

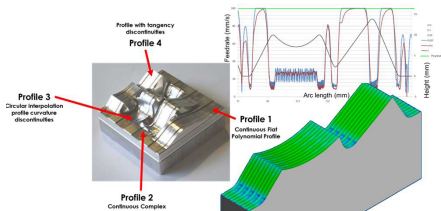


WP4 Smart Manufacturing Optimizer (SMO) completes R&D

The SMO, WP4, is one of the building blocks of the digitalization of the manufacturing process and has two aims: first, the simulation of the manufacturing process to predict time and surface quality beforehand and second, to extend machining with process monitoring to safeguard the manufacturing. Also in case of production disturbances, record the disturbance and machine settings and make the data available via the Manufacturing Information Pipeline (MIP) to the other components and higher management through a Smart Enterprise Content Management (SECM). Eight partners were active: ARTIS, CADCAMATION, CRF, GFAC, ECN, DELCAM, ETHZ and UPATRAS.

The team recently completed activities and two years of R&D and experimental work. The activities were addressed in separate tasks.

In task T4.1, the platform for the simulation and verification tools was the PowerMILL CAM platform where the actual feedrate model was developed to drive the simulation tools. Key components are the accelerations and jerk rates of the machine. Experimental work has resulted in validation of the model by comparing simulated and real feedrate profiles on different geometrical parts. Using the model, the time estimation for machining operations is much more realistic, allowing better process planning. The same model is also able to drive the ViewMILL simulation and thereby able to better predict the surface quality of a part before manufacture and avoid scrap. The achieved results satisfy the goals of the task. There is also a stand-alone simulator developed by ECN, which is exploited separately and can be used with any other platform.



T4.1 results: Actual feedrate predictions verified on '4waves' test geometry

Task T4.2 resulted in a prototype implementation of the intelligent process monitoring. ARTIS' CTM process monitoring solution methodology was used to monitor the machine and the machining process. From all R&D sub-tasks, prototypes were developed

and each of them has been installed at one or more of the machining centres available in the team. Process monitoring compares the actual situation on a machine with a target situation. Traditionally it is done by monitoring the spindle torque signal; a very rough indicator of the actual process condition. Results achieved include new monitoring strategies based on teachless monitoring and a combination of several key dynamic properties for more accurate and reliable process monitoring.

Project	Type	Problems	Solution	Visualization
State of the Art T4.2.4b	Reactive	Collision	Static Limits	
		Tool missing	Minimum not fulfilled	
	Breakage	Dynamic Limits		
	Preventional	Tool Wear	Percentage upper Limit	
		Over- and Underload	Adaptive Control	

T4.2 results: Overview of typical production problems and corrective actions

Typical scenarios include collision, tool missing, tool breakage, tool wear and over- and underload. To set up process monitoring CADPM technology has been developed. For the first time it is now possible to configure thresholds, alarm reactions or additional process information to the monitoring system with the help of CADCAM. For each deviation corrective actions have been developed and implemented into demonstration setups. The second major topic was the communication of the detected deviation and corrective actions taken to the overall MIP. Validation experiments of the developed hard- and software solutions were performed, e.g. at CRF for "tool wear monitoring" with preventive corrective action taken accordingly. The results show use of the prototypes and prove the successful development of the intelligent adaptive and sustainable approach, enabling two main information bridges; Design to Production and Production to High Level Management.

Six exploitable results have been defined from this work, which will be used to generate a return of the investment made by partners. Results will be used in WP8 to demonstrate the use of SMO on defined use-cases.

Cool stuff!
 Rolf Riemenschneider, Project Officer
 FoFdration, DG Connect

The FoFdration EU Project Newsletter
 Issue 3 - July 2013

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Welcome to the third quarterly newsletter of the FoFdration project!

Please [click here](#) to sign up to our email newsletter and please share it with your friends and colleagues.

FoFdration News

February 2013 - Partners meet in Athens to discuss Smart Manufacturing Execution System (SMES)

Consortium partners met in to discuss the status of the research and implementations of the SMES. Research is focused on using the collected data for visualising sustainability through KPIs at factory level with implementations being demonstrated through the FIAT use case.



Consortium partners discussing the status of research & implementations so far

February 2013 - WP4 meet at ETHZ, Zurich

Realistic kinematic models are now implemented into the CAM software and achieved results have been validated against captured process data using real-time process monitoring hardware.



FoFdration partners at ETHZ, Zurich, Switzerland

Second Project Review Meeting, Brussels

20 representatives from the 16 project partners of the FoFdration project recently gathered for their second Progress Review Meeting at the European Commission headquarters in Brussels, Belgium. As the project is now in its third year there was a lot to present to the Project Officer Mr. Rolf Riemenschneider and other external experts. The main technical developments presented covered all technical aspects of the production line that the project deals with, ranging from machine level on the shopfloor, through to content management and visualisation at management level.

The modules presented included:

- Machine modeling
- Machine control
- Productivity & sustainability data acquisition
- Workflow generation
- Macro-optimization
- Data visualization (dashboard)

and have been demonstrated within the framework of the Airbus, CRF and Agie Charmilles Use Cases.

In addition to the technical achievements, activities like training, dissemination, and the Living Lab that has been created were also highlighted.



The Project Officer and the reviewers indicated that there has been a very positive view on both the project activities and also technical progress in critical areas. For the forthcoming period the project will continue to integrate each part of the FoFdration platform and concentrate on demonstrating the advantages in a variety of applications, such as aerospace and automotive parts.

FoFdration Partner Profiles



Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Founded in 1855, ETH Zurich offers researchers an inspiring environment and students a comprehensive education as one of the leading

international universities for technology and the natural sciences. ETHZ regularly appears at the top of international rankings as one of the best universities in the world.

The Institute of Machine Tools and Manufacturing (IMW), with approximately 40 primarily scientific employees and close cooperation with another 40 scientific staff members of an industry oriented transfer institute (inspire), represents one of the larger institutes at the ETHZ. The IMW is focused on national and international cooperation with suppliers of machine tools and related services, currently involved in over 30 ongoing projects in the field of machining processes, machine design, simulation, virtual reality and additive manufacturing.



Founded by the Fidia Spa group in 1993, CADCAMation KMR SA is recognized today as one of the

leading Swiss knowledge-intensive SME in manufacturing. Currently, its core competences are focused on the ranges of the PLM/CAD/CAM technologies and their integration with manufacturing processes. The company used to participate to European Research projects and is particularly distinguished as a SME which has been able to initiate many research projects in manufacturing such as OPTIMAL, HIQU, FAME, STEP-NC. It was also the first company to launch the concept of on-line generation of the tool path correctly on the NC controller for milling and for EDM wire cutting. In 1997, CADCAMation separated from Fidia and extended its activities to become a full integrator of advanced CAD-CAM-NC systems.

As the technical coordinator for the work-packages, CADCAMation ensures their best integration towards a coherent manufacturing solution. They also focus on:

- The delivery of a STEP-NC compliant controller "open, scalable, and versatile and based on open-source software".
- The innoLAB infrastructure, which is expected to be the FoFdration living laboratory, based on a joint effort between industry and academy partners.

FoFdration Hosting Workshop at Joint Dissemination Conference



The FoFdration project was one of five FP7 projects chosen to host a workshop entitled "Integrated Platforms for the Smart Factory" at the Joint Dissemination Conference Factories of the Future Horizon 2020. With CADCAMation as lead organisers, the conference was aimed at European companies who are currently

involved in research in the domain of manufacturing. The event was an excellent opportunity for all projects to share ideas on dissemination, particularly cross-dissemination. Around 70 people attended, with key speakers including Dr. Massimo Matucci, President of EFFRA, and Dr. Dan Nagy, Director of Intelligent Manufacturing Systems (IMS).

“ It was a great opportunity to sharpen the idea of the Factory of the Future together. ”

Dominic Gorecky, Head of Human-Machine-Interaction Group,
German Research Center for Artificial Intelligence (DFKI)

To find out more about Horizon 2020 [click here](#).

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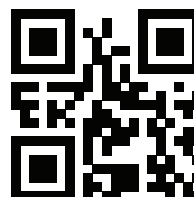
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FoFdration



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