

# Application Note

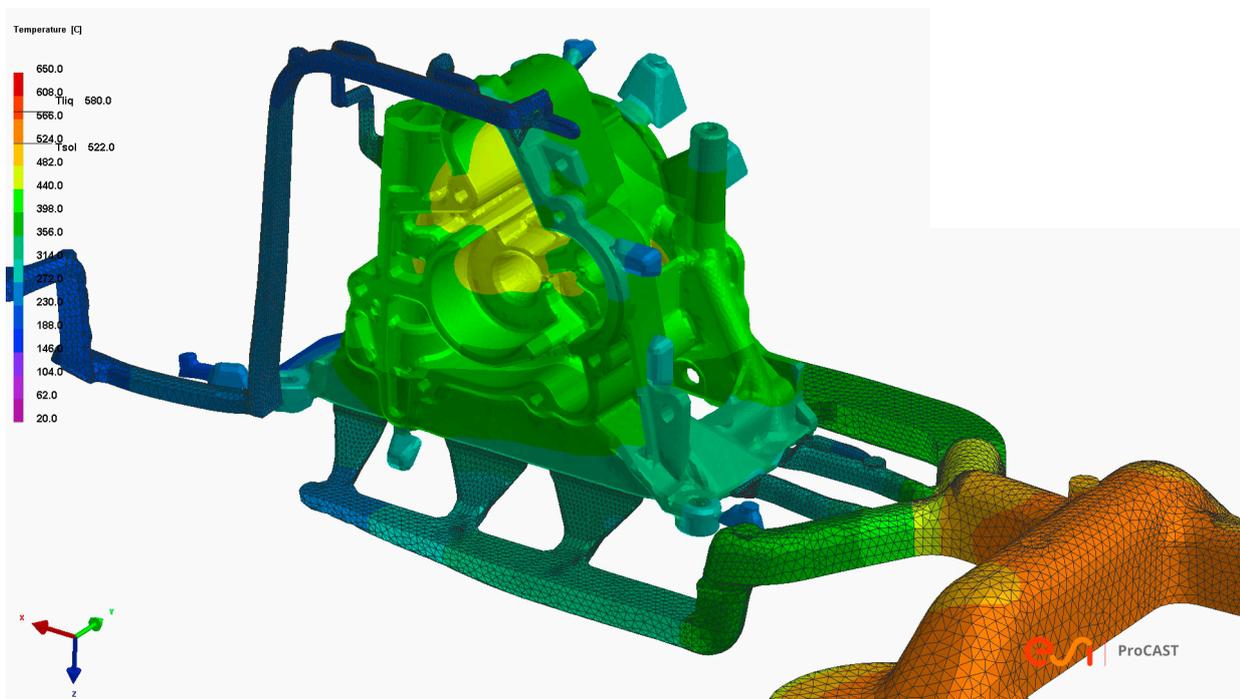
## ECOTRE Valente: The Future of Foundry – GOM Inspect Professional for the Dimensional Analysis of Virtual Simulations

City / Country: Brescia, Italy

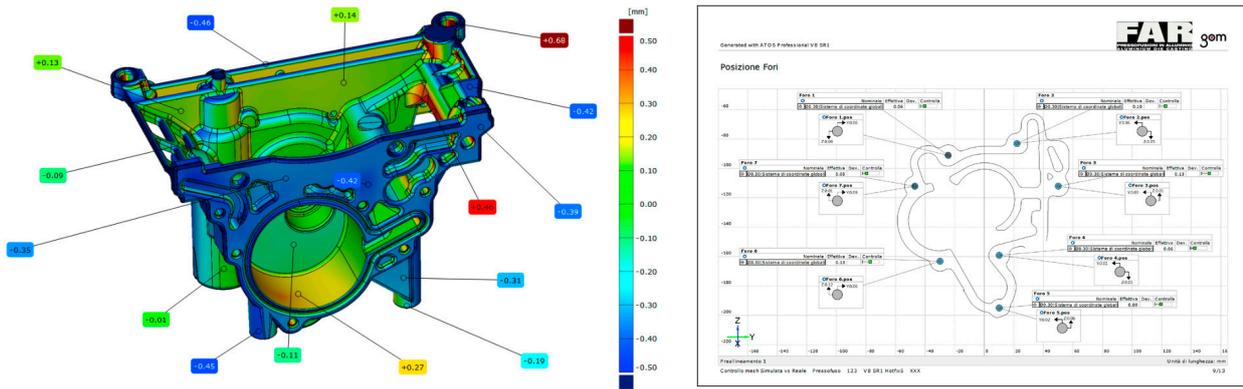
GOM software: GOM Inspect Professional

Departments: Design, simulation of casting processes

Casting processes simulation software identifies metallurgical defectiveness, mechanical properties and deformations of parts. Such software is fundamental for operating in a market that requires the rapid manufacturing of geometrically complex components, and which leaves no room for mistakes, testing or re-sampling. ECOTRE Valente, experts in the simulation of casting processes, use GOM Inspect Professional and ProCAST for the dimensional analysis of virtual parts, in order to forecast and correct defects linked to shrinkage and warpage.



The ProCAST stress module calculates shrinkage and deformation over the entire mold and casting during filling, solidification and cooling.



Predictive dimensional control. Comparison between nominal CAD model and current model produced by ProCAST. Verification of hole position.

The industrial area around the city of Brescia in Italy is a land where metal technology put deep roots. Dr. Tiziano Valente, the founder of the namesake company ECOTRE Valente, has metallurgy in his DNA and passed it on to his son Lorenzo, sharing his expertise with the whole ECOTRE team. Thanks to their profound knowledge of metallurgical processes and of the associated defects, ECOTRE has become an industrial reference of the ESI Group – a global leader in the field of virtual simulation services and software. In 2018, ECOTRE became the top European center for 4.0 virtual foundry, thanks to its network of 5 offices in Germany.

### Predicting and preventing defective castings

For the last twenty years, the main requirement for those working in steelworks and foundries has been forecasting, with the highest possible accuracy, the typical casting defects with the scope of rectifying them before the production stage: shrinkage porosity, porosity from gas, the formation of cracks and all other defects typically found in metallurgy. The calculations at the basis of the simulation programs provide an objective forecast of what happens to the metal during the process. Depending on the calculation models used in the software and other background conditions, very reliable simulations are created and made available to operators, who can choose the best cost-effective solution to proceed with the production.

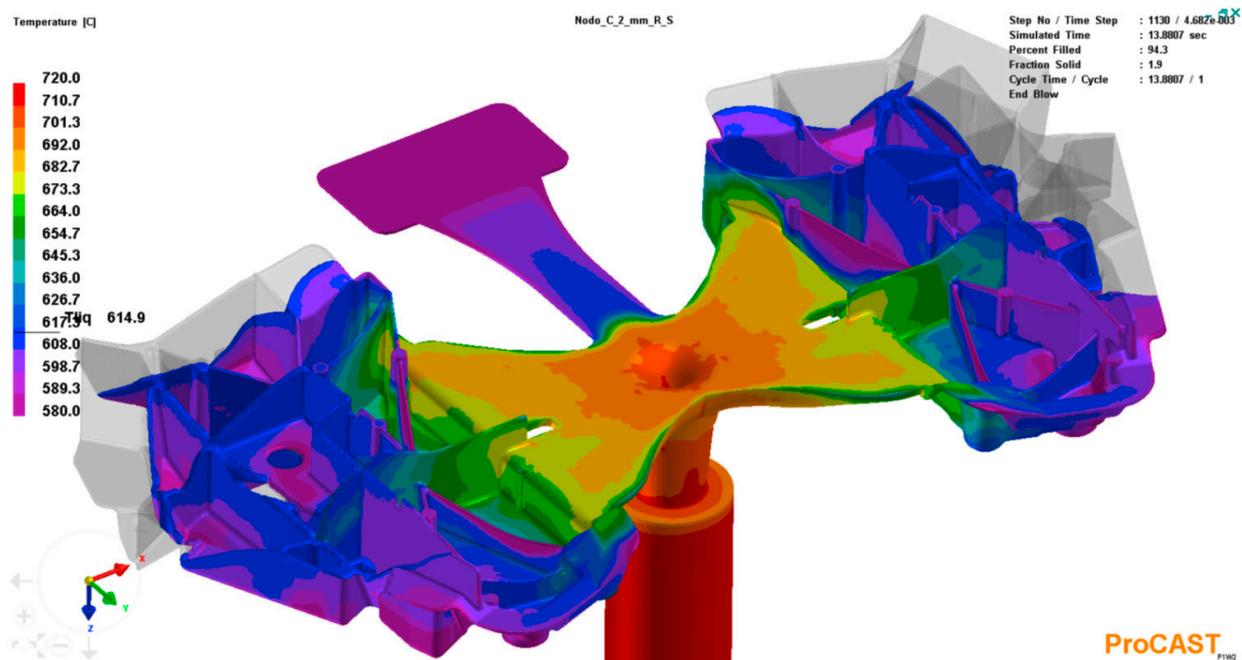
### Dimensional analysis of the ProCAST virtual model

The ProCAST software can perform a dimensional analysis using a very comprehensive process, simulating a machine that produces virtual pieces as if they were physical ones. For ECOTRE the challenge was to implement a reliable and user-friendly dimensional check of the virtual model during the simulation.

In examining the issue of dimensional control, the company invested a lot of time in research, until some GOM metrological solutions became the key. “We learned how the dimensional checks are performed by comparing the point cloud of the scanned physical object with the CAD 3D model, and in this way we realized how to proceed”, explains engineer Dr. Ing. Lorenzo Valente, CEO of ECOTRE. By pooling a passion for challenges and sharing their technological approach, GOM Italy and ECOTRE Valente began to work together, and in 2016 they presented their initial results demonstrating the effective forecasting capacity of the ProCAST simulation tool, in terms of defectiveness and dimensional analysis of the final product.

### An unchanged verification methodology

One revolutionary aspect of this interaction, aside from the process reliability, is the verification methodology which remains unchanged in its usual process. The user performs the casting simulation with ProCAST



ECOTRE Valente: State-of-the-art technology ProCAST

(filling, solidification, stress, heat treatment and micro-structure) resulting in a point cloud in a \*.G3D file format, showing the virtual piece once shrunk and deformed, which is imported directly into GOM Inspect Professional. The integration of ProCAST and GOM Inspect Professional significantly shortens the overall process time because it reduces the prototyping and sampling times. "The collaboration has been so close that GOM acknowledged ECOTRE its profound understanding of this topic, as well as its drive for innovation and the value of the work done together with GOM Italy, and authorized the use of its codes to generate a file in the native \*.G3D format, thereby eliminating potential uncertainties due to the conversion process", underlines Gabriele Graziosi, CEO of GOM Italy.

#### Design workflow and completely virtual verification process

By introducing GOM Inspect Professional to support the planning of the casting process, ECOTRE and GOM Italy have built a virtual bridge between the work of the technical team, which provides the simulation, and

the quality control team, which can now contribute to the process without needing a physical component to complete this task. The two teams can now work together to improve the production even before the product is made.

The integration of the ProCAST and GOM Inspect Professional software means that the design and verification workflow becomes entirely virtual and can be done with no extra costs, as it does not involve any prototyping. As soon as the design stage is completed, the analysis project can be set up and performed during the production process. In the meantime, the same project serves to verify the GOM Inspect Professional simulation. Moreover, this validation is carried out by metrology experts who can best interpret the measuring results in a shorter time.

#### ProCAST: proven reliability

"An essential element at the bottom of this project is the users' awareness of the high level of reliability regarding the simulation process provided by ProCAST.

By applying GOM's method and technology, we proved that the simulations are reliable. As a result, if the simulation is correct, the dimensional analysis is coherent and reliable to the simulation. Without the dimensional validation of the solution, the prototypes can't be built", says engineer Dr. Ing. Cristian Viscardi, ECOTRE's Technical Director.

Today, ECOTRE and GOM Italy are replicating the project with the DEFORM software, created by the American company SFTC, aimed at the dimensional analysis of the simulation of forging, pressing and heat-treatment processes. The results are excellent also in this case, we will see the final developments.



Meeting at ECOTRE: Dr. Ing. Cristian Viscardi, Dr. Ing. Lorenzo Valente, Dr. Tiziano Valente (from left to right)

#### **ECOTRE Valente**

ECOTRE Valente has been the exclusive distributor in Italy of FONDAREX vacuum-sealing equipment and of state-of-the-art simulation software for over 30 years. ProCAST, QuikCAST, QuikCAST Lt and DEFORM. ProCAST, QuikCAST and QuikCAST Lt are simulation software packages for casting, produced by the ESI Group – the only group in the world to have two calculation engines – finite-element and finite-difference – for foundries and steelworks. Thanks to their deep knowledge of metals, and of metallurgical process and techniques, the ECOTRE engineers are able to support customers in performing numerical simulations in order to optimize the product, the mold and the process as a whole.

[www.ecotre.it](http://www.ecotre.it)

#### **GOM GmbH**

GOM specializes in industrial 3D coordinate metrology, 3D computed tomography and 3D testing. From product development to production and worldwide distribution, GOM offers machines and systems for manual and automated 3D digitizing, evaluation software, training and professional support from a single source. In industries such as automotive, aerospace, energy and consumer goods, more than 17,000 GOM system installations are in use internationally. At more than 60 locations and with more than 1,000 measurement technology specialists, GOM guarantees profound advice and first-class service.