

## Simulation of Casting and Injection Moulding

### HPC-Competence Center

The Fraunhofer Institute for Algorithms and Scientific Computing SCAI offers the application of sophisticated in-house and/or commercial optimization and robust design methods in combination with numerical simulations for complex flow problems.



### Enterprise

Since 1988 the SME MAGMA GmbH has been a pacesetter in defining new directions for the foundry industry. It has developed MAGMA-SOFT®, a comprehensive simulation tool used for the production of castings worldwide. Its simulation capabilities provide users with a better understanding of key processes such as mould filling, solidification, mechanical properties, thermal stresses and distortion.

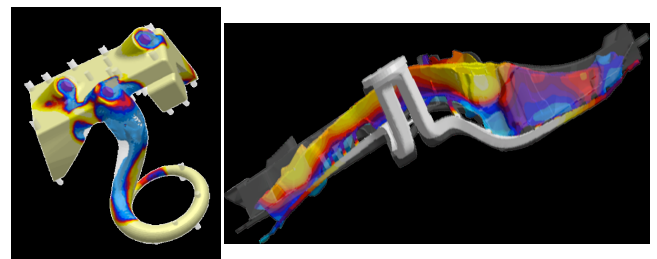


### How HPC makes the difference

Customers of MAGMA want to run bigger and more accurate simulations, meaning finer meshes and, as a result, larger systems of equations. Hence, MAGMA-SOFT needs robust and scalable solvers.

Fraunhofer SCAI one of the SESAME Net partners has developed a state-of-the-art solver library, SAMG, with a focus on industrial use. SAMG stands for Algebraic Multigrid Methods for Systems and is a library of subroutines for the highly efficient solution of large linear systems of equations with sparse matrices. In contrast to classical linear solvers, SAMG solvers are optimal in the sense that the computational time of using SAMG depends only linearly on the number of unknowns. Hence, depending on the application and problem size, SAMG solvers reduce the computational time by 1-2 orders of magnitude or even more, compared with standard linear solvers.

MAGMA decided to employ SAMG to accelerate their simulators. Customers now achieve acceleration factors between 2 and 10 compared to standard solvers. Hence, MAGMA's customers can run more simulations per day, facilitating an improved optimization of their castings and casting processes.



*Fig: Numerical grid for photovoltaic panels (left), Velocity profile on horizontal plane for oblique wind (right)*

