

Factories of the Future

Projects launched under the FP7 ICT Theme in 2010

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The Foundation for the Smart Factory of the Future

Partners:

AIRBUS OPERATIONS, France
CADCAMATION KMR SA CADCAM, Switzerland
CHARMILLES TECHNOLOGIES SA CT, Switzerland
SIEMENS PRODUCT LIFECYCLE MANAGEMENT SOFTWARE (CH), Switzerland
ETH Zürich, Switzerland
CENTRO RICERCHER FIAT, Italy
FIDIA SPA FIDIA S.P.A., Italy
DELICAM PLC DELICAM, United Kingdom
Mecadtron GmbH, Germany
FUNDACION TEKNIKER, Spain
UNIVERSITY OF PATRAS, Greece
PARAGON S.A., Greece
ARTIS GESELLSCHAFT FUER ANGEWANDTE MESSTECHNIK MBH, Germany
ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE, Switzerland
POHANG UNIVERSITY OF SCIENCE AND TECHNOLOGY FOUNDATION – POSTECH, Korea

Summary:

Today's major challenges for manufacturing companies are clearly identified as global cooperation with multiple supply chain partners, production optimisation, and tracking and management of information to meet new requirements like traceability, security, sustainability. Requirements are derived in the aerospace and automotive manufacturing sector. The project will establish a universal manufacturing information system based on a data exchange standard that allows disparate entities and their associated devices of a manufacturing system to share data seamlessly in a common format. This future digital manufacturing foundation will then enable the implementation of the Smart Factory Architecture based on a high bandwidth Manufacturing Information Pipeline for data interoperability. The Smart Factory integration of the project towards real-time networking and adaptive capability also envisions:

- Optimising the numerically controlled (NC) machining systems including programmable logic controllers (PLC) through an embedded Supervisory Control and Data Acquisition (SCADA) system
- Supporting an advanced Manufacturing Execution System (MES) providing not only integrated process automation but also extension of its scope to achieve energy efficiency and sustainability goals as well as waste reduction and e-manufacturing.
- Reducing product integration, time-to-market costs and resource diagnosis and maintenance costs through a common control and monitoring platform.
- Implementing homogenous information sources generating data from the whole process, thus achieving information binding and integration from the extended MES to both vertical (innovation) dimension with the Product Lifecycle Management (PLM) and horizontal (business) dimension with the Enterprise Resource Planning (ERP).

Starting Date: 01 June 2010

Duration: 48 months

Total costs: 9,855,009 €

EC funding: 6,659,910 €

Coordinator:

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PlantCockpit – 260018

Production Logistics and Sustainability Cockpit

Partners:

SAP AG, Germany
ACCIONA INFRAESTRUCTURAS S.A., Spain
BAYERISCHE MOTOREN WERKE AG, Germany
COMAU SPA, Italy
DOEHLER, Netherlands
ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE EPFL, Switzerland
FUNDACION FATRONIK, Spain
ICONICS Europe B.V, Netherlands
INTEL PERFORMANCE LEARNING SOLUTIONS, Ireland
POLITECNICO DI MILANO, Italy
TECHNISCHE UNIVERSITAET DRESDEN TUD, Germany
TTY-SAATIO, Finland

Summary:

Today, numerous methods, systems, and tools exist to facilitate production management, optimise resource utilisation, and process efficiency. With the growing focus on sustainability, complexity grows even further as production supervisors have to manage energy and material consumption, the carbon footprint, and waste output in addition to classical key performance indicators (KPIs) such as process efficiency, asset utilisation, quality, scrap rate, and costs. Efforts to find the optimum for yield, quality, speed or energy consumption individually often result in local optima, far from the ideal solution. The project targets a tight integration of existing legacy ERP (Enterprise Resource Planning) systems, MES (Manufacturing Execution Systems), SCADA (Supervisory Control and Data Acquisition), and special-purpose solutions that provide the needed visibility and process integration to recognise the potential of and to optimise intra-logistics processes with respect to yield, quality, energy consumption, or waste.

The project's vision is to offer manufacturers the “Production Logistics and Sustainability Cockpit” (PLANTCockpit) as a central environment for monitoring and control of all intra-logistic processes. It will give production supervisors, foremen, and line managers the required visibility to make well-informed decisions for the optimisation of plant processes. PLANTCockpit will further provide a model for integrating heterogeneous shop floor management systems including ERP, MES, SCADA, condition-based maintenance, energy management, and other special purpose systems.

PLANTCockpit will focus on defining standard interfaces and a reference model for integrating the most prominent manufacturing processes. Current shop floor integration standards such as ISA 95, OAGIS, OPC Unified Architecture, MTConnect will be used as starting points.

The consortium includes world-leading system providers (INTEL, SAP), technology leaders (Iconics), strong academic partners (EPFL, FTK, POLIMI, TUD, TUT), and high-profile end-users (ACCIONA, BMW, COMAU, DOEHLER).

Starting Date: 01 September 2010
Duration: 36 months
Total costs: 12,711,558 €
EC funding: 7,979,682 €

Coordinator:

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QCOALA – 260153

Quality Control of Aluminium Laser-welded Assemblies

Partners:

TWI Ltd, United Kingdom
RUHR-UNIVERSITÄT BOCHUM, Germany
FRAUNHOFER-GESELLSCHAFT ZUR FÖRDERUNG DER ANGEWANDTEN FORSCHUNG E.V, Fraunhofer Institute for Laser Technology, FhG-ILT, Germany
FLISOM AG, Switzerland
LASAG AG, Switzerland
PRECITEC KG, Germany
COMPUTERISED INFORMATION TECHNOLOGY LTD, United Kingdom
SOCIETE D'ASSEMBLAGES PAR FAISCEAUX D'ELECTRONS ET LASER, SAFEL, France
SOLARPRO EAD, Bulgaria
VOLKSWAGEN AG, Germany

Summary:

The QCOALA project will develop a new dual-wavelength laser processing system for welding thin-gauge aluminium and copper, 0.1mm to 1.0mm in thickness, with integrated process monitoring and in-line non-destructive inspection, and establish its capability to provide a reliable, high-speed, low-cost and high-quality joining solution for electric car battery and thin-film photovoltaic (PV) cell interconnections. Through fully integrated process ICT and Statistical Process Control (SPC), the new system will facilitate in-line quality control, as well as a higher level of automation in manufacturing, and thereby achieve higher yield and throughput, for both these high-in-demand applications. This project will help the beneficiaries, with expertise in the constituent components of the new system, to increase their annual turnover between 15 and 25%, their productivity between 50% and 100% and their yield between 2 and 10%.

The new laser processing system will be based on a pulsed platform, capable of laser pulses in the range of μs to ms and pulse energies of up to (tens of) Joules, and capable of generating both the near-IR and green wavelength through a dual-wavelength beam scanner. Real-time temporal pulse control will be developed to allow closed-loop control of the monitored process. The fully-integrated system will produce 100% inspection rate, with a 'fingerprint' of each laser weld captured in 'real-time', and allow in-line process control when welding car battery and thin-film PV cell interconnections.

QCOALA is focused on energy-efficient, environmental-friendly and agile manufacturing, through the feed-back of in-line-monitoring and inspection information into the production line, allowing process control, continuous quality improvement and waste reduction. Whereas the concept of the project is aimed at smarter and more energy-efficient manufacturing, the applications that are addressed in the project fall are categorised in the 'green' alternative energy market.

Starting Date: 01 September 2010

Duration: 36 months

Total costs: 3,926,091 €

EC funding: 2,627,239 €

Coordinator:

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ActionPlanT - 258617

European Forum for ICT in Factories of the Future

Partners:

SAP AG, Germany
Fraunhofer-IPK, Germany
EPFL, Switzerland
FATRONIK-TECNALIA, Spain
INTERCIM, France
University of PATRAS-LMS, Greece
Politecnico di Milano, Italy
AGORIA, Belgium

Summary:

ICT plays a multifaceted role in all major European industrial sectors and its contribution to the manufacturing sector has become paramount over the last few years. Quite undeniably, ICT will become increasingly intertwined with Factories of the Future and will be seen developing efficient business processes through dynamically evolving business models. Although Europe has been investing in the efficient use of ICT-enabled manufacturing in the last decade, its innovation and profitability has been waning compared to other major economies such as the United States and Japan. In order to ensure the sustainable competitiveness of Europe's manufacturing industry, a thorough analysis is required such that R&D resources are applied most efficiently. This analysis will consider technology and business trends as well as policy, environmental, and societal needs. The threefold objective of ActionPlanT is therefore to come up with an ICT-enabled manufacturing vision for use cases and services of the future using this analysis as a basis. Secondly, this vision would pave the way for a detailed roadmap which will prioritise and schedule most promising topics for the upcoming Framework Programme 8. Finally, within the scope of ActionPlanT, a concept for industrial learning will be developed, validated and extensively piloted via summer schools and workshops amongst stakeholders in industry, academia, and the relevant European Technology Platforms.

Starting date:	1 June 2010
Duration:	24 months
Total costs:	2,103,623 €
EC funding:	1,499,964 €

Coordinator:

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KAP - 260111

Knowledge, Awareness and Prediction of Man, Machine, Material and Method in Manufacturing

Partners:

SAP AG, Germany
ATOS ORIGIN SOCIEDAD ANONIMA ESPANOLA, Spain
EUROPAEISCHES MICROSOFT INNOVATIONS CENTER GMBH, Germany
DE MONTFORT UNIVERSITY, United Kingdom
INFINEON TECHNOLOGIES DRESDEN GMBH UND CO OHG, Germany
INTEL PERFORMANCE LEARNING SOLUTIONS LIMITED, Ireland
FUNDACION LEIA CENTRO DE DESARROLLO TECNOLOGICO, Spain
UNIVERSITY OF PATRAS, Greece
MISSLER SOFTWARE, France
NISSAN MOTOR IBERICA SA, Spain
TECHNISCHE UNIVERSITAT BERLIN, Germany
UNIVERSITA DEGLI STUDI DI TRENTO, Italy
VOLVO TECHNOLOGY AB, Sweden
OPTIMITIVE SL, Spain

Summary:

Manufacturing is the driving force of Europe's economy, providing over € 6,553 billion in GDP. However, against a background of climate change legislation, volatile energy prices and increased environmental awareness, modern manufacturing must encompass a focus on eco-efficiency. Given the current economic situation, this must be achieved without the need for large capital expenditure. Adding information technology to an already existing production facility is a cost-effective investment. The KAP project will deliver energy management standards and a technology framework for next-generation, sustainable manufacturing. KAP stands for Knowledge of past performance, combined with Awareness of the present state, which together can support Prediction of future outcomes. This philosophy forms the basis of a framework that will enable every existing resource to be used as efficiently as possible through the effective co-ordination of man, machine, material and method. To achieve this goal the project will define a range of sustainable manufacturing standards. Measurements will be gathered through a factory-wide network of sensors. Complex Event Processing (CEP) and data stream analysis will compute on-the-fly production performance indicators (PPIs) for real-time monitoring. Data mining in combination with OLAP will support problem diagnosis and resolution.

Computational learning techniques will create a self-improving system for operational control. The inclusion of energy management makes the interpretation of system data an even greater challenge. Perceptually efficient visualisations will communicate PPI's to decision makers in a format that will reduce cognitive workload and improve situation awareness. A well-balanced consortium of research centres, academic and industry partners provides an ideal opportunity to realise the innovations proposed by the project. In terms of impact, partners estimate reductions of over 5% p.a. in waste and energy and 10% in time to market.

Starting date: 1 September 2010

Duration: 36 months

Total costs: 12,827,466 €

EC funding: 7,545,000 €

Coordinator:

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ROBOFOOT - 260159

Smart Robotics for High Added-Value Footwear Industry

Partners:

FUNDACION TEKNIKER - Spain
CONSIGLIO NAZIONALE DELLE RICERCHE - Italy
ISTITUTO TECNOLOGICO DEL CALZADO Y CONEXAS - Italy
COMAU SPA - Italy
ROBOTNIK AUTOMATION SLL - Spain
QDESIGN S.R.L. - Italy
AUTOMATICA Y CONTROL NUMERICO SL. - Spain
PIKOLINOS INTERCONTINENTAL S.A. - Italy
ROTTA S.R.L. - Italy
DEUTSCHES FORSCHUNGSZENTRUM FUER KUENSTLICHE INTELLIGENZ GMBH - Germany

Summary:

Footwear production is still mainly handcrafted. Currently, opposite to other manufacturing sectors like automotive, food or metal processing, robots are not used in the footwear industry. Only technical shoe producers have introduced robots to assist in the injection moulding process, but other relevant applications are still not in use. The introduction of robotics in this industry will contribute to overcoming complexity in processes automation that may lead to shortest production runs.

To achieve this objective the consortium aims to research and develop:

- New manipulation strategies and devices for non-rigid parts that allow grasping, handling and packaging shoes without damaging them;
- Sensor-based robot programming and control tools that use information from the CAD system and available sensors, in particular vision sensors, for visual servo-ing, allowing easy programming of flexible robotic applications;
- The re-design of shoe production processes for robot-assisted manufacturing and assembly, in areas such as selective heating, visual inspection and packaging.

The project will further address six operations in shoe manufacturing that are most suitable for short-to-medium term introduction of robotics in this sector. They will be used in three prototypes that will be scheduled throughout the 30-month duration of the project in such a way that, from the beginning, the footwear industry becomes aware of potential applications and the benefits of robotics.

Starting Date: 01 September 2010

Duration: 30 months

Total costs: 3,685,073 €

EC funding: 2,559,540 €

Coordinator:

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TAPAS - 260026

Robotics-enabled Logistics and Assistive Services for the Transformable Factory of the Future

Partners:

KUKA ROBOTER GMBH, Germany
GRUNDFOS AS - GBJ GRUNDFOS WATER EQUIPMENT AS GRUNDFOS ELECTRONICS AS GRUNDFOS INTERNATIONAL AS, Denmark
CONVERGENT INFORMATION TECHNOLOGIES GmbH, Austria
AALBORG UNIVERSITET? Denmark
ALBERT-LUDWIGS-UNIVERSITAET FREIBURG, Germany
DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV, Germany

Summary:

Today's automation and logistics paradigms make it difficult, time consuming, and costly to change the type of the product manufactured and to scale the production up-and-down in response to market volatility. Consequently, and with the increasing market uncertainties, it becomes more and more difficult to justify new automation lines. To keep production in Europe instead of shifting it to low-wage countries, this project will break new ground in robot-based automation and logistics as the backbone of a transformable factory of the future, enabling an economic production regardless of changes in volumes and product type.

TAPAS aims to pioneer the following tasks in real production environments: mobile robots with manipulation arms will make logistic tasks more flexible and more complete by not only transporting, but by also collecting the parts needed and delivering them right to the place where they are needed. Since moving parts around the shop floor does not create value by itself, TAPAS robots go even beyond: they will automate assistive tasks that naturally extend the logistic tasks, such as preparatory and post-processing work, e.g., pre-assembly or machine tending with inherent quality control. Through this additional creation of value and by a faster adaptation to changes with new levels of robustness, availability, and completeness of jobs TAPAS promises to yield an earlier return of investment.

To reach the objectives, the TAPAS consortium will iteratively test and validate the developments with two pilot installations of increasing complexity and scale. The drivers behind TAPAS are a robot manufacturer and a system integrator, providing both their production environments for intensive testing and validation, and a software technology provider. Teaming up with three excellent research partners they will develop logistic and assistive robotic solutions for transformable automation that are generally applicable and scalable.

Starting Date: 01 October 2010

Duration: 42 months

Total costs: 5,179,257 €

EC Funding: 3,400,000 €

Coordinator:

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CUSTOMPACKER - 260065

Highly Customisable and Flexible Packaging Station for Mid- to Upper-sized Electronic Consumer Goods Using Industrial Robots

Partners:

TECHNISCHE UNIVERSITAET MUENCHEN, Germany
FerRobotics Compliant Robot Technology GmbH, Austria
Loewe Opta GmbH, Germany
PROFACTOR GMBH, Austria
VALTION TEKNILLINEN TUTKIMUSKESKUS, Finland
FUNDACION TEKNIKER, Spain
MRK-Systeme GmbH, Germany

Summary:

The project aims at developing and integrating a scalable and flexible packaging assistant that aids human workers while packaging mid- to upper-sized and mostly heavy goods. Electronic consumer goods, e.g. TV sets, have a large number of variants and are packaged manually. Only in single-variant production lines with high lot sizes, automation of the packaging step has been introduced. However, automating the packaging process will decrease the production cycle time and costs also for mixed variant production lines, thus allowing that several production lines can be merged to a reduced number of flexible packaging stations. This also allows optimisation with regard to the actual demands of the various goods (i.e. number of items produced per day).

To achieve the realisation of these challenging goals for a highly flexible packaging station, CustomPacker will bring together the highly adaptable skills of a human worker with the precision and ability of robots to carry heavy goods. The main goal of CustomPacker is to design and assemble a packaging workstation mostly using standard hardware components resulting in a universal handling system for different products. Ideally one setup for packaging a high variety of products and components can be implemented, which can be achieved by a teachable system architecture. This will open a new dimension in how industrial robots are deployed today, namely the collaboration of human workers with robot co-workers. Only by driving reliability and precision of today's available technology to the limit and by additionally forcing the use of highly sophisticated software modules for worker detection and intention recognition, the cycle times can be reduced to justify the investment costs for additional complexity.

Starting Date:	01 July 2010
Duration:	36 months
Total costs:	3,812,766 €
EC Funding:	2,615,000 €

Coordinator:

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