



EnginSoft celebrates a milestone of 100 research projects and continues its commitment to innovation

EnginSoft's commitment to collaborative research and innovation projects has achieved an ambitious goal: in 2023 we reached 100 research projects (national and European) in which we were involved as partners or coordinators. There have been enormous spin-offs for the company – from the development of new methodologies and technologies, to the business network and relationships that have been established, as well as the skills we have acquired, increased and shared in areas that add great value and have truly international scope.

As a company, proud to be at the forefront of innovation, we will certainly continue to invest in this pillar which even now, at the beginning of 2024, sees us continue to play a leading role in new projects spanning very different sectors.

Among the European initiatives we have joined, the “newest” additions are:

- **BioStruct:** which will develop an innovative manufacturing process for bio-based fibre-reinforced composite parts for structural applications;
- **ACCURATE:** which aims to achieve resilience through manufacturing as a service, digital twins of manufacturing systems, and ecosystems;
- **ODE4HERA:** the Open Digital Environment for Hybrid-Electric Regional Vehicles project; and
- **YOGA:** which, and as the full title “Your Osteoarthritis Goes Away” says, will focus on tests of new personalized treatments for osteoarthritis

For more information:

Carla Baldasso – EnginSoft
c.baldasso@enginsoft.com



BioStruct

Manufacturing process for bio-based fibre-reinforced composite parts for structural applications

The BioStruct project is committed to developing high-precision manufacturing processes for bio-based, fibre-reinforced composite parts for structural applications. With a budget of €8m over three years, BioStruct brings together ten partners including end users and partner companies in automation, machine building, measurement technology, material manufacturing, and simulation software to comprehensively cover all aspects of development.

BioStruct aims to address the challenges currently associated with the use of bio-composites in structural components and to broaden the scope of applications for bio-composites. Its specific objectives and corresponding actions include:

- Developing an accurate draping process to control fibre orientation
- Creating material models to capture natural variability
- Integrating nano-structured, bio-based sensors for load monitoring

The project aims to achieve predictable properties and consistent quality through enhanced accuracy and additional control loops in the manufacturing process. It will demonstrate these advancements through two distinct use cases focusing on wind energy and boat-building that will prove the effectiveness of these innovative manufacturing technologies. In this project, EnginSoft is responsible for the simulation of the manufacturing phases of the bio-based composite, such as draping and curing, including the calibration of virtual models through experimental verification. Then EnginSoft will be responsible for structural verification and optimization of the maritime components. And, finally, for creating the Life-cycle Assessment (LCA) data inventory and estimating the economic and environmental impact of the newly developed process.

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ACCURATE

Achieving resilience through manufacturing as a service, digital twins, and ecosystems

The ACCURATE project aims to boost the competitiveness of European manufacturing companies and value chains by improving their sustainability, performance stability, resilience, and ability to manage unforeseen events.

ACCURATE will develop innovative approaches and deliver an integrated set of results culminating in:

- a human-centric Decision Support System (DSS) offering a better understanding of the impact of unforeseen events on manufacturing and industrial networks, providing timely, optimal and robust manufacturing supply and value chain design, planning, stress testing, reconfiguration, and recovery and improving circular and sustainable performance;
- a Manufacturing-as-a-Service (MaaS) framework covering multiple critical supply and value chains, leveraging data-space technologies as well as multi-scale and multi-level Digital Twins and co-simulation in order to deliver swift adaptation capabilities for logistics and production that are technically and economically viable;
- an open, standards-based, federated and trustworthy data space and ecosystem that integrates data flows, models, and tools across actors in manufacturing value chains thereby creating smart manufacturing networks and empowering humans and organizations to share valuable information and collaborate on MaaS solutions while retaining full sovereignty over their sensitive data and intellectual property.

ACCURATE's results will be validated through three pivotal use cases covering multiple key European industrial sectors and value networks: aerospace, automotive, biotech, energy, medical, and mobility.

The participation and commitment of industrial partners like Airbus, Continental and TRONICO underlines the project's viability. The ACCURATE project will exploit the transformative potential of data spaces and ecosystems in revolutionizing business models and value propositions, and will leverage these technologies and approaches to achieve impact, create resilient manufacturing networks, instigate deep innovation, and accelerate the adoption of results.

EnginSoft is the scientific coordinator of the project and is also responsible for the design and development of ACCURATE's human-centric DSS. To this end, the company provides its expertise in data analytics and data modelling applied to manufacturing processes and will develop data- and simulation-driven digital twins at process/system-level. Additionally, EnginSoft will implement the modelling of unforeseen disruptive events and multi-level analysis of the propagation of cause and effect on supply chains.

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ODE4HERA

Open Digital Environment for Hybrid-Electric Regional Architectures

The objective of the ODE4HERA project is to enable and accelerate the development of Hybrid-Electric Regional (HER) aircraft through improved tools and techniques implemented in a transferable and Open Digital Platform (ODP).

The project, coordinated by DLR, involves the largest international players in the sector, including Airbus and LEONARDO. HER configurations contain far higher complexity than conventional configurations and involve new aircraft technologies and broader collaboration across the value/supply chain. The Open Digital Platform developed in ODE4HERA will combine Model-Based System Engineering (MBSE), Multi-Disciplinary Optimization (MDO), Simulation Data Management (SDM) and Product Lifecycle Management (PLM) technologies and extend them with novel open interfaces, formats, and smart model and data transformation technologies to efficiently handle and process the complexity of HER configurations.

The ODE4HERA project will introduce four innovations:

- a comprehensive and industry-ready open data platform tailored to the unprecedented level of complexity of HER configurations;
- full interoperability across the entire HER value/supply chain;
- tracing and checking the complex models and mapping them to the huge amount of data generated during the HER development process by different organizations using different tools;
- use of certification guidelines for software development

EnginSoft will implement the MDO both for CAE (Computer-Assisted Engineering) and for MBSE, which is increasingly required in the application of Integrated Verification and Validation (IV&V). In addition, EnginSoft will develop the PLM and SDM interfaces that are crucial for the automation of workflows to ensure the digital continuity of enterprise.

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YOGA

Miniaturized cartilage-tissue culture wells for point-of-care diagnosis and personalized treatment of osteoarthritis and Your Osteoarthritis Goes Away

Osteoarthritis is a widespread disabling condition among the elderly. YOGA is the first step of a broader pathway that aims to find personalized therapies by coupling in vitro diagnostics and artificial intelligence. In YOGA, a complex cell culture system will be developed to simulate cartilage tissue for use with biopsies in a physiological, proinflammatory and hydrogel-treated regenerative environment.

The concentrations of inflammatory markers will be measured using EliChip, a microfluidic platform from Trustech, and the concentration of nitric oxide with a specially developed Lab on Chip (LoC). The results will be archived and standardized in a specially created database for future developments aimed at diagnosis and personalized medicine. Sensitivity analyses on data from the laboratory environment will be performed to study the behaviour and relationships between tissue and therapeutic characteristics in order to develop a model that can replicate in vitro experiments and predict the efficacy of a therapy.

YOGA's goal is to create a semi-automated and standardized platform that can be used in any clinical laboratory to characterize tissue by biopsy when very little material is available. The application to osteoarthritis aims to provide a comprehensive, versatile and scalable model that can be easily adapted to other diseases. The innovation is the integration with the digital platform to host and analyse large amounts of data through advanced machine learning algorithms.

EnginSoft's contribution is focused on implementing a user-friendly platform based on machine learning algorithms for the predictive and personalized medicine) and on modelling the micro-fluidic behaviour of the EliChip.

The YOGA project has received funding from the Cascade funding calls of the NODES Programme, supported by the MUR - M4C2 1.5 of the PNRR funded by the European Union - NextGenerationEU Grant agreement No. ECS00000036.