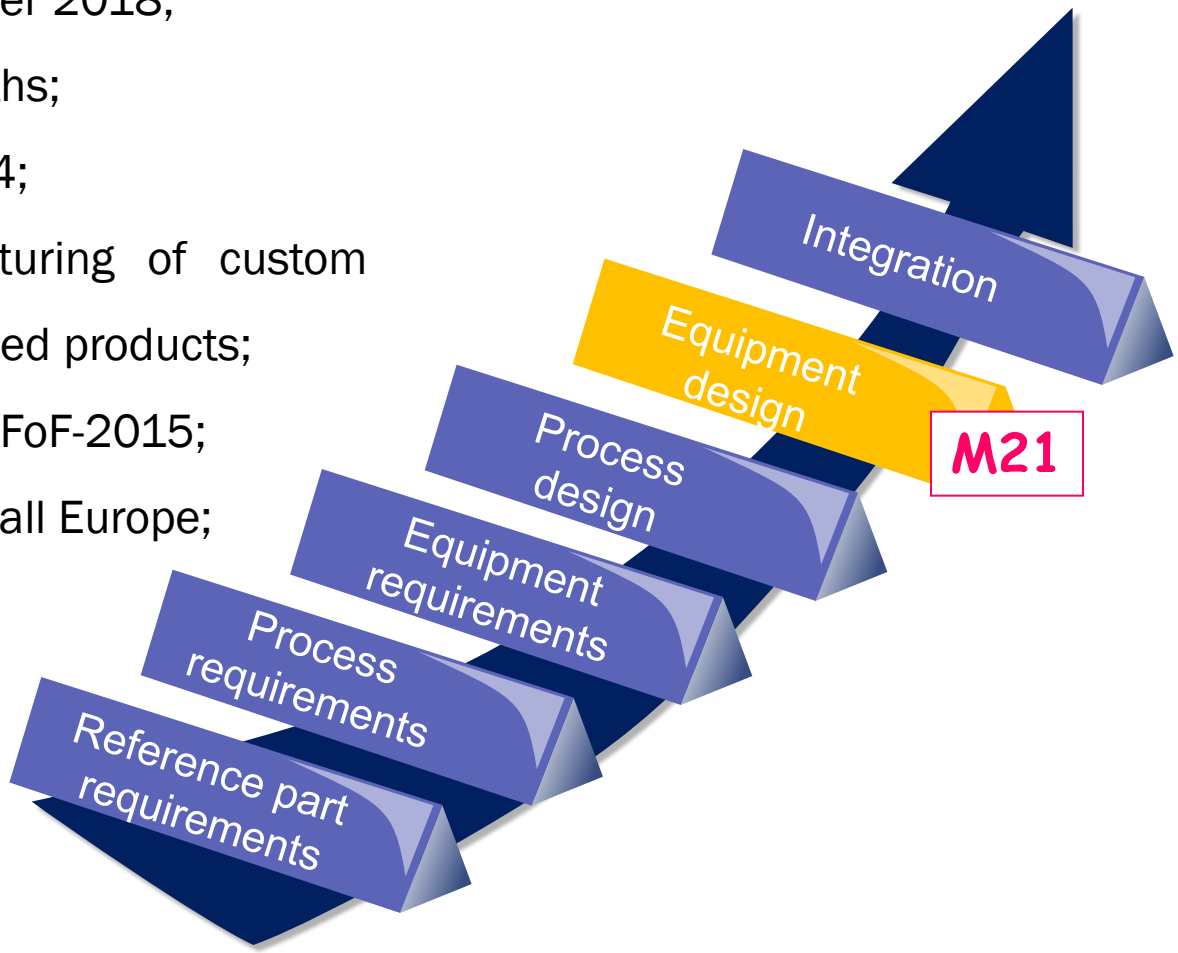


SYMBIONICA

Project Data and Status

- 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.

SYMBIONICA PROTOTYPE



Thank you

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www.symbonicaproject.eu