DIGITAL LASER PRODUCTION: DIGITAL TWINS OF LASER PROCESSING FOR MULTI-CAPABILITY MANUFACTURING OF COMPLEX COMPONENTS AND CERTIFICATION

[Porto Salvo, May, 2024] - DILAPRO, an innovative consortium dedicated to advancing the landscape of laser manufacturing, announces its groundbreaking initiative aimed at accelerating the implementation of complex product manufacturing while ensuring adherence to the highest standards of design, quality, cost-effectiveness, and sustainability.

At the core of the DILAPRO project lies a bold mission to leverage multiscale physics-based models and machine learning methodologies to enhance predictive capabilities in manufacturing. By developing state-of-the-art digital twins specifically tailored for laser-materials interactions, DILAPRO aims to revolutionize the industry's ability to assess material quality from microstructural perspectives.

DILAPRO (Digital Laser Production) introduces two groundbreaking software solutions revolutionizing laser-based manufacturing solutions: DILAFACT and DILACERT.

DILAFACT (Digital Laser Factory) stands as a pioneering, sustainable software platform, engineered to facilitate laser process planning through the innovative technique of Digital Twinning. It intricately simulates laser-material interactions, integrating data on technology, material properties, economic factors, and environmental considerations. This comprehensive approach ensures optimal planning and execution of laser processes, paving the way for enhanced efficiency and sustainability in manufacturing.
DILACERT (Digital Laser Certification) represents a novel paradigm in the field of laser-produced parts certification. By leveraging existing and prospective standards, this cutting-edge software aims to certifying laser-produced parts with unparalleled accuracy and reliability. Its implementation heralds a new era of quality assurance, ensuring that laser-produced parts meet the highest industry standards.

Key Achievements include the development of certified end products for strategic partners within the Oil&Gas, Automotive, Space, Mining, Pharmaceutical, Nuclear, produced through demonstrator lines, and the advancement of machine technologies facilitating improved qualification processes and reduced production costs. Additionally, detailed business cases and exploitation routes will be created to sustain DILAPRO's long-term impact.

With DILAPRO, it is anticipated that industrial partners and early adopters will increase their usage of laser production due to its enhanced efficiency. By implementing laser production, expecting to reduce scrap by 60-90%, consume up to 5% less energy, reduce costs of existing parts by up to 20%, and achieve up to 50% faster certification times. Moreover, users can anticipate a reduction of up to 25 per cent in logistics time for heat treatments.

The project aims to achieve the following objectives:

DILAPRO grounds its development in specific materials (316L, IN718, IN625) and laser technologies (PBF-LB, DED-LB, and Laser Texturing) as deployed on 6 operational production lines owned by project partners. These will be developed as distinct modules during the first half of the project, and synthesised into DILAFACT and DILACERT in the project's second half.

The DILAPRO objectives are divided into three distinct groups: objectives specific to the DILAFACT software, objectives specific to the DILACERT software and overall DILAPRO objectives.

DILAPRO will improve additive manufacturing and laser production of complex products by:

- Creating Digital Twin software that will qualify the materials proprieties of such products
- Develop tools for their digital certification
- Demonstrate their effectiveness in the energy sector and other sectors, identified by the project's LASER community

Expected Impact

DILAPRO partners are committed to proactive engagement with major standardization bodies and regulatory authorities, facilitated through interactions within larger manufacturing communities. The consortium will address any regulatory constraints or standards within its purview, ensuring development realignment on a case-by-case basis.

DILAPRO aims to reduce production costs, including energy, waste, and materials quality certification expenses. This reduction allows for a marginal increase in production costs due to licensing, while partners will explore open-source, non-proprietary software solutions to mitigate significant increases in third-party software and patent license expenses. DILAPRO's open-source workflows will facilitate the expansion of software capabilities to accommodate new materials and laser processes, fostering collaboration and innovation within the DILAPRO community.

DILAPRO aims to foster research exchange with Horizon Europe projects and other Research and Innovation (R&I) initiatives focused on absolute sustainability within manufacturing industries. Quantitative Life Cycle Assessment (LCA) models and findings will be continually updated and incorporated into DILAPRO's framework.

With standardisation and certification bodies are in pace to gice steps towards in digital certification. Moreover, inclusion of machine manufacturers in ongoing discussions will further integrate DILAPRO's methodologies, particularly in inline monitoring and quality assurance, into industry practices. Manual guides for physical simulation of additive manufacturing and surface-laser interaction will disseminate DILAPRO's expertise widely.

Partners

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