dilapro

DIGITAL LASER PRODUCTION

Project n° 101138859

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

Newsletter #1

01. WP1 Sets the Foundation for DILAPRO Project Success

Work Package 1 (WP1) is critical in establishing the practical framework that will underpin the subsequent work packages of the **DILAPRO** Project.

This phase involves several essential steps:

Use Case Requirements
Serving as a tool for data collection and process validation.

Specifications and Standards
Ensuring all components meet industry benchmarks.

Required Quality Control
Implementing sensors for inline, online, and offline validation through inspection.

Certification Requirements
Aligning with necessary certification standards.

Software Architecture in Relation to DILAFACT
Structuring the software framework integral to **DILAFACT**.

WP1 concludes with a comprehensive description of the boundary conditions for use cases, production lines, and software architecture, culminating in a robust business case definition that addresses logistics, environmental impact, and cost considerations.

02. Spotlight on Deliverable 1.1
Use case definition and requirements including business case definitions

Aligning Laser-Based Production Technology with the Real World
Cutting-edge technologies offer new possibilities, but their value depends on finding the right applications. The **DILAPRO** project focuses on identifying real-world uses for laser-based technologies to maximize their impact.

Identifying Valuable Use Cases
The **DILAPRO** consortium has identified 10 components across industries like automotive, oil & gas, space, mining, nuclear, and pharmaceuticals. These will be produced using advanced laser technologies, including laser powder bed fusion, directed energy deposition, and laser texturing, with materials like aluminium, stainless steel, tool steel, and Inconel.

Ensuring Functional and Reliable Solutions
Each component's functional requirements and operating conditions were thoroughly analysed, outlining production processes, adhering to standards, and assessing risks. This ensures reliable solutions and aims for digital qualification over traditional physical testing.

Understanding Business Benefits
The project assessed business advantages such as reduced lead times, minimized material waste, repaired components, and improved structural integrity. These insights provide a strong foundation for developing software tools to meet industrial needs.

03. Spotlight on Deliverable 1.3
Optimizing Manufacturing with Digital Twins and Predictive Modelling

The DILAPRO project proudly announces **Deliverable 1.3: "Description of Relevant and Current Software Workflows for the Respective Use Cases."** This milestone is key to integrating advanced digital solutions into European laser-based manufacturing.

Key Highlights

Objective and Scope:
Deliverable 1.3 analyses software workflows essential for laser manufacturing techniques like powder bed fusion, directed energy deposition, and laser texturing. It identifies optimization opportunities using **DILAFACT** and **DILACERT** platforms.

Comprehensive Workflow Mapping:
The document outlines the software architecture for **DILAFACT**, including real-time data processing, predictive modelling, and user-friendly interfaces.

DATAmaestro Platform Integration:
Focusing on PEPITe's DATAmaestro platform, the deliverable details its role in data collection, storage, analysis, and dashboarding, creating a comprehensive data analytics pipeline.

Architecture and User Access:
The **DILAFACT** platform's multi-tiered architecture is detailed, from automated data acquisition to secure storage, machine learning for predictive modelling, and differentiated user access.

Implementation and Examples:
A practical example showcases **DILAFACT's** implementation within DATAmaestro, demonstrating effective data integration, processing, and visualization.

The Way Forward:
Deliverable 1.3 lays the foundation for advanced software solutions in manufacturing, enhancing efficiency, reliability, and compliance in laser manufacturing. **DILAPRO's** commitment to innovation ensures it leads the digital transformation in manufacturing, paving the way for a sustainable and competitive European sector.

04. Environmental Impact of Laser Technologies

One of DILAPRO's goals is to reduce the environmental impact of laser technologies. To achieve this, it is crucial to deeply understand the various processes used in the project. By gaining knowledge about these processes, we can identify meaningful parameters to measure and monitor, which is the first step towards minimizing environmental impacts.

Therefore, we have created detailed process maps that outline all the inputs and outputs of each step. A section of one such map can be seen in Figure 1.



Figure 1
Section of the Process Map for PBF-LB, showing the PBF-LB process itself, yellow and blue arrows indicating the inputs and outputs of the process and orange arrows showing material losses. A legend of the different blocks and arrows can be found on the left. This is only a section of a bigger flowchart, mapping other processes related to the additive manufacturing process like powder production, build file preparation, process finalization or part specific post-processes.

These maps can become quite complex, depending on the level of detail. Each process can be broken down into sub-processes with separate inputs and outputs, including different waste and emission streams.
By analysing these maps, we can define specific parameters to monitor and assess the environmental impacts of the processes involved.
The process maps will later serve as a solid foundation for performing the life cycle assessments of various use cases and developing a sustainability module for the **DILAFACT** software.

In addition to mapping processes, we have developed research guidelines aimed at reducing the environmental impact of our project. One key factor is mindful planning. Effective planning helps avoid producing too many or too few samples, thus preventing unnecessary repetition of tests and helping to optimally utilize the whole build plate.
For additively manufactured parts, optimizing and fully utilizing the build volume can minimize waste. Performing a Design of Experiments and agreeing on consistent test geometries across project partners also help reduce the number of required tests.
Moreover, we adhere to general sustainability practices: using minimal materials, recycling, being cautious with chemical use, and shutting down unused equipment.

Project management also plays a critical role in minimizing environmental impact. This includes avoiding unnecessary travel, utilizing public transport or carpooling when travel is necessary, and being considerate with data usage—such as avoiding sending emails with both attachments and links to documents.

By following this approach, DILAPRO aims to reduce the environmental impact of our research and use resources as sustainably and responsibly as possible.

Events



DILAPRO Kick-off-meeting

DILAPRO Project officially kicked off with a productive meeting held at the Teknologisk Institut in Aarhus, Denmark at 10th of January.

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AM Village 2024 Addresses Defence Sector Challenges

The AM Village has been organized to facilitate collaboration between military stakeholders and solution providers.

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360 TECH INDUSTRY 2024 Highlights

The 360 TECH INDUSTRY - International Trade Fair for Industry 4.0/5.0, Robotics, Automation, and Composites 2024 was held on May 22-23 in Porto, Portugal.

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