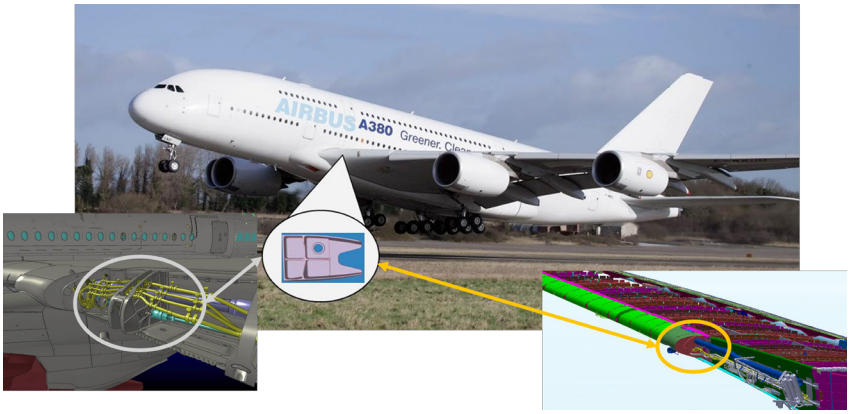
FoFdation
FOUNDATION FOR THE SUSTAINABLE FACTORY OF THE FUTURE

SEVENTH FRAMEWORK PROGRAMME

14/02/2014, Demonstrating the next generation of Smart Machine Controllers

During the last three and half years, the FoFdation project consortium has investigated on how the next generation machine tool controller will "close the gap" between the designer, the manufacturing engineer and the shop floor. The consortium agreed on the opinion that STEP-NC would also have had an important role in that.

As a result of the efforts of all involved partners, today we are ready for the demonstration of the project outcomes to highlight the smart features of the next generation controllers.
The whole story is based on a part (the fish head) that should be engineered, manufactured and assembled in an Airbus aircraft (A380) after a design change.



Airbus fish head part to be realized using the Smart Machine Controller

This demonstrator focuses on the integrated approach from design-to-production that should happen on the shop floor level. It demonstrates:

- Next generation and open controller addressing smart NC programming and micro optimization (for new and legacy machine) towards increased productivity and capability
- Real adaptive machining based on signatures of the machine tool and the machining process
- Final integrated digital prototype for the simulation and verification tools and an intelligent adaptive and sustainable approach

FoFdation was expected to define a unified and open IT architecture at the shop floor level in order to enable both progressive and breakthrough innovations for industry.

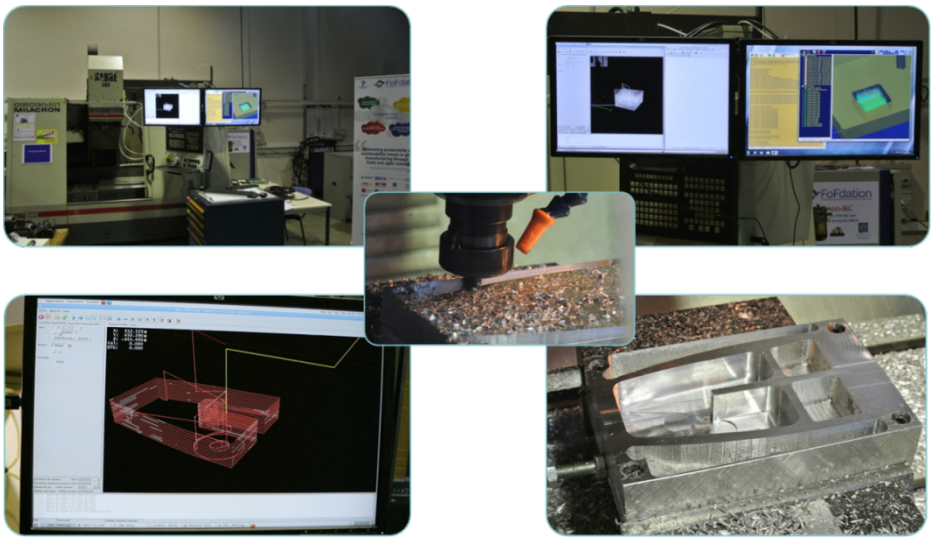
The progressive innovation must be based on an additional component compatible with legacy systems, thus supporting the industry transformation by introducing more IT assisted technology into conventional and existing manufacturing process for better optimization of the manufacturing process. Within the recovery context, the FoFdation SMC (FSMC) architecture must be compatible with legacy "brand name NC" controllers. This condition is necessary to support the transformation of prevalent brand name controllers mostly based on ISO G&M code into STEP-NC compliant controllers, thus allowing companies to increase their production performance without heavily investing in new expensive machines

Realization of the FoFdation Integrated Test Platform [EC-Nantes]

and time-consuming training. This "Legacy Use Case" is based on a STEP-NC remote FSMC interface for part programming tightly integrated with the optimization module and running on a dedicated Windows PC. This allows the implementation of an intelligent meta-controller system which includes both optimization and supervision, beside any "brand name controller" and that could be tightly coupled with any brand name CAM system for tool path generation.

To answer the question of what should the next generation CNC machine tool look like, a demonstration prototype platform has been created using currently available tools and new developments to build an Open-NC platform that shows functionalities expected in future CNC machine tools. These developments were guided by the FoFdation Smart Machine Controller Open Architecture. The Integrated Test Platform is made of NUM-750, LinuxCNC-ISO, LinuxCNC-STEP-NC and Fidia nC12 controllers installed on a 3-axes Cincinnati Sabre milling machine.

The smart machine controller has been made STEP-NC compliant using the FoFdation SMC platform (based on EC-Nantes' SPAIM software) for advanced STEP-NC programming and control.
The Integrated Test Platform has been used to mill the STEP-NC based fish head test part.
Advanced shop floor features such as part-program modifications and many other smart on-line features based on STEP-NC are now available on this platform.



Machining operations on the FoFdation Integrated Test Platform

The storyboard to demonstrate the new features, was made of the following steps:

- First call of tender: a new part to produce, the fish head
- A change of geometry coming from the customer
- A process modification to meet new target cost from OEM or a new part demand after several months

The final goal of the demonstration was increasing flexibility, adaptability and adaptivity of the process thus improving productivity and quality for the aerospace industry

Flexibility
- communicating and exchanging information easily with closer systems integration
- make last minute decision based on shop floor conditions and priorities

Adaptability
- accommodating unforeseen changes
- SME preparation for future manufacturing solutions and functionalities

Adaptivity
- Closed-looped real-time process adjustment based on monitoring

Productivity
- improve quality and throughput with 'first-part-right'
- reducing downtime

For more information about the FoFdation project visit **http://www.fofdation-project.eu** and the project's social media pages, including Facebook (**#fofdationproject**) and Twitter (**@FoFdation**).

Acknowledgements:
This project is co-funded by the European Commission as part of the European Economic Recovery Plan (EERP) adopted in 2008. The EERP proposes the launch of Public-Private Partnerships (PPP) in three sectors, one of them being Factories of the Future (FoF). Factories of the Future is a EUR 1.2 billion program in which the European Commission and industry are collaborating in research to support the development and innovation of new enabling technologies for the EU manufacturing sector.

For further information please visit:
http://ec.europa.eu/research/industrial_technologies/factories-of-the-future_en.html