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PROJECT ALABAMA - ADAPTIVE LASER BEAM FOR ADDITIVE MANUFACTURING

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The ALABAMA project aims to develop and mature adaptive laser technologies for AM. The objective is to lower decrease the porosity and to tailor the microstructure of the deposited material by shaping the laser beam, both temporally and spatially, during the AM process. The key innovations in the project are to develop multiscale physics-based models to enable optimization of the AM process. These process parameters will be tested and matured for multi-beam control, laser beam shaping optics and high-speed scanning. To ensure the quality of the process, advanced online process monitoring, and closed loop control will be performed using multi spectral imaging and thermography to control the melt pool behaviour coupled with wire-current and high-speed imaging to control the process. To verify that the built material fulfils the requirements, advanced characterization will be conducted on coupons and on use-cases.

The matured technology will be tested on three use-cases: aviation, maritime and automotive. These three industrial sectors span a broad part of the manufacturing volumes: from low numbers with high added value, to high numbers with relatively low cost.

However, all these sectors struggle with distortions, stresses, and material quality. The ALABAMA use-case demonstrators will improve the compensation for distortions during the AM process, reduce the build failures due to residual stresses, reduce porosity and improve tailoring of the microstructure. Overall, this will contribute to up to 100% increase in process productivity, 50% less defects, 33% cost reduction due to increased productivity and energy savings, a reduction of 15% in greenhouse gases and enable first time- right manufacturing thanks to simulation, process monitoring and adaptive control. The end users will insert the technologies while the sub-technologies developed in the work packages will be commercialized. This will increase the autonomy for a resilient European industry.

One of the main aims of ALABAMA is to replace native formats with standards such as VMAP. ALABAMA-specific extensions and customizations for these data standards and corresponding semantic concepts (ontologies) are being developed and published. This means that previously separate data sources can be integrated into a standardized information management system and coordinated consistently.

PROJECT BASE - BATTERY PASSPORT FOR RESILIENT SUPPLY CHAIN AND IMPLEMENTATION OF CIRCULAR ECONOMY

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The battery although is at its central role for green transitioning of the road transport, the current battery supply chain is lacking in traceability and sustainability, resiliency, and circularity aspects. Critical Raw Materials (CRM) are essential ingredients for battery manufacturing. The exploding growth of Electric vehicles driven by the climate neutrality policy objectives will create pressure on CRM supply chain and will increase the EU dependency for CRM on 3rd countries, resulting in decrease of competitiveness of the EU automotive and battery manufacturers. Implementation of the digital battery passport (DBP) concept in the battery value chain might resolve these issues.

The main goal of BASE project is to develop, validate and implement a working DBP service, as mandated by the "Regulation", by exploiting the collected data via number of constantly evolving tools and methods, to ensure transparent, secure, and cost-efficient platform operation, by also catalyzing the growth of circular businesses. The BASE will develop transparent methodologies to calculate battery performance & ESGE indicators while ensuring traceability down to CRM level through the entire battery value chain.

In the physical domain this will be achieved through the mass balancing approach. For data management side, exploiting distributed ledger technology, the BASE will ensure built-in data authenticity verification, along the value chain, with no data duplication, avoiding data manipulation assuring privacy by design, with promoting data interoperability.

BASE will pursue the concept of digital twin targets in federated data spaces to track data from physical parts and materials across the supply chain lifecycle to enable data-driven use cases across all n-tier levels, each without jeopardizing data sovereignty. As part of this task, standardized data formats and vocabularies tailored to battery components, materials and their lifecycles will be defined.