

THE TRANSFORMATIVE POWER OF RESEARCH



Projects' insights



The field of Simulation Based Engineering Sciences (SBES) has always been at the forefront of innovation in companies' design and production processes since it relates to understanding physical phenomena and their impact on the creation and use of products using computer-developed models. This is even more true today, which sees SBES being presented as one of the nine enabling technologies of the Industry 4.0 trend, and of the digital transformation of companies in general.

However, innovation without research is impossible because knowledge plays a leading role in any development process, which is why research is at the heart of EnginSoft's business and its service offering to corporate customers.

Industrial research aims to achieve results that can be applied both immediately and over the longer term through subsequent industrialization. This type of research is best approached by consortia which make it possible to holistically share the complementary aspects of individual knowledge and expertise that lead to the creation of solutions that are complete from every point of view and which can then be used without further substantive integration.

These pages document the path that has been taken by EnginSoft and illustrate the variety of contexts and disciplines in which SBES can be applied, and how and when this can be done for the benefit of the industry, while also highlighting the capacity that EnginSoft has developed as a facilitator and coordinator of these research consortia.

In presenting this collection, which focuses on the research projects that have involved EnginSoft largely since 2003, my hope is that it will make stimulating reading for company decision-makers, aspirant corporate project research workers and managers, and anyone else who may find herein inspiration for new ideas and initiatives.

*Stefano Odorizzi,
President and CEO of EnginSoft*

EnginSoft's contribution to European Innovation

Why should a company invest in industrial research and innovation?

It might seem a trivial question, but the answer certainly is not. Solid expertise combined with an exceptional collaborative industrial network, academic partners and a sustainable funding approach have enabled the EnginSoft Group to operate as an innovation enabler, leveraging the co-creation of knowledge between its customers and the most technologically advanced research centers in Europe.

Since 2003, EnginSoft has actively contributed to innovation in European industry by participating in international research projects that exploit Simulation Based Engineering Science (SBES).

Stefano Odorizzi, president and CEO of EnginSoft, explains, *"EnginSoft has always believed in research and it is this conviction that has allowed us to remain at the forefront of the various technological sectors in which we specialize. Research projects are an excellent way for us to gain cutting-edge know-how, to deepen and extend the knowledge and expertise we already have, to access new sectors and, last but not least, to create and test new tools and platforms in the SBES field."*

The company also participates intensively in various European research bodies, such as the European Factories of the Future Research Association (EFFRA), the European Materials Modelling Council (EMMC), the European Platform for High-Performance Computing (ETP4HPC), and the

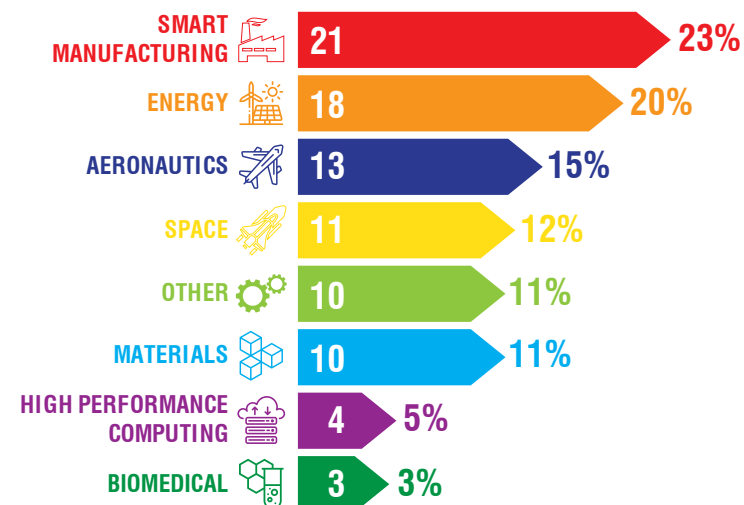
European Institute of Innovation and Technology (EIT)'s Raw Materials consortium.

It is one of the founding members of the Apulian Aerospace Technological District (Distretto Tecnologico Aerospaziale, DTA) and a member of the District for Rail Technologies, High Speed trains, Safety & Security (Distretto per le Tecnologie Ferroviarie, l'Alta Velocità e la Sicurezza delle Reti, DITECFER) in Italy, as well as a member of APRE (the National Agency for the Promotion of European Research - Agenzia per la Promozione della Ricerca Europea) to keep abreast of all the European research developments. Moreover, it is one of the few companies investing in three of the eight Italian national Competence Centers (CC), namely CC MADE (led by the Polytechnic of Milan), CC SMACT (led by the University of Padua), and CC Industria 4.0 (led by University of Naples "Federico II" and the Polytechnic of Bari).

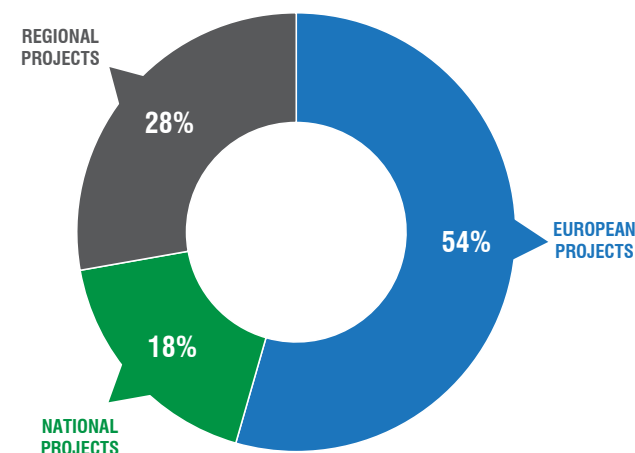
EnginSoft is also an associate of the Innovation Cluster of the Piedmont Region dedicated to Smart Products and Smart Manufacturing (MEccatronica e Sistemi Avanzati di Produzione, MESAP).

EnginSoft's multinational presence across Italy, Turkey, Germany, Sweden, France, Norway and the UK makes it a versatile partner for reaching the required geographical balance in a consortium. Being a medium-sized company also makes it a sought-after partner, since many European research projects target small and medium-sized enterprises to stimulate, encourage and commercialize innovation.

PROJECTS BY INDUSTRIAL SECTOR



PROJECTS BY TYPE OF FUNDING



Over the years, the company has participated in almost 90 research projects and contracts across sectors as diverse as Smart Manufacturing, Energy, Aeronautics, Space, Materials, High Performance Computing (HPC), Biomedical, and Others such as Construction, Geomechanics and Consumer goods (see chart “Projects by type of funding”). There were 27 projects funded by the European Commission, 8 by the European Space Agency and 14 by the ITER Organization and Fusion4Energy, 16 were Italian, Swedish and Turkish national projects, and 25 were regionally funded initiatives. Aggregated shares are represented in the graph “Projects by type of funding”.

This publication presents an overview of the most successful projects and aims to outline of the research areas in which EnginSoft is involved as well as a perspective on its contribution to research.

Numerical simulation has a multiplicity of applications and, consequently, as experts in SBES, EnginSoft has contributed to projects ranging from the most traditional, such as Space, Aeronautics and Construction, to the most cutting-edge, such as Biomedical, Energy, HPC (High Performance Computing) and Materials. For example, over the years, the company has studied the behavior of advanced composites in Aeronautics, created management platforms for zero-emission hydrogen production plants, studied hydroponic systems for agricultural cultivation in

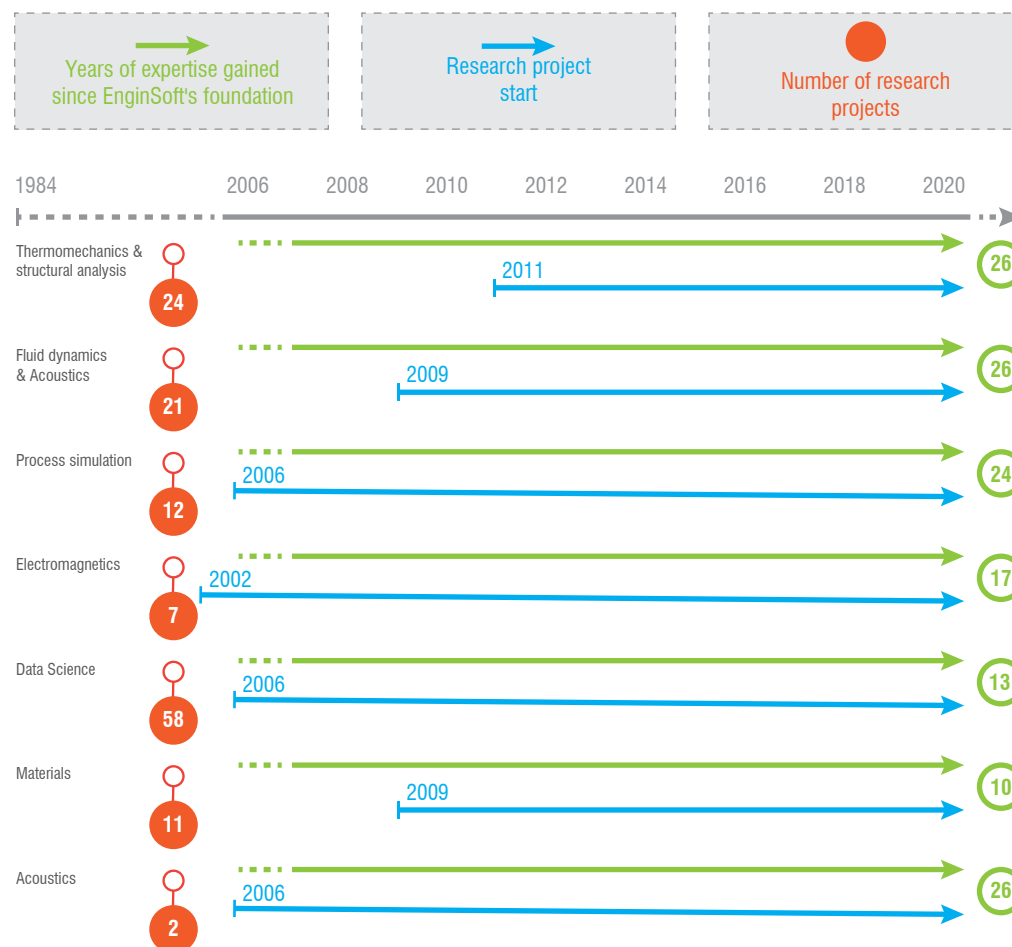
space, and simulated the behavior of networks of artificial neurons implanted in the brain.

EnginSoft has applied its mature expertise to advanced applications in thermo-mechanics, structural analysis, acoustics and fluid dynamics. To complement its well-established mastery in the field of simulation, the company has also developed relevant skills in data science, introducing cutting-edge solutions in software platforms, like customized decision support systems and simulation- and data-based digital twins. A comprehensive representation is provided in the graph “Expertise in research projects”. This expertise enables it to offer the further highly innovative value of complex platforms capable of combining and analyzing data collected on-site with the results obtained from simulation to assist and steer both the design and process management phases of projects.

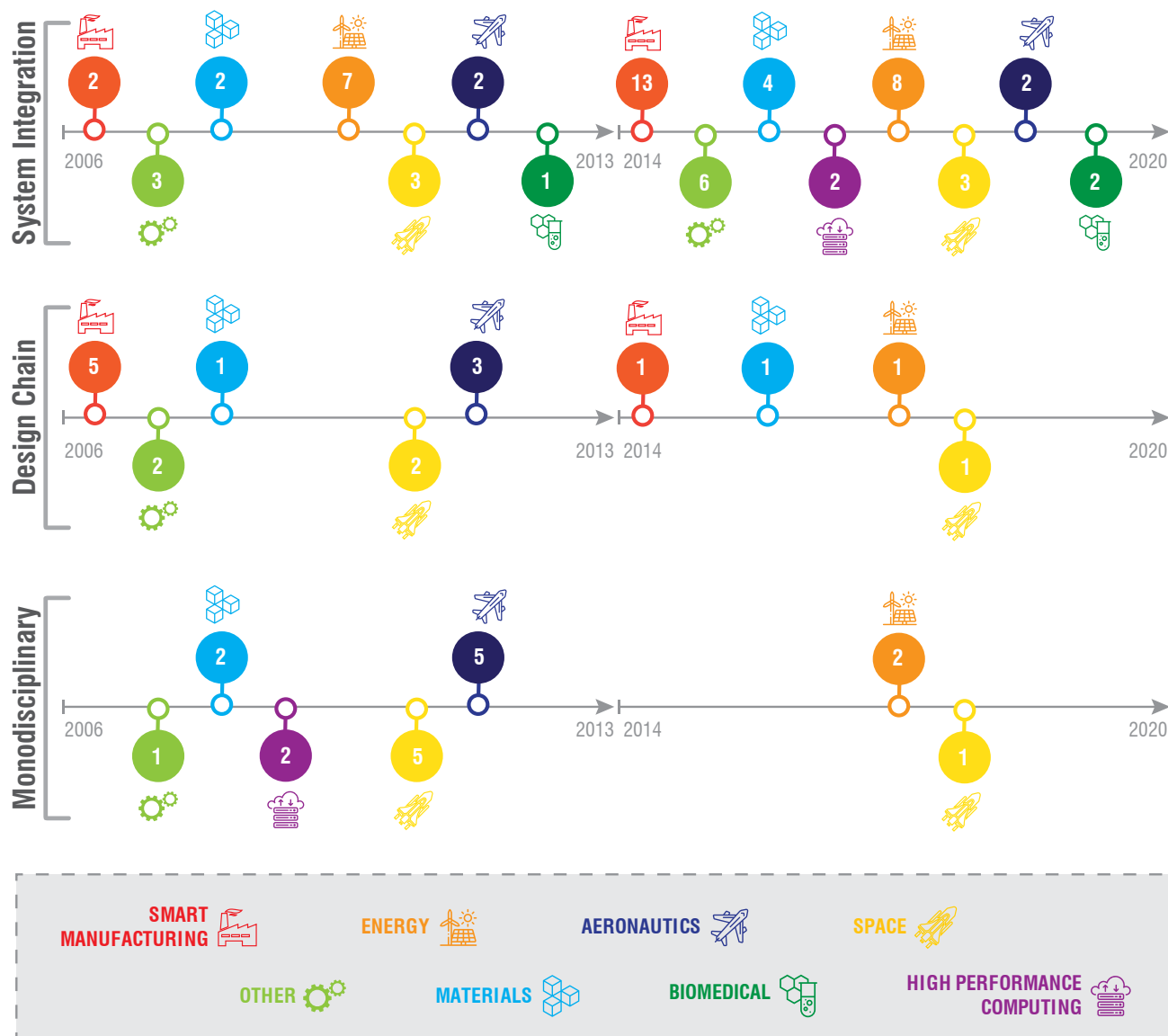
A significant example is the creation of a cognitive platform that optimizes quality management in production, a forerunner to the current Smart Manufacturing concept. This platform is the result of the collaborative 7th Framework Programme project “MUSIC” which was coordinated by EnginSoft itself. It acquires real-time data from production and, using complex numerical models and optimization techniques which border on Artificial Intelligence algorithms, is able to evaluate the machine’s production status and its seamlessness. Consequently, it recommends actions that can be taken to

EXPERTISE IN RESEARCH PROJECTS

Innovative applications
in research projects
for selected years 2006 - 2019



PROJECTS BY COMPLEXITY LEVEL AND PERIOD SINCE 2006



improve production processes and product quality, and to reduce production costs.

Over the years, EnginSoft has developed a multidisciplinary approach and the ability to integrate increasingly complex layers of technologies and applications across a wide range of domains. The company's ability to handle and connect different technologies to multiple sectors is mapped by the chart "Projects by complexity level and period since 2006". Research projects began under the 6th Framework Programme (FP6) in monodisciplinary contexts (at complexity level 1) such as Space, and evolved under the 7th Framework Programme (FP7) to applications in design chain (at complexity level 2) in the Aeronautics and Manufacturing domains, up to systems integration and optimization under H2020 (at complexity level 3) in new fields such as Materials and Energy and Smart Manufacturing.

Referring to the company's coordination of eight FP7 and H2020 projects, Carla Baldasso, EnginSoft's Chief of International Research, states: "Years of participation have enabled us to develop and strengthen our considerable project management and coordination skills, in addition to expertise in result dissemination and exploitation, which are key factors especially for European projects. For this reason we also developed a platform, called *Eucoord2020*, to coordinate, promote and report on the European projects."

She states that participation in research projects has enabled EnginSoft to work alongside exceptional industry partners, to offer new services to its customers and to enhance its high value proposition activities: "Research allows EnginSoft to access cutting-edge approaches and applications, which enables us to constantly innovate and generate leading-edge solutions for our customers."

A snapshot of EnginSoft's involvement in pan-European research

Listed below are the major funding opportunities leveraged by EnginSoft in contributing to international, national and local research and innovation for Science and Industry.

European investments in R&D

According to the European Commission, Europe represents 20% of international R&D spend, despite only representing 7% of the global population^[01]. Its R&D spend has garnered it a top international position in various market sectors, specifically in pharmaceuticals, chemicals, mechanical engineering and fashion^[02].

The EU makes much of the funding available through its so-called Framework Programmes, which started in 1984, and which were originally five-year programs. Subsequently, they became 7-year programmes^[03]. The EU's Framework Programme for research and innovation has grown from 4% of its annual budget a decade ago to 8% now, and totals €74.8 billion (US\$83.5 billion) for 2014–20 alone^[04].

The current "Horizon 2020", from 2014 to 2020, is the 8th Framework Programme and represents an investment of approximately Euro 80-billion in funding^[05]. It will be replaced by "Horizon Europe", slated to be the "most ambitious research and innovation programme ever", with the intention of retaining the EU's leading position, improving

its ability to compete globally and also protecting and augmenting the European way of life^[06].

In June 2019, the findings of the European Innovation Scoreboard showed that EU innovation has improved for four consecutive years, even outperforming the USA for the first time^[07].

Horizon Europe's Euro 94.1-billion budget has three pillars: Excellent Science, Global Challenges and European Industrial Competitiveness, Innovative Europe, and five proposed missions' areas: Adaptation to climate change including societal transformation; Cancer; Healthy oceans, seas, coastal and inland waters; Climate-neutral and smart cities; Soil health and food.^[08] Continuing the unique feature of previous Framework Programmes, projects are required to include substantial cross-border partnerships and teamwork between academia and industry, however this focus is being further extended to invite participation from other nations globally, such as Australia, South Korea and Canada^[09] under the fourth pillar Widening Participation and Strengthening the European Research Area.

EnginSoft has contributed both as a Coordinator or a Partner to more than 30 FP7- H2020 projects ranging from DIRECTION (Demonstration of very low energy new buildings) in 2012, EDEN ISS

(Ground Demonstration of Plant Cultivation Technologies and Operation in Space) in 2014, ExaNeSt (European Exascale System Interconnect and Storage) dedicated to HPC in 2015, to the ongoing challenge of SYNCH (A SYNaptically-connected brain-silicon Neural Closed-loop Hybrid system) in 2018, ForZDM (Integrated Zero Defect Manufacturing solution for high value multi-stage manufacturing systems) in 2019, DigiPrime (Digital Platform for Circular Economy in Cross-sectorial Sustainable Value Networks) in 2020.

European Space Agency: the MELiSSA project

MELiSSA (Micro-Ecological Life Support System Alternative) is the European Project, financed by ESA (the European Space Agency), on closed life support systems. It aims to produce food, water and oxygen for manned space missions that would otherwise result in tremendous costs. EnginSoft has worked on several aspects of the life support system, for example simulating cells' behavior for hydroponic cultivation (HySSE, AtSSE and PACMAN Projects) or designing platforms for energy balance in the space vector (ENRUM Project).

International R&D for Carbon-free Energy: the ITER experiment

The International Thermonuclear Experimental Reactor (ITER) is the world's largest fusion experiment. Thirty-five nations are collaborating to build and operate the ITER Tokamak, a magnetic fusion device that has been designed to prove the feasibility of

fusion as a large-scale, carbon-free source of energy that uses the same principle that powers our Sun and stars. The ITER reactor has been designed to produce 500MW of output power per 50MW of input. Just a few meters separate the 4 Kelvin degrees of the cooling liquid in the superconductive coils and the 150-million degrees of the plasma where the fusion reaction takes place^[10]. Set between these two extremes, the reactor's metallic surface is exposed to a heating flux comparable to the Sun's; simulation, therefore, plays a key role in the design of the reactor. The ITER Organization and Fusion4Energy, the EU Joint Undertaking for ITER, have committed themselves and through the EnginSoft subcontract, to perform finite element method (FEM) calculations dedicated to different functionalities ranging from the electro-mechanical and magneto-static analysis of the ITER reactor blanket module to the simulation of the welding of the Toroidal Field Coil Cases.

National key initiatives

The Competence Centers in Italy, the Technological Clusters and Districts, the Regional Innovation Networks, the role of TÜBİTAK in Turkey and R&D strategies in France and Sweden.

Each government invests in research and innovation, in accordance with the EU's broader programs, to keep its country at the forefront of technology, to exploit its excellences and to stimulate the development of each area.

Below is an overview of the main National and Regional initiatives to which EnginSoft has contributed.

The Italian Industry 4.0 Competence Centers (CCs)

Competence Centers are Italian public-private partnerships that bring together the business world and the academic world with the goal of providing Italian companies (particularly SMEs) with Industry 4.0 orientation, training and support. The CC are intended to serve as catalysts for transformative change. They have the potential to redefine innovation processes and transform industries and economic activities. The CCs will provide training and applied research to support companies in embracing digital technologies and industrial innovation. EnginSoft Italy contributes as a national technology provider to the CC Made in Italy 4.0, led by the Polytechnic of Milan, CC SMICT, led by the University of Padua, and CC Industry 4.0, led by the University of Naples "Federico II" and Polytechnic of Bari.

Technological clusters: the Italian experience

The Italian technological clusters are networks of public and private entities operating at national level in sectors such as industrial research, training and technology transfer. They act as conduits for resources to meet the needs of the territory and the market, and to coordinate and strengthen the connection between the worlds of research and business. There are twelve National Clusters in Italy, aligned with the twelve priority research areas as identified by the

National Research Program from 2015-2020.

Thanks to its experience in Smart Manufacturing and system engineering, EnginSoft is an active member of the "Fabbrica Intelligente" [Smart Factory] cluster operative in the advanced manufacturing domain. It is also a committed member of the Cluster Tecnologico Nazionale "Trasporti Italia 2020" [National Technological Cluster - Transport Italy 2020], involving national industrial and scientific stakeholders from the road, rail, maritime transport and intermodal production chains, working together for sustainable surface mobility.

Technological districts: DTA and DITECFER

Several initiatives such as local aggregations of academia, research centers and industry have been launched on the basis of national excellences in order to strengthen local production systems. EnginSoft has joined two of them, namely the Apulian Aerospace Technological District (Distretto Tecnologico Aerospaziale, DTA) and the District for Rail Technologies, High Speed trains, Safety & Security (DITECFER). Their mission is to support R&D collaboration at national and EU level, to enhance collaborative internationalization of supply and to provide training.

Smart specializations: the Veneto Regional Innovation Networks

As part of the Veneto Region's strategy of Smart Specialization, the (current) 18 Regional Innovation Networks (Reti Innovative Regionali – RIR) represent a valuable vehicle

for activity. The networks bring together public entities and private companies to develop and exploit multisectoral skills to obtain innovative results and thus develop the regional economy. Each RIR is included in one of four regional smart specializations^[11] (RIS3), namely Smart Agrifood, Smart Manufacturing, Sustainable Living, and Creative Industries^[12]. EnginSoft Italy participates in three RIR, specifically:

- ★ IMPROVENET: ICT for smart manufacturing processes Veneto Network^[13];
- ★ SINFONET: Smart & INnovative FOundry NETwork^[14];
- ★ M3-NET: Meccanica di precisione, Micro-tecnologie e Manifattura additiva^[15] [precision mechanics, micro-technologies and additive manufacturing].

Five projects have been generated by the RIR: PreMANI (digital and predictive manufacturing), FORSAL (automated foundry for workers' health), GAP (high performance cast iron and aluminum alloys), INFOS (INTERNationalisation of Veneto FOundry by networked Strategies) and Temart (Technologies and materials for artistic manufacture, cultural heritage, furniture, architectural and urban decor and the design of the future).

TÜBİTAK: the Turkish Scientific and Technological Research Council

The Scientific and Technological Research Council of Turkey (TÜBİTAK)^[16] is the leading agency for management, funding and research in Turkey. The Council is an

autonomous institution and is governed by a scientific board whose members are selected from among prominent scholars at universities, industry and research institutions.

TÜBİTAK acts as an advisory agency to the Turkish Government on science and research issues and is the secretariat of the Supreme Council for Science and Technology (SCST), the highest S&T policy making body. EnginSoft Turkey, situated within the Istanbul Technopark, has made valuable contributions to industrial research in shipbuilding, by means of simulation applied to the noise prediction of propellers and to the main actuators of ships for monitoring and alarms.

Vinnova: the Swedish government agency for innovation

Vinnova is the Swedish government agency for innovation^[17]. It contributes to sustainable growth by improving the conditions for innovation by funding projects and the research necessary to develop new solutions. Each year, Vinnova invests around SEK 3-billion in fostering innovation by stimulating collaboration among companies, universities and other higher education institutions.

EnginSoft Nordic, located in the IDEON Science Park of Lund, contributed to developing computer support and work methods for the systematic optimization of lightweight solutions in automotive and aerospace, as well as tools to explore viable strategies for innovative product development processes, as part of Vinnova's programs "SIP Lighter" and "Digitalization of

Swedish Industry”.

FUI: the French Single Inter-ministerial Fund

Within the French R&D strategy, the role played by the Pôles de Compétitivité (competitiveness clusters) is strengthened by the Single Inter-ministerial Fund (FUI - fonds unique interministériel)^[18]. These clusters bring together large and small firms, research laboratories and training facilities in a specific region to develop synergies through collaborative R&D projects. MUSICAS, a multi-stakeholder FUI project, improved the ability to predict the performance and the fatigue of welded structures. The methodology, presented by EnginSoft France, demonstrated the successful integration of CAE tools using modeFRONTIER.

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SMART MANUFACTURING



DIGIPRIME

DigiPrime Digital Platform for Circular Economy in Cross-sectorial Sustainable Value Networks

START DATE - END DATE

2020 - 2023

PARTNERS

POLITECNICO DI MILANO, ATLANTIS ENGINEERING AE, BALANCE TECHNOLOGY CONSULTING GMBH, BOSCH REXROTH AG, CENTRO TESSILE COTONIERO E ABBIGLIAMENTO SPA, CIRCULAR ECONOMY SOLUTIONS GMBH, COBAT SERVIZI , CONTINENTAL AG, DESIGNAUSTRIA (DA), E REPAIR SRL, EDAG ENGINEERING GMBH, ENGINSOFT SPA, ENGINSOFT TURKEY MUHENDISLIK YAZILIM TICARET LIMITED SIRKETI, ENVIROBAT ESPANA SL, EXTRA RED SRL, FLEXIS AG, FUNDACIÓN TECNALIA RESEARCH & INNOVATION, HOLONIX SRL— SPIN-OFF OF POLITECNICO DI MILANO, IDEA STRATEGISCHE ECONOMISCHE CONSULTING, INDRA SAS, INGENIERIA Y APLICACIONES SOLARES 2005 SL, INNOVA SRL, INOTEX SPOL SRO, KARLSRUHER INSTITUT FUER TECHNOLOGIE, KNORR-BREMSE SYSTEME FÜR NUTZFAHRZEUGE GMBH, LULEA TEKNISKA UNIVERSITET, MAGYAR TUDOMANYOS AKADEMIA SZAMITASTECHNIKAI ES AUTOMATIZALASI KUTATOINTEZET, NTUA – NATIONAL TECHNICAL UNIVERSITY OF ATHENS, PLASTIPOLIS, RESEARCH AND EDUCATION LABORATORY IN INFORMATION TECHNOLOGIES, RIVIERASCA SPA, SAUBERMACHER DIENSTLEISTUNGS AG, SIEMENS GAMESA RENEWABLE ENERGY INNOVATION & TECHNOLOGY S.L., SIMPLAN AG, TTS – TECHNOLOGY TRANSFER SYSTEMS SRL, UNIVERSITAT AUTONOMA DE BARCELONA, VELTHA IVZW

CALL AND GRANT AGREEMENT NUMBER

Horizon 2020, DT-ICT-07-2018-2019

Grant Agreement ID: 873111

PURPOSE AND MAIN OBJECTIVES

The project aims to develop a new concept for a digital platform for the Circular Economy that overcomes information asymmetry among stakeholders in the value chain, in order to unlock new circular business models based on the data-enhanced recovery and re-use of functions and materials from high value-added post-use products with a cross-sectorial approach.

DigiPrime will create and operate a federated model of digital platforms by developing reliable data sharing mechanisms and preserving the confidentiality of business-critical data, governed by smart contracts and using block-chain tracking.

Services include:

- ★ the cross-sectoral dimension of value chains (de- and re-manufacturing-oriented product information management, product co-creation, life cycle assessment (LCA)-life cycle costing (LCC) for eco-design, demand-supply matching, sustainable value network and identification of reverse logistics barriers and legislative support);
- ★ the operational dimension (prediction of product conditions, decision support systems for de- and re-manufacturing, demand and supply forecasting, circular production planning and control, material testing and certification).

DigiPrime will be validated through six intersectoral pilots covering five European industrial sectors: automotive, renewable energy, electronics, textiles, construction.

ES's ROLE AND VALUE

EnginSoft is a leader in the formalization of specific use-cases for the services provided to pilot projects by digital platform software applications.

The company provides cutting-edge expertise in modeling, simulation and optimization for:

- ★ The development of a high-level simulation-optimization model to define the best configuration for reverse logistics in order to maximize the economic and environmental performance of the cross-sectorial value chain.
- ★ The implementation of a platform service to predict the conditions of post-use products prior to the de- and re-manufacturing processes.
- ★ The de- and re-manufacturing decision support system (DSS) to define the best circular economy strategy for specific post-use product conditions.
- ★ The development of a general dynamic modeling environment to assess the impact of the multi-sided, multi-user DigiPrime platform under uncertain conditions, taking into account the business models and value-chain interaction mechanisms.

ForZDM

**Integrated Zero Defect Manufacturing Solution
for High Value Adding Multi-stage Manufacturing systems**

START DATE - END DATE

2016 - 2020

WEBSITE

forzdmproject.eu

PARTNERS

GKN AEROSPACE NORWAY AS, ABF-INDUSTRIELLE AUTOMATION GMBH, CAF, ENGINSOFT SPA, ENKI SRL, IK4-IDEKO, MARPOSS SPA, MASMC SPA, MONTRONIX, NXTCONTROL GMBH, POLITECNICO DI MILANO, TECNALIA RESEARCH & INNOVATION, UNIVERSITY OF STUTTGART

CALL AND GRANT AGREEMENT NUMBER

H2020-FOF-03-2016

Grant agreement ID: 723698

PURPOSE AND MAIN OBJECTIVES

The ForZDM project aimed to develop and demonstrate tools to support the rapid implementation of Zero-Defect Manufacturing solutions in industry, and to design more competitive and robust multi-stage manufacturing systems. The proposed ZDM approach is based on the combined adoption of new solutions based on data collection and root cause analysis to reduce defect generation as well as new in-line defect management and improved production traceability solutions to mitigate defect propagation along the production line stages. This was achieved through the proper integration of innovative enabling technologies, such as cyber-physical systems, selective inspections, advanced analysis and integrated process, system-level modelling and simulation and partial flow control solutions.

ES's ROLE AND VALUE

EnginSoft supported the development of the ZDM System Level Engineering and Control platform, a Decision-Support System tool able to identify optimal assignment, routing, scheduling and planning policies for manufacturing.

It expanded the range of modeFRONTIER applications and created a new product in a market where no competing software package exists. modeFRONTIER is an integration platform for multi-objective and multi-disciplinary optimization.

ReCaM

**Rapid Reconfiguration of Flexible Production Systems
through Capability-based Adaptation, Autoconfiguration and
Integrated tools for Production Planning**

START DATE - END DATE

2015 - 2018

PARTNERS

ROBERT BOSCH GMBH, COMPANIA ESPANOLA DE SISTEMAS AERONAUTICOS SA, COSBERG SPA, DGH ROBOTICA, AUTOMATIZACION Y MANTENIMIENTO INDUSTRIAL SA, ENGINSOFT SPA, FUNDACIÓN TECNALIA RESEARCH & INNOVATION, NXTCONTROL GMBH, POLITECNICO DI MILANO, TAMPEREEN KORKEAKOULUSAATIO SR, TUT- TTY-SAATIO

CALL AND GRANT AGREEMENT NUMBER

H2020-FoF-2015

Grant agreement ID: 680759

PURPOSE AND MAIN OBJECTIVES

The requirements for production systems are constantly being shifted towards greater flexibility and adaptability. The ReCaM project demonstrated (to Technology Readiness Level - TRL 7) a set of integrated tools to rapidly and autonomously reconfigure agile production systems, both at operational and management levels, and integrated with existing production planning and scheduling (MES) tools. This method was based on intelligent, self-describing, plug-and-produce-capable mechatronic objects, which were able to auto-program and self-adjust to the required task by using parametric capabilities. These next-generation flexible production systems and the proposed set of enabling ICT tools will allow a rapid and cost-effective response to dynamic market changes, even in small-batch production contexts, reducing the effort required to switch between product types and production quantities. Thus, the ReCaM results are going to be brought to the market in the near future through further cooperation.

ES's ROLE AND VALUE

EnginSoft developed a KPI-driven optimization engine integrating different performance evaluation software tools. The entire evaluation and optimization package was also integrated to interoperate with the MES and the production monitoring systems.

Note: Technology Readiness Levels (TRLs) are indicators of the maturity level of particular technologies. This measurement system provides a common understanding of technology status and addresses the entire innovation chain. There are nine technology readiness levels; TRL 1 being the lowest and TRL 9 the highest. European Commission, retrieved September 06, 2019, from <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/support/faq/2890>

ProRegio

**Customer-driven design of product-services
and production networks
to adapt to regional market requirements**

START DATE - END DATE

2015 - 2017

PARTNERS

KIT - KARLSRUHER INSTITUT FÜR TECHNOLOGIE, AIRBUS OPERATIONS GMBH, ARCELIK A.S., AUDROS TECHNOLOGY, COMAU SPA, DEBBACHE-LAGIOS (GIZELIS ROBOTICS) EE, ÉCOLE CENTRALE DE NANTES, ENGINSOFT SPA, FLEXIS AG, PANEPISTIMIO PATRON, POLITECNICO DI MILANO, TEXXMO MOBILE SOLUTION GMBH & CO KG

CALL AND GRANT AGREEMENT NUMBER

H2020-FoF-2014

Grant agreement ID: 636966

PURPOSE AND MAIN OBJECTIVES

The objective of the ProRegio project was to develop intelligence-based manufacturing product-services that could rigorously change the way in which customer requirements are addressed by companies. This technology-based business approach has enabled European manufacturers operating globally to efficiently deliver innovative product-services to a network of globally distributed customers with strongly differing regional requirements in terms of product design and functionality. The development of the new business approach was based on the design of customer-driven product-services for frugal innovation (in a bottom-up development process), the optimization of production systems and networks, and the planning and control of regional production systems to enable ad-hoc redesign. These three deliverables were executed by innovative cloud-based Product Lifecycle Management (PLM) solutions that integrate production (shop-floor and vendor) and customer feedback into a comprehensive decision support tool.

ES's ROLE AND VALUE

EnginSoft developed new methods to support the comprehensive decision support tools, based on multi-objective optimization algorithms. In addition, EnginSoft defined the hardware and software requirements for new ICT solutions and developed an innovative methodology based on a software platform for the design and redesign of an assembly line.

RLW Navigator

Remote Laser Welding Navigator

START DATE - END DATE

2012 - 2015

WEBSITE

rlw-navigator.eu

PARTNERS

THE UNIVERSITY OF WARWICK, COMAU SPA, ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE, ENGINSOFT SPA, JAGUAR LAND ROVER LIMITED, LAND ROVER, MAGYAR TUDOMANYOS AKADEMIA SZAMITASTECHNIKAI ES AUTOMATIZALASI KUTATOINTEZET, PANEPISTIMIO PATRON, POLITECNICO DI MILANO, PRECITEC GMBH & CO KG, QUOTEC, STADCO, ULSAN NATIONAL INSTITUTE OF SCIENCE AND TECHNOLOGY, UNIVERSITÀ DEGLI STUDI DEL MOLISE

CALL AND GRANT AGREEMENT NUMBER

FP7-2011-NMP-ICT-FoF

Grant agreement ID: 285051

PURPOSE AND MAIN OBJECTIVES

The project developed an innovative “process navigator toolbox” to configure, integrate, test and validate applications of the Remote Laser Welding (RLW) technology in automotive assembly lines. A set of tools for the systematic evaluation of this innovative production technology, able to assess and improve the overall performance, cost-effectiveness and eco-efficiency of an RLW-based production system was developed and tested. The set of tools included a production system configurator, an off-line robotic cell programming tool, a process optimizer, a process control tool (resulting in a patent), and tools for digital visualization and process energy consumption monitoring and reduction.

ES's ROLE AND VALUE

EnginSoft developed tools to evaluate the production system design that were able to calculate the cycle times and equipment costs of different layouts; furthermore, an optimization layer of the RLW Navigator architecture was developed as well as the related integration platform for the software modules. Lastly, EnginSoft coordinated the Consortium exploitation and dissemination activities, with a focus on innovation management.

MUSIC

Multi-layers control&cognitive System to drive metal and plastic production line for Injected Components

START DATE - END DATE

2012 - 2016

WEBSITE

music.eucoord.com

PARTNERS

ENGINSOFT SPA, AALEN UNIVERSITY, ASSOMET SERVIZI, AUDI AG, ELECTRONICS GMBH, FUNDACIÓ EURECAT - CENTRE TECNOLÒGIC DE CATALUNYA, FRAUNHOFER SOCIETY - FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG, FUNDACIÓ TEKNIKER, MAGMA GMBH, MAIER S. COOP, MOTULTECH BARALDI, OSKAR FRECH, RDS MOULDING TECHNOLOGY, REGLOPLAS AG, SAEN SRL, UNIVERSITÀ DEGLI STUDI DI PADOVA

CALL AND GRANT AGREEMENT NUMBER

FP7-2012-NMP-FoF-ICT
Grant agreement ID: 314145

PURPOSE AND MAIN OBJECTIVES

High pressure die-casting (HPDC) of light alloys and plastic injection molding (PIM) are two of the most “defect generating” and “energy-intensive” processes in EU industry, with a low level of flexibility for product and process development. MUSIC’s objective was to give the major EU-HPDC/PIM plants a cost-based competitive advantage during the transition to a demand-driven industry with lower waste generation, greater efficiency, robustness and minimum energy consumption. The development and integration of a completely new ICT platform, based on an innovative Cognitive and Control System linked to real-time monitoring, has allowed active quality control, avoiding defects and excessive costs by acting directly on the optimization of the machine-process variables or equipment boundary conditions.

ES’s ROLE AND VALUE

EnginSoft was the Project Leader and it was involved in configuring the system for data acquisition and processing, necessary to generate the database of the Control and Cognitive System. This first platform, which interfaced with different devices using the OPC-UA protocol, allowed the development of software capable of analyzing the process and the quality of the product, with real-time interventions on the production line. The final implementation of the Cognitive System led to the creation of a new ICT platform for quality forecasting and optimization, called smart prod ACTIVE, www.smartproactive.com

NADIA

**New Automotive components
Designed for and manufactured
by Intelligent processing of light Alloys**

START DATE - END DATE

2006 - 2010

WEBSITE

www.nadiaproject.org

PARTNERS

ENGINSOFT SPA, ABAMOTOR ENERGIA, AUTOKOMP INGENIERIA - FUNDACIÓ CIE, CRF - CENTRO RICERCHE FIAT, DAIMLER AG, FORD FORSCHUNGSZENTRUM AACHEN, FOUNDRYSOFT - INGUS ENGINEERING, FUNDACIÓ TEKNIKER, HUT - HELSINKI UNIVERSITY OF TECHNOLOGY - AALTO KORKEAKOULUSAATIO SR, HYDRO ALUMINIUM DEUTSCHLAND, IMPERIA, INGUS ENGINEERING AB, IPPT-PAN - INSTYTUT PODSTAWOWYCH PROBLEMÓW TECHNIKI POLSKA AKADEMIA (POLISH ACADEMY OF SCIENCES), JÖNKÖPING UNIVERSITY, LPM, MAGMA GMBH, MATFEM, MBN, NTNU - NORWEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY (UNIVERSITY OF TRONDHEIM), RAFFINERIA METALLI CAPRA, SINTEF, TEKSID ALUMINUM, THERMICO, TOOLCAST, UNIVERSITÀ DEGLI STUDI DI PADOVA, UNIVERSITÄTSKLINIKUM AACHEN

CALL AND GRANT AGREEMENT NUMBER

FP6 - PRIORITY 3 - NMP
Grant agreement ID: 26563

PURPOSE AND MAIN OBJECTIVES

NADIA was an IP-PMI project aimed at improving the competitiveness of 12 EU SMEs engaged in the simultaneous engineering and production of novel high-tech transport components to exploit the potential of light multifunctional alloys for cars and trucks.

As an integrated project it combined materials, processes and new NM2 (Nano/Micro/Macro) simultaneous engineering tools to be used in the production of transport demonstrators (mainly automotive).

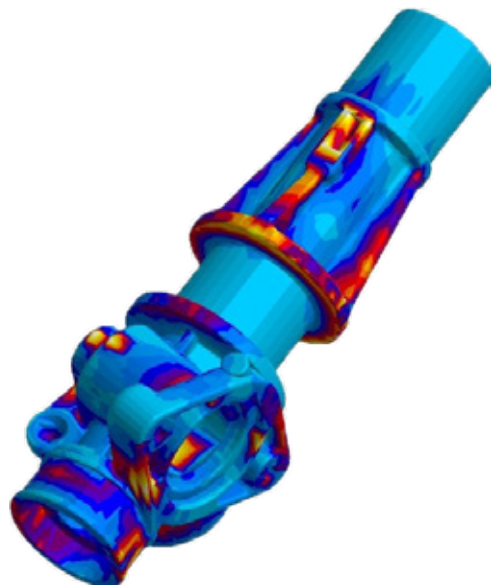


It was a multidisciplinary project linking the production of primary light alloys on the one hand and car manufacturers on the other. The main radical innovation of this project was the total integrated systematic approach to the complete value chain (from alloy options to component design, component production and the use of specific components to meet new vehicle requirements).

This innovation enabled the development of an intelligent computing system to produce integrated multifunctional high-tech components for EU transport with compact and cost-effective integration of various functions (mechanical, acoustic, thermal, electrical, environmental).

ES's ROLE AND VALUE

In addition to coordinating the project, EnginSoft was mainly engaged in the development of the model for life cycle and crash performance analysis, the models for casting and microstructure prediction, and simulations of the casting, heat treatment and welding processes.



SIADD

Soluzioni tecnologiche Innovative per la qualità e la sostenibilità dei processi di ADDitive manufacturing

Innovative technological solutions to enhance the quality and sustainability of Additive Manufacturing processes

START DATE - END DATE

2019 - 2022

PARTNERS

DTA - DISTRETTO TECNOLOGICO AEROSPAZIALE SCARL, ELFIM SRL, ENEA - AGENZIA NAZIONALE PER LE NUOVE TECNOLOGIE, L'ENERGIA E LO SVILUPPO ECONOMICO SOSTENIBILE, ENGINSOFT SPA, GE AVIO SRL, HB TECHNOLOGY SRL, INGENIA SRL, ITIA-CNR - ISTITUTO DI TECNOLOGIE INDUSTRIALI E AUTOMAZIONE, CONSIGLIO NAZIONALE DELLE RICERCA, NOVOTECH SRL, POLITECNICO DI BARI, POLITECNICO DI MILANO, UMBRA GROUP CUSCINETTI SPA, UNIVERSITÀ DEGLI STUDI DI ENNA "KORE", UNIVERSITÀ DEL SALENTO

CALL AND GRANT AGREEMENT NUMBER

MIUR Programma Operativo Nazionale (PON) "Ricerca e Innovazione 2014-2020"

PURPOSE AND MAIN OBJECTIVES

The SIADD project aims to increase the manufacturing quality and sustainability of some additive manufacturing processes for metals, composite materials and multi-material metals/composites, while also taking into account the personnel's economic and environmental conditions and well-being. The objective will be pursued through extensive industrial research aimed at significantly reducing defects by studying new treatments, and producing lighter metal structures for the aerospace, aviation and marine sectors.

ES's ROLE AND VALUE

EnginSoft's role in the project is related to different objectives and content.

- ★ the simulation of a hot isostatic pressure (HIP) furnace,
- ★ the development of software tools and methodologies for in-situ monitoring of the Additive Manufacturing process (laser power bed fusion, L-PBF), starting from the large amount of data acquired in situ. These tools will enable the traceability of defects and unstable process conditions through big data analysis techniques, data mining and advanced statistical process monitoring techniques (design for additive manufacturing, DfAM),
- ★ the topological optimization, design and simulation of AM components with metallic, composite and hybrid materials.

FLET 4.0

FL eet management optimization through I4.0 enabled smart maintenance

START DATE - END DATE

2018 - 2021

PARTNERS

DTA - DISTRETTO TECNOLOGICO AEROSPAZIALE, BLACKSHAPE, EKA, ENGINSOFT SPA, GE AVIO SRL, MERMEC, PLANETEK ITALIA, POLITECNICO DI BARI, POLITECNICO DI TORINO, UNIVERSITÀ DEL SALENTO

CALL AND GRANT AGREEMENT NUMBER

MIUR Programma Operativo Nazionale (PON) "Ricerca e Innovazione 2014-2020"

PURPOSE AND MAIN OBJECTIVES

The project addresses the problem of managing the data collected when servicing very different objects in order to optimize their costs and availability for the end user.

This will be done by developing algorithms that enable intelligent information management in order to simulate scenarios, reduce time to data availability and to optimize maintenance.

The requirements are divided into three sectors, aeronautics, railways and space:

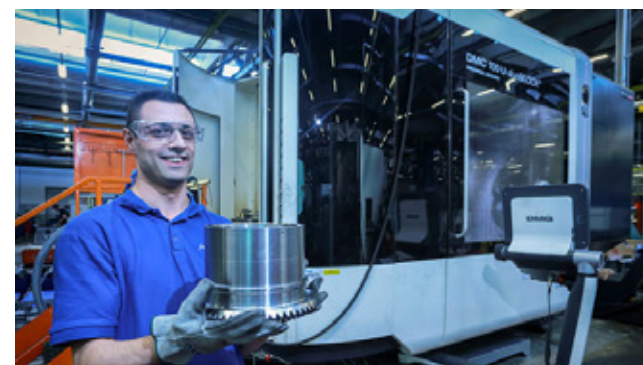
- ★ For the aeronautics sector, the aim of the project is to create an iterative simulation model that integrates all the information described in order to predict landing plans and logistic and strategic indications, integrated with the planning of depot activities.
- ★ For the railway sector, the project intends to develop new enabling technologies and methodologies (based on service-oriented architecture (SOA) and human-machine interface (HMI) architecture) for operators directly involved in maintenance by developing tools based on non-traditional interaction approaches through the introduction of visual information systems support (augmented reality, reverse engineering) for remote assistance of railway vehicles and optoelectronic measurement systems for railway infrastructure.
- ★ For the space sector, the aim is to develop a system to highlight the alarms and checklist orders suggested to the operator by the anomaly identified or by the level of recentness (and therefore the necessary attention required) for the specific behaviour found.

ES's ROLE AND VALUE

EnginSoft is the lead partner for the project's first objective, dedicated to the Maintenance Planner module's development.

he purpose is to create an algorithm to generate a landing plan (Removal Plan) and a Maintenance Planner (MP) that can be applied to a fleet of aircraft engines to maximize their availability to end users and minimize the time and cost of routine and/or extraordinary maintenance work.

EnginSoft has a primary role both in coordinating the objective and in developing the algorithms and the iterative simulation model to predict the service status of a fleet of aircraft engines.



LUBFORLIFE

Attuatori Elettromeccanici per Comandi Primari di Volo, Lubrificati a Vita
Electromechanical Actuators for Primary Flight controls, Lubricated for life

START DATE - END DATE

2018 - 2020

PARTNERS

UMBAGROUP, EMS - ELECTRO MOTOR SOLUTIONS SRL, ENGINSOFT SPA, UNIVERSITÀ DEGLI STUDI DELL'AQUILA

CALL AND GRANT AGREEMENT NUMBER

MIUR Programma Operativo Nazionale (PON) "Ricerca e Innovazione 2014-2020"

PURPOSE AND MAIN OBJECTIVES

LUBFORLIFE's ultimate goal is the integration of innovative components and technologies into electromechanical actuators, for aircraft and UAV flight controls, which do not require re-lubrication during their entire operating lives. This requirement, which is critical for the safety and to contain the operating costs of an aircraft, requires a redesign of the actuator and its components in order to preserve the the lubricant's characteristics and efficiency for the full 20-30 years of operation.

The project is structured around 10 implementation objectives ranging from the selection of lubricants to durability and environmental tests, including the definition of the actuator architectures and the related sensors and lubricant components, the topological design of the electric motors and magnetic gears, the creation of a methodology for the development of the actuator (of which EnginSoft is the leader) and the screening and implementation of test methods.

ES's ROLE AND VALUE

EnginSoft is developing the system model of an electromechanical actuator (EMA). The system model is created by means of a methodological process which represents the technical foundation for the realization of a Simulation Based Digital Twin of the electromechanical actuator of the primary flight controls covered by the research project. The system model will be used to create a Digital Twin of the system itself and to develop predictive models of useful life using Reduced Order Models (ROMs). The Simulation Based Digital Twin is being built using the know-how and data shared by the partners. EnginSoft is collecting this data and is using its know-how to direct partners to provide the information in the most effective and usable manner. This is a model-driven approach to develop the predictive part of a complex system in order to monitor, analyze and forecast its actual behavior.

MUSICAS

MUSICAS Méthodologie Unifiée pour la Simulation de l'Intégrité et de la Contrôlabilité des Assemblages Soudés
Unified methodology for the simulation of the integrity and controllability of welded assemblies

START DATE - END DATE

2013 - 2015

WEBSITE

systematic-paris-region.org/fr/projet/musicas

PARTNERS

BERTIN TECHNOLOGIES, AREVA NP, CEA CENTRE DE SACLAY, CETIM, CNRS CENTRE EST/INSTITUT JEAN LAMOUR, DCNS BU PROPULSION, DIGITAL PRODUCT SIMULATION, ENGINSOFT FRANCE, ESI GROUP, INSA LYON / LAMCOS (INSAVALOR), IUSTI (UNIVERSITÉ D'AIX-MARSEILLE), LTDS (ENISE), OVH/OXALYA, PSA, RENAULT

CALL AND GRANT AGREEMENT NUMBER

BPI France

reference Areva Project FUI AAP I4

PURPOSE AND MAIN OBJECTIVES

MUSICAS, a multi-stakeholder project, improved the ability to predict the performance and fatigue of welded structures and the ability to simulate their non-destructive testing using a refined Multiphysics simulation of the welding process for a car. It also demonstrated that the rational integration of existing software into a company's infrastructure can consider automating processes that correspond to effective methodologies in the industry.

The project developed a pre-competitive demonstrator of a consistent and scalable solution including:

- ★ a complete modelling chain from process parameters (from the soldering bath to the assemblies);
- ★ prototyping of associated services including methodological guides and best practices;
- ★ a collaborative platform on an HPC cloud drive, set up by OVH-Oxalya;
- ★ characterization criteria for commercial deployment as a service that can be used in design, dimensioning and R&D, from detailed analysis to the modelling process as a whole, and to assess the behavior of the resulting assemblies.



ES's ROLE AND VALUE

EnginSoft contributed to:

- ★ the specifications for the software interfaces, which enabled each node (CATIA, SYSWELD, WPROCESS, CIVA, ABAQUS, DesignLife-nCode) to correctly execute its part in the MUSICAS demonstration chain, and facilitated the file transmissions between them;
- ★ the development of the demonstrator nodes SYSWELD and modeFRONTIER, that run on the OVH-Oxalya collaborative platform;
- ★ SP3.4, the optimization of the demonstrator chain by providing test cases for the first optimization trials based on the outputs of the AREVA subproject.

The methodology illustrated the successful integration of CAE tools by using modeFRONTIER. The project found optimal values for the tuning parameters, tested different algorithms (piLOPT, MOGA II), and added and removed tuning parameters to improve the fit. modeFRONTIER is an integration platform for multi-objective and multi-disciplinary optimization.

SMARTI 4.0

Smart Manufacturing for an Automotive TIER 4.0

START DATE - END DATE

2020-2023

PARTNERS

MECCANICA CAINELLI SRL, ENGINSOFT SPA, FBK - FONDAZIONE BRUNO KESSLER, ISTITUTO ITALIANO DI SALDATURA, KTH ROYAL INSTITUTE OF TECHNOLOGY, NEW OLEF SRL, POLO DI MECCATRONICA DI ROVERETO, SMART 3K, UNIVERSITÀ DEGLI STUDI DI PADOVA, UNIVERSITÀ DEGLI STUDI DI TRENTO

CALL AND GRANT AGREEMENT NUMBER

PAT- APIAE - L.P. 6/99 - Legge provinciale sugli incentivi alle imprese

PURPOSE AND MAIN OBJECTIVES

The aim of the project is to study and improve increasingly machinable and performing metal alloys for die-casting and to introduce the use of the additive manufacturing process in the automotive sector, replacing the sand casting process.

The ultimate goal of this research is the creation of ever lighter and more performing automotive parts, in order to lighten cars and reduce emissions.

The objectives of the SMARTI project are:

- ★ The acquisition of specific skills in the design of die-casting alloys using simulation technologies to conduct the studies more efficiently and produce the components in a laboratory without the aid of the slower, more expensive casting process;
- ★ The acquisition of additive manufacturing know-how to replace traditional sand casting;
- ★ The complete digitalization of the diecasting island to monitor the process in real time.

ES's ROLE AND VALUE

EnginSoft will study the best configuration of technologies for the digitalization of the die-casting cell and will be in charge of the implementation and set-up of the related equipment.

EnginSoft will also carry out the simulation of the chemical-physical and mechanical characteristics of the alloy, the simulation of heat treatment and weldability and the study of the filling and solidification phases of the casting process.

INFOS

**Internationalisation of Veneto FOUNdry
by networked Strategies**

START DATE - END DATE

2017 - 2018

WEBSITE

www.retesinfonet.org/progetto-infos/

PARTNERS

ENGINSOFT SPA, LPM, SAEN, TECNOLABOR, ZANARDI FONDERIE SPA

CALL AND GRANT AGREEMENT NUMBER

Programma operativo POR FESR 2014-2020, Asse 3 “COMPETITIVITÀ DEI SISTEMI PRODUTTIVI”, “Incremento del livello di internazionalizzazione dei sistemi produttivi” AZIONE 3.4.1 “Progetti di promozione dell’export destinati a imprese e loro forme aggregate individuate su base territoriale o settoriale” DGR n. 1104 del 13 luglio 2017 - Regione del Veneto

PURPOSE AND MAIN OBJECTIVES

The main objective of the INFOS project was to improve the systematic presence of the innovative SINFONET network in articulated international contexts, by involving companies that represented the different expertise in the network: EnginSoft, LPM, SAEN, Tecnolabor, and Zanardi Fonderie.

Market potential analyses were conducted, and the companies’ positioning was studied. The project included specific international marketing activities, participation in trade fairs and institutional communication.

ES's ROLE AND VALUE

EnginSoft coordinated the full marketing activity plan and participated in the EUROGUSS trade fair, the biggest international fair for Die Casting and Die Casting Processes.

PreMANI

**MANIFATTURA PREDITTIVA:
progettazione, sviluppo e implementazione di soluzioni
di Digital Manufacturing per la previsione della Qualità
e la Manutenzione Intelligente**

*PREDICTIVE MANUFACTURING: design, development and implementation of Digital
Manufacturing solutions for quality forecasting and smart maintenance*

START DATE - END DATE

2017 - 2020

WEBSITE

www.retesinfonet.org/progetto-premani/

PARTNERS

CONSORZIO IMPROVENET, UNIVERSITÀ DEGLI STUDI DI PADOVA, CIELLE SRL, EDALAB SRL, ELECTROLUX ITALIA SPA, ENGINSOFT SPA, FONDERIA CORRÀ SPA, GALDI SRL, IRS SRL, M31 ITALIA SRL, M3E SRL, RDS MOULDING TECHNOLOGY SPA, SINFONET - SMART AND INNOVATIVE FOUNDRY NETWORK (RIR), SIMNUMERICA SRL, SMIT SRL, SORDATO SRL, STATWOLF DATA SCIENCE SRL, T2I SCARL, UNIVERSITÀ DEGLI STUDI DI VERONA, ZANARDI FONDERIE SPA

CALL AND GRANT AGREEMENT NUMBER

Programma operativo POR FESR 2014-2020, Bando per il sostegno a progetti di Ricerca e Sviluppo sviluppati dai Distretti Industriali e dalle Reti Innovative Regionali ASSE 1 “RICERCA, SVILUPPO TECNOLOGICO E INNOVAZIONE”

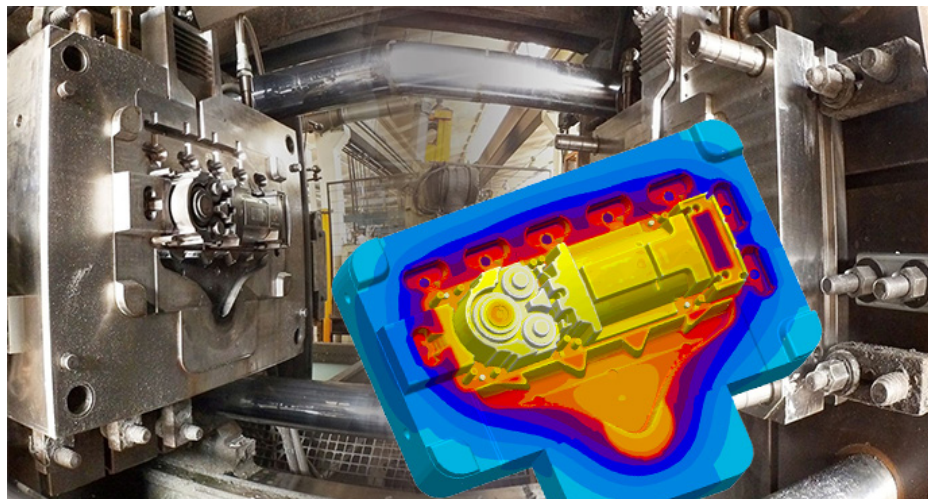
OBIETTIVI SPECIFICI “Incremento dell’attività di innovazione delle imprese” AZIONE 1.1.4 “Sostegno alle attività collaborative di R&S per lo sviluppo di nuove tecnologie sostenibili, di nuovi prodotti e servizi” DGR n. 1139 del 19 luglio 2017 - Regione del Veneto

PURPOSE AND MAIN OBJECTIVES

Modern manufacturing requires new integrated methodologies, technologies and tools to be developed for maintenance, quality control and production logistics.

The PreMANI project aims to produce techniques that can be applied to heterogeneous application areas having different requirements by using general methodologies. These techniques will be able to forecast the operational characteristics of machines and plants and combine product quality analysis with systems efficiency analysis to achieve predictive production.

The solutions developed concern digital production and provide advanced tools for decision



support, as well as hardware components (dedicated sensor architectures, low-cost embedded systems for real-time forecasting of complex models), infrastructure (cloud-based IT platforms) and algorithms (with particular emphasis on the use of machine learning techniques).

ES's ROLE AND VALUE

EnginSoft is providing “smart prod ACTIVE”, an innovative tool to diagnose the quality, energy-consumption and costs of the production process in real-time.

EnginSoft developed this application within the European FP7 project “MUSIC”, creating a digitalization application to control and predict vertical quality for foundries and plastic injection.

During the PreMANI project, EnginSoft's goal is to develop and validate the “smart prod ACTIVE” application in die casting, iron casting plants and machining, extending and generalizing it to become a transverse system for digitalizing production, while testing its scalability and flexibility in other sectors.

FORSAL

FOnderia Robotizzata per la SALute dei Lavoratori
Robotized foundry for workers' health

START DATE - END DATE

2017 - 2020

WEBSITE

www.retesinfonet.org/progetto-forsal/

PARTNERS

CONSORZIO SPRING, ADI TOOLS SPA, BNP SRL, BUSON SRL, ENGINSOFT SPA, FONDERIA CORRÀ SPA, IT+ROBOTICS SRL, SAFAS SPA, UNIVERSITÀ DEGLI STUDI DI PADOVA - DTG

CALL AND GRANT AGREEMENT NUMBER

Programma operativo POR FESR 2014-2020, Bando per il sostegno a progetti di Ricerca e Sviluppo sviluppati dai Distretti Industriali e dalle Reti Innovative Regionali ASSE 1 “RICERCA, SVILUPPO TECNOLOGICO E INNOVAZIONE” OBIETTIVI SPECIFICI “Incremento dell'attività di innovazione delle imprese” AZIONE 1.1.4 “Sostegno alle attività collaborative di R&S per lo sviluppo di nuove tecnologie sostenibili, di nuovi prodotti e servizi” DGR n. 1139 del 19 luglio 2017 - Regione del Veneto

PURPOSE AND MAIN OBJECTIVES

The project aims to develop a prototype robotic system with human and interactive guidance, capable of performing certain types of machining (sanding, deburring, grooving/slotting) characteristic of steel and cast-iron castings.

The production of these products, which have exceptional quality requirements, still requires expensive machining to be performed or managed manually by the operator. However, these processes can lead to considerable problems in terms of ergonomics and above all lack of vibro-acoustic comfort for the operators.

The robotic solutions developed within the FORSAL project will help to significantly limit these types of problems.

ES's ROLE AND VALUE

EnginSoft's role in the FORSAL project focuses on the design and numerical verification of innovative robotic equipment to mitigate the negative effects of finishing processes for operators, as well as on the development of the innovative digital vibro-acoustic comfort system that integrates data from simulation models with real sources from the workplace.

GreenFactory4Compo

Green Factory
for Composites

START DATE - END DATE

2016 - 2019

PARTNERS

CENTRO RICERCHE FIAT, 2 GAMMA SRL, AC GRAF CLIMATIZZAZIONE SRL, ADLER EVO SRL, BYLOGIX SRL, COMAU, CSP SCARL, ECNP - European Centre for Nanostructured Polymers, ELTEK SPA, ENGINSOFT SPA, GALLICCHIO STAMPI SRL, GRINP SRL, INGENIA AUTOMATION SRL, MOD.EN SRL, NOVASIS INNOVAZIONE SRL, POLITECNICO DI TORINO, PRIMA ELECTRO SPA, PROPLAST, SACEL, SIMPRO SPA, SISTEMI SOSPENSIONI SPA, SPARCO SPA, TECH SYSTEM SRL, UNITO, VER-PLAST SRL

CALL AND GRANT AGREEMENT NUMBER

Regione Piemonte con Fondo Europeo di Sviluppo Regionale (FESR) 2014/2020 e Fondo Agevolazione per la Ricerca (FAR)

PURPOSE AND MAIN OBJECTIVES

This project deals with advanced machining processes, production and the use of high-tech thermoplastic and new thermosetting composite materials for components and structures within the automotive industry.

By means of a multidisciplinary approach, some characteristics of the thermoplastic and thermosetting composite materials used are studied, particularly: surface properties (surface tension) and structure (Raman spectroscopy), porosity and surface area using volumetric methods, and morphology using scanning electron microscopy (SEM).

In addition, in relation to innovative production processes, such as laser welding or painting, research will focus on the analysis of particulate matter, even at the nanoscale.

ES's ROLE AND VALUE

EnginSoft identified and defined a structured methodology predominantly using virtual analyses to create a robust process for the design of TP and Ti matrix composite components.

The company also developed an automatic optimization process that allows designers to search for the best outcome in problems with multiple objectives, avoiding traditional design processes such as Trial & Error that waste a lot of time.

MUST

Modellazione virtuale multi-body del comportamento dinamico di macchine utensili in processi di asportazione di truciolo

*Virtual multi-body modeling of the dynamic behavior
of machine tools in chip removal processes*

START DATE - END DATE

2016 - 2017

PARTNERS

UNIVERSITÀ DEGLI STUDI DI PADOVA, ENGINSOFT SPA

CALL AND GRANT AGREEMENT NUMBER

Programma operativo FSE 2014-2020, Asse Occupabilità, Avviso "Assegni di Ricerca" Delibera della Giunta Regionale della Regione del Veneto n° 2121 del 30/12/2015 e Decreto di approvazione del Direttore di Sezione Istruzione n° 88 del 07/06/2016

PURPOSE AND MAIN OBJECTIVES

The MUST project aimed to develop a combined numerical and experimental methodology to predict and prevent chattering on machine tools from the early stages of their design. The methodology was developed with reference to a specific type of machine tool, but it was sufficiently general to be applied to different types of machines.

The increasing know-how of machine tool manufacturers has benefited the entire industry, enabling growth in the culture and use of design tools as is the case in major competitive countries such as Germany, Korea, Japan and the United States.

ES's ROLE AND VALUE

EnginSoft provided the necessary skills in the virtual modeling of complex dynamic systems and in the software and hardware resources for the sector.

EnginSoft had the dual role, firstly of conducting in-depth analysis of the relevant industrial process and of the problems related to the dynamics and vibrations of the systems, and secondly of supporting the research fellow in learning and using the virtual simulation tools necessary to execute the project.

Applicazioni avanzate di AP

**Implementazione e caratterizzazione
di applicazioni avanzate di Additive Manufacturing
nel ciclo produttivo dell'industria meccanica veneta**
*Implementation and characterization of advanced Additive Manufacturing
applications in the production cycle of the Venetian mechanical industry*

START DATE - END DATE

2016 - 2017

PARTNERS

INFN - ISTITUTO NAZIONALE DI FISICA NUCLEARE, CNA REGIONALE DEL VENETO - CONFEDERAZIONE NAZIONALE DELL'ARTIGIANATO E DELLA PICCOLA E MEDIA IMPRESA, ECIPA SOC. CONS.A R.L., ENGINSOFT SPA, OFFICINA DEI MATERIALI SAS, POLIDORO SPA, SISMA SPA

CALL AND GRANT AGREEMENT NUMBER

Programma operativo FSE 2014-2020, Asse Occupabilità, Avviso "Assegni di Ricerca"
Delibera della Giunta Regionale della Regione del Veneto n° 2121 del 30/12/2015 e Decreto di approvazione del Direttore di Sezione Istruzione n° 88 del 07/06/2016

PURPOSE AND MAIN OBJECTIVES

The project had two main objectives. The first was to study the feasibility, achievable quality and industrial impact of Additive Production (AP) in real cases proposed by the partner companies.

This study was executed using design tools that allowed specific optimizations in the design phase as well as the development of appropriate thermal and surface treatments. The second objective was to provide top quality education to young graduates, mentoring them in the use of modern design tools, multi-physics simulation and optimization applied to AP, in understanding the problems related to the use of AP in the mechanical field, and transferring knowledge of methodologies applicable in practice.

ES's ROLE AND VALUE

As a leading company in the field of mechanical design support tools, EnginSoft contributed its skills in advanced tools for CAE/CAM, design optimization and morphological optimization.

TUFOC

Trattamenti Ultrasonici applicati a Fibre di Origine Cartacea
Ultrasonic treatments applied to paper fibers

START DATE - END DATE

2012 - 2014

PARTNERS

PMT ITALIA SPA, ENGINSOFT SPA, SMARTEC SRL

CALL AND GRANT AGREEMENT NUMBER

F.E.S.R. 2007/2013; Asse 1:
Innovazione e transizione produttiva; Attività: 1.1.3 - Innovazione e PMI

PURPOSE AND MAIN OBJECTIVES

The TUFOC project studied the effects of ultrasound on the cellulose fibers used in papermaking, both for separating ink-fiber links (de-inking of wastepaper), and for the active and controlled displacement of fibers within an aqueous suspension (consistency control of the pulp).

A prototype was built to simulate and study the influence of speed, concentration and type of pulp on phenomena related to the effects of ultrasound on fiber. The prototype was also used to make a detailed study of the ultrasonic emitter (sonotrode) that was specifically designed for the application, the best way of binding the sonotrode to the vessel containing the suspension, and the electronic components that pilot the emitter.

Through the application of ultrasound at different frequencies and intensities, an efficient device that acts directly on the links between the ink and fiber particles could be created. Tests carried out on samples of recycled pulp confirmed that separation occurs, and it was also visually perceptible.

ES's ROLE AND VALUE

EnginSoft applied and explored new techniques and methods of numerical assessment and simulation in the electromagnetic, mechanical and fluid dynamics fields.

HPDC_Efficiency

**Monitoraggio “real-time” e Ottimizzazione per l’efficienza
Produttiva dell’isola di pressocolata**

Real-time Monitoring and Optimization for High Pressure Die Casting

START DATE - END DATE

2010 - 2013

PARTNERS

ENGINSOFT SPA, SIT GROUP

CALL AND GRANT AGREEMENT NUMBER

L.R. 18/05/2007, n. 9 “Piano strategico regionale per la ricerca scientifica, lo sviluppo tecnologico e l’innovazione 2008-2010” - Regione del Veneto

PURPOSE AND MAIN OBJECTIVES

The HPDC_Efficiency project aimed to improve the management of the high-pressure die-casting (HPDC) process, through the creation of an automated system to capture and process real-time production data and monitor/modify process parameters to optimize production.

The research sought sensitive variables and defined the frequency and format of data acquisition in order to describe the die-casting process starting from the preparation of the alloy through to the quality control of the final item, with particular attention to the core of the system (machine and mold).

The project output allows machine operators to instantly receive notifications of product quality indicators, which can also be displayed on remote terminals for production and plant managers with descriptions, diagrams and tables adapted to the level of the request.

ES's ROLE AND VALUE

EnginSoft conducted the numerical simulation of the process to support actual data collection, data processing, experimental design and meta-model creation.

It gained additional experience in managing the HPDC process and in the application of new methods and tools to monitor, control and optimize resources.

RuBeeCOMP

**Componenti in materiale composito con sistemi di comunicazione
wireless integrati capaci di operare in ambienti ostili alla radiofrequenza:
sistemi, tecnologie di fabbricazione e**

piattaforma di progettazione integrata prodotto/processo

Composite material components with integrated wireless communication systems

capable of operating in environments hostile to radio frequency: systems,

manufacturing technologies, and integrated product/process design platform

START DATE - END DATE

2010 - 2012

PARTNERS

WHITEHEAD ALENIA SISTEMI SUBACQUEI SPA, ENGINSOFT SPA, IDNOVA SRL

CALL AND GRANT AGREEMENT NUMBER

POR CReO FESR 2007–2013 REGIONE TOSCANA, LINEA D'INTERVENTO 1.5.a-1.6,
BANDO UNICO R&S ANNO 2012

PURPOSE AND MAIN OBJECTIVES

The objective of the RuBeeCOMP project was to study, test and validate the materials, production technologies and integrated product/process design procedures to produce composite material components. The project included wireless communication systems able to operate correctly in environments that are hostile to radio frequencies (e.g. water, oil, etc.).

The integrated product/process design was executed with a specific software platform that implemented the entire planning and design process using CAD modeling tools, and methodologies and tools to simulate component performance during operation.

ES's ROLE AND VALUE

EnginSoft was involved in developing the numerical models for the structural, electromagnetic and process analysis and for the IT development of the implementation platform.

In summary, EnginSoft developed an integrated design procedure and the related numerical platform that enabled the coupling of the electromagnetic and structural models within a single optimization workflow.



SPACE



EDEN ISS

Ground Demonstration of Plant Cultivation Technologies for Safe Food Production in Space

START DATE - END DATE

2015 - 2019

WEBSITE

eden-iss.net

PARTNERS

DLR - GERMAN AEROSPACE CENTER, AIRBUS DEFENCE AND SPACE GMBH, AIRBUS DS GMBH, ARESCOSMO SPA, AWI - ALFRED-WEGENER-INSTITUT FÜR POLAR- UND MEERESFORSCHUNG, CNR - CONSIGLIO NAZIONALE DELLE RICERCHE, ENGINSOFT SPA, HELIOSPECTRA AB, LIT - LIMERICK INSTITUTE OF TECHNOLOGY, LIQUIFER SYSTEMS GROUP GMBH, TELESPIAZIO SPA, THALES ALENIA SPACE ITALIA SPA, UNIVERSITY OF FLORIDA, UNIVERSITY OF GUELPH, WUR - WAGENINGEN UNIVERSITY AND RESEARCH, With the support of a SCIENTIFIC ADVISORY BOARD

CALL AND GRANT AGREEMENT NUMBER

H2020-COMPET-7-2014
Grant Agreement ID: 636501

PURPOSE AND MAIN OBJECTIVES

The supply of edible food for crewmembers is a critical component of future exploration by humans to worlds unknown.

Innovating the cultivation of food in closed-loop systems is integral to future missions.

The aim of EDEN ISS was to identify operations procedures for safe food production in space through the adaptation, integration and demonstration of higher plant cultivation techniques.

The EDEN ISS project goal was to advance controlled-environment agricultural technologies beyond the existing state of the art. It focused on Earth-based demonstrations of plant cultivation technologies and their application in space.

EDEN ISS developed safe food production for on board the International Space Station (ISS) and for future human space exploration vehicles and planetary outposts.

EDEN ISS combined the disciplines of plant physiology, biochemistry and mathematical modelling with the design of key electrical and mechanical elements.



ES's ROLE AND VALUE

EnginSoft was involved in the integration and testing of the International Standard Payload Rack plant cultivation system.

Real-time detection of microbiological contamination and specific decontamination by type and level of contamination supports the medium-term sustainability of the plants in the greenhouse and represents a substantial step towards reliable "food production" in orbit.

From this perspective, EnginSoft's contribution was mainly focused on the thermal fluid dynamics and environmental simulations.

PACMAN

Plant Characterization Unit for closed life support system: engineering, manufacturing & testing

START DATE - END DATE

2018 - 2019

PARTNERS

ENGINSOFT SPA, CIRIS, HOSOKAWA MICRON, ODYS, UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II

CALL AND GRANT AGREEMENT NUMBER

ESA (European Space Agency)

PURPOSE AND MAIN OBJECTIVES

The goal of the project was to design a full Plant Characterization Unit (PCU) chamber with a completely sealed environment for the plants and roots. The designed plant control unit inherited the know-how from two previous projects, HySSE and AtSSE.

The objective of this PCU was to allow scientists to fully characterize plant growth parameters, in order to measure these plant growth parameters, from the minerals of the nutrient solution to the spectral light of the LED system, in order to understand how plants could become an alternative life support system for astronauts in space, producing oxygen and water.

ES's ROLE AND VALUE

EnginSoft has accumulated extensive experience in this area over the years and was, therefore, selected to participate in one of the MELiSSA consortium's major challenges and to lead the development of the most advanced plant control unit in existence today.

With ESA's support, EnginSoft coordinated a team of experts from this vertical sector, such as Hosokawa for the watertight seal, CIRIS for the sensors and ODYS for the control system, to ensure the project was a success.

AtSSE

Atmospheric Sub-system Engineering

START DATE - END DATE

2016 - 2017

PARTNERS

ENGINSOFT SPA, NTNU - NORWEGIAN UNIVERSITY OF SCIENCE TECHNOLOGY, POLYTECHNIQUE MONTRÉAL, SHERPA ENGINEERING, ULB - UNIVERSITÉ LIBRE DE BRUXELLES, UGENT - UNIVERSITEIT GENT, UNIVERSITY OF GUELPH

CALL AND GRANT AGREEMENT NUMBER

ESA (European Space Agency)

PURPOSE AND MAIN OBJECTIVES

The objective was to design, study and characterize the atmospheric sub-system of a Plant Control Unit and its processes related to crop growth. The atmosphere of the plant-related environment had to be homogeneous and meet the plants' requirements.

The requirements established by plant scientists of the University of Blaise Pascal determined the optimal conditions for light, evapotranspiration of leaves, temperature and relative humidity for crops such as potatoes, soybeans and durum wheat.

ES's ROLE AND VALUE

EnginSoft has previously participated as a partner in other ESA life support system projects. The company's engineering background has resulted in a higher level of involvement in ongoing projects where it now plays a coordinating role with direct design involvement with ESTEC (European Space Technological Center) scientists.

In this specific project EnginSoft worked on the full control of the air management and flexible air management (distribution system) in order to create an optimal growth environment with T, RH and contaminant control.

EnRUM

Space Energy Resources Utilization Mapping

START DATE - END DATE

2015 - 2018

PARTNERS

ENGINSOFT SPA, CSEM - CENTRE SUISSE D'ELECTRONIQUE ET DE MICROTECHNIQUE, SHERPA ENGINEERING, UNIVERSITÉ DE LIÈGE

CALL AND GRANT AGREEMENT NUMBER

ESA (European Space Agency)

PURPOSE AND MAIN OBJECTIVES

The aim of the project was to develop a comprehensive simulation and mapping tool for all the energy sources involved in a given space mission, allowing the user to analyze and optimize the energy balance.

The availability of an analysis tool to design and optimize the system architecture is necessary to ensure the success of a space mission. Mass and energy optimization are key factors in space missions, hence the need to develop a comprehensive energy balance assessment tool.

EnRUM was based on modelling the energy transformation processes within a given mission: primary energy resources, secondary energy sources and energy consumers (such as life support systems, propulsion, guidance). In each phase, the power, energy, and energy potential were assessed for visualization within the ALISSE platform.

ES's ROLE AND VALUE

EnginSoft participated as project coordinator and was responsible for all aspects of the IT design of the EnRUM software: definition of user interaction, GUI (Graphical User Interface) design, database, interconnection with the ALISSE platform, and maintenance of the user manual.

EnginSoft also contributed to the test plan and suggested future improvements.

SCALISS

SCALing of Life Support System

START DATE - END DATE

2012 - 2016

PARTNERS

THALES ALENIA SPACE SPA, DLR - DEUTSCHES ZENTRUM FÜR LUFT- UND RAUMFAHRT (GERMAN AEROSPACE CENTER), ENGINSOFT SPA, TUM - TECHNISCHE UNIVERSITÄT MÜNCHEN

CALL AND GRANT AGREEMENT NUMBER

ESA (European Space Agency)

PURPOSE AND MAIN OBJECTIVES

Designing the Environmental Control and Life Support System (ECLSS) for exploration missions in interplanetary space is a complex task that starts with the definition of needs (e.g. diet, safety, radiation levels, etc.) and includes the selection of technological possibilities. In this context, the influence of crew numbers and mission duration are important issues for the ECLSS design. These are the main reasons why the design of the ECLSS system starts mostly from scratch during mission studies. Uncertainties about the requirements, functions and technologies most suitable for the mission lead to a high number of iterations before a baseline design can be achieved.

The aim of the SCALISS study was to understand and analyze the ECLSS functionality, technologies and scalability to produce a robust initial design point for future Phase-A studies using an automated tool. This included a comprehensive review of ECLSS technology, functions and systems. The main outcome of the study was the development of an automated tool based on the ECLSS scaling methodology. This tool is called SCALISS.

ES's ROLE AND VALUE

EnginSoft developed the automated Java-based tool. The SCALISS tool was developed on standard 32-bit and 64-bit workstations, integrating models such as Excel spreadsheets developed by partners inside the core platform.

EnginSoft was responsible for the design and modification of the user interface for the SCALISS tool and further integration of the program, and, in particular, the possible evolutions and interactions with the ALISSE tool (developed by EnginSoft in a previous ESA project).

GMSS

Greenhouse Module for Space System

START DATE - END DATE

2013 - 2014

PARTNERS

DLR - DEUTSCHES ZENTRUM FÜR LUFT UND RAUMFAHRT, DRESDEN UNIVERSITY OF APPLIED SCIENCES, EADS GMBH, ENGINSOFT SPA, UNIVERSITY OF ARTS AND INDUSTRIAL DESIGN LINZ

CALL AND GRANT AGREEMENT NUMBER

ESA (European Space Agency)

PURPOSE AND MAIN OBJECTIVES

The development of bio-regenerative life support systems is essential to increase the human possibilities for space exploration: these systems must fulfill all human needs by enabling a sufficient level of living conditions. In this context, a greenhouse module becomes a fundamental part of the concept for each stable and independent base for future space missions. In fact, a greenhouse can (re-)generate essential resources for humans by closing the life cycle loops within a habitat, like waste-water recycling, CO₂ reduction, food and O₂ production.

This project was a feasibility study and was incorporated into ESA's MELiSSA framework of research projects.

The main task of this study was to define a greenhouse module for a lunar base. All the relevant issues related to a complete bio-regenerative system were examined: type of plants, cultivation area, lighting and air conditioning systems, overall energy requirements and structure of the module. At the end, a final layout of a greenhouse module was developed.

ES's ROLE AND VALUE

The development of bio-regenerative life support systems is a long-term mission in the ESA program. This project highlighted the primary problems related to the engineering of a greenhouse module and proposed a first solution to the realization of a prototype. In this project, EnginSoft was engaged in providing engineering solutions for air treatment (heat, ventilation and air conditioning) with the definition of each component. In addition, using its experience in CFD analysis, EnginSoft verified the efficiency of the system.

HySSE

HYdroponic SubSystem Engineering

START DATE - END DATE

2013 - 2015

WEBSITE

www.enginsoft.com/research/hysse.html

PARTNERS

ENGINSOFT SPA, NTNU - NORWEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY (UNIVERSITY OF TRONDHEIM), POLYTECHNIQUE MONTRÉAL, SHERPA ENGINEERING, UNIVERSITÉ LIBRE DE BRUXELLES, UNIVERSITEIT GENT, UNIVERSITY OF GUELPH

CALL AND GRANT AGREEMENT NUMBER

ESA (European Space Agency)

PURPOSE AND MAIN OBJECTIVES

The production of food in space using regenerative systems is a long-term project being addressed by the ESA (European Space Agency) since its MELiSSA (Micro Ecological Life Support System Alternative) program. A completely sealed environment between the root and leaf zones of the plants had never been tested, thus mass balance and/or contamination between the two environments could not be controlled. HySSE addressed the development of a sealed system for the roots so that the rhizosphere environment could be characterized and studied in isolation. The project developed, produced and tested an Earth-based pilot test facility. The entire life cycle of three crops (potatoes, soya bean and durum wheat) was completed. The project focused on developing an innovative design for a sealed hydroponic channel for food production using regenerative systems in space: space stations, lunar bases and the exploration of Mars. The project developed, constructed and tested an Earth-based pilot test facility.

ES's ROLE AND VALUE

EnginSoft has partnered in several ESA projects for life support systems. It was the coordinator of this project and was directly involved with ESTEC (European Space Technological Center) in design issues, in addition to coordinating the group of international biochemical scientists to make the project a success.

From a technical perspective, EnginSoft's contribution was mainly related to the design of different components for air treatment and sterilization, the simulation of plant behavior, and the evaluation of the ambient air composition (O₂, CO₂ and humidity) to reveal the influences of plants in a closed environment.

MELiSSA

Micro Ecological Life Support System Alternative

START DATE - END DATE

2009 - 2010

PARTNERS

ENGINSOFT SPA, SCK-CEN - BELGIAN NUCLEAR RESEARCH CENTRE, SEMILLA IPSTAR, SHERPA ENGINEERING, UAB - UNIVERSITAT AUTÒNOMA DE BARCELONA, UGENT - UNIVERSITEIT GENT, UMONS - UNIVERSITÉ DE MONS, UNIL - UNIVERSITÉ DE LAUSANNE, UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II, UNIVERSITÉ BLAISE PASCAL - CLERMONT 2, UNIVERSITY OF GUELPH, VITO

CALL AND GRANT AGREEMENT NUMBER

ESA (European Space Agency)

PURPOSE AND MAIN OBJECTIVES

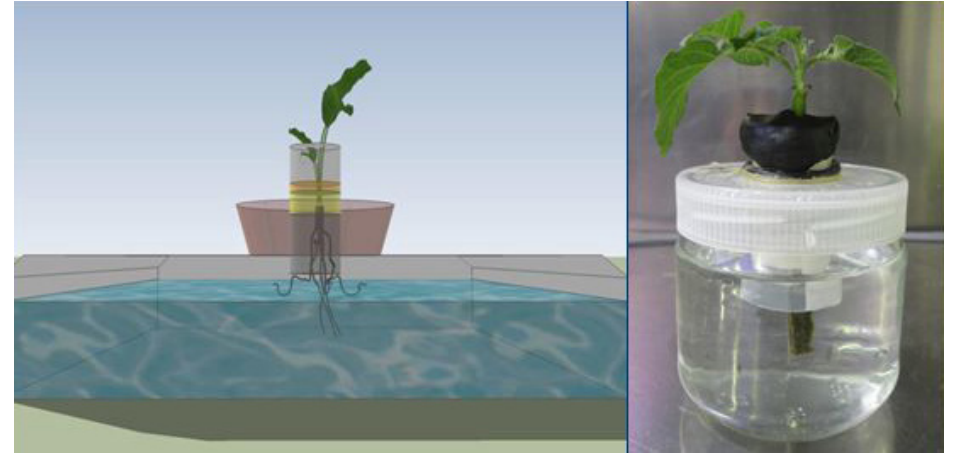
Food production in space using regenerative systems is a long-term project being addressed by the ESA (European Space Agency) with the MELiSSA (Micro Ecological Life Support System Alternative) program.

The MELiSSA project is developing an artificial ecosystem as a tool to study and advance technology for a future life support system for long-term manned space missions.

A critical issue for this type of mission is life support, which requires the supply of food, water and O₂ and the removal of generated waste. As duration, distance and crew size increase, so do the mass and volume of food and waste transported, resulting in unattainable mass transport requirements.

Periodic replenishment of basic life support elements from the Earth is not a viable solution as it is associated with high economic costs and risks. Hence the need for a self-sufficient system capable of treating, recovering and recycling edible mass, water and oxygen from human waste and carbon dioxide. Based on the principle of an aquatic ecosystem, the MELiSSA closed regenerative life support loop consists of five interconnected compartments. In three of them, waste is progressively broken down by fermentation processes.

In the fourth compartment, plants are grown to produce food, oxygen and water. The fifth compartment is where the crew lives - rats in the case of this experiment, and on real missions, the astronauts. A completely sealed environment between the root and leaf zones of the plants had never been tested, thus mass balance and/or contamination between the two environments could not be controlled.



ES's ROLE AND VALUE

EnginSoft was involved in the food characterization activities, contributing to the characterization of the plant growing environment, a key factor in ensuring satisfactory conditions for food production.

Typically, plant growth chambers used for plant physiology research suffer from a degree of environmental parameter heterogeneity that could affect the yield quality and quantity. In fact, depending on the light intensity, temperature or air mixing rate, individual crops will display different growth rates and compositions at a given sampling time.

The modelling of the chamber hardware has the potential to provide an insight into the phenomena leading to uneven growing conditions and to provide suggestions on how to mitigate them.

ALISSE

Advanced Life Support System Evaluator

START DATE - END DATE

2008 - 2010

PARTNERS

EADS - European Aeronautic Defence and Space Company GMBH, EMPRESARIOS AGRUPADOS AIE, ENGINSOFT SPA, ICAST, SHERPA ENGINEERING, UNIVERSITÉ DE LIÈGE

CALL AND GRANT AGREEMENT NUMBER

ESA (European Space Agency)

PURPOSE AND MAIN OBJECTIVES

Long-term missions, such as setting up permanent bases on the lunar surface or travelling to Mars, require so many life support consumables (e.g. food, water and oxygen) that direct supply or re-supply from Earth is no longer an option. Regenerative life support systems are therefore necessary to sustain long-term manned space missions to increase recycling rates and thus reduce the launch mass.

The architecture of an Environmental Controlled Life Support System (ECLSS) depends largely on the mission scenario, although different architectures could be envisaged for a given mission scenario and all of them need to be evaluated and compared with appropriate tools. Since the single criterion of Equivalent System Mass is not considered sufficiently comprehensive, a multidimensional and multi-criterion (i.e. mass, energy, efficiency, human risk, reliability, crew time, sustainability, life cycle cost) approach is proposed through the development of an IT support platform.

ALISSE's main objective was to define and implement a metric system, addressing the complexity of any Environmental Controlled Life Support System (ECLSS) along its Life Cycle phases. ALISSE enabled the verification of the ECLSS life cycle performance based on the historical know-how and design tools of the progressive technology readiness level (TRL) development. ALISSE provided significant input to the ESA Concurrent Design Facility and is a valuable tool to support the decision-making process for any manned space mission.

ES's ROLE AND VALUE

EnginSoft was responsible for the design and implementation of the design workflow in a software platform that links different design tools. EnginSoft also developed the post-processing for the data.

CLOSE

CLOSE to the Earth

START DATE - END DATE

2018 - 2021

PARTNERS

DTA - DISTRETTO TECNOLOGICO AEROSPAZIALE, BLACKSHAPE SPA, CNR - CONSIGLIO NAZIONALE DELLE RICERCHE, ENEA - AGENZIA NAZIONALE PER LE NUOVE TECNOLOGIE, L'ENERGIA E LO SVILUPPO ECONOMICO SOSTENIBILE, ENGINSOFT SPA, GAP, IMT, PLANETEK SRL, POLITECNICO DI BARI, SITAEL SPA, UNIVERSITÀ DEGLI STUDI DI BARI "ALDO MORO", UNIVERSITÀ DEL SALENTO

CALL AND GRANT AGREEMENT NUMBER

MIUR Programma Operativo Nazionale (PON) "Ricerca e Innovazione 2014-2020"

PURPOSE AND MAIN OBJECTIVES

The ultimate goal of the project is to "open" a new operating area in Space, namely that of Very Low Earth Orbits (VLEO), or orbits between 160 and 250km in altitude.

This range is currently precluded to both aeronautics and space systems, and its operational availability would pave the way for a new phase of innovation in Earth observation services. Achieving this goal requires intensive research and the achievement of numerous partial objectives, which are well-suited to the main thrusts of Space development.

ES's ROLE AND VALUE

EnginSoft is involved in developing a Graphical User Interface (GUI) for a numerical code developed by the CNR (the Italian Research Council) which simulates hall-effect thrusters.

EnginSoft is also involved in the study and characterization of the stresses at VLEO orbits and will support the partner SITAEL in structural (from static to thermoelastic), thermal (radiative and orbital thermal, transient LEOP) and electrical analysis.

Apulia Space

Sviluppo di Tecnologie Abilitanti nei segmenti Spazio, Terra e Utente
Development of Enabling Technologies for Space, Earth and User segments

START DATE - END DATE

2013 - 2016

WEBSITE

www.dtascarl.it

PARTNERS

PLANETEK ITALIA, ALTA SPA E CENTROSPAZIO, CNR - CONSIGLIO NAZIONALE DELLE RICERCHE, ENEA, ENGINSOFT SPA, GAP - GEOPHYSICAL APPLICATIONS PROCESSING SRL, IMT - INGEGNERIA MARKETING TECNOLOGIA SRL, POLITECNICO DI BARI, SIT GROUP - SITAEI SPA, UNIVERSITÀ DEGLI STUDI DI BARI, UNIVERSITÀ DEL SALENTO

CALL AND GRANT AGREEMENT NUMBER

PON 03 Programma Operativo Nazionale Ricerca e Competitività,
DD 713/Ric. Del 29/10/2013 (MIUR)

PURPOSE AND MAIN OBJECTIVES

The project covered a wide range of space-related issues ranging from exploration of the Universe to Earth observation, including systems, the management of remote data reception, and awareness-raising activities for regional consumer acceptance of the use of space systems. Research and development activities were geared towards creating a set of innovative tools and technologies to construct space- and ground-based technological infrastructures to acquire, process and manage satellite data (Earth observation and space exploration), as well as to provide operators and end-users (regional and scientific bodies) with the necessary tools (innovative products and value-added services) for their operational, management and decision-making activities in both the application and the management of data acquired from scientific missions.

The theme of the exploration of the Universe was also strategically important to the scientific and industrial team. There were five key areas of focus: innovative sensors for the exploration of the universe, electric propulsion, unconventional propulsion, space transport, and plasma phenomena and processes in space.

ES's ROLE AND VALUE

EnginSoft was involved in the development, including the graphical user interface (GUI) of the decision-making software for a 3D kinetic code for simulating plasma thrusters.



MATERIALS



DERMAP

**DEsign of components
in a critical Raw MAterials Perspective**

START DATE - END DATE

2018 - 2020

WEBSITE

dermap.eu

PARTNERS

UNIVERSITÀ DEGLI STUDI DI PADOVA, CONSELL GENERAL DE CÀMBRES DE COMERC INDUSTRIÀ I NAVEGACIO DE CATALUNYA, CONSORZIO SPRING, ENGINSOFT SPA, FUNDACIÓ EURECAT - CENTRE TECNOLÒGIC DE CATALUNYA, MONDRAGON GOI ESKOLA POLITEKNIKO J.M.A. S. COOP., SWEREA AB, SWEREA SWECAS AB, ZANARDI FONDERIE

CALL AND GRANT AGREEMENT NUMBER

EIT RawMaterials

PURPOSE AND MAIN OBJECTIVES

DERMAP is a current, intensive (one full day) training course on material selection from a critical raw materials (CRM) perspective. The course is aimed at designers, mechanical engineers and professionals involved in the selection of materials who wish to deepen their knowledge of material selection strategies with particular reference to issues related to CRM.

An online training tool that allows one to easily check “critical alloys” and find substitutes has been developed and is available to DERMAP customers during the course.

ES's ROLE AND VALUE

EnginSoft actively participates in this project with training sessions on the design of innovative components in lightweight alloys.

In addition, due to its extensive network, EnginSoft contributed to disseminating information about the DERMAP tool and training course around Europe. EnginSoft also hosted the main training course event at the 2019 International CAE Conference and Exhibition.

FORCE

Formulations and Computational Engineering

START DATE - END DATE

2017 - 2020

WEBSITE

www.the-force-project.eu

PARTNERS

FRAUNHOFER SOCIETY - FRAUNHOFER GESELLSCHAFT ZUR FÖRDERUNG DER ANGEWANDTEN FORSCHUNG, DOW BENELUX BV, ENGINSOFT SPA, ENTHOUGHT LTD, GRANTA DESIGN LTD, IBM RESEARCH GMBH, PANEPISTIMIO PATRON, ETH ZÜRICH - R. EIDGENÖSSISCHE TECHNISCHE HOCHSCHULE ZÜRICH, UNILEVER U.K. CENTRAL RESOURCES, MEGARA RESINS - VIOMICHANIA RITINON MEGARON ANASTASIOS FANIS ANONYMOS ETAIRIA

CALL AND GRANT AGREEMENT NUMBER

H2020-NMBP-23-2016-two-stage
Grant agreement ID: 721027

PURPOSE AND MAIN OBJECTIVES

The project aimed to develop an open integrated framework that connects materials models at various levels of complexity, experimental data sets and commercial information (e.g. ingredients and processing costs), so that decision makers can use a wider variety of key performance indicators.

These are combined with multi-criteria optimization algorithms to identify the optimal trade off when making a business decision, considering appropriate formulation and business constraints. FORCE brings materials modelling into the center-stage of business by combining it with advanced machine learning approaches for handling big data, empowering decision makers through the provision of rapid avenues to optimize existing, and design new products to enhance the position of European industries in their global markets.

ES's ROLE AND VALUE

EnginSoft's role was to integrate the Business Decision Support System (BDSS) platform using interoperability and open simulation platform principles. In addition, EnginSoft developed the user interfaces and the workflow management technologies.

RecycAl

High Shear Processing of Recycled Aluminum Scrap for Manufacturing High Performance Aluminum Alloys

START DATE - END DATE

2014 - 2016

WEBSITE

recycal-project.eu

PARTNERS

TWI LIMITED, AZCATEC TECNOLOGIA E INGENIERIA SL, BRUNEL UNIVERSITY LONDON, CENTRO RICERCHE FIAT, ENGINSOFT SPA, FOMT - FONDERIE OFFICINE MECCANICHE TONNO SPA, GIF - GESELLSCHAFT FÜR INNOVATIVE FERTIGUNGSTECHNIK MBH & CO KG, IDALSA - IBERICA DE ALEACIONES LIGERAS SL, INNOVAL TECHNOLOGY, QUANTAL LASER TECNOLOGIA SA, SULDOURO - VALORIZACAO E TRATAMENTO DE RESIDUOS SOLIDOS URBANOS SA, UNIVERSIDAD PUBLICA DE NAVARRA, UNIVERSITY COLLEGE DUBLIN

CALL AND GRANT AGREEMENT NUMBER

FP7-ENV-2013-two stage
Grant agreement ID: 603577

PURPOSE AND MAIN OBJECTIVES

The project aimed to develop a new process to transform secondary aluminum. The project demonstrated that secondary aluminum scrap can be transformed into a low-cost, low-carbon raw material to create high quality processed products and castings through High Shear Processing (HSP) technology.

The HSP technology is based on a new physical melt conditioning process and is suitable for both batch and continuous metal processing. The gap to industrialization was bridged by involving a research-orientated SME that designed and built a small industrial-scale prototype of an HSP unit and then made recommendations regarding improved equipment design.

ES's ROLE AND VALUE

In this project, EnginSoft carried out a comprehensive life cycle analysis to quantify the economic and environmental impacts of the new technology. A complete economic and environmental life cycle study was developed to assess the costs and the CO2 savings for the components selected for the demonstration.

CERMAT2

New ceramic technologies and novel multifunctional ceramic devices and structures

START DATE - END DATE

2013 - 2017

WEBSITE

cermat2.unitn.it

PARTNERS

UNIVERSITÀ DEGLI STUDI DI TRENTO, ABERYSTWYTH UNIVERSITY, ENGINSOFT SPA, INSTYTUT ENERGETYKI, POLITECHNIKA RZESZOWSKA IM IGNACEGO LUKASIEWICZA PRZ, UNIVERSITY OF LIVERPOOL, UNIVERSITY OF BELGRADE - FACULTY OF MECHANICAL ENGINEERING, VESUVIUS GROUP SA

CALL AND GRANT AGREEMENT NUMBER

FP7-PEOPLE-2013-ITN Marie Curie ITN
Grant agreement ID: 606878

PURPOSE AND MAIN OBJECTIVES

The CERMAT2 project aimed to train young researchers to understand the modeling of Solid Mechanics problems applied to the process and design of advanced ceramics. In a synergetic collaboration between academia and industry, the project addressed the social aspects relating to the improvement of industrial production and the reduction of pollution. The objective was pursued using a training-through-research methodology that focused on the improvement of processes related to the compaction of ceramic powder, the fundamental understanding of the behaviors of granular and composite materials, and the development of multifunctional ceramic materials and structures.

ES's ROLE AND VALUE

EnginSoft worked on translating numerical prototype models developed by the University of Trento into effective numerical routines.

The outcomes were a software prototype that implements an integrated routine for ceramic production and a dedicated program to optimize the processing of ceramics. In addition, EnginSoft was involved in the organization of a training course for students and PhDs.

INTERCER2

**Modelling and optimal design of ceramic structures
with defects and imperfect interfaces**

START DATE - END DATE

2011 - 2015

WEBSITE

intercer2.unitn.it

PARTNERS

UNIVERSITÀ DEGLI STUDI DI TRENTO, ABERYSTWYTH UNIVERSITY, ENGINSOFT SPA, SACMI COOPERATIVA MECCANICI IMOLA SOCIETÀ COOPERATIVA, UNIVERSITY OF LIVERPOOL

CALL AND GRANT AGREEMENT NUMBER

FP7-PEOPLE-2011-IAPP
Grant agreement ID: 286110

PURPOSE AND MAIN OBJECTIVES

The industrial production of ceramic components is still based on empirical processes, which are often poorly understood and difficult to control. This project aimed to deeply understand the production process of ceramic components with the aim of optimizing it and developing new technological and industrial strategies.

The consortium worked on modelling and experimentally validating the process of forming ceramics and of innovative ceramic products. Three academic institutions and two industrial bodies were involved. The academic institutions supported the development of new material testing protocols and mathematical models with the aim of simulating the forming processes, analyzing defects and improving the production technologies, while the industrial bodies provided the experimental data for the validation of the mathematical models.

ES's ROLE AND VALUE

EnginSoft worked on the new ceramic rheological model (and integrated it into Ansys) and aligned the experimental curves (using modeFRONTIER software). modeFRONTIER is an integration platform for multi-objective and multi-disciplinary optimization.

DOPP

Digital pilot för optimering av produkttegenskaper
Digital pilot for optimization of product attributes

START DATE - END DATE

2017 - 2018

WEBSITE

lighterarena.se/en/node/265

PARTNERS

SWEREA IVF AB, ENGINSOFT NORDIC, GKN AEROSPACE SWEDEN AB, HUSQVARNA AKTIEBOLAG, LAMERA AB, SWEREA SIGCOMP AB

CALL AND GRANT AGREEMENT NUMBER

Vinnova programme "Digitalisering av svensk industri Nya piloter våren 2017",
project n. 2017-01542

PURPOSE AND MAIN OBJECTIVES

The main objectives of the project were to halve costs and development times and to halve the weight with new materials. The project explored both topology and parametric optimization methods in order to reach the objectives in three industrial demonstration cases. While most products on the market are optimized to some degree, this optimization is often achieved manually; systematic design optimization allows engineers to:

- ★ Explore huge design spaces
- ★ Improve the efficiency of collaboration with colleagues, suppliers and customers
- ★ Find better designs and make better decisions

The project achieved the following forecast outcomes: Lamera shortened the lead time for designing a sandwich material; Husqvarna developed and tested calculation models to optimize a laminate design for carbon fiber, metal and adhesive, with good results, which became the starting point for introducing these methods to other areas of the company; and GKN used the result of the project as part of a multi-objective optimization system for airplane engines.

ES's ROLE AND VALUE

EnginSoft Nordic supported all the industrial partners in applying parametric optimization methods to their applications. CAE tools were applied to: (a) The simulation of the use of sandwich metal; (b) The optimization of an aircraft engine part. In addition to direct support with modeling and the design of viable optimization strategies, EnginSoft Nordic helped guide the project based on its 15 years of experience in the field.

DSMO

Datorstödd Material- och Strukturoptimering
Computer-aided optimization of material choice and structure

START DATE - END DATE

2013 - 2015

WEBSITE

www.vinnova.se/en/p/structure--materials-cae-optimization/

PARTNERS

SWEREA IVF AB, ALTAIR ENGINEERING AB, ARSIZIO AB, BENTELER ENGINEERING SERVICES AB, ENGINSOFT NORDIC, GKN AEROSPACE SWEDEN AB, KUNGLIGA TEKNISKA HÖGSKOLAN, LAMERA AB, LEANNOVA ENGINEERING AB, SEMCON SWEDEN AB, VOLVO PERSONVAGNAR AB

CALL AND GRANT AGREEMENT NUMBER

Vinnova programme "SIP Lighter"
 project n. 2013-03309

PURPOSE AND MAIN OBJECTIVES

The project aimed to develop computer support (CAE methods) and work methodologies for the systematic optimization of lightweight solutions for the automotive and aerospace industries where environmental requirements, among other things, drive a continuous quest for weight reduction.

The project achieved its objective to increase the technology-readiness level (TRL) of a new development process that had been more explorative in its early stages from TRL3 to TRL5. The project achieved the targets of halving costs and development time and achieving 50% lighter weight with new materials. Technology Readiness Levels (TRLs) are indicators of the maturity level of particular technologies. This measurement system provides a common understanding of technology status and addresses the entire innovation chain. There are nine levels; TRL 1 being the lowest corresponding to fundamental research and TRL 9 the highest related to marketed technologies.

ES's ROLE AND VALUE

EnginSoft Nordic supported the end users in applying parametric optimization methods to their applications. It provided insights and tools to explore viable strategies for innovative product development processes in light-weight structural designs by applying multi-objective optimization and decision making.

SMATI

Sviluppo Materiali Avanzati e Tecnologie Innovative
Developing Advanced Materials and Innovative Technologies

START DATE - END DATE

2011 - 2015

WEBSITE

ponrec.it/open-data/progetti/scheda-progetto?ProgettoID=5228

PARTNERS

ENEA - AGENZIA NAZIONALE PER LE NUOVE TECNOLOGIE, L'ENERGIA E LO SVILUPPO ECONOMICO SOSTENIBILE, CETMA - CENTRO DI PROGETTAZIONE, DESIGN & TECNOLOGIE DEI MATERIALI, ENGINSOFT SPA, NUOVO PIGNONE SRL, POLITECNICO DI BARI, UNIVERSITÀ DEL SALENTO

CALL AND GRANT AGREEMENT NUMBER

Programma Operativo Nazionale "Ricerca e Competitività 2007-2013" Regioni Convergenza ASSE I - Sostegno ai mutamenti strutturali

PURPOSE AND MAIN OBJECTIVES

The SMATI Project studied and developed materials, technologies and design methodologies for contexts characterized by harsh conditions and highly corrosive environments.

To achieve the project objective, it was necessary to combine innovative production, production technologies and advanced materials, therefore the project developed methodologies for an integrated design process specifically for the requirements of the target context.

ES's ROLE AND VALUE

EnginSoft developed integrated design methodologies for the Design Chain and worked on numerical correlations between the experimental data and casting simulations.

In addition, EnginSoft performed numerical analyses (compared with experimental data) for the estimation of residual stress, studied aging treatments, and optimized the product and the process.

GAP

**Ghise e leghe di Alluminio ad elevate Prestazioni
per componenti innovativi**

High Performance Cast Iron and Aluminum Alloys for Innovative Components

START DATE - END DATE

2017 - 2019

WEBSITE

www.retesinfonyet.org/progetto-gap/

PARTNERS

CONSORZIO SPRING - STRATEGIC PARTNERSHIP FOR RESEARCHED-BASED, INNOVATIVE AND NETWORKED GROWTH, ECOR INTERNATIONAL SPA, ENGINSOFT SPA, FONDERIA CORRÀ SPA, ITALKER SRL, LINO MANFROTTO + CO SPA, RDS MOULDING TECHNOLOGY SPA, SLIM FUSINA ROLLING SRL, UNILAB LABORATORI INDUSTRIALI SRL, UNIVERSITÀ DEGLI STUDI DI PADOVA, ZANARDI FONDERIE SPA

CALL AND GRANT AGREEMENT NUMBER

Programma operativo POR FESR 2014-2020, Bando per il sostegno a progetti di Ricerca e Sviluppo sviluppati dai Distretti Industriali e dalle Reti Innovative Regionali ASSE 1 "RICERCA, SVILUPPO TECNOLOGICO E INNOVAZIONE" OBIETTIVI SPECIFICI "Incremento dell'attività di innovazione delle imprese" AZIONE 1.1.4 "Sostegno alle attività collaborative di R&S per lo sviluppo di nuove tecnologie sostenibili, di nuovi prodotti e servizi" DGR n. 1139 del 19 luglio 2017 - Regione del Veneto

PURPOSE AND MAIN OBJECTIVES

This Smart Manufacturing project is focused on advanced light alloys and innovative high-performance cast iron. It makes use of enabling technologies and advanced production systems to enhance environmental sustainability (the creation of "light" components that reduce environmental impact and use less resources) and energy efficiency (reducing consumption and increasing the efficient use of materials).

ES's ROLE AND VALUE

EnginSoft's manufacturing operations units (Foundry and Metal Forming) and mechanical designers are involved in the development and implementation of the materials database and the development of design case histories.

The company's goal is to produce reliable databases and design methodologies that take into account the effect of microstructure and defects on the performance of innovative (and conventional) alloys.

TEMART

**Tecnologie e materiali per la manifattura artistica,
i Beni Culturali, l'arredo, il decoro architettonico e urbano
e il design del futuro**

*Technologies and materials for artistic production,
Cultural Heritage, furnishing, architectural and urban decor
and for the design of the future*

START DATE - END DATE

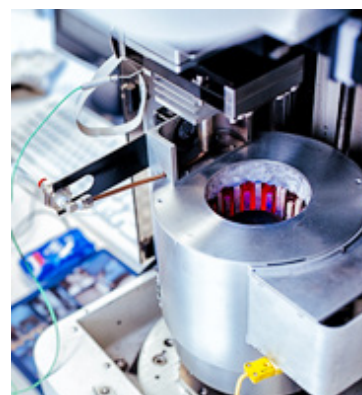
2017 - 2020

PARTNERS

CONSORZIO M3 NET, COCCO GABRIELE, CONSORZIO CLUSTER MANAGEMENT NETWORK, COOPSERVICES SOCIETÀ COOPERATIVA, DELKA SRL, DFF SRL, ECOR INTERNATIONAL SPA, ENGI SRL, ENGINSOFT SPA, FRANCESCON SRL, KAZAN, METAL FINISH SRL, MORELLO GIANLUCA SRL, OFFICINA DEI MATERIALI DI ANTONIO ALESSANDRO ROSSI & C. SAS, P. FACTOR SRL, PRS SRL, PRISMATECH SRL, RETE DI IMPRESE LUCE IN VENETO, STUDIO 4 SRL, UNIVERSITÀ DEGLI STUDI DI PADOVA, UNIVERSITÀ DEGLI STUDI DI VENEZIA - IUAV, UNIVERSITÀ VENEZIA - CÀ FOSCARI, UNIVERSITÀ DEGLI STUDI DI VERONA, VAR CONNECT SRL, VENETIAN HERITAGE CLUSTER SRL

CALL AND GRANT AGREEMENT NUMBER

Programma operativo POR FESR 2014-2020, Bando per il sostegno a progetti di Ricerca e Sviluppo sviluppati dai Distretti Industriali e dalle Reti Innovative Regionali ASSE 1 "RICERCA, SVILUPPO TECNOLOGICO E INNOVAZIONE" OBIETTIVI SPECIFICI "Incremento dell'attività di



innovazione delle imprese" AZIONE 1.1.4 "Sostegno alle attività collaborative di R&S per lo sviluppo di nuove tecnologie sostenibili, di nuovi prodotti e servizi" DGR n. 1139 del 19 luglio 2017 - Regione del Veneto

PURPOSE AND MAIN OBJECTIVES

The project aims to improve technical and scientific knowledge and new combinations of manufacturing technologies and materials to respond to the needs in the domains of artistic craftsmanship, restoration of cultural heritage, urban furniture and design. The project combines innovative technological applications capable of prototyping and producing components and products of artistic value with complexity of form and material.

Particular attention is paid to the use of additive manufacturing technologies for an extended range of materials and their combinations in the same artifact.

ES's ROLE AND VALUE

EnginSoft will design and implement a decision support system (DSS) to assist companies and research centers in the Veneto region to develop and integrate the innovative technologies and processes that are being studied in the project.

This DSS will add strategic value to the project by enabling the value of the project to extend far beyond the development of solutions to specific cases, even if they are relevant. By systematizing and organizing the different knowledge and experience acquired during the project, the DSS will make this accessible and usable to all project partners during the project, and later to the whole industrial and research sector in the Veneto Region to enable the project to be completed.





AERONAUTICS



WINGTECH EVALUATION

WING BOX TECHNOLOGY EVALUATION - TRADE-OFF STUDY FOR THE RANKING OF NEW TECHNOLOGIES BEST FITTING WING

START DATE - END DATE

2011 - 2012

PARTNERS

ENGINSOFT SPA, PIAGGIO AERO INDUSTRIES SPA, UNIVERSITÀ DEGLI STUDI DI PISA

CALL AND GRANT AGREEMENT NUMBER

FP7-JTI-CS - Clean Sky
Grant agreement ID: 270586

PURPOSE AND MAIN OBJECTIVES

The core of this project was the development of a trade-off study to identify the most promising new technologies to incorporate into different structures. Different solutions were compared based on the following objectives/indicators relating to the construction, use and maintenance phases: increased safety, reduction of weight, reduction of production and maintenance costs, and reduction of environmental impact.

A methodology to effectively solve the problem was developed and used. The problem was simulated, and all the following issues were addressed: geometry management (importation, repair, simplification, adaptation, etc.), definition of a high-quality mesh and application of specific materials (composites), behavior laws, loading, solution and post-processing.

ES's ROLE AND VALUE

EnginSoft developed a model to study different variations of the wing stub box, to identify the most promising technical solutions and to assess the impact of structural changes on the overall system performance.

VOCAL-FAN

VOCAL-FAN Virtual Optimization CFD platform Allowing FAN noise reduction

START DATE - END DATE

2011 - 2013

PARTNERS

ENGINSOFT SPA, TAES - THALES AVIONICS ELECTRICAL SYSTEMS

CALL AND GRANT AGREEMENT NUMBER

FP7-JTI-CS - Clean Sky
Grant agreement ID: 271753

PURPOSE AND MAIN OBJECTIVES

The VOCAL-FAN project aimed to investigate the noise generated by the original design geometries of the fans and ducts in an electrical machine and then to evaluate different geometric modifications to reduce the noise while maintaining or improving the other fluid dynamic properties (fan head, volume flow rate, fan efficiency, etc.).

The innovative nature of the project was linked to the implementation of the most advanced algorithms and procedures for CFD simulation, the exploitation of Design Of Experiment algorithms and the development of a simulation process flow controlled by Multi-Objective Optimization algorithms.

Finally, the analyzed models were ranked, with respect to their key performances, and the optimal candidates were selected, by means of the most advanced multi-criteria decision methods.

ES's ROLE AND VALUE

The VOCAL-FAN project offered EnginSoft the opportunity to contribute to significant advancements in noise emission reduction in civil aviation. EnginSoft, which coordinated the whole project, worked closely with Thales to develop and optimize new generation starters/generators.

The experience of EnginSoft's Computational Fluid Dynamics team in simulating and designing air-cooled systems and in aero-acoustic simulation were crucial to the success of the project. In this specific project EnginSoft developed a fully integrated software platform based on the most advanced functionalities of Ansys CFX (the advanced simulation tool for fluid-dynamics computational analysis) and modeFRONTIER (the platform for multi-objective optimization and process integration).

E-BREAK

Engine BREAKthrough Components and Subsystems

START DATE - END DATE

2012 - 2017

PARTNERS

SAFRAN HELICOPTER ENGINES, AAC MICROTEC AB, ALCIMED, ALSTOM POWER LTD, ASOCIACION CENTRO TECNOLÓGICO CEIT-IK4, BAUHAUS LUFTFAHRT EV, CEIT - CENTRO DE ESTUDIOS E INVESTIGACIONES TÉCNICAS, CENAERO - CENTRE DE RECHERCHE EN AÉRONAUTIQUE, CHALMERS TEKNISKA HÖGSKOLA AB, CTA - FUNDACION CENTRO DE TECNOLOGIAS AERONAUTICAS, DLR - DEUTSCHES ZENTRUM FÜR LUFT UND RAUMFAHRT, DUTCHAERO BV, ENGINSOFT SPA, ENIT - ÉCOLE NATIONALE D'INGÉNIEURS DE TARBES, GE AVIO SRL, GKN AEROSPACE SWEDEN AB, HSR - HOCHSCHULE FÜR TECHNIK RAPPERSWIL, IMP-PAN - INSTYTUT MASZYN PRZEPŁYWOWYCH, INDUSTRIA DE TURBO PROPULSORES S.A.U., ISAE-SUPAERO - INSTITUT SUPÉRIEUR DE L'AÉRONAUTIQUE ET DE L'ESPACE, KIT - KARLSRUHER INSTITUT FÜR TECHNOLOGIE, MTU AERO ENGINES AG, MTU AERO ENGINES GMBH, NLR - NATIONAL AEROSPACE LABORATORY, ONERA - OFFICE NATIONAL D'ÉTUDES ET DE RECHERCHES AÉROSPATIALES, PRATT & WHITNEY RZESZOW SPOLKA AKCYJNA, POLITECNICO DI MILANO, POLITECNICO DI TORINO, ROLLS-ROYCE DEUTSCHLAND LTD & CO KG, ROLLS-ROYCE PLC, RWTH AACHEN UNIVERSITY - RHEINISCH-WESTFAELISCHE TECHNISCHE HOCHSCHULE AACHEN, SAFRAN AERO BOOSTERS, SNECMA SAS, SULZER METCO AG, TU DARMSTADT - TECHNISCHE UNIVERSITÄT DARMSTADT, TU DRESDEN - TECHNISCHE UNIVERSITÄT DRESDEN, UGENT - UNIVERSITEIT GENT, ULB - UNIVERSITÉ LIBRE DE BRUXELLES, UNIGE - UNIVERSITÀ DEGLI STUDI DI GENOVA, UNIVERSITY OF NOTTINGHAM, UNIVERSITY OF OXFORD, UNIVERSITY



OF SOUTHAMPTON, UPPSALA UNIVERSITET, UTBM - UNIVERSITÉ DE TECHNOLOGIE DE BELFORT MONTBÉLIARD, WSK "PZL-KALISZ" - WYTWÓRNA SPRZETU KOMUNIKACYJNEGO

CALL AND GRANT AGREEMENT NUMBER

FP7-AAT-2012-RTD-1

Grant Agreement ID: 314366

PURPOSE AND MAIN OBJECTIVES:

E-BREAK completed the map of technologies required for the UHOPR (ultra-high overall pressure ratio) engine to increase thermal efficiency and the higher bypass ratios (BPR) to increase propulsive efficiency to improve engine reliability and maintainability. E-BREAK's objective was to ensure the mandatory evolution of sub-systems for new temperature and pressure constraints, to ensure the ability to integrate them into a new generation of aircraft engines to be introduced around 2020 and to allow a further reduction in CO2 emissions compared to the 2000-generation engines.

E-BREAK's main aim was to develop and validate adapted generic technologies and robust sub-systems. By minimizing the losses that occur naturally as engine cores are reduced, fundamental gains from the higher turbine inlet temperature, the overall pressure ratio and the bypass ratio were realized.

ES's ROLE AND VALUE

EnginSoft was engaged as a partner in modeling the Breather Technology with the specific task of designing the filter using CFD methodologies. EnginSoft numerically analyzed a breather, designed by Avio Aero, using a multi-phase LaGrangian method in Ansys-CFX ((the advanced simulation tool for fluid-dynamics computational analysis).

The model studied the interaction of wall droplets for different droplet entrapment mechanisms, such as impingement, recirculation and particle recirculation. The different entrapment mechanisms were studied using parametric designs of the breather coupled with DOE (Design of experiments) techniques, which thus enabled an adequate number of scenario investigations.

ERICKA

Engine Representative Internal Cooling Knowledge and Application

START DATE - END DATE

2009 - 2014

PARTNERS

ROLLS-ROYCE PLC, ARTTIC, AVIO SPA, CAMBRIDGE FLOW SOLUTIONS LTD, CENTRE DE RECHERCHE EN AERONAUTIQUE ASBL - CENAERO, ENGINSOFT SPA, GE AVIO SRL, GENERAL ELECTRIC (SWITZERLAND) GMBH, INDUSTRIA DE TURBO PROPULSORES S.A.U., INSTYTUT MASZYN PRZEPLYWOWYCH IM ROBERTA SZEWALSKIEGO POLSKIEJ AKADEMII NAUK - IMP PAN, MTU AERO ENGINES AG, MTU AERO ENGINES GMBH, NUMERICAL MECHANICS APPLICATIONS INTERNATIONAL SA, OFFICE NATIONAL D'ÉTUDES ET DE RECHERCHES AEROSPATIALES-ONERA, ROLLS-ROYCE DEUTSCHLAND LTD & CO KG, SAFRAN AIRCRAFT ENGINES (SNECMA) SAS, THE CHANCELLOR, MASTERS AND SCHOLARS OF THE UNIVERSITY OF OXFORD, UNIVERSIDAD POLITÉCNICA DE MADRID, UNIVERSITÀ DEGLI STUDI DI FIRENZE, UNIVERSITÄT STUTTGART

CALL AND GRANT AGREEMENT NUMBER

FP7-AAT-2008-RTD-1

Grant agreement ID: 233799

PURPOSE AND MAIN OBJECTIVES

Pushed by ever tighter regulations on environmental impact and by customers requiring better fuel economy, aero engine manufacturers are continuously striving to improve the efficiency of their engines to reduce fuel burn, with specific attention to CO₂ and NO_x emissions reduction. ERICKA's main objective was to reduce CO₂ emissions by 1% compared to reference engines from the year 2000. This was achieved by improving the cooling of the turbine while enabling an increased entry temperature to the turbine. The project significantly advanced blade cooling technology, and the following supporting objectives were also achieved: new heat-transfer data and computer modeling strategies to design turbines that handle low NO_x combustors; improved modelling and computer methods to reduce turbine design time by 20% and, consequently, time to market and the whole engine cost.

ES's ROLE AND VALUE

Based on its knowledge and experience in CFD simulation and optimization, EnginSoft was involved in the development of new technologies to reduce CO₂ emissions from aircraft engines, and in the definition of an advanced optimization workflow that was able to find an optimal solution in terms of thermal performance.

FIRST

Fuel Injector Research for Sustainable Transport

START DATE - END DATE

2010 - 2014

PARTNERS

ROLLS-ROYCE PLC, A2 PHOTONIC SENSORS, ARTTIC, AVIO SPA, CNRS - CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE, DLR - DEUTSCHES ZENTRUM FÜR LUFT UND RAUMFAHRT (GERMAN AEROSPACE CENTER), ENGINSOFT SPA, CERFACS - EUROPEAN CENTRE FOR RESEARCH AND ADVANCED TRAINING IN SCIENTIFIC COMPUTATION, GE AVIO SRL, IMPERIAL COLLEGE OF SCIENCE TECHNOLOGY AND MEDICINE, KIT - KARLSRUHER INSTITUT FÜR TECHNOLOGIE, LOUGHBOROUGH UNIVERSITY, MTU AERO ENGINES AG, MTU AERO ENGINES GMBH, ONERA - OFFICE NATIONAL D'ÉTUDES ET DE RECHERCHES AÉROSPATIALES, ROLLS-ROYCE DEUTSCHLAND LTD & CO KG, SCITEK CONSULTANTS LIMITED, SAFRAN HELICOPTER ENGINES, TURBOMECA, UNIVERSITÀ DEGLI STUDI DI FIRENZE, UNIVERSITÀ DEGLI STUDI DI BERGAMO, UNIVERSITÉ PIERRE ET MARIE CURIE

CALL AND GRANT AGREEMENT NUMBER

FP7-AAT-2008-RTD-1

Grant Agreement ID: 265848



PURPOSE AND MAIN OBJECTIVES

Aviation's environmental impact must be reduced to allow sustainable growth to benefit European industry and society. This is captured in ACARE's 2020 targets to reduce CO₂ by 50%, NO_x by 80%, and in SRA1/2's proposed soot reductions and the development of alternative fuels.

By understanding and controlling the complex physics of fuel atomization and mixing, emission performance can be directly improved, however CFD simulations have relied on over-simplistic definitions of the fuel spray for many years. The availability of methods developed in the automotive industry and faster computers make their application to aero-engines timely. The FIRST project delivered a step change in the detail and accuracy of fuel spray boundary conditions through novel physics-based modeling techniques, advanced diagnostic measurements and the derivation of sophisticated correlations.

FIRST also delivered improved CFD soot models, thereby enabling soot reduction in aero-engine combustors. These calculations required improved fuel spray boundary conditions, but they also require higher fidelity physical and chemical models that describe the processes of soot production and consumption.

ES's ROLE AND VALUE

EnginSoft was involved in the CFD analysis of the injection zone using advanced models for secondary breakup, and in the parametric analysis of the spray where an artificial neural network was implemented.

EnginSoft contributed its experience in the use of Ansys CFD (a high-performance computational fluid dynamics software tool) gained in characterizing the primary and secondary atomization processes in an industrial spray produced by AVIO.

RPASInAir

**Integrazione dei Sistemi Aeromobili a Pilotaggio Remoto
nello spazio aereo non segregato per servizi civili innovativi**

*Integration of Remotely Piloted Aircraft Systems (RPAS)
into non-segregated airspace to provide innovative civil services*

START DATE - END DATE

2018 - 2021

WEBSITE

www.dtascarl.org

PARTNERS

DTA - DISTRETTO TECNOLOGICO AEROSPAZIALE, AEROPORTI DI PUGLIA, CNR - CONSIGLIO NAZIONALE DELLE RICERCA, ENAV SPA, ENEA - AGENZIA NAZIONALE PER LE NUOVE TECNOLOGIE, L'ENERGIA E LO SVILUPPO ECONOMICO SOSTENIBILE, ENGINSOFT SPA, INFN - ISTITUTO NAZIONALE DI FISICA NUCLEARE, LEONARDO, PLANETEK ITALIA SRL, POLITECNICO DI BARI, TELESPIAZIO, UNIVERSITÀ DEGLI STUDI DI ENNA "KORE", UNIVERSITÀ DEGLI STUDI DI BARI, VITROCISET

CALL AND GRANT AGREEMENT NUMBER

MIUR Programma Operativo Nazionale (PON) "Ricerca e Innovazione 2014-2020"

PURPOSE AND MAIN OBJECTIVES

The RPASInAir project has the strategic objective of developing the use of Remotely Piloted Aircraft Systems (RPAS) and innovative sensors connected to airborne, satellite or public archive systems, which are capable of reporting critical events and of helping to prevent and manage emergencies (floods, landslides, earthquakes, industrial accidents). The project strengthens the mission of supporting the development of the aerospace industry entrusted to Taranto-Grottaglie airport in the National Airport Plan approved by the Italian Ministry of Transport in 2016.

ES's ROLE AND VALUE

EnginSoft was involved in developing a methodology to manage the paths of Remote Piloted Aircraft Systems with respect to unforeseen events.

MAIPCO

Metodologie Avanzate di Ispezione e Controllo dei processi produttivi di strutture complesse in composito

Advanced Methodologies of Inspection and Control of the manufacturing processes of complex composite structures

START DATE - END DATE

2015 - 2018

WEBSITE

www.dtascarl.org

PARTNERS

DTA - DISTRETTO TECNOLOGICO AEROSPAZIALE, AGUSTA WESTLAND, ALENIA AERMACCHI SPA, CETMA - TECHNOLOGIES DESIGN AND MATERIALS EUROPEAN RESEARCH CENTRE, ENGINSOFT SPA, UNIVERSITÀ DEL SALENTO

CALL AND GRANT AGREEMENT NUMBER

PON 03 Programma Operativo Nazionale Ricerca e Competitività, DD 713/Ric. Del 29/10/2013 (MIUR)

PURPOSE AND MAIN OBJECTIVES

The MAIPCO project concerns defect analysis in the production of complex composite components in the aeronautical sector and has developed new methodologies to reduce these defects.

The project focused on the development of highly automated on-line and off-line inspection and control technologies for production processes, which have enabled a significant reduction in production costs, increasing the competitiveness of the industrial partners in the project.

ES's ROLE AND VALUE

EnginSoft developed a methodology for the thermo-structural analysis of polymerization (curing) and demoulding with a stress relaxation study using FE (finite element) solvers. During the course of the project, EnginSoft was able to widely expand the use of Ansys Composite Cure Simulation software (ACCS) to model composite materials.

Greening Propulsion

Greening Propulsion

START DATE - END DATE

2014 - 2015

PARTNERS

AVIO SPA, BLUE ENGINEERING SRL, BSIM SRL, ENGINSOFT SPA, HIT09 SRL, P&G SOLUZIONI SRL, PETROCERAMICS SPA, POLITECNICO DI BARI, POLITECNICO DI MILANO, POLITECNICO DI TORINO, PROGESA SRL, SECONDO MONA SPA, UNIVERSITÀ DEL SALENTO, UNIVERSITÀ DEGLI STUDI DI GENOVA, LA SAPIENZA UNIVERSITÀ DEGLI STUDI DI ROMA

CALL AND GRANT AGREEMENT NUMBER

Cluster Tecnologico Nazionale Aerospazio / Aerospace National Technological Cluster

PURPOSE AND MAIN OBJECTIVES

The "Greening the Propulsion" project aimed to strengthen and make the industrial, scientific and district levels of aeronautical propulsion more ecologically sustainable. A national system of distinctive skills was needed to preserve international competitiveness.

The aeronautical propulsion requirements were as follows: to reduce production process and product costs over the entire life cycle, and to design and develop new environmentally friendly engine configurations with significant reductions in CO₂, NOx and noise emissions.

The focus of this project was the strategic plan to approach the aerospace market with regional applications, wide-body and narrow-body engines with traditional, innovative (Geared Turbo Fan) and future (Open Rotor) configurations that would come into service between 2016-2025.

ES's ROLE AND VALUE

EnginSoft contributed to this project by developing methodologies for the fluid dynamic characterization of gear pumps.

TAKE-OFF

Test and Knowledge-based Environment for Operations, Flight and Facility

START DATE - END DATE

2015 - 2017

WEBSITE

www.takeoff-grottaglie.it

PARTNERS:

AEROPORTI DI PUGLIA, ALTRAN ITALIA, CNR - ISSIA CONSIGLIO NAZIONALE DELLE RICERCHE - ISTITUTO SUI SISTEMI INTELLIGENTI PER L'AUTOMAZIONE, DTA - DISTRETTO TECNOLOGICO AEROSPAZIALE, EKA SRL, ENGINSOFT SPA, SITAEL SPA, UNIVERSITÀ DEL SALENTO

CALL AND GRANT AGREEMENT NUMBER

Bando Cluster Tecnologico Regionale Puglia

PURPOSE AND MAIN OBJECTIVES

The objective of the research project was to study, design and implement a technology infrastructure capable of supporting the experimentation and testing activities based at Taranto-Grottaglie Airport.

The Taranto-Grottaglie Airport is the first national airport to have an industrial orientation and is totally dedicated to developing general aviation (GA) aircraft and the unmanned aerial vehicle (UAV) market from the scientific and technological perspectives for both military and civil applications.

ES's ROLE AND VALUE

EnginSoft was engaged in developing the ICT environment with a focus on simulation activities. The development of numerical methods, based on Data Fusion processes, allowed the management, integration and processing, within a single environment, of information and data from various sources.

DITECO

Difetti, danneggiamenti e tecniche di riparazione nei processi produttivi di grandi strutture in composito

Defects, damage and repair techniques in the production processes of large composite structures

START DATE - END DATE

2014 - 2016

WEBSITE

www.dtascarl.org

PARTNERS

FINMECCANICA SPA, CETMA - CENTRO DI PROGETTAZIONE DESIGN & TECNOLOGIE DEI MATERIALI, CNR - CONSIGLIO NAZIONALE DELLE RICERCHE, ENEA - AGENZIA NAZIONALE PER LE NUOVE TECNOLOGIE, L'ENERGIA E LO SVILUPPO ECONOMICO E SOSTENIBILE, ENGINSOFT SPA, GSE INDUSTRIA AERONAUTICA SRL, POLITECNICO DI BARI, SALVER (SALVER CIBA COMPANY) SPA, UNIVERSITÀ DEL SALENTO

CALL AND GRANT AGREEMENT NUMBER

PON 03 Programma Operativo Nazionale Ricerca e Competitività, DD 713/Ric. Del 29/10/2013 (MIUR)

PURPOSE AND MAIN OBJECTIVES

This project focused on the design and manufacture of composite structures for aeronautic use and paid particular attention to innovative repair techniques for large structures made of composite materials, such as an aircraft's tail section and fuselage tail section.

The project involved the development of a structural analysis platform to detect damage or defects in composite structures. The main focus was on detection during production and operation, distinguishing between materials and structures.

ES's ROLE AND VALUE

EnginSoft developed the structural numerical model to predict delamination and defined the effective procedure to analyze and predict the effects of defection/damage by highlighting the main contributory parameters. This allowed an effective definition of the mechanical properties of composite materials and made it possible to predict the structural behavior of the entire system using finite element method (FEM) simulation.

SPIA

Strutture Portanti Innovative Aeronautiche
Innovative aeronautical load-bearing structures

START DATE - END DATE

2014 - 2016

WEBSITE

www.dtascarl.org

PARTNERS

FINMECCANICA SPA, AVIO AERO, CETMA - CENTRO DI PROGETTAZIONE DESIGN & TECNOLOGIE DEI MATERIALI, ENGINSOFT SPA, POLITECNICO DI BARI, SALVER (SALVER CIBA COMPANY) SPA, UNIVERSITÀ DEL SALENTO

CALL AND GRANT AGREEMENT NUMBER

PON 03 Programma Operativo Nazionale Ricerca e Competitività
DD 713/Ric. Del 29/10/2013 (MIUR)

PURPOSE AND MAIN OBJECTIVES

SPIA aimed to study innovative structural solutions (both from the design and production perspectives) to be implemented on the empennages and rear fuselages of a regional aircraft. Starting with the material properties, this was achieved using a scale-up approach, from the design, production and testing of details and sub-components, to the manufacture of fully representative demonstrators.

The project worked towards a significant improvement in the performance of crucial aeronautical components and in the manufacturing process, including the design, implementation and testing of new methodologies and technologies linked to the smart factory paradigm.

ES's ROLE AND VALUE

The project consisted of two distinct parts and EnginSoft played a significant role in both. In the first part, EnginSoft focused on optimizing the configuration and development of co-cured multi-spar boxes and developing innovative process configurations for the manufacture of the fuselage tail section.

In the second part, EnginSoft was involved in developing techniques for knowledge-based manufacturing, the distribution of manufacturing data, design optimization, and the correlation of simulation and test data.

GREAT2020

GReen Engine for Air Traffic 2020
Phase 2

START DATE - END DATE

2013 - 2015

WEBSITE

www.great2020.it

PARTNERS

AVIO AERO, APR SRL, ACTUATION AND CONTROL TECHNOLOGIES SRL, BLUE GROUP SRL, BSIM ENGINEERING SRL, BYTEST, CONVERTINGPOWER SRLS, CRIOTEC IMPIANTI SPA, ENGINSOFT SPA, EXEMPLAR SRL, FAVRETTO SRL, GUAZZONI SRL, LEAR SNC, MEPIT - MECCANICA PIGATO TORINO SRL, NEOHM COMPONENTI SRL, NOVATEA SPA, P&G SOLUZIONI, POLITECNICO DI TORINO, PRAXAIR, PROGESA SRL, RTM LASER SYSTEM, SAET SPA, SILMAX SPA, SKYTEAM - SKY TECHNOLOGY SRL, SPI-TECH SRL, TECNOGRANDA SPA, TESEO SPA, URMAROLLS

CALL AND GRANT AGREEMENT NUMBER

Fondo Europeo di Sviluppo Regionale POR-FESR 2007-2013 (Regione Piemonte), Asse 1: "Innovazione e transizione produttiva", Misura I.1.1: "Piattaforme innovative"

PURPOSE AND MAIN OBJECTIVES

GREAT 2020 aimed to reduce aircraft engine emissions through the design of efficient air/oil separation systems within the context of the sustainable development of the air transport system. In addition, it aimed to strengthen the competitiveness of the aerospace industry in the Italian region of Piedmont.

ES's ROLE AND VALUE

In this project, EnginSoft was involved in supporting the design of the oil separators by developing CFD models for zero emission air/oil separators. The main objective was to develop methodologies to analyze multi cyclones and metal filters.

STAR-EXD

Simulation Technology Aeronautic Research - EXperimental Data

START DATE - END DATE

2009 - 2011

WEBSITE

www.enginsoft.com/research/star-exd.html

PARTNERS

ENGINSOFT SPA, UNIVERSITÀ DEL SALENTO

CALL AND GRANT AGREEMENT NUMBER

POR PUGLIA 2007-2013, Asse I Linea 1.1 - Azione 1.1.2 - Bando "Aiuti agli Investimenti in Ricerca per le PMI"

PURPOSE AND MAIN OBJECTIVES

The STAR-EXD project aimed to develop a software platform, consisting of a virtual design environment to allow engineers to monitor and analyze, in a single logical stream, all the different design and procedural steps in the construction of a mechanical element. Since the platform was targeted at the aeronautical industry, the production processes and subsequent post-treatment were selected on the basis of their importance to this sector (foundry, surface treatment, welding, etc.). The distinctiveness of the STAR-EXD platform was its use of meta-models, taken from specifically targeted experiments, to study and optimize the carburizing and nitriding surface hardening treatments and the welding process.

Predictive meta-models of the investigated phenomena were constructed by applying response surface methods (RSM). By integrating these meta-models into a logical flow, including the study of the operating conditions, it was possible to evaluate and optimize the performance of the elements subjected to these treatments. In particular, a virtual design environment dedicated to the study of surface hardening (carburizing and nitriding) and to the welding of steel alloy products was created.

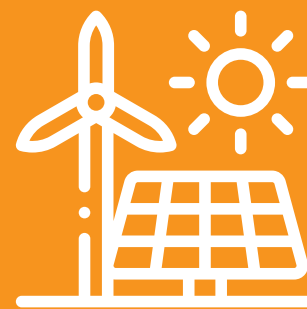
ES's ROLE AND VALUE

EnginSoft led the activities focused on developing the software platform, achieved by means of the integration of MAGMAsoft (an optimization software tool for improving metal casting quality) and Ansys Workbench (the platform connects with all major CAD systems). This platform is able to support and optimize some integrated design phases in the aerospace field, based on results from a large experimental campaign and on the use of advanced methods of analysis and data processing (RSM). The activities were concentrated on the implementation of FE models for carburization, nitride hardening treatments, and the welding process by applying a numerical approach.





ENERGY



SOL2HY2

Solar To Hydrogen Hybrid Cycles

START DATE - END DATE

2013 - 2016

WEBSITE

sol2hy2.eucoord.com

PARTNERS

ENGINSOFT SPA, AALTO KORKEAKOULUSAATIO SR, DLR - DEUTSCHES ZENTRUM FÜR LUFT- UND RAUMFAHRT, ENEA - AGENZIA NAZIONALE PER LE NUOVE TECNOLOGIE, L'ENERGIA E LO SVILUPPO ECONOMICO SOSTENIBILE, ERBICOL SA, OUTOTEC CORPORATION, OY WOIKOSKI AB

CALL AND GRANT AGREEMENT NUMBER

FCH-JU-2012-1
Grant agreement ID: 325320

PURPOSE AND MAIN OBJECTIVES

The SOL2HY2 project aimed to demonstrate that it is possible to produce “green” hydrogen using solar power. The project focused on research of applied materials and on the full-scale demonstration of solar-powered components to implement the CO₂-free, hybrid water splitting cycle.

The project was complemented by advanced modeling and process simulation including real conditions and optimization of the site-specific technical-economic assessment, quantification and benchmarking.

ES's ROLE AND VALUE

EnginSoft developed the ICT platform that simulated the performance of the complete process. This platform is based on MODAO tools and methods of meta-modelling, including the elaboration of the DOE (Design of Experiment) strategy, data mining and optimization.

The company also contributed to modeling issues and to simulating relevant components of the solar concentrator. EnginSoft was responsible for coordinating the whole project.

REM

Recupero di Energia Meccanica da fluidi per internet delle cose e sensori remoti

Recover of Energy from fluid Mechanics for internet of things and remote sensing

START DATE - END DATE

2018 - 2021

WEBSITE

cbn.iit.it/funding

PARTNERS

ENGINSOFT SPA, IIT - ISTITUTO ITALIANO DI TECNOLOGIA (CENTER FOR CONVERGENT TECHNOLOGIES), WEBELETTRONICA SRL

CALL AND GRANT AGREEMENT NUMBER

MIUR Programma Operativo Nazionale (PON) “Ricerca e Innovazione 2014-2020”

PURPOSE AND MAIN OBJECTIVES

The project proposes the development of a system to recover kinetic energy from easily accessible sources in order to make it immediately available for equipment in daily use (e.g. sensors for wearable devices, very low power actuators, low range wireless transmitters, etc.), whose need to be as energy independent as possible is propelling a rigorous search for appropriate technological solutions.

This proposed energy recovery system is based on an innovative technology composed of recyclable and environmentally friendly materials, which uses extremely flexible piezoelectric devices and very small dimensions to recover kinetic energy from gaseous fluids (e.g. wind, gases in pipes and air currents), but also from the movement of liquids (e.g. waves, sea and river currents), and which has virtually zero environmental and visual impact.

ES's ROLE AND VALUE

EnginSoft is the project coordinator and will conduct the FSI (fluid structure interaction) and system simulation activities.

DRAPÒ

Sistemi ausiliari integrati ad alta efficienza per il recupero dell'energia e la riduzione dei consumi di autoveicoli

High efficiency integrated auxiliary systems for energy recovery and reduced fuel consumption in motor vehicles

START DATE - END DATE

2012 - 2015

PARTNERS

CRF - CENTRO RICERCHE FIAT, ADLER EVO SRL, ARCHIMEDE ENERGIA SPA, BLUE ENGINEERING SRL, BRIGONI SPA, DENSO THERMAL SYSTEMS SPA, DOTT. GALLINA SRL, ECNP - EUROPEAN CENTRE FOR NANOSTRUCTURED POLYMERS, ENECOM SRL, ENGINSOFT SPA, GALLICCHIO STAMPI SRL, GRINP SRL, IN.TE.CO. - GRUPPO MAIP, LANDRA SRL, MAGNETI MARELLI, MECTRA, NEXXUS, O.M.G. SRL, ONNI-STAMP SRL, OPTIMAD ENGINEERING SRL, POLITECNICO DI TORINO, POWER DEVICE, PROMAU ENGINEERING SRL, PROPLAST, SEA MARCONI TECHNOLOGIES SAS, SIVE SPA, TECH SYSTEM, TRW AUTOMOTIVE ITALIA SRL, TUV, VALEO - SMART TECHNOLOGY FOR SMARTER CARS, VARNISH SRL

CALL AND GRANT AGREEMENT NUMBER

Fondo Europeo di Sviluppo Regionale POR-FESR 2007-2013 (Regione Piemonte), Asse 1: "Innovazione e transizione produttiva", Misura I.1.1: "Piattaforme innovative"

PURPOSE AND MAIN OBJECTIVES

The DRAPÒ project aimed at creating a new concept for an urban car with better energy efficiency and reduced polluting emissions. The new car would have a low environmental impact and incorporate new-generation components and systems that were technically advanced and economically sustainable.

The following technical and sustainable solutions were developed:

- ★ the recovery and reuse of thermal and kinetic energy waste;
- ★ auxiliary systems and control strategies for efficient onboard energy management;
- ★ mass reduction using high performance polymeric composite materials for structural and aesthetic applications and high recyclability;
- ★ reduction of drag resistance using efficient and sustainable aerodynamic solutions.

ES's ROLE AND VALUE

EnginSoft conducted the aerodynamic calculations to support the design of the front of the prototypes, for the technological demonstrator and for the concept car. In addition, EnginSoft developed new methodologies for the aerodynamic and fluid dynamic evaluations.

ATENE

Advanced Technologies for Energy Efficiency

START DATE - END DATE

2012 - 2014

PARTNERS

NUOVO PIGNONE SRL, ALTA INDUSTRIES SRL, AM TESTING SRL, INSTM - CONSORZIO INTERUNIVERSITARIO NAZIONALE PER LA SCIENZA E TECNOLOGIA DEI MATERIALI, ENGINSOFT SPA, ERGON RESEARCH SAS, ILT TECNOLOGIE, LETOMEC, OPUS AUTOMAZIONE SRL, PONTLAB SRL, STAV SRL, TECMA SRL, UNIVERSITÀ DEGLI STUDI DI PISA - DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE, UNIVERSITÀ DEGLI STUDI DI SIENA - DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE, UNIVERSITÀ DEGLI STUDI DI FIRENZE CERTUS CENTRO RICERCA TURBOMACCHINE E SISTEMI ENERGETICI

CALL AND GRANT AGREEMENT NUMBER

POR CRo FESR 2007-2013 REGIONE TOSCANA, LINEA D'INTERVENTO 1.5.a-1.6, BANDO UNICO R&S ANNO 2012

PURPOSE AND MAIN OBJECTIVES

This project aimed to increase the efficiency of alternative machines and turbomachinery for the oil and gas industry in four areas: loss reduction, extending operating conditions, increasing power density, and reducing the environmental impact of production.

The idea behind the ATENE project was to set up and launch a new research and development infrastructure model by creating a research network based in Tuscany and using the know-how and excellence available.

ES's ROLE AND VALUE

EnginSoft was involved in two different activities in the project. The first was dedicated to turbine trains and, in particular, to the turbine basement system, with the aim of developing and implementing advanced techniques of dynamic analysis. The second was related to the development, modelling and resolution of the finite elements of the hot sintering processes of innovative metallic materials.

The ITER Experiment

ITER, meaning “the way” in Latin, is a major international experiment that aims to demonstrate the scientific and technical feasibility of nuclear fusion as an energy source^[1]. It will be 30 times more powerful than the Joint European Torus (JET), currently the largest comparable experiment active in the world. Established in 2006, ITER is enabling scientists and engineers to develop the knowledge and technologies necessary to progress to a subsequent phase of electricity generation using fusion power stations. The ITER members - China, the European Union, India, Japan, Korea, Russia and the United States - are now engaged in a 35-year collaboration to build and operate the world’s largest tokamak in southern France.

The Tokamak^[2]

Power plants everywhere generate electricity by converting mechanical power, such as the rotation of a turbine, into electrical power. In a coal-fired steam station, the combustion of coal turns water into steam which, in turn, drives turbine generators to produce electricity. Power plants today rely either on fossil fuels, nuclear fission, or on renewable sources like hydro.

The tokamak is an experimental machine designed to harness the energy of fusion. Inside a tokamak, energy produced by the fusion of atoms is absorbed as heat into the walls of the vessel. Just like a conventional power plant, a fusion power plant uses this heat to produce steam and then electricity using turbines and generators. The operation of ITER is allowing ITER members to test long-pulse operation and the many technologies required at reactor scale. For further information about the experiment, visit the ITER organization (www.iter.org) and Fusion4Energy (fusionforenergy.europa.eu).

EnginSoft has been providing its expertise to the ITER experiment directly and through Fusion4Energy calls for interest, both as a primary contractor and as a subcontractor to ENEA, ENEL, SIMIC, and NIER within 14 agreements, since 2009. Six of these projects have been carefully selected for publication to a wider audience.

2015-2018 | Toroidal Field Coil (TFC) Winding Pack Insertion

The ITER magnet system consists of 48 superconducting coils of different shapes and sizes subdivided into four sub-systems: the Toroidal Field Coil (TFC) system, the Poloidal Field Coil (PFC) system, a central solenoid and the correction coil system. The TFC system consists of 18 TF coils assembled around a torus. Each of the TFCs consists of a superconducting Winding Pack (WP) enclosed in a stainless-steel casing, which is the main structural component of the TF-magnet system; the dimensions of one TFC are ~10m high and 8m wide, with a weight of ~350 tons. The WP and the first set of TFC Cases (TFCC) for ITER were delivered in January 2019. The TFCC are steel structures which provide structural integrity to the WP, contribute to its neutron-shielding capacity, and provide support to the operating forces and interfaces to the rest of the ITER machine. The TFCC assembly has four main parts, two sectors with U-shaped sections and two closure plates, which, after being welded together, enclose the WP. Each TFCC weighs about 150 tons and has a wall thickness of between 60 and 120mm.

The occurrence of distortions when welding such thick structures is particularly problematic for these components, which require minimal tolerances since they have several interfaces to other components of the tokamak. In order to compensate for the distortions, extra material is left in the critical areas to allow for post-welding machining. The amount of extra material has to be optimized to reduce machining time and, therefore, the cost of the components. The evaluation of the distortions caused by welding is essential to determine the extra-material strategy. Based on this scenario, a complete experimental and virtual campaign was created to predict and minimize TFCC deformation during welding.

As a first step, welding coupons were simulated in representative configurations. This data was used to build a preliminary modelling approach using Ansys software, which was then benchmarked against a ‘blind test’ coupon and three 1m-long TFC-like mock-ups. Finally, a full Finite Element Method (FEM) model was built using lessons learnt previously to predict the deformation of the coil structures during the welding process.

In this period of the project, EnginSoft developed the FEM Models and the FEM Analysis, while SIMIC handled the welding processes and data acquisition, and Fusion4Energy acted as the contractual and technical supervisor. EnginSoft helped to simulate the insertion of the winding pack into the coil case and to optimize the position of the spacers (sliders) to reduce stress on the winding pack.

[1] According to the website www.iter.org/proj/inafewlines Retrieved December 12, 2019

[2] According to the website www.iter.org/mach/tokamak Retrieved December 12, 2019

2014 | Toroidal Field Coil Cases (TFCC) of the ITER Magnet System

Eighteen D-shaped TFCs - responsible for confining the ITER plasma - account for over a quarter of the Tokamak's total weight. Each TFC, consisting of a winding pack and stainless-steel coil case, measures 15m in height by 9m in width and weighs approximately 300 tons. Europe is responsible for 10 coils (including one spare).

The winding packs were cold tested at -200 degrees Celsius (80 K) using a combined cycle of nitrogen and helium. Subsequently, they were inserted into the TFCC, which required sophisticated laser dimension-controlled technology and complex tools to move and fit the hundreds of tons of weight with millimeter-like precision. Finally, the cases were welded according to stringent standards. Two characteristics added complexity to the process: the thickness of the weld (up to 130mm) and the fact that the welding had to be carried out from one side only. Ultrasonic technology was used to inspect the quality of the welds. In this phase, EnginSoft developed the methodology to simulate the welding process with Tungsten Inert Gas, with the objective of estimating the deformation and residual stresses that would be generated by the welding process itself.

2013 | Support Frame for the Divertor Cassette Body

This part of the project encompassed the engineering and manufacturing activities related to the construction of the cassette body prototype of the ITER Divertor, which is manufactured with various materials in stainless steel, and aluminum and bronze alloy. The cassette body is a part of the ITER Divertor containing three plasma-facing components. Situated at the bottom of the vacuum vessel, the divertor extracts heat and ash produced by the fusion reaction, minimizes plasma contamination, and protects the surrounding walls from thermal and neutronic loads^[3]. Its main function is to minimize the impurities in the plasma whilst depleting part of the plasma's thermal power. The cassette body consists of 316 L (N) grade ITER stainless steel and has a total mass of approximately 4.7 tons.

The technical design enables the lower part of the targets to intercept the magnetic field lines and thus remove the high heat from the plasma. The upper curved part of the targets provide a baffle that limits the neutral particle flow and prevents it from extinguishing the fusion reaction. The dome also baffles the neutral particles and protects the cassette body from direct contact with the plasma. In this phase, EnginSoft provided the tools and expertise for optimizing the design of the cassette body support frame to withstand all the prescribed loads.

2010 | FUSION4ENERGY Code: F4E-OMF-508 Multiscale modelling of the TFCs

The ITER magnet structure consists of three main systems: a central solenoid (CS) coil composed of six modules, 18 Toroidal Field (TF) coils, and 6 Poloidal Field (PF) coils.

The CS and TF coils were manufactured using Nb3Sn-based cables, while NbTi was used for the PF coils. All the coils were wound using cable-in-conduit conductors (CICC). The magnet system, including the related cryogenics, was the most expensive item in the whole ITER budget, representing up to 30% of the total cost. The behavior of the TF coils was studied using a multi-scale approach including the continuum to discrete linkage. This part of the work was coordinated by Prof. Bernhard Schrefler. In this phase, EnginSoft, using a multiscale approach and a dedicated Ansys tool, conducted the magneto-static analysis of the ITER Test Blanket Modules (TBMs) to simulate the possible limitations that might have been generated during the assembly of the ITER components.

2009 | In Vessel Viewing System (IVVS)

The ITER generates a high-temperature plasma gas which is confined in a vacuum vessel by strong magnetic fields. This type of machine requires periodic inspections to check for any damage to the components; inserting TV systems directly in the container vessel is unreliable due to the large amounts of neutrons and gamma radioactivity (typical side effects of nuclear fusion).

To overcome this limitation, a prototype laser-in-vessel viewing and detection system, based on an amplitude modulation (AM) laser radar scheme, was developed at the ENEA Frascati laboratories within the European Fusion Development Agreement (EFDA). This prototype, called the In Vessel Viewing System (IVVS), is undergoing optimization that requires the aid of a virtual tool that simulates the operation of the system.

Based on ENEA's technical specifications, EnginSoft developed the so-called IVVS Platform: a software tool based on Ansys Program Design Language (APDL) routines managed by modeFRONTIER (an integration platform for multi-objective and multi-disciplinary optimization). The software platform is currently used to model the IVVS scanning algorithms and to optimize the position of the viewing heads.

Plasma disruption and its effects on device structures

In devices where a large toroidal current (15 Mega-amp in ITER) is generated, the non-linear evolution of the magnetohydrodynamic instabilities results in a dramatic quenching of the plasma current in a very short time - in the order of milliseconds. This induces large magnetic forces on the structures of the device itself. This phenomenon is associated with the sudden loss and displacement of the plasma's net current, which induces an eddy current in the metallic structures.

EnginSoft assisted in the first step of calculating the current density occurring in the plasma during disruptive phenomena, and in the second step of calculating the time-histories of the torques and net forces among the tokamak components (shielding module, FW beam and Blanket1's FW fingers).

[3] According to the website www.iter.org/mach/Divertor Retrieved February 11, 2020



HIGH PERFORMANCE COMPUTING



ExaNeSt

European Exascale System Interconnect and Storage

START DATE - END DATE

2015 - 2019

WEBSITE

www.exanest.eu

PARTNERS

FORTH - FOUNDATION FOR RESEARCH AND TECHNOLOGY HELLAS, INSTITUTE OF COMPUTER SCIENCE, ALLINEA SOFTWARE, ARM LTD, ENGINSOFT SPA, EXACT LAB, FRAUNHOFER INSTITUTE (FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG), ICEOTOPE RESEARCH AND DEVELOPMENT, INAF - ISTITUTO NAZIONALE DI ASTROFISICA, INFN - ISTITUTO NAZIONALE DI FISICA NUCLEARE, MONETDB SOLUTIONS, UNIVERSITY OF MANCHESTER, UNIVERSITAT POLITECNICA DE VALENCIA, VIRTUAL OPEN SYSTEMS

CALL AND GRANT AGREEMENT NUMBER

H2020-FETHPC-1-2014
Grant Agreement ID: 671553

PURPOSE AND MAIN OBJECTIVES

The ExaNeSt project involved the development, evaluation and prototyping of the physical platform and architectural solution for a unified Communication and Storage Interconnect and the physical rack and environmental structures required to deliver European Exascale Systems. The consortium leveraged technology, expertise and knowledge across the entire value chain from computing IP to packaging and system deployment; and from operating systems, storage, and communication to HPC with big data management, algorithms, applications, and frameworks. Building on a decade of advanced R&D, ExaNeSt delivered the solution to support exascale deployment for the follow-up industrial commercialization phases.

ES's ROLE AND VALUE

EnginSoft led the integration and evaluation of the ExaNeSt platform using various CAE applications which often require parallelism and big data management. These applications are both commercial and open source and are dedicated to the most relevant areas of computational science such as mechanics, fluid dynamics, speed and crash dynamics, metallurgy, process simulation, porous media, environmental engineering, offshore engineering, acoustic analysis, and process integration and design optimization (PIDO). EnginSoft also assisted FORTH in the coordination and management of the project.

FORTISSIMO

Factories of the Future Resources, Technology, Infrastructure and Services for Simulation and Modelling

START DATE - END DATE

2013 - 2016

WEBSITE

www.fortissimo-project.eu

PARTNERS

EPCC - THE UNIVERSITY OF EDINBURGH, ACTIVEEON, AIMEN - ASOCIACION DE INVESTIGACION METALURGICA DEL NOROESTE, ALGO'TECH INFORMATIQUE, ALSEAMAR, ARCTUR - ARCTUR RACUNALNISKI INZENIRING DOO, AUTOMOBILI LAMBORGHINI, AVL LIST, BIBA - BREMER INSTITUT FUER PRODUKTION UND LOGISTIK, BINKZ, BULL, CERAMICX IRELAND, CERC - CAMBRIDGE ENVIRONMENTAL RESEARCH CONSULTANTS, CESGA - CENTRO DE SUPER COMPUTACION DE GALICIA, CINECA CONSORZIO INTERUNIVERSITARIO, COMPASS INGENIERIA Y SISTEMAS, DATAPIXEL, DFRC, DINAK, DISTENE, UNIVERSITY COLLEGE DUBLIN, DYNAFLOW RESEARCH GROUP, eAMBIENTE, ELECTRIC ANT LAB, ENGINE POWER COMPONENTS GROUP EUROPE, ENGINSOFT SPA, ENGYS, ERGOLINES LAB, ESI GROUP, FORMTECH COMPOSITE, FRAUNHOFER SOCIETY - FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG, FUNDICIONES DE RODA, GENCI - GRAND EQUIPEMENT NATIONAL DE CALCUL INTENSIF, GOMPUTE, HKV LIJN IN WATER, HOLONIX, HSL, HYDROCEAN, HYDROLIFT, ICON TECHNOLOGY & PROCESS CONSULTING, IES - INTEGRATED ENVIRONMENTAL SOLUTIONS, IMR ENGINEERING & TECHNOLOGIES, INRIA - INSTITUT NATIONAL DE RECHERCHE EN INFORMATIQUE ET EN AUTOMATIQUE, INTEL DEUTSCHLAND, INTEL, INVENTAS KRISTIANSAND, IONIQ TECHNOLOGIES, ISONAVAL, KE-WORKS, KIT - KARLSRUHE INSTITUTE OF TECHNOLOGY, KOENIGSEGG AUTOMOTIVE, LASERSYSTEMTECHNIK BOLLINGER & OHR, LAUER & WEISS, LONZA, LUN'TECH, MATRICI S.COOP., MOXOFF, NAG - NUMERICAL ALGORITHMS GROUP, NATIONAL TECHNICAL UNIVERSITY OF ATHENS - DSS LAB, NOESIS SOLUTIONS, NUMTECH, OPTEC-BERLIN-BRANDENBURG (OPTECBB), PIPSTREL - PODJETJE ZA ALTERNATIVNO LETALSTVO DOO AJDOVŠČINA, POWERSYS, PRINCIPIA RECHERCHE DEVELOPPEMENT, PRYSMIAN PIRELLI, RWTH AACHEN UNIVERSITY - RHEINISCH-WESTFÄLISCHE TECHNISCHE HOCHSCHULE AACHEN, SCAPOS, SCM - SCIENTIFIC COMPUTING & MODELLING, SDI, SICOS BW, STICHTING DELTARES, SURFSARA, TEXAS CONTROLS, THE SCILAB CONSORTIUM (SCILAB ENTERPRISE), UNIVERSITÄT STUTTGART - THE HIGH-PERFORMANCE COMPUTING CENTRE (HLRS), UNIVERSITÄT PADERBORN, VORTECH, XLAB - XLAB RAZVOJ PROGRAMSKE OPREME IN SVETOVANJE DOO

CALL AND GRANT AGREEMENT NUMBER

FP7-2013-NMP-ICT-FOF

Grant Agreement ID: 609029

PURPOSE AND MAIN OBJECTIVES

The concept of this project was to enable European SMEs to be more competitive globally by using simulation services based on a High-Performance Computing (HPC) cloud infrastructure featuring greatly improved parallelism.

In general, large companies can access advanced simulation more easily than SMEs, which face both technological barriers and financial challenges that mean they are often unable to take advantage of advanced simulation, even though it would clearly make them more competitive. Furthermore, SMEs are unfamiliar with the tools and potential of HPC. They perceive HPC centers, such as CINECA for hardware and EnginSoft for software, as something too far removed from industry, whereas they could be of enormous help in solving major industrial problems.

Fortissimo's goal was to overcome this impasse by providing simulation services and tools running on a cloud infrastructure. A "one-stop-shop" greatly simplifies access to advanced simulation, particularly for SMEs, making hardware, experience, applications, visualization and tools easily available and affordable on a pay-per-use basis.

ES's ROLE AND VALUE

In Fortissimo, EnginSoft was involved in two HPC-Cloud-based sub-projects, one dealing with the optimization of water turbines for power generation and the other with the HPC-Cloud-based design of centrifugal pumps. In both cases, the use of the cloud and HPC, associated with EnginSoft's expertise, reduced the design time up to five times and significantly decreased the development costs for the prototypes. Both projects were developed in collaboration with CINECA and one of the projects involved Zeco, an Italian SME active in the renewable energy sector, as an end-user.

The project on water turbines, called SuRE_HPC, was selected from among 110 applicants, as the winner of the prestigious Hyperion Research HPC Innovation Award. This award recognizes the outstanding achievements enabled by HPC simulation that allowed Zeco to considerably improve its competitive position.

Neurocloud

Neuroinformatics for clinical studies

START DATE - END DATE

2012 - 2013

PARTNERS

FBK - FONDAZIONE BRUNO KESSLER, AZIENDA PROVINCIALE PER I SERVIZI SANITÀ - REPARTI DI NEUROCHIRURGIA E RADIOLOGIA, ENGINSOFT SPA, INFORMATICA TRENTINA, PROVINCIA AUTONOMA DI TRENTO, TRENTINO NETWORK, UNIVERSITÀ DEGLI STUDI DI TRENTO - CENTRO INTERDIPARTIMENTALE MENTE E CERVELLO

CALL AND GRANT AGREEMENT NUMBER

Provincia Autonoma di Trento - Legge provinciale n.6/99

Programma Operativo FESR 2007-2013 Obiettivo 2

PURPOSE AND MAIN OBJECTIVES

Neuroinformatics represents the intersection between neuroscience and information science and provides methods and tools for the study of the human brain in terms of structures and functions. Following developments in ICT, neuroimaging techniques are becoming increasingly common in the activities of clinical neurologists and neurosurgeons.

The project focused on a pilot study to manage the clinical neuroimaging data acquired in hospitals. The aim of the project was to promote and test a distributed architecture for the management and analysis of clinical data in different locations to where the data were acquired.

The activity plan included configuring the communication infrastructure, designing the neuroimaging analysis service, implementing the software components, and a test case "borrowed" from a clinical research project previously funded by the Health Service of the autonomous Italian province of Trento. Clinical practitioners and scientific researchers collaborated by means of a technological platform that enabled the exchange of data and knowledge between the clinical departments in hospitals and the research centers in universities. Academic studies were extended to the clinical field and it was possible to draw on data collected directly in the clinics.

ES's ROLE AND VALUE

EnginSoft was involved in analysis activities mainly focused on integrating HPC infrastructures and data analysis services with web interfaces to enable data management, job management and the execution of data analysis scripts through distributed computing frameworks, as well as the collection of results, potentially from anywhere.



BIOMEDICAL



PREMUROSA

Precision medicine for musculoskeletal regeneration, prosthetics and active ageing

START DATE - END DATE

2020 - 2023

PARTNERS

UNIVERSITÀ DEGLI STUDI DEL PIEMONTE ORIENTALE AMEDEO AVOGADRO, AALTO KORKEAKOULUSAATIO, AO-FORSCHUNGSINSTITUT DAVOS, ENGINSOFT SPA, FACULTY OF TECHNOLOGY AND METALLURGY UNIVERSITY OF BELGRADE, INEB-INSTITUTO NACIONAL DE ENGENHARIA BIOMEDICA, ISTITUTO ORTOPEDICO RIZZOLI, NATIONAL UNIVERSITY OF IRELAND GALWAY, POLITECNICO DI TORINO, RIGAS TEHNISKA UNIVERSITATE, TTY-SAATIO

CALL AND GRANT AGREEMENT NUMBER

H2020-MSCA-ITN-2019
Grant agreement ID: 860462

PURPOSE AND MAIN OBJECTIVES

Musculoskeletal diseases are a major burden on individuals, healthcare and welfare systems. The treatment is currently based either on prosthetic or regenerative surgical procedures, involving medical device implantation. A great improvement could be achieved using precision medicine that develops innovative devices and optimized clinical applications specifically designed for the patient's individual characteristics. This implies combining a personalized clinical approach with individual 'omic' characterization and the correct choice of medical device.

The concept is "To take care with care". Thirteen researchers supervised by the partners will work towards this aim by means of an interdisciplinary, intersectoral, international approach that integrates academic and industrial aspects in a carefully designed, diversified and unprecedented training program.

ES's ROLE AND VALUE

EnginSoft will assist the assigned researcher by providing competencies in scientific computing, mathematical modeling and optimization along with uncertainty quantification, data analysis, data mining and software development competencies.

The company will also provide an existing hardware infrastructure, including a 200-core high performance computing cluster specifically dedicated to simulation located in the company's Trento head office.

SYNCH

A SYnaptically connected brain-silicon Neural Closed-loop Hybrid system

START DATE - END DATE

2019 - 2023

WEBSITE

synch.eucoord2020.com

PARTNERS

UNIVERSITÀ DEGLI STUDI DI PADOVA, AICTX AG, ARC INSTRUMENTS LTD, BAR-ILAN UNIVERSITY, ENGINSOFT SPA, TU DRESDEN - TECHNISCHE UNIVERSITÄT DRESDEN, TU GRAZ - UNIVERSITY OF TECHNOLOGY GRAZ, UNIVERSITY OF SOUTHAMPTON

CALL AND GRANT AGREEMENT NUMBER

H2020-FETPROACT-2018-2020
Grant agreement ID: 824162

PURPOSE AND MAIN OBJECTIVES

The brain, with its remarkable computational properties, provides animals with capabilities of physical autonomy, interaction and adaptation that are unmatched by any artificial system. The brain is a complex network that has evolved to optimize processing of real-world inputs by relying on electrical events and self-reorganizing connectivity. Spikes (the events) are transmitted between neurons through synapses which undergo continuous 'birth'- 'death' and adjustment, reconfiguring brain circuits and adapting processing to ever-changing inputs. SYNCH's scientific and technological objective is to create a hybrid system where a neural network in the brain of a living animal (BNN) and a silicon neural network (SNN) of spiking neurons on a chip are interconnected by neuromorphic synapses, thus enabling the co-evolution of connectivity and the co-processing of the information of the two networks.

ES's ROLE AND VALUE

EnginSoft will provide its expertise in scientific computing and mathematical modelling and in software development, and it will provide the hardware computing infrastructure, including a 200-core high-performance computing cluster dedicated to simulation and located at its headquarters in Trento. The company will also provide its expertise in the effective use of the following two specific tools: Ansys Maxwell's code for developing electromagnetic finite element method (FEM) models of neural cells, and Ansys Simplorer's code for circuit modelling of neural networks. Together with the University of Padua, EnginSoft will develop a biophysical model and simulation software to simulate currents and potentials from spatial-temporal patterns of stimuli generated by an array of capacitive microelectrodes implanted in the brain tissue.

KINECT

Kinect™-based Platform for Engaging Older Population in the Assessment of Purpose-built Facilities and Services

START DATE - END DATE

2012 - 2014

PARTNERS

HOUSING & CARE 21, CRANFIELD UNIVERSITY, ENGINSOFT UK, PENN HIGH WYCOMBE

CALL AND GRANT AGREEMENT NUMBER

Innovate UK
Reference 101149

PURPOSE AND MAIN OBJECTIVES

The project objective was to use Microsoft's Kinect™ in housing and caring for elderly people in assisted-living schemes. It is better and more cost-effective to allow elderly people to live independently but they require monitoring in a smart way.

The project aimed to understand how the Kinect skeleton (without the video) could be used to track the elderly's activities. By using advanced data-mining, self-organizing maps (SOMs) and clustering, the project successfully demonstrated that it could determine with 95% accuracy every time the person stood up from a chair and went into the kitchen, without needing to 'spy' on the person with the video. This meant that a carer could ensure that the elderly were potentially behaving normally and getting nourished (visits to the kitchen). A flag could be triggered if the pattern changed i.e. down to zero or only a reduced number of trips to the kitchen.

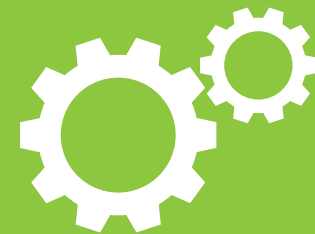
ES's ROLE AND VALUE

EnginSoft was responsible for mining the data once it was received from Cranfield (who had filtered it). EnginSoft used the data mining capability in modeFRONTIER (an integration platform for multi-objective and multi-disciplinary optimization) to determine the activities of the person in the trial. Based on this, EnginSoft created a dashboard to monitor the vital statistics of the elderly patient, e.g. their average speed. Any drastic change in this could then alert a carer or pre-empt medical check-ups.





OTHER



COGAN

Competency in geotechnical analysis

START DATE - END DATE

2013 - 2015

WEBSITE

cogan.eu.com

PARTNERS

NAFEMS LTD, ENGINSOFT SPA, GEOFEM LTD, MOTT MACDONALD, SKANSKA, TERRA SOLUM, TU GRAZ UNIVERSITY OF TECHNOLOGY, WESI GEOTECNICA

CALL AND GRANT AGREEMENT NUMBER

EU Lifelong Learning Programme 2007–2013, Leonardo da Vinci

PURPOSE AND MAIN OBJECTIVES

The certification of competencies is a key issue that affects individual engineers' mobility and access to the job market, and for companies to adapt to the rapid changes in technical competencies that play a vital role in their businesses. COGAN's primary goal was to improve engineering competency in geotechnical numerical analysis by adapting and transferring the results of the previous EASIT2 project.

COGAN improved geotechnical competencies through the following activities:

- ★ Defining the minimum user competencies required for a reliable implementation of software analysis.
- ★ Identifying training materials to facilitate the gaining of competencies.
- ★ A web-based platform to view competencies and training material, and to track progress, and the preparation of e-learning courses in key areas.

ES's ROLE AND VALUE

EnginSoft further developed the EASIT2 Competency Tracker software application, creating a specific version of it for geotechnical engineering analysis.

EASIT2

Engineering Analysis and Simulation Innovation Transfer (Squared)

START DATE - END DATE

2010 - 2012

WEBSITE

easit2.eu

PARTNERS

UNIVERSITY OF STRATHCLYDE, AMEC POWER & PROCESS EUROPE - PETROCHEMICAL & PROCESS, E.ON - POWER AND GAS, EADS INNOVATION WORKS - AEROSPACE, ENGINSOFT SPA, GEOFEM - CIVIL & CONSTRUCTION LTD, NAFEMS, NEVESBU - MARINE & OFFSHORE, NOKIA CORPORATION - CONSUMER GOODS, RENAULT - LAND TRANSPORT, SELEX GALILEO - DEFENCE, TETRA PAK PACKAGING SOLUTIONS - GENERAL INDUSTRIAL GOODS

CALL AND GRANT AGREEMENT NUMBER

EU Lifelong Learning Programme 2007–2013, Leonardo da Vinci

PURPOSE AND MAIN OBJECTIVES

The main aim of the project was to create a set of tools that enable simulation (CAE) engineers to develop, manage and certify their competencies across a wide range of industry sectors.

Three distinct, but functionally related, competency management tools were developed:

- ★ a database of “standard” analysis and simulation competencies (Educational Base);
- ★ software that enables companies and individuals to verify, track, develop and attest to competencies in the field (Competency Tracker);
- ★ the new NAFEMS PSE - Professional Simulation Engineer competence certification scheme - that fosters a transparent and independent certification of individual analysis and simulation competencies.

The EASIT2 project created a new set of tools specifically designed for the analysis and simulation industry, that benefits both individual engineers and companies.

ES's ROLE AND VALUE

EnginSoft was proactively involved in the development of the innovative competency-based tools and, specifically, developed the Competency Tracker software application.

WIN Shoes

When INnovation makes Shoes

START DATE - END DATE

2009 - 2012

PARTNERS

EVERYN SRL, ARCHA SRL, CALZATURIFICIO MARUSKA SRL, ENGINSOFT SPA, TUSCANY SERVICES SRL

CALL AND GRANT AGREEMENT NUMBER

POR CRo FESR 2007-2013
REGIONE TOSCANA, LINEA D'INTERVENTO 1.5.a-1.6, BANDO UNICO R&S ANNO 2012

PURPOSE AND MAIN OBJECTIVES

WIN Shoes aimed to develop an integrated ICT system to revolutionize the organizational and management practices of footwear manufacturers in Tuscany.

An integrated platform was developed to automate the design and prototyping process, which was previously totally artisanal. Digital manufacturing techniques were revealed to be a strategic tool to design new shoe models, reducing time and material waste. This is significantly relevant for high-heeled shoes where a satisfying trade-off between comfort and attractiveness is difficult to achieve. The WIN Shoes project introduced comfort parameters among the requirements for any new product and developed socks with sensors to automatically detect the comfort of a shoe. As a case study, two commercial shoe designs were analyzed to assess the effect of foot-shoe pairing on the soles of the feet and on back pressure.

CAS/CAD/CAE/CAM technologies were combined in a unique platform in order to optimize and automate shoe design and production.

ES's ROLE AND VALUE

EnginSoft collaborated with Archa Laboratories to develop the ICT platform to optimize shoe design and production, integrating new algorithms developed during the project. Furthermore, EnginSoft integrated code related to database search and multi-objective optimization to support product development.

DIRECTION

Demonstration of very low energy new buildings

START DATE - END DATE

2012 - 2015

PARTNERS

FUNDACION CARTIF, 1A INGENIEROS SLP, ACCADEMIA EUROPEA DI BOLZANO (EURAC), CLAUDIO LUCCHIN & ARCHITETTI ASSOCIATI DR. ARCH. ANGELO RINALDO, DR. ARCH. DANIELA VARNIER ASSOCIAZIONE, DOMAGK GEWERBEPARK GMBH & CO KG, DRAGADOS SA, ENGINSOFT SPA, FACIT GMBH & CO KG, FRAUNHOFER SOCIETY - FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG, PROVINCIA AUTONOMA DI BOLZANO, YOURIS.COM

CALL AND GRANT AGREEMENT NUMBER

FP7-ENERGY EeB.ENERGY.2011.8.1-1
Grant agreement ID: 285443

PURPOSE AND MAIN OBJECTIVES

The DIRECTION project aimed at creating a framework for demonstrating and disseminating highly innovative and cost-effective energy-efficient technologies to achieve new, very low-energy buildings. It focused mainly on analyzing appropriate energy efficiency technologies (their technical and economic viability) and on a pilot project that involved three new buildings.

In each building, a series of highly innovative measures were implemented including building elements to optimize energy consumption, and the use of highly efficient equipment and advanced energy management.

ES's ROLE AND VALUE

EnginSoft was responsible for the online Building Information eXchange system, which allows users to integrate and reuse building information and domain knowledge across the lifecycle of a building.

By providing quick access to relevant information, it supports troubleshooting and informed decision-making.

MyMUSEx:

walk through your MUSE Experience

START DATE - END DATE

2020 - 2021

PARTNERS

FBK - FONDAZIONE BRUNO KESSLER, ENGINSOFT SPA, MUSEO DELLE SCIENZE, TRENTO

CALL AND GRANT AGREEMENT NUMBER

Fondi CARITRO - Bando ricerca e sviluppo 2019

PURPOSE AND MAIN OBJECTIVES

The design of museums mistakenly assumes that all visitors live the museum experience in the same way. It has recently been demonstrated that these museum models favor visitors with defined socio-economic / cultural characteristics, disadvantaging many others.

The MyMUSEx project will develop an application for mobile devices, based on artificial intelligence and psychometric data analysis, that will be able to suggest personalized cultural tours to each visitor. The scientific objective of the project is to encourage the integration of typical (human-driven) approaches of social sciences and psychology with the latest artificial intelligence technology, in order to achieve a data driven analysis of the human data. The goal is to stratify visitors and use data science to improve their museum experience. The participation of MUSE, the museum of sciences located in Trento, Italy will make it possible to test the proposed solution in the field.

ES's ROLE AND VALUE

EnginSoft will support the development of the mobile device application, which will be accessible from within MUSE.

In particular, EnginSoft will be involved in evaluating how the application works compared to traditional applications, based on the Google Android development kit definitions, and in preparing the application testing environment.

BENIMPACT

Building's ENvironmental IMPACT evaluator & optimizer

START DATE - END DATE

2009 - 2011

WEBSITE

www.enginsoft.com/research/benimpact.html

PARTNERS

ENGINSOFT SPA, EURAC RESEARCH, HABITECH, ITEA SPA, UNIVERSITÀ DEGLI STUDI DI TRENTO

CALL AND GRANT AGREEMENT NUMBER

Provincia Autonoma di Trento - Legge provinciale n.6/99
Programma Operativo FESR 2007-2013 Obiettivo 2

PURPOSE AND MAIN OBJECTIVES

The BENIMPACT project's objective was to develop methodologies (and implement a software platform prototype) to support architects and engineers in the design of sustainable buildings that achieve an optimal compromise between environmental performance (i.e. the production of CO2 equivalent over the building's entire life cycle) and costs.

The BENIMPACT methodology enabled the implementation of an integrated construction project. By contract, the calculation tools typically used to assess the characteristics of a building during the design phase are not integrated with each other, and they are generally used by different professionals at different stages of the design process.

ES's ROLE AND VALUE

EnginSoft coordinated the project and was responsible for the IT development of the BENIMPACT Suite, which allows the simultaneous execution of the analyses and calculations necessary to design an eco-sustainable building by controlling the interactions between a series of highly integrated computational tools using modeFRONTIER, an integration platform for multi-objective and multi-disciplinary optimization.

MODGEOMECH

**Implementazione di modelli numerici avanzati
per la simulazione di problemi di geomeccanica ambientale**

*Implementation of advanced numerical models for
simulating environmental geomechanical problems*

START DATE - END DATE

2016 - 2017

PARTNERS

UNIVERSITÀ DEGLI STUDI DI PADOVA, ENGINSOFT SPA

CALL AND GRANT AGREEMENT NUMBER

Programma operativo FSE 2014-2020, Asse Occupabilità, Avviso “Assegni di Ricerca”
Delibera della Giunta Regionale della Regione del Veneto n° 2121 del 30/12/2015 e Decreto
di approvazione del Direttore di Sezione Istruzione n° 88 del 07/06/2016

PURPOSE AND MAIN OBJECTIVES

MODGEOMECH's industrial and scientific objective was the development of original and advanced computational models that would allow the coupled geomechanical simulation of various natural and/or artificial environmental problems, such as landslides - especially catastrophic ones - subsidence due to the extraction of gas and oil, embankments, geothermal foundations, earth dams and the storage of radioactive waste in deep deposits.

ES's ROLE AND VALUE

MODGEOMECH's goal was to create advanced software for virtual modeling and simulation of geomechanical environmental problems in civil engineering, in order to increase safety and environmental protection. This project allowed EnginSoft to increase its leading position in virtual simulation on the Italian market and begin extending it to the international market.

EnginSoft's role was to provide the software and hardware resources necessary to carry out the following activities:

- ★ To provide assistance in implementing new models.
- ★ To collaborate in the subsequent numerical validation phase, using results from laboratory tests from literature and checking the numerical results obtained.
- ★ To collaborate in the definition of civil engineering problems to be simulated and provide the necessary skills in the virtual modeling of complex problems.

SEMODEM

Ship Exhaust Muffler Optimum Design Methodology

START DATE - END DATE

2015 - 2016

PARTNERS

ENGINSOFT TURKEY Muhendislik Yazilim TICARET LIMITED SIRKETI

CALL AND GRANT AGREEMENT NUMBER

TÜBİTAK TEYDEB 1507

PURPOSE AND MAIN OBJECTIVES

The project involved developing a methodology to design ship exhaust mufflers with optimum sizes and with their acoustic and back pressure effects. A new method of reducing the acoustic effects was also implemented in this project. The full methodology was tested and the results were verified.

The aim of this project, in the design phase, was to reduce the time taken for design projects and, simultaneously, to boost the effectiveness of these devices, which leads to a superior design considering the criteria mentioned above.

ES's ROLE AND VALUE

EnginSoft successfully developed the methodology and verified the results by different test methods.

In addition, an innovative acoustic methodology was added to the muffler design process that positions EnginSoft as a reliable consulting or outsource partner both in the development of new methodologies and in research and development projects.

SOPDOPEMUD

**Software Package Development
for Optimum Exhaust Muffler Design**

START DATE - END DATE

2016 - 2017

PARTNERS

ENGINSOFT TURKEY Muhendislik Yazilim TICARET LIMITED SIRKETI

CALL AND GRANT AGREEMENT NUMBER

KOSGEB R&D Innovation Funding Programme

PURPOSE AND MAIN OBJECTIVES

Designing exhaust mufflers is a very time-consuming task involving a large number of parameters, all of which must be taken into account to achieve the best design considering the back pressure and acoustic performance of the muffler.

The purpose of this project was to develop a software package for muffler designers that could be used to estimate the above-mentioned parameters by simply entering the amount of free space for the muffler. The software can supply all the necessary parameters such as outer diameter, inner diameter, insulation material thickness and so on, based only on the desired size, to produce well-optimized muffler performance.

ES's ROLE AND VALUE

EnginSoft successfully developed the software package with a very easy to use graphical interface which can be used by any design engineer.

The user doesn't need to have any information or knowledge about mufflers and entering the desired size will give the final design parameters to the engineer. The project reinforces EnginSoft's reputation as a reliable partner in developing new methods for engineering projects.

V-FIDES

**Veicolo Filoguidato per l'Identificazione
e l'Esplorazione Subacquea**

Remote controlled vehicle for underwater identification and exploration

START DATE - END DATE

2011 - 2014

PARTNERS

WASS - WHITEHEAD ALLENIA SISTEMI SUBACQUEI, COMPOLAB SRL, CRM COMPOSITI, ENGINSOFT SPA, KAYSER ITALIA SRL, SCUOLA SUPERIORE S. ANNA (PISA), UNIVERSITÀ DEGLI STUDI DI PISA - POLO DEI SISTEMI LOGISTICI

CALL AND GRANT AGREEMENT NUMBER

PAR FAS 2007-2013 Linea di azione 1 "Aiuti a favore di ricerca, sviluppo e innovazione" – Azione 1 "Potenziamento delle attività di ricerca industriale e sviluppo sperimentale: il distretto Tecnologico" Azione 1.1 P.I.R. 1.1.B PROMOZIONE DELLA RICERCA INDUSTRIALE, DEL TRASFERIMENTO TECNOLOGICO, DELLO SVILUPPO PRECOMPETITIVO; VALORIZZAZIONE DELLA RICERCA E INNOVAZIONE

PURPOSE AND MAIN OBJECTIVES

The V-FIDES project aimed to design, analyze and build an unmanned submarine vehicle capable of conducting missions in hostile submarine environments.

This vehicle had to guarantee precise control and maneuverability, long endurance, large payload volumes and minimum drag. Its applications in the commercial, scientific and defense sectors required high-level design to satisfy the operational capabilities, energy efficiency, speed and maneuverability requested.

ES's ROLE AND VALUE

EnginSoft was involved in the development of a numerical platform to design the vehicle structure, based on the preliminary fluid-dynamics assessment and the design requirements defined by the WASS team leader. The numerical platform, based on the Hybrid Design and Optimization Under Uncertainty methods, was developed to integrate several advanced numerical tools to implement a fully integrated procedure to optimize design, analysis and performance.

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industry 4.0

The project coordinators' perspective



In the ForZDM project, the use of modeFRONTIER and EnginSoft's experience with optimization issues created the opportunity to develop and implement innovative planning and scheduling strategies to manage the quality of high added-value aerospace components.

Davide Caputo
ForZDM Project Coordinator,
GKN Aerospace Norway AS



EnginSoft's expertise in customized algorithms and optimization will be crucial for the RPASInAir project. In fact it will allow the proper planning of drones' paths according to real-time data acquired from the drone itself and from other sources and, if necessary, to re-plan and optimize the route in case of unexpected events.

The fundamental added value lies in the fact that all these operations and optimizations will be done in real time.

Giuseppe Acierno and Antonio Zilli,
RPASInAir Project Coordinators,
Distretto Tecnologico Aerospaziale



The SOL2HY2 project took EnginSoft into a relatively new modelling and multi-optimization market - a challenging task in the renewable hydrogen economy.

In addition to more or less traditional chemical engineering and fixed element method (FEM)/computational fluid dynamics (CFD), this involved selection of the location, solar energy supply, management of the heat and material flows and, of course, minimizing the investment and operational costs. The open source solutions and tools developed permitted a comprehensive and flexible evaluation of virtual hybrid power plants prior to the design and planning stage..

Michael Gasik,
SOL2HY2 Project Scientific Coordinator,
Aalto University



The project coordinators' perspective



An important activity within the SYNCH project is the development of novel brain stimulation protocols using advanced neural interfaces to achieve high resolution, finely tunable stimulation of neuronal circuits. EnginSoft has contributed by simulating brain tissue response to stimulation, which will be key to designing effective protocols to control neuronal activity.

In fact, the recording and stimulation of neurons using implanted probes represents a key strategy to understanding brain function and developing new treatments for neurological diseases. For example, it is common practice in Parkinson's to treat patients who do not respond to pharmaceutical treatments with implanted electrodes – a technology known as Deep Brain Stimulation – and there is growing interest in applying similar approaches to treat other pathologies like epilepsy or strokes.

Stefano Vassanelli,
SYNCH Project Coordinator,
University of Padua



EnginSoft contributed significantly by integrating optimization technologies into assembly process reconfiguration.

This allowed optimal reconfiguration paths for versatile production systems to be identified for relevant outputs, costs and KPIs.

Sebastian Schröck,
RECaM Project Coordinator,
Robert Bosch GmbH



We were lucky to have had EnginSoft as a partner in the ExaNeSt project: it had the crucial role of leading the integration of the results into the testbed of the project, as well as its evaluation.

EnginSoft's hard work and expertise in the management of high-density HPC systems for scientific and engineering applications contributed centrally to enabling the ExaNeSt consortium to deliver a fully functional HPC testbed of hundreds of ARM nodes, where partners ran several MPI applications.

Manolis Katevenis,
ExaNeSt Project Coordinator,
Foundation for Research & Technology
Hellas FORTH





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