Design Services

Simulation services for the optimization of foundry processes

ASKCHEMICALS
We advance your casting

Simulation services

Simulation of foundry processes helps provide the foundryman with relevant information for designing a die-cast or sand-cast mold. Pouring systems, overflows, vents and risers can all be optimized in this way. A precise representation of these aspects, by taking not only cooling and heating measures but also cycle times into account, enables such problems as shrinkage cavities, veining and many other casting defects to be avoided.

The simulation services of ASK Chemicals offers you comprehensive technical know-how and understanding combined with state-of-the-art simulation programs (MAGMA, FLOW-3D and ARENA-FLOW) in order to give you the best possible support with your casting processes. Besides the simulations, we provide help with the design of castings, tools and your complete process – consistent with our maxim: “We advance your casting”!

The advantages to you at a glance

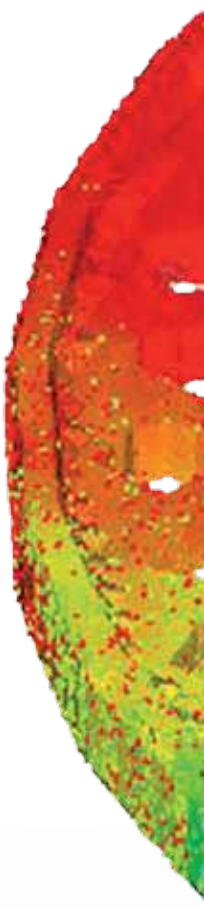
- Shorter product rollout times and, consequently, faster time to market
- Clear time-saving in the design of pattern plates, core boxes and molds

Core making:

- Higher productivity due to perfect cores and optimized catalyst consumption
- Design of your core making process, includes INOTEC

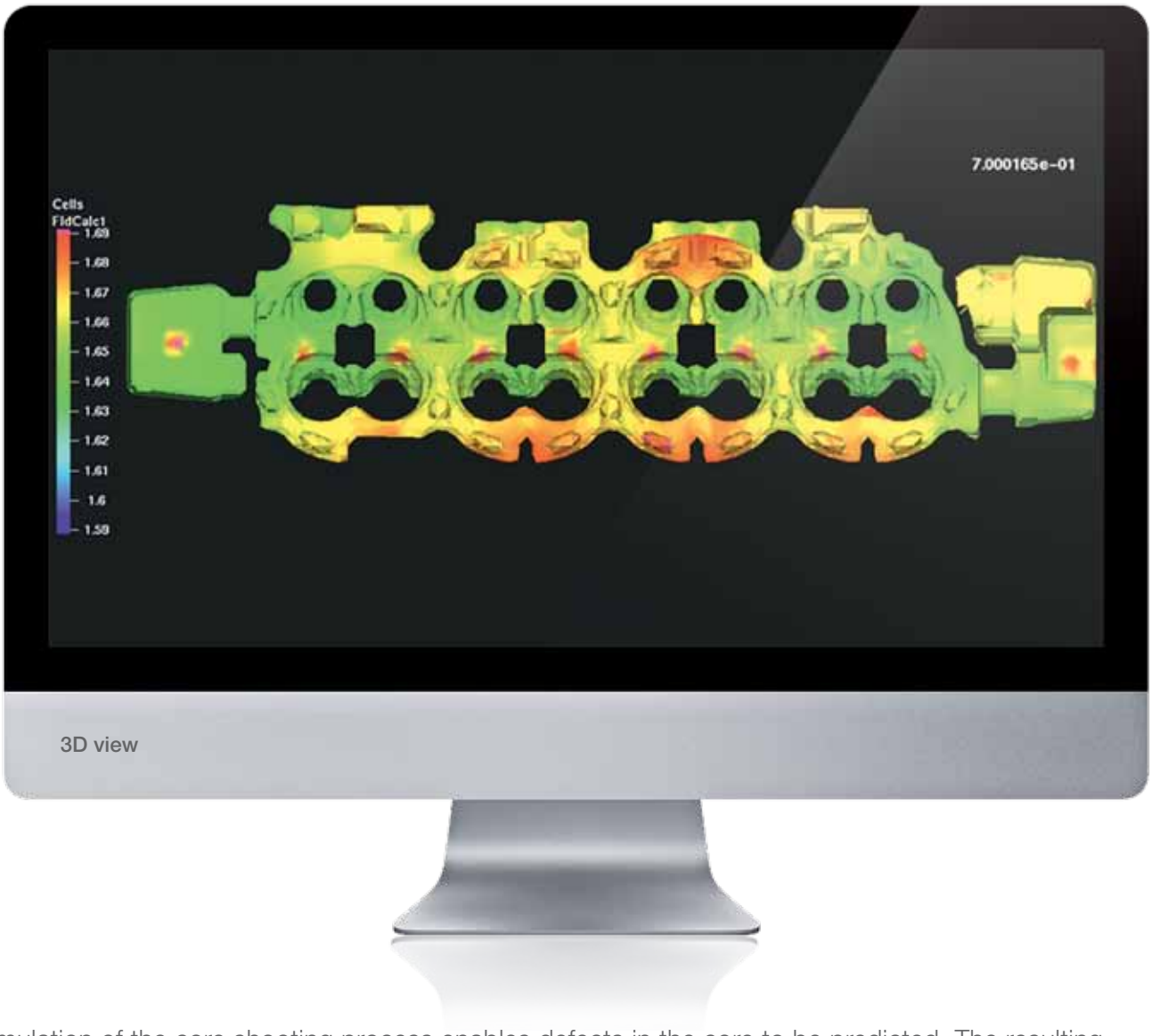
Casting simulation:

- Calculation of optimum feeding
- Less scrap due to casting defects



“Simulation for
PERFECT
CASTING RESULTS!”

Simulation Core shooting



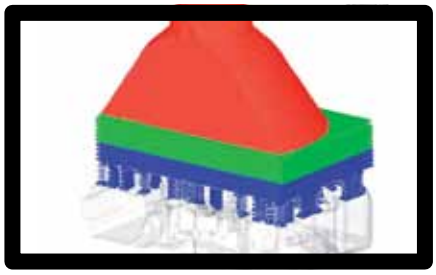
Simulation of the core shooting process enables defects in the core to be predicted. The resulting sand compaction, the flow path of the sand, pressure and speed are all used in the evaluation.

Core shooting simulations at a glance

- **Visualization of complex shooting processes**
- **Visualization of non-filled or insufficiently filled areas**
- **Visualization of areas of increased tool wear**

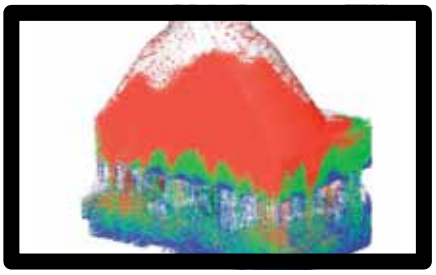
Example – Shooting head performance

The simulation represented here depicts the less than ideal draining of the shooting head as a result of the given tool design.



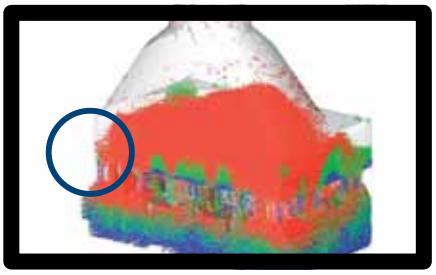
Sequence 1

Completely filled shooting



Sequence 2

Mixing of the sand

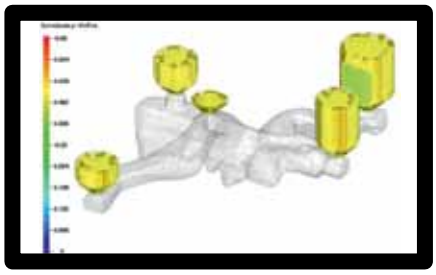


Sequence 3

Inadequately filled cores due to poor supply of sand to the shooting

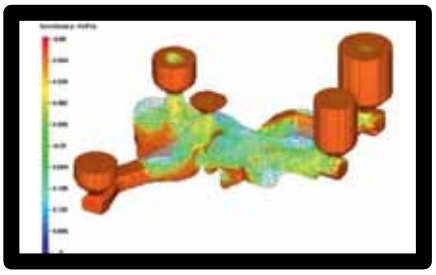
Example – Time-dependent packing density [kg/m³]

The simulation of the shooting process visualizes the filling process and displays areas of varying compaction.



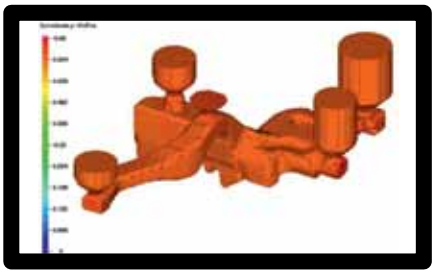
Sequence 1

Empty core tool



Sequence 2

Incompletely filled core tool



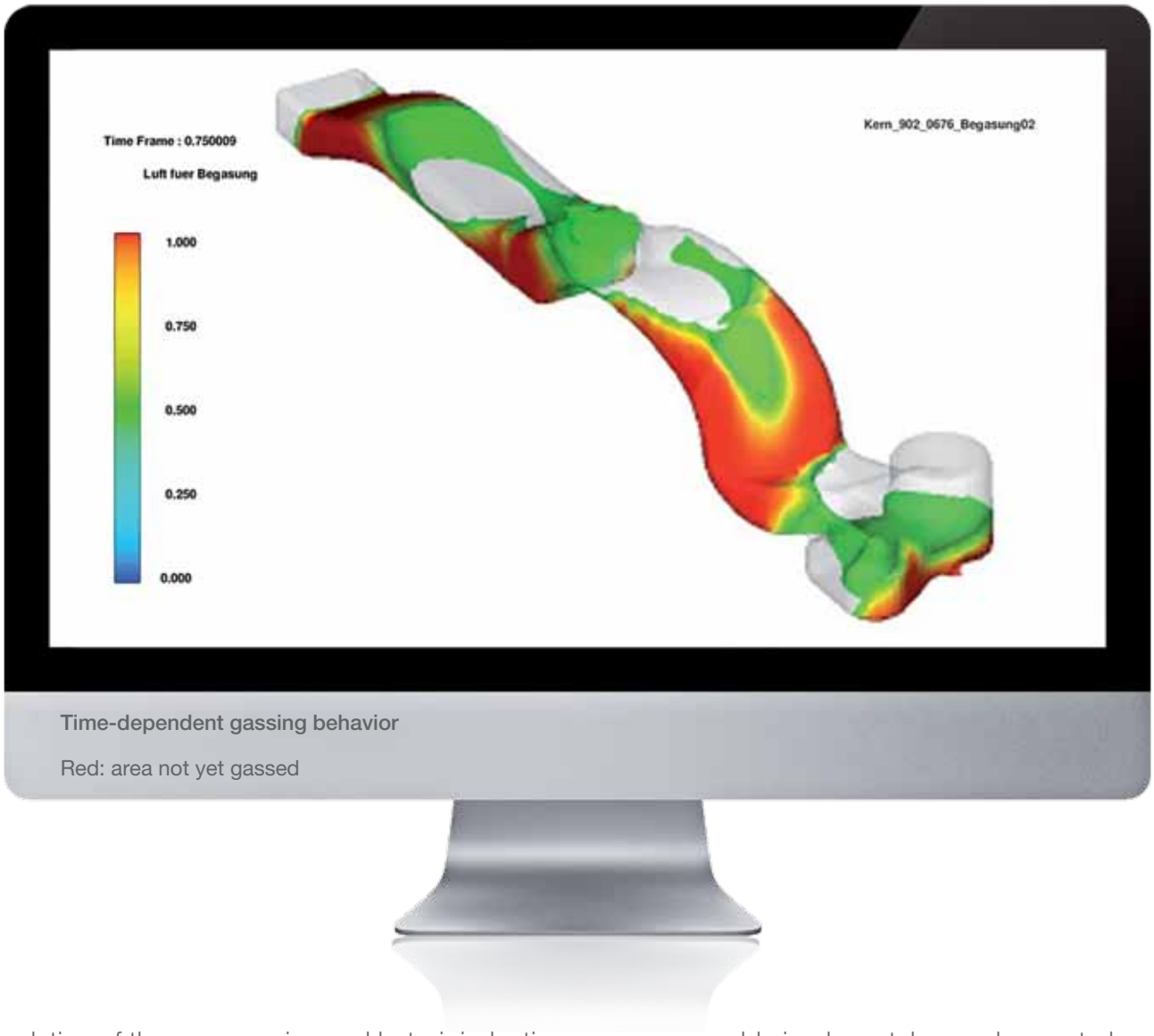
Sequence 3

Completely filled core tool

Benefits at a glance

- Optimization of injection nozzles and positions
- Optimization of vent nozzles and positions
- Optimization of shooting pressure and tool design, incl. the design of the shooting head

Simulations Core gassing and hot-air induction



Time-dependent gassing behavior

Red: area not yet gassed

Simulation of the core gassing and hot-air induction processes enable inadequately cured areas to be visualized and eliminated through deliberate modification of the CAD setup. We are systematically developing optimization approaches for you to improve the gassing times and reduce catalyst consumption.

Core gassing simulations at a glance

- **Visualization of the flow conditions**
- **Visualization of the gas pressures**
- **Visualization of inadequately gassed areas**

Example – Core gassing before optimization

Sequence 1

Core before gassing

Sequence 2

Gassing behavior

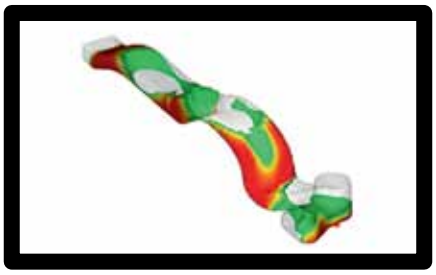
Sequence 3

Uncured area after gassing

Example – Core gassing after optimization

Sequence 1

Core before gassing



Sequence 2

Gassing behavior

Sequence 3

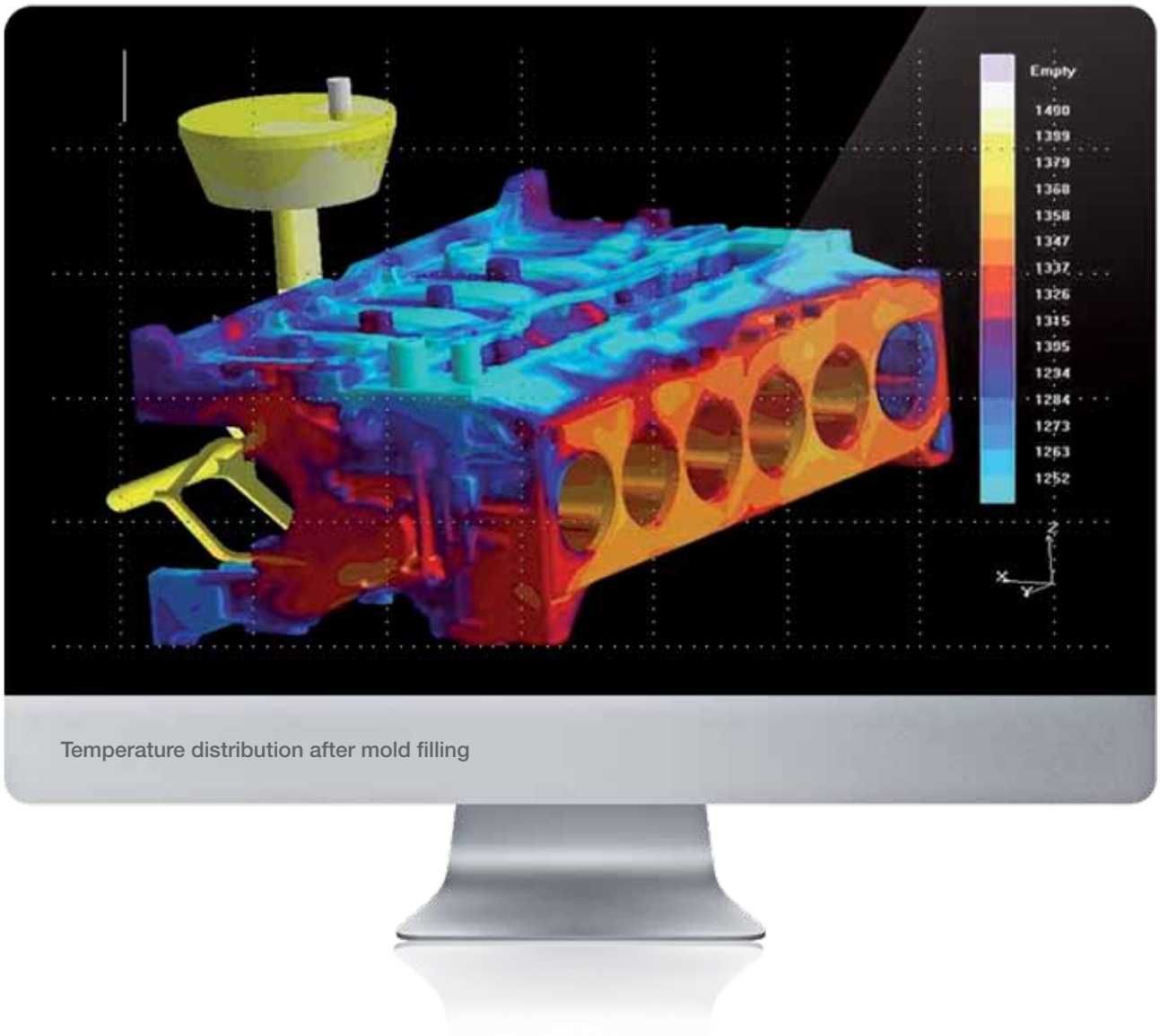
Core completely gassed ≤ 4 sec.

The information from the core gassing simulation made it possible to optimize the position and number of gassing nozzles and vents. A fully cured core is the result: cycle time saving.

Benefits at a glance

- Optimization of the gassing setup and gassing pressure
- Optimization of venting
- Optimization of cycle time and catalyst consumption

Simulation Mold filling



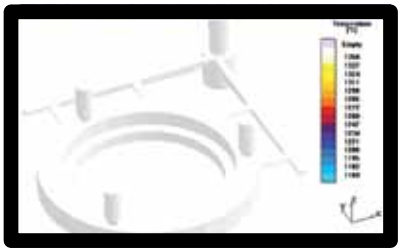
Temperature distribution after mold filling

Simulation of the mold filling process allows conclusions to be drawn about the functionality of the riser and gating system. The focus here is on temperature and flow speed distribution, cold laps, air entrapment and mold erosion.

Mold filling simulations at a glance

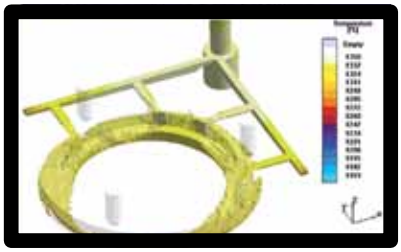
- **Visualization of the temperature distribution**
- **Visualization of the flows, turbulences, areas of risk**
- **Visualization of cold laps, hot tears and mold erosion**
- **Visualization of air entrapment**

Example – Optimization of the temperature distribution during mold filling



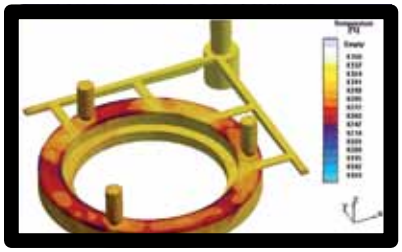
Sequence 1

Unfilled mold



Sequence 2

Partly filled mold



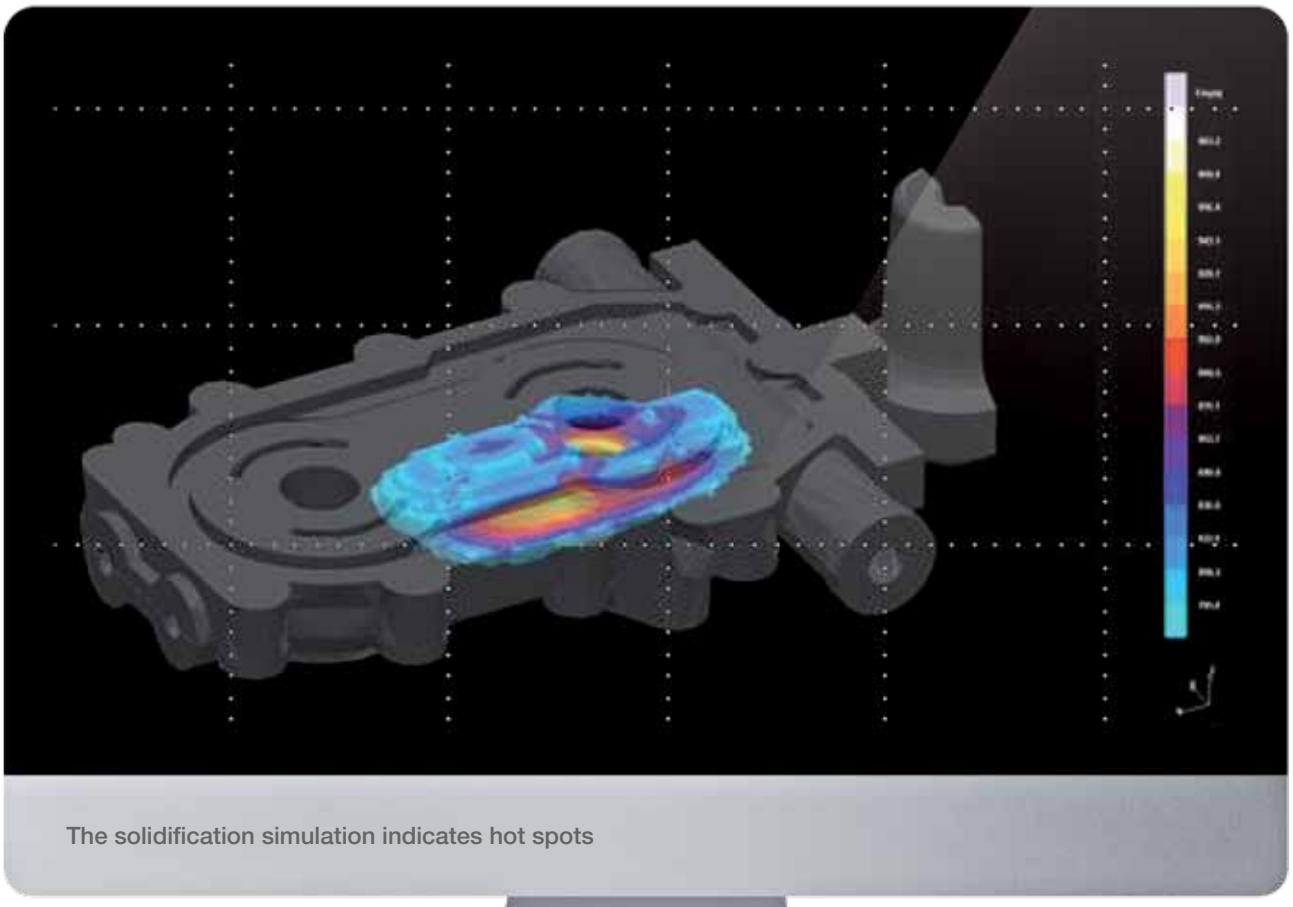
Sequence 3

Completely filled mold, very cold tempera-

Benefits at a glance

- Optimization of the riser and gating system
- Optimization of the model designs
- Optimization of the casting parameters

Simulation Solidification



The solidification simulation indicates hot spots

ASK Chemicals simulates optimum feeding, taking thermo-physical values and riser geometries as a basis. Besides simulating solidification and cooling, thermoelastic and thermoplastic stress as well as residual stresses and distortion of cast parts can also be forecast.

Solidification simulations at a glance

- **Visualization of solidification behavior and cooling**
- **Visualization of shrinkage-induced porosities**
- **Visualization of microstructures**
- **Visualization of stresses**

Example – Solidification without riser

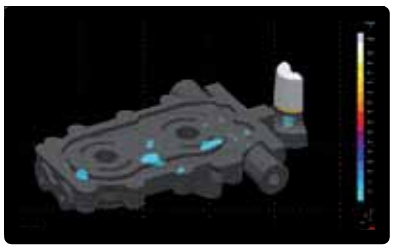
During the transition from the molten to the solid state, core volume traction (solidification shrinkage) occurs for most metallic substances and alloys. This can cause cavities and other casting defects to form.

Sequence 1

Start of the casting simulation

Sequence 2

Distribution of metal (yellow)



Sequence 3

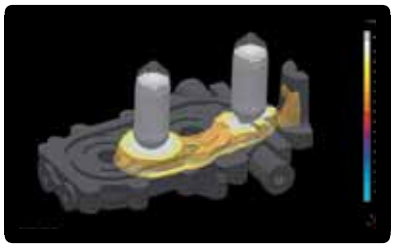
Cavity formation in the casting

Example – Optimized solidification with riser

The volume deficit produced in the mold cavity needs to be counterbalanced by post-feeding with still molten metal. This occurs with the aid of risers. The simulation reveals that the cavity formation has now relocated to the riser.

Sequence 1

Start of the casting simulation



Sequence 2

Distribution of metal (yellow)

Sequence 3

Cavity formation in the riser

Benefits at a glance

- Optimization of the riser and gating system
- Optimization of the chilling strategy
- Optimization of the output
- Optimization of the mechanical properties

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