Penelope, a new Industry 4.0 solution to further innovation in intelligent, efficient, and flexible manufacturing for high-precision large parts

The project, supported by the European Commission and launched in November 2020, will be taking advantage of the new horizons in manufacturing, opened by Industry 4.0, to develop a novel closed-loop digital pipeline based on the development of modular and reconfigurable production approach for the manufacturing of high-precision large-scale parts.

The manufacturing industry is a strong asset for the European economy and an important driver of employment and prosperity. In December 2019, the European Commission announced the Green Deal to make EU's economy sustainable and boost the efficient use of resources by moving to a clean, circular economy. Achieving a climate neutral and circular economy requires the full mobilisation of the industry. PeneloPe goes in line with these goals by triggering the manufacturing industry digitalisation and contributing to Europe´s competitiveness of several value chains, strategic for the overall European economy. Penelope will help the European large part manufacturing sector to achieve superior quality and precision while allowing the fast deployment of products highly customized for unique customer needs.

Together and for a period of 48 months, PENELOPE´s extensive and multinational partnership of 31 European organizations, led by AIMEN TECHNOLOGY CENTRE, will develop an end-to-end digital manufacturing solution for a flexible and more precise manufacturing of large parts in novel connected factories. PENELOPE relies on a modular, flexible, and worker-centric approach, targeting key labour-intensive and non-ergonomic tasks while preserving workers' knowledge and skills. Penelope´s solution will allow factories to release highly customised and value-added products while reducing reconfiguration time.

This initiative will rely on developing and adopting technologies such as simulation models, Digital Thread, Digital Twin, online control and inline inspection, data analytics and Artificial Intelligence and a broad range of worker-centric tools (VR/AR tools, exoskeletons, collaborative robots, etc.) to build the path towards the future modular and flexible factory 4.0.

PENELOPE´s solution will be implemented, benchmarked, and demonstrated in four industrial-driven pilot lines, in real manufacturing conditions, addressing both one-of-a-kind (Oil&Gas, Shipbuilding) and low-volume manufacturing (Aeronautics and Bus&Coach). A pan-European network of Didactic Factories and showrooms will be set up to provide training and upskilling capabilities enabling the workforce transition towards Industry 4.0 and a general-purpose testbed for assisting in the industry adoption.

PENELOPE results will reinforce Europe's industrial competitiveness and leadership in the manufacturing sector. The increasing production performance, quality and accuracy while ensuring workers' safety and resource efficiency will allow manufacturing companies in Europe to compete globally through breakthrough technologies in manufacturing, yet still benefiting from its highly experienced and skilled workforce.

This project should have a major impact on productivity, energy efficiency and costs. It is for instance estimated that the PeneloPe solution will achieve in its 4 industry-driven pilot lines:

- A reduction of 15% in production costs through process integration.
- A decrease in production time of 20% by a significant automation increase.
- A scrap reduction over 25% by implementing a robust Zero-Defect Manufacturing approach.
- A better use of raw materials, up to a 15%, and an overall reduction of waste management.
- A production performance improvement greater than 20% (ranging from 21% to 40%) resulting in a direct reduction of up to a 22% of energy consumption.
- Overall, PENELOPE manufacturing approach has the potential to contribute directly to 111M tonnes of CO2 eq. reduction per year, if widely adopted by industry.

More information about this project: https://penelope-project.eu/

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