

HPC based high-resolution modelling of magnets

Fortissimo Experiment Facts:

- Industry Sector: **Automotive**
- Country: **Slovenia**
- Software Used: **ELMER, ParaView, NetGen**

THE COMPANIES

Magneti Ljubljana is a Slovenian SME that has produced permanent metallic and systems magnets for the European market for over 60 years. These have many uses in a variety of sectors. XLAB is a Slovenian R&D company with a strong research background in the fields of distributed systems, cloud computing, system security, information visualization and image processing.

THE CHALLENGE

Magneti produces its magnets through a process called compaction, which uses a hydraulic press to apply pressure to magnetic powders until they solidify. The hydraulic press is made up of several very expensive parts which regularly wear out and must be replaced. The pressing tool needed to be optimized, so it could be used for longer and with lower material costs, but doing this requires the ability to automatically detect yielding of the tool under a given pressure. This requires many iterations of computer simulation and post-processing, which exceeds in-house capabilities.

THE SOLUTION

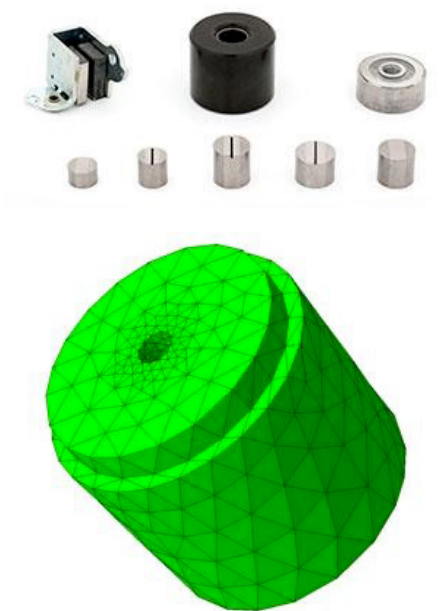
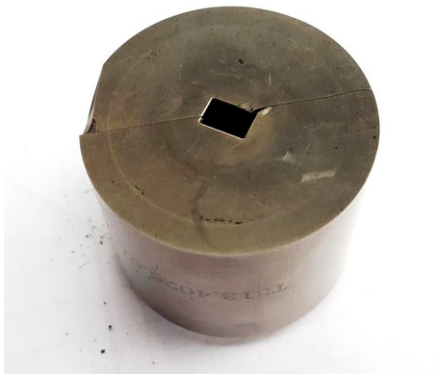
To tackle the problem of pressing tool optimization, XLAB developed a set of software services based on open-source solutions. XLAB built a computer model of the pressing tool and its behaviour during the compaction process. This model is highly configurable, so Magneti can reuse it for other applications.

The optimization service runs as a web application, which provides an easy-to-use interface. The application connects to Arctur's HPC system and submits an HPC job according to configuration and input parameters from the end user. This means that even inexperienced users are able to design and run experiments using HPC resources, avoiding the need for costly training. Magneti only needs to pay for the computing resources it uses, providing the company with a cost-effective solution.

BUSINESS IMPACT

The partners in this experiment have derived a number of benefits from their involvement in the Fortissimo project.

For Magneti, there are several benefits. Due to the optimized geometric properties of the pressing tool, the quantity of excess material in an existing tool was reduced by around 32%, reducing material costs. This has reduced the cost of making the pressing tool by 27%, which represents an annual saving of €87k. The pressing tool is also of a higher quality, containing narrower coils which consume less power. Assuming Magneti replaces all of their pressing tools with those designed by the HPC tool, this will save another €16.2k annually.

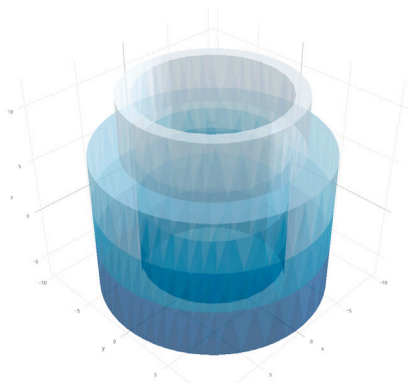
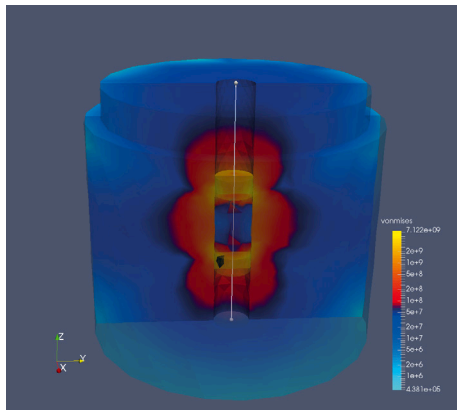
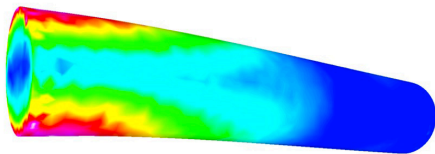


Fortissimo Experiment Partners:

- Magneti (End User)
- XLAB (HPC Expert)
- Arctur (HPC Provider)

More Information:

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XLAB has broadened its software development expertise to the field of magnet production, and gained knowledge about developing complex software with the help of opensource tools. The existing software developed for Magneti can be extended and modified to potential new customers coming from the same or similar industries.

Arctur has increased its reputation in the research community, potentially allowing it to attract new customers from the magnet production industry.

BENEFITS

- Design of a better pressing tool that saves money, does not need to be replaced as often, and uses less energy.
- Savings of over €100,000 per year for Magneti and ability to create new services based on improved pressing tool.
- Magneti and XLAB both gained experience in simulation.

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 more than 100 partners including Manufacturing Companies, Application Developers, Domain Experts, IT Solution Providers and HPC Cloud Service Providers from 14 countries. These partners are engaged in over 90 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 Horizon 2020 and is part of the I4MS Initiative.

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



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