PHOTONICS PUBLIC PRIVATE PARTNERSHIP

PHOTONICS21

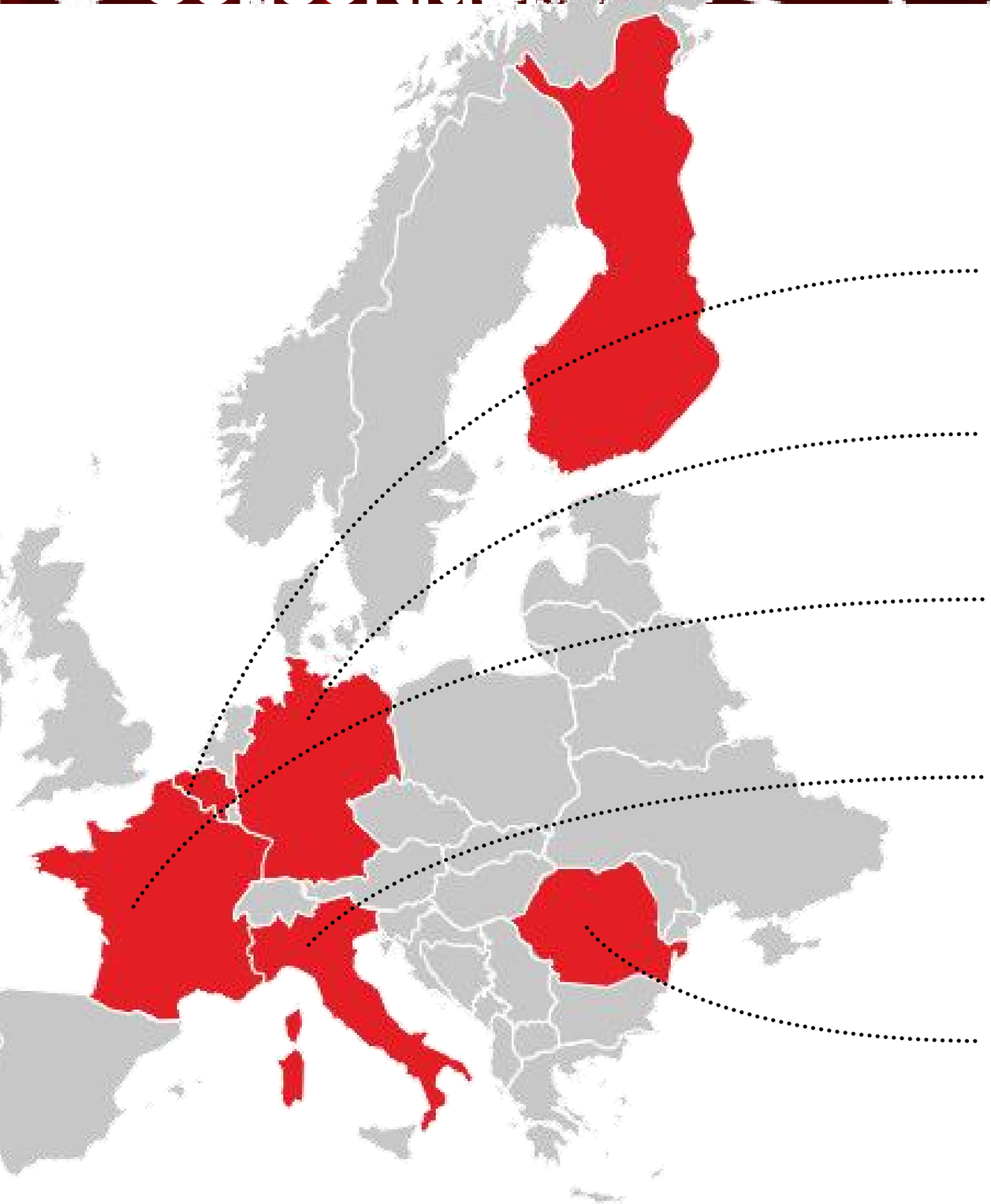
Factories of the Future
Public Private Partnership

HORIZON2020

DREAM

Title: Driving up Reliability and Efficiency of Additive Manufacturing
Acronym: DREAM
Call identifier: H2020-FOF-2016
Topic: FOF-13-2016: Photonics Laser-based production
Funding scheme: Research and Innovation Action
Grant Management number: 723699
Duration: 36 months
Start Date: 01 Oct 2016
Estimated Project Cost and Requested EU Contribution: €3,242,435.00
Project Website: www.dream-euproject.eu

Consortium



beWARRANT

EOS e-Manufacturing Solutions

ADLER ORTHO FRANCE

POLY-SHAPE additive manufacturing

Ferrari

R.B. s.r.l.

MUSINI

Transilvania University of Brasov

MIND.4D one step beyond

Partner list

Partecipant No	Short name type	Partecipant Organization name	Country
1	**INSTM** (UNI)	Consorzio Interuniversitario Nazionale per la Scienza e Tecnologia dei Materiali	Italy
2	**EOS** (LE)	EOS Gmbh Electro-Optical Systems	Germany Finland
3	**UTBv** (UNI)	Universitatea Transilvania din Brasov	Romania
4	**BEWG** (SME)	BeWarrant	Belgium Italy
5	**MIND4D** (SME)	S.C. Mind Four D S.R.L.	Romania
6	**POLYS** (SME)	Poly-Shape S.A.S.	France Italy
7	**ADLERFR** (SME)	Adler Ortho France S.A.R.L.	France Italy
8	**RB** (SME)	R.B. S.R.L.	Italy
9	**FERRARI** (LE)	Ferrari S.p.A.	Italy

Objective

The aim of DREAM is to significantly improve the performance of laser **Powder Bed Fusion** of **titanium**, **aluminium,** and **steel** components in terms of **speed**, **costs**, **material use** and **reliability**, also using a Life Cycle approach, whilst producing work pieces with controlled and significantly **increased fatigue life**, as well with **higher strength-to-weight ratios**.

The motivation for the project is to go far beyond the state of the art in laser-based Powder Bed Fusion, by mastering of all stages of the process chain; among the numerous industrial applications, the project is focused on components for **prosthetic**, **automotive** and **moulding** applications to optimize the procedure respectively for titanium, aluminium and steel.

DREAM targets the development of a competitive supply chain to increase the productivity of laser-based Additive Manufacturing and to bring it a significant step further towards larger **scale industrial use**.

Project Introduction

opportunities

- Prevention of powder contamination phenomena
- Groundbreaking freedom of design for extremely lightweight components with novel and integrated functionalities
- Fast production with no tooling needs
- No tooling investment costs
- High flexibility

needs

- Solid foundations, mainly in terms of process reliability and robustness
- Quality assurance and long-term predictability of parts
- Reduced machine-to-machine variance across materials and machine types
- Standard operating procedures for raw materials and for product control
- Improved control of process performance in different set-ups, in order to set desired objectives in terms of costs and productivity for different expected responses.

Project Approach

the challenge

In order to upscale the results and to reach an industrial relevant level of productivity, the project is focused on the following four main challenges:

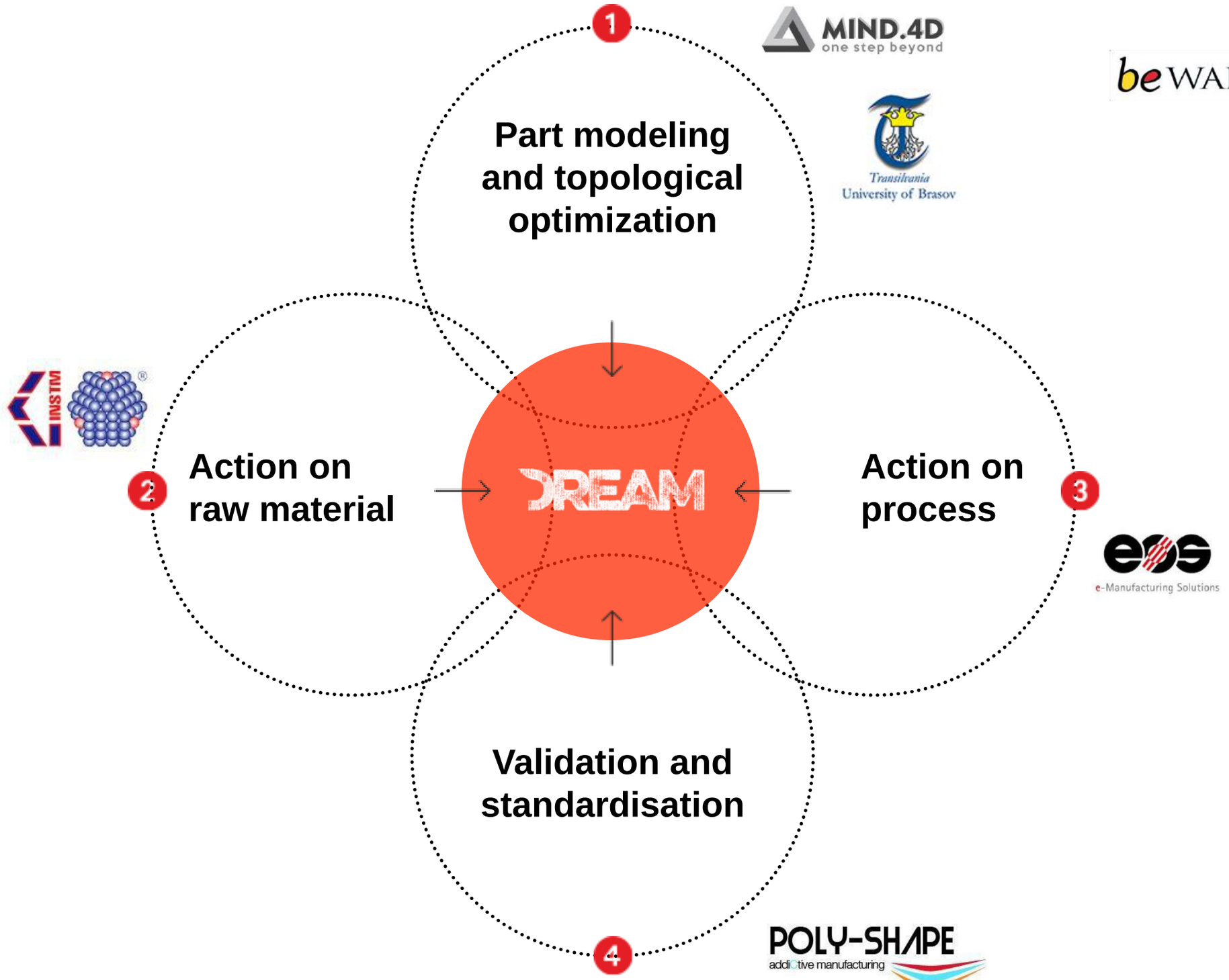
1. **Part modeling and topological optimization**

2. **Raw material optimization** to avoid powder contamination

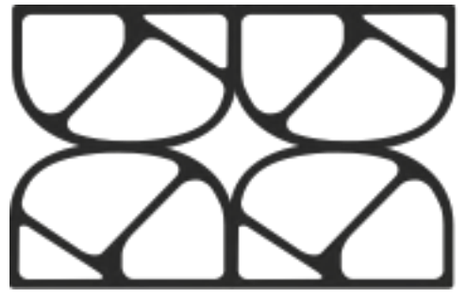
3. **Process optimization**, including innovations of the control software of the Additive Manufacturing machine to enable high throughput production

4. **Validation and standardisation** of the process on industrial components for three different materials (**titanium**, **aluminium,** and **steel**)

The Project


1
Part modeling and topological optimization
2
Action on raw material
3
Action on process
4
Validation and standardisation
DREAM

Project Ambition



1. **Novel component geometry:**

   a) Part redesign by applying topology optimization/design for Additive Manufacturing
   b) Lower cost, building time and part weight

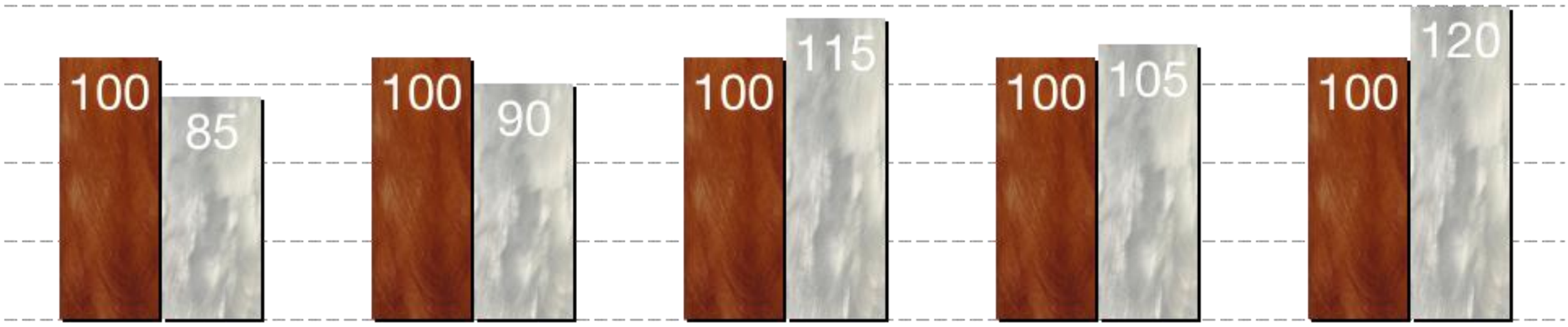
2. **Use of improved and new raw materials:**

   a) Device to remove contamination from the raw material
   b) Use of nanostructured titanium powders

3. **Superior process control:**

   a) Better control of the effects of laser parameters on melt track instability/cooling defects
   b) Finer control of the heat input and augmented fatigue life
   c) Innovations of Additive Manufacturing machine control software
   d) Increase of productivity
   e) Higher reliability

Project Key Performance Indicators



KPI1

at least **15%** weight reduction of parts optimized in topology and for Additive Manufacturing

KPI2

reduction of more than **10%** of material cost

KPI3

increase over **15%** of productivity achieved for PBF process

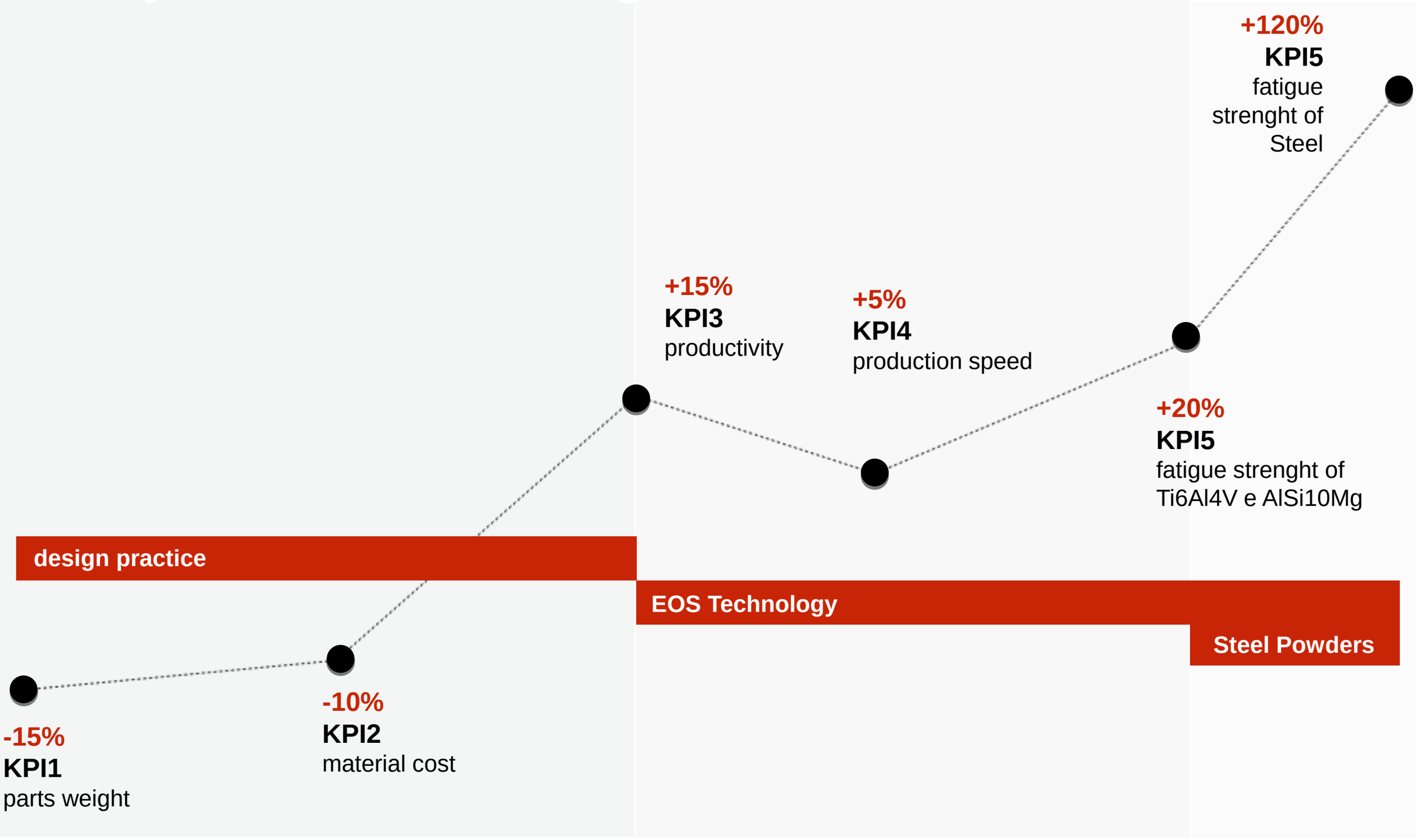
KPI4

increase over **5%** of production speed of laser PBF systems

KPI5

increase above **20%** of fatigue strength of metal parts produced with laser PBF (up to +**120%**)

Project Innovation Target



Project Business Cases

Dreams aims at

1. widening the application of Additive Manufacturing to medium femoral stems, by overcoming the current limitations through the combined innovation of part modelling, raw material, and process parameters **(medium size prosthetic titanium components)**.

2. redesigning the engine subframe mount and producing it by Powder Bed Fusion, with expected ground-breaking drops of weight, cost, and time **(lightweight automotive aluminium components)**.

3. redesigning the insert by a topological optimization approach to channel design and producing it by Powder Bed Fusion, with improved functionality and impressive prolongation of fatigue life **(steel mould inserts with improved functionality and longer fatigue life).**

Project Business Cases

Medium size prosthetic titanium components

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Lightweight automotive aluminium components

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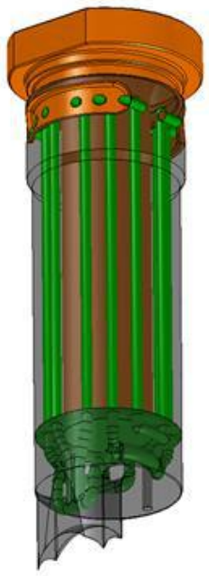
Mould Inserts



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Project impact

Through innovations in part modelling, materials, and additive processing, DREAM will add competitiveness at all steps of the manufacturing chain, so that each of the Consortium partners will benefit from a reinforced industrial leadership, consisting in the offer of:

- **More efficient Additive Manufacturing** systems and **higher quality materials**
- **Optimized on-demand services** for the production of cost-effective components
- **Novel engineering design services** combining topology optimization and design for Additive Manufacturing
- **More lightweight, more reliable, more functional end products**