

Advanced Simulation for Metal Forming

Fortissimo Experiment Facts:

- Segment: Automotive
- Application Domain: Metal Forming Simulation
- Application: Stampack

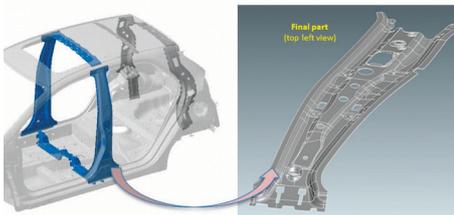
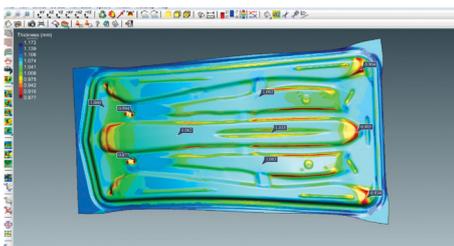
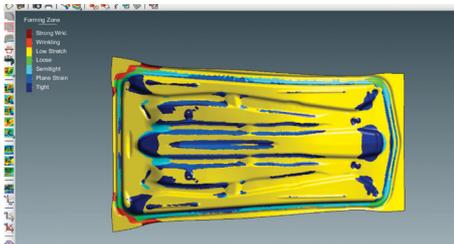


Figure 1 - B-Pillar (View of simulated part)



The Company

MATRICI is a Spanish midcap company founded in 1964, specialising in the production and design of complex metal panels in the automobile and aerospace industries. In these sectors, it is involved from the initial phases of design through to installation and test. The sheet metal forming industry is important in the development of the world's economy. The use of HPC-based simulation can have a significant financial impact on the manufacturers of such panels.

However, despite recent significant advances in computing hardware and software, high-end computer simulation and engineering design tools are often unaffordable for small companies because of the large capital investment in computing power required. This experiment demonstrates the benefits of advanced Cloud-based HPC tools in design and how these can be delivered as a pay-per-use service, affordable by small companies.

The Challenge

This experiment tested the feasibility of using a Cloud-based HPC simulation environment for the forming of sheet metal parts. The challenge was to develop a software solution that allows industry to simulate metal forming with higher efficiency and ease of use than possible using today's state-of-the-art commercial codes. The main customers of the new service will be SMEs, usually acting as part providers to OEMs and factories in the metal-forming industrial sector. End-users are also expected from large design departments of big companies, mainly automobile manufacturers. The goal is the full, simple, efficient and affordable integration of available powerful high-performance computing infrastructures with advanced simulation software

Stampack, a simulation code available from QUANTECH, models the forming of sheet metal panels. Its simulations enable engineers to concentrate on engineering problems and their solution. The major challenge of this experiment was to develop a high-performance version of Stampack able to run effectively in a Cloud of HPC resources, made available on a pay-per-use basis.

The Solution

A Cloud-based version of Stampack (StamHPC) has been adapted, developed and validated. Its performance and usability have been evaluated in an industrial setting. A graphical interface has been developed offering easy and intuitive use in the metal forming industry. This allows any end-user, even without HPC expertise, to launch a calculation and get results with an appropriate response time. Furthermore an appropriate licensing server has been developed which supports the availability of StamHPC on a pay-per-use basis.

Fortissimo Experiment Partners:

- Matrici (End-user)
- Fraunhofer SCAI (Technology Expert)
- Quantech (ISV)
- CESGA (HPC Provider, Expert and Host Centre)

More Information:

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MATRICI



The Benefits

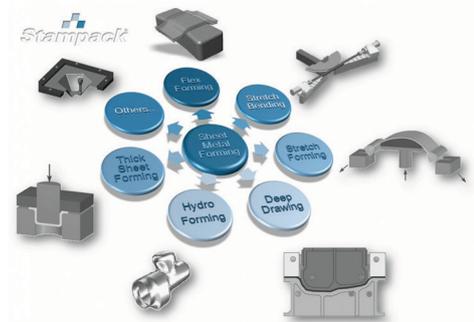
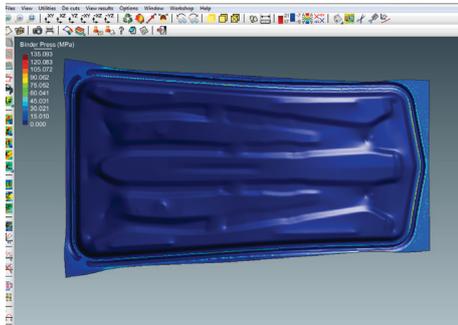
MATRICI estimates that it will realise a minimum additional revenue of €200K per year through the use of a Cloud-based StamHPC in its design processes. QUANTECH and CESGA expect to involve around 300 new metal forming SMEs in using StamHPC over the next 5 years, leading to a potential return on investment of 60 M€ in that period.

A typical simulation to support the design of a metal forming process takes around 120 iterations each of which needs 20 computing hours on a standard workstation (8 cores and 32 GB of memory). Such a simulation represents 10 weeks of work involving a workstation and an engineer. Using the StamHPC solution within an HPC-Cloud it is possible to run, at the same time, several options of the feasibility design concepts. This reduces the time to design a prototype. The reduction of time to solution is about 50%, which means an overall reduction of engineering costs of 50%. Considering that in a year a company like MATRICI performs 200 Feasibility design studies in order to make offers to customers, the reduction of design costs, plus the accuracy of the new StamHPC software would represent savings around 1.5 M€/year (2.5% of current company turnover for MATRICI).

CESGA estimates that it will see, due to the sale of computer cycles as a result of the Cloud-based StamHPC, an additional annual revenue of €45K in 2017 growing to €365K in 2021. SCAI will use the success of this experiment as a reference to support the sales of its software products, particularly those relevant to HPC-based Clouds.

The Fortissimo Project

Fortissimo is a collaborative project that enables European SMEs to be more competitive globally through the use of simulation services running on a High Performance Computing cloud infrastructure. The project is coordinated by the University of Edinburgh and involves 123 partners including Manufacturing Companies, Application Developers, Domain Experts, IT Solution Providers and HPC Cloud Service Providers from 14 countries. These partners are engaged in 53 experiments (case studies) where business relevant simulations of industrial processes are implemented and evaluated. The project is funded by the European Commission within the 7th Framework Programme and is part of the I4MS Initiative.



Fortissimo is part of I4MS ICT Innovation for Manufacturing SMEs: www.i4ms.eu



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