

Simulation of Quenching Process

HPC-Competence Center

IT4Innovations National Supercomputing Center is an important part of e-Infrastructure of the Czech Republic focused on HPC research and services. The Center operates the most advanced HPC technologies and services and makes them available to Czech and foreign research teams from both academia and industry. One of the key functions of the IT4Innovations National Supercomputing Center is to support industry in the Czech Republic.

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Enterprise

Ferram strojírna founded in 1991 established itself on the market for machinery production; thanks to quality, reliability, tradition and experience. Basic production program in the past was focused mainly on various types of conveyors. Later, portfolio expanded to include the production of special components and steel constructions based on the customer's plans and documentation. Today Ferram focuses on the whole assembly and delivery of equipment, including installation at the end user. The main activities are the production (Metalworking, Milling & Welding) and assembly of special equipment and components in accordance with the documentation provided, conveyor and handling equipment, and mining equipment.



How HPC makes the difference

The Quenching process was simulated by numerical modelling and simulation methods. The challenge of the numerical simulation of quenching processes is to create a Multiphysics model containing all the physical processes during quenching (multiphase fluid flow of water spray with heat exchange, deformation of thin wall aluminium profile due to thermal loading etc.). To capture all physics mentioned, it is necessary to create a large CFD model of the whole water quench. This quench consists of seven separate sectors, each equipped with four nozzles, with each nozzle being modelled in detail. To capture all the physical processes, the assembled numerical model will contain hundreds of millions of computational cells and therefore it is necessary to apply HPC

techniques to obtain the result of the transient analysis in a relatively short time period. This type of problem cannot be resolved on a standard workstation within an acceptable time frame.

