PENELOPE

Close-loop digital pipeline for large-part and high-precision manufacturing

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The Manufacturing Partnership Day

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PeneloPe´s Consortium

WEBSITE

www.penelope-project.eu

TWITTER

@PenelopeEU1

LINKEDIN

/penelope-eu

31

EUROPEAN PARTNERS

9

DIFFERENT COUNTRIES

DT-FOF-10-2020

Pilot lines for large-part high-precision manufacturing
(IA 50%)

€ 20.891.603

OVERALL BUDGET

€ 14.811.631

EU CONTRIBUTION

Needs from the industry

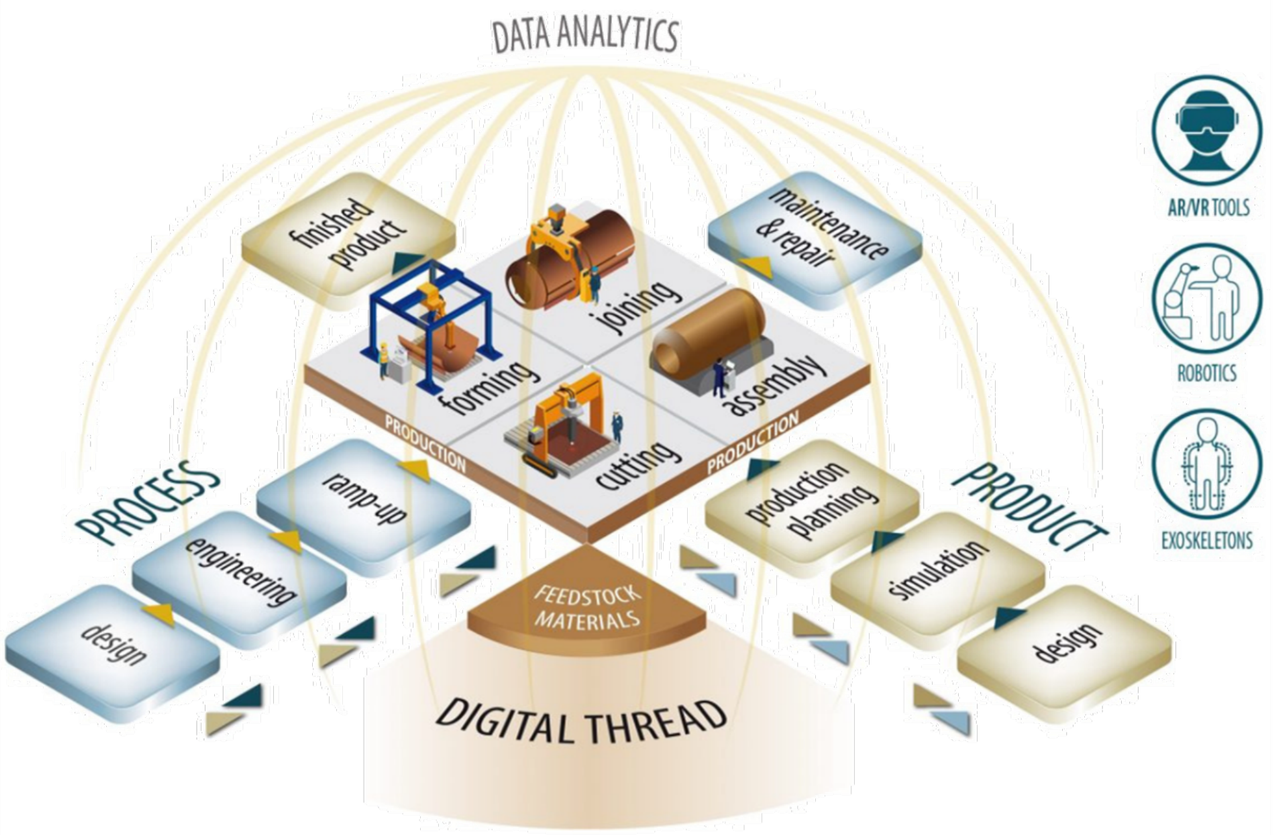
CHALLENGES:

Manufacturing and repairing of large-scale components is complex, highly manual, time-consuming and imprecise/inaccurate processes:

- Design and construction preparation: 20-25% of total costs of one-of-a-kind components.
- Tolerances, deformations… impose constant reconfiguration and adaptation of the work.
- Subassemblies are being manufactured and assembled involving a sequence of different manufacturing processes.
- Preserving industry-specific knowledge and skills.

Novel integrated methodology linking ***product-centric data management*** and ***flexible and reconfigurable production planning.***

PeneloPe´s Vision



01

A CLOSED-LOOP DIGITAL PIPELINE

End-to-end digital manufacturing solution.
- Product-centric data management
- Modular and reconfigurable production

02

WORKER-CENTRIC SOLUTIONS IN SHARED WORKSPACES

Industry-specific workers' knowledge and skills are preserved.
- Product-centric data management
- Modular and reconfigurable production

03

ZERO-DEFECT MANUFACTURING STRATEGY

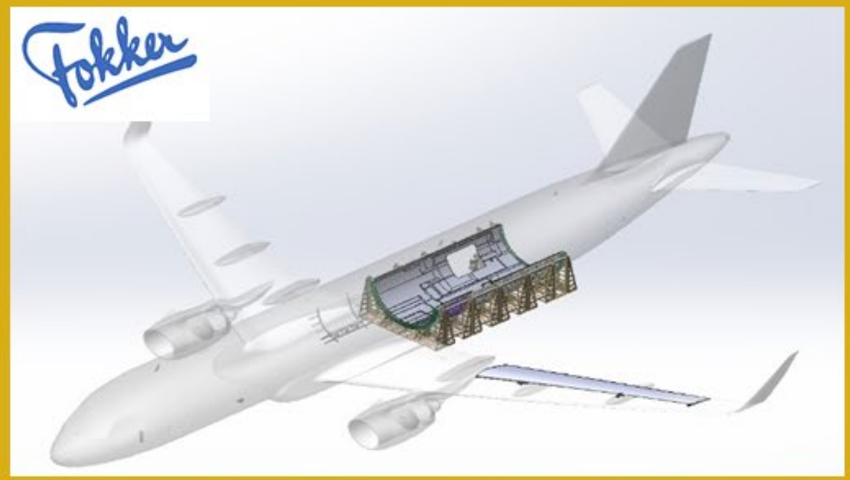
AI-powered digital twins.

PRODUCT-SERVICE FACTORIES

INDUSTRIAL ADOPTION

One-of-a-kind

Low-volume



IDESA: ONE-OF-A-KIND MANUFACTURING (OIL&GAS)

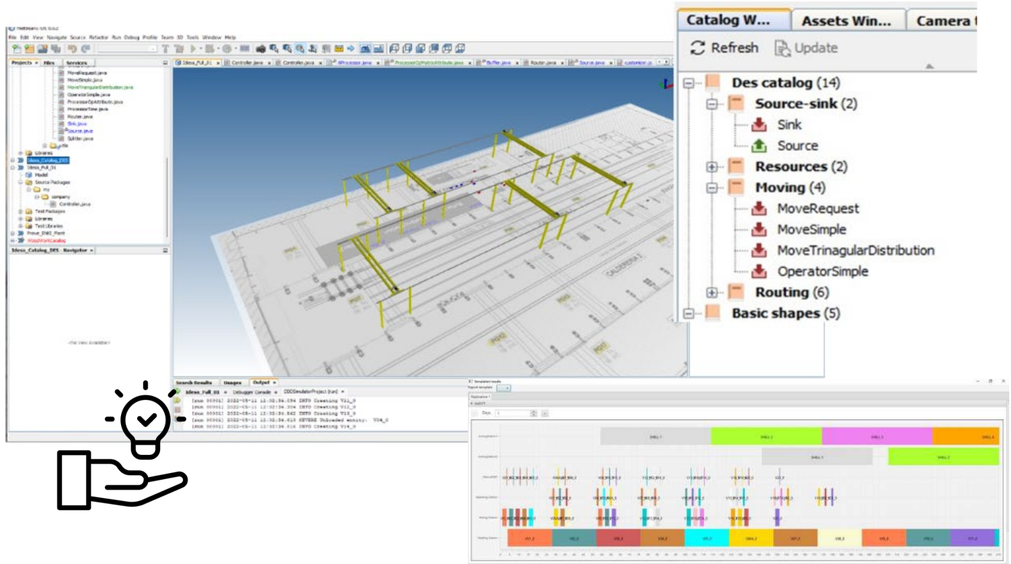
IDESA Pilot line

1 ROLLING

2 WELDING

3 ASSEMBLY

4 QA



- One-of-a-kind
- Design/engineering tasks are executed in parallel to production.
- Different references involving variable geometries, sizes, materials…

FACTORY PLANNING

- Optimising production efficiency
- CPPS representation

IDESA Pilot line

1 ROLLING

2 WELDING

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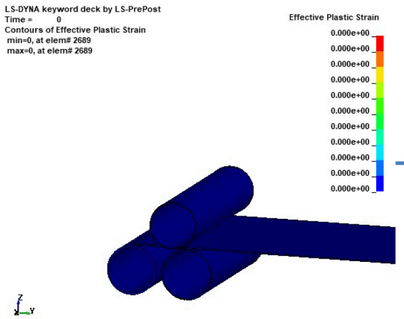
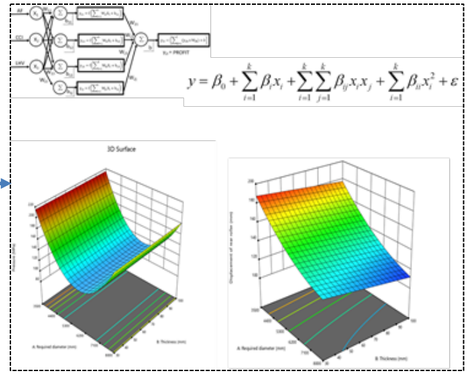
FEM simulation

Input Parameters
Material properties
Required Diameter
Thickness
width
Length
.....

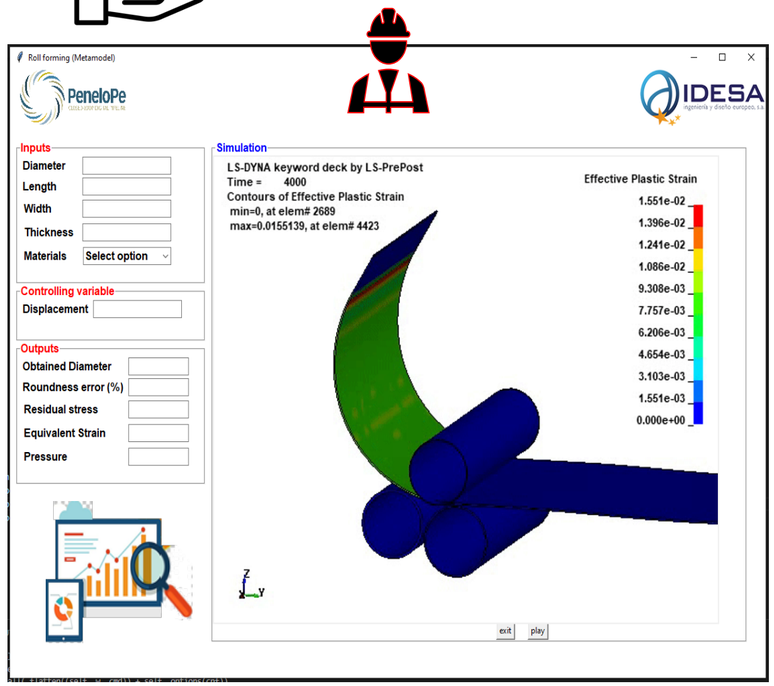


Rolling signals acquisition

Metamodel



ASSISTED FORMING



Rolling parameters recommendation

IDESA Pilot line

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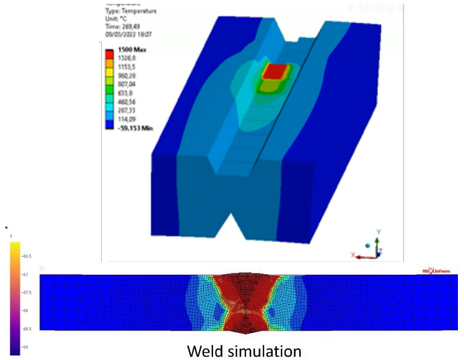
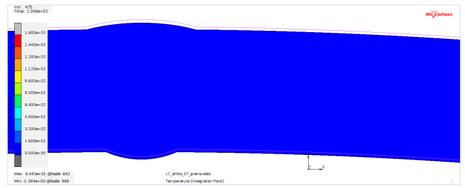
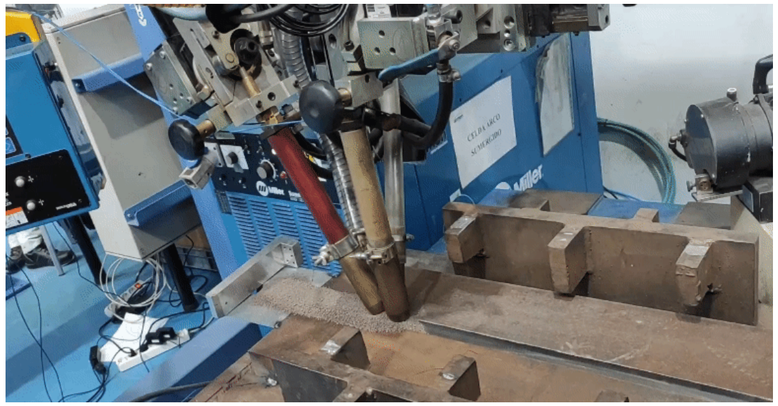
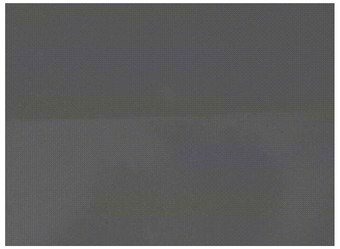
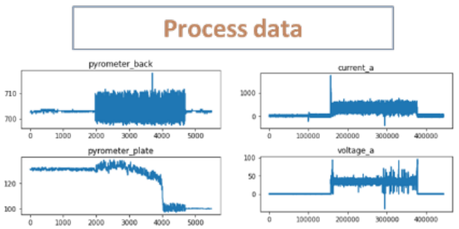


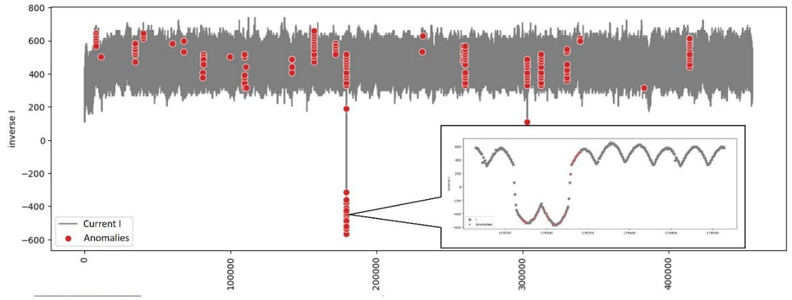
Weld simulation

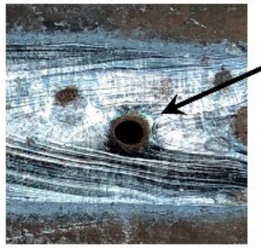




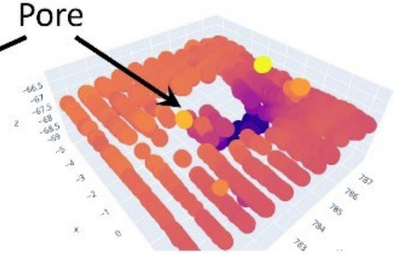








Pore



FEM SIMULATION

MULTIMODAL MONITORING

COGNITIVE QA

IDESA Pilot line

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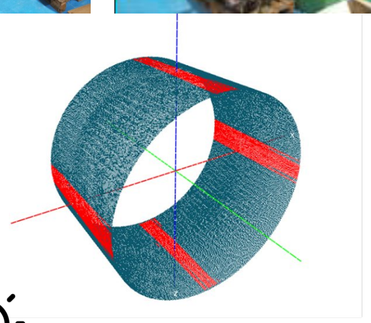
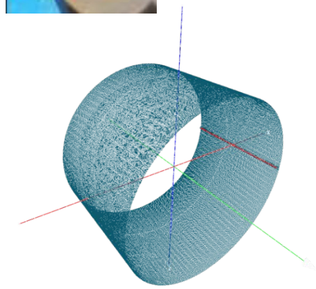
3 ASSEMBLY

4 QA





SCANNING SYSTEM FOR ROUDNESS VERIFICATION

ONSITE AND ADAPTIVE PROJECTION OF AUXILIARY EQUIPMENT

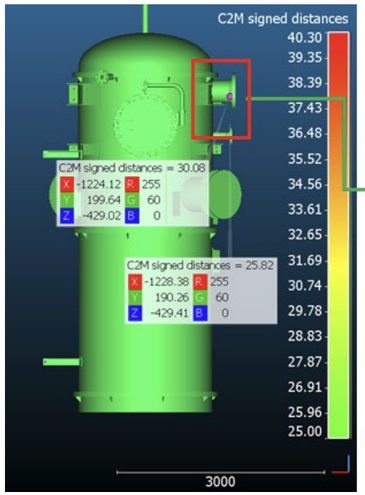
IDESA Pilot line

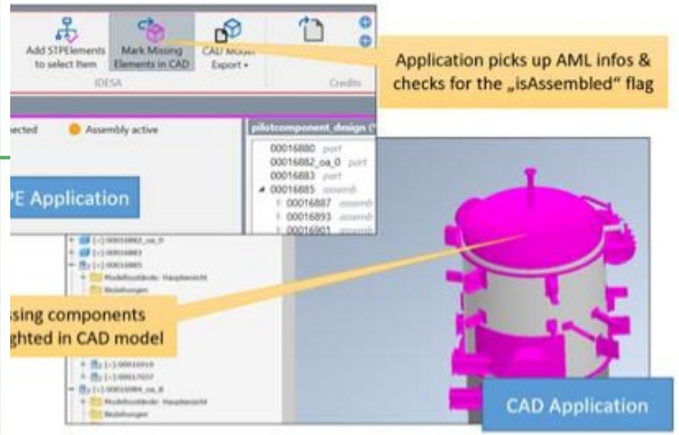
1 ROLLING

2 WELDING

3 ASSEMBLY

4 QA





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psc_ TRANSITION TECHNOLOGIES

AUTOMATIC VERIFICATION OF THE POSITION OF AUXILIARY EQUIPMENT

REMOTE QUALITY INSPECTION

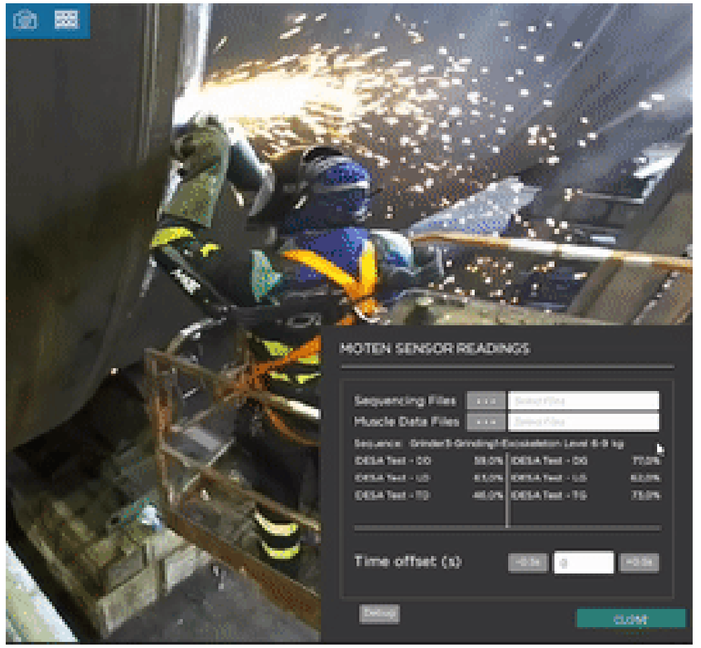
IDESA Pilot line

1 ROLLING

2 WELDING

3 ASSEMBLY

4 QA



EXOSKELETONS ASSISTING WORKERS IN MANUAL OPERATIONS

VISION in PENELOPE

- ✓ End-to-end methodology linking Product, Process and Resources data
- ✓ Hierarchical data orchestration methodology providing an updated view of the component that is being assembled
  - Traceability
  - Data Interoperability along the product lifecycle
- ✓ Future: Cognitive factory by learning from the information collected in the manufacturing dataflow

- ✓ Holistic data management along the product lifecycle (no data silos)
- ✓ Heterogeneous data exchange
- ✓ Adoption of Industry 5.0 concepts

- ✓ Multistage manufacturing (large amount of data generated)
- ✓ Correlation of data

PeneloPe
CLOSED-LOOP DIGITAL PIPELINE

Thank you for your attention!

Félix Vidal Vilariño
PENELOPE Project Coordinator
AIMEN Technology Centre
September, 26th 2023

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