Bruschi

Focus on simulation for door hinges

Focus on hinges - How to avoid porosity in casting

The following case study shows how to avoid porosity in casting using simulation software. In fact, thanks to this approach, is possible to minimize many kind of defects, such as porosity, caused by air entrapment which could influence components mechanical characteristics.

Hinges should have mechanical characteristics as core features: this is the reason why a better pre-casting analysis allows designers to foresee material reactions inside the mould cavity and, concerning mould temperature, is possible to identify any defects such as cold laps and hot spots, and is feasible to simulate temperature exchanges during the solidification phase and mould opening.

For this reason is necessary to start with die casting simulation: it can help specialists to identify the best mould design parameters since the very beginning, obtaining an important cost reduction and better mechanical performances.

Summarizing a designer proactive approach can avoid and anticipate defects in hinges such as flow marks and blisters, cold laps, porosity, shrinkage porosity, lakes, and shot to shot inconsistency.

To learn more about this topic please read the following case study.

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CASE STUDY

Door Hinges

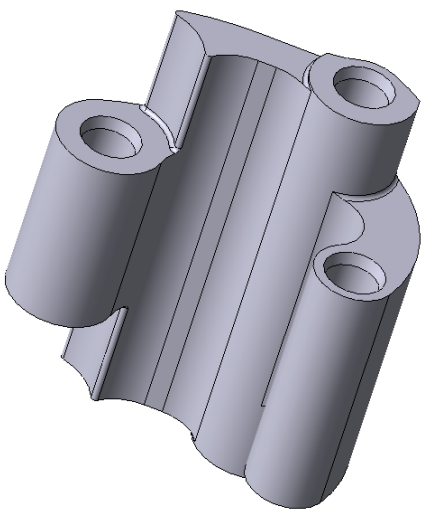
Case Study - Door hinges

PRODUCT
Door hinge

PROJECT CHARACTERISTICS
Mechanical component are under medium-low stress intensity: mechanical characteristics and resistance to wear are fundamental. Simulation could help to avoid possible defects due to air entrapment.

Objective and phases

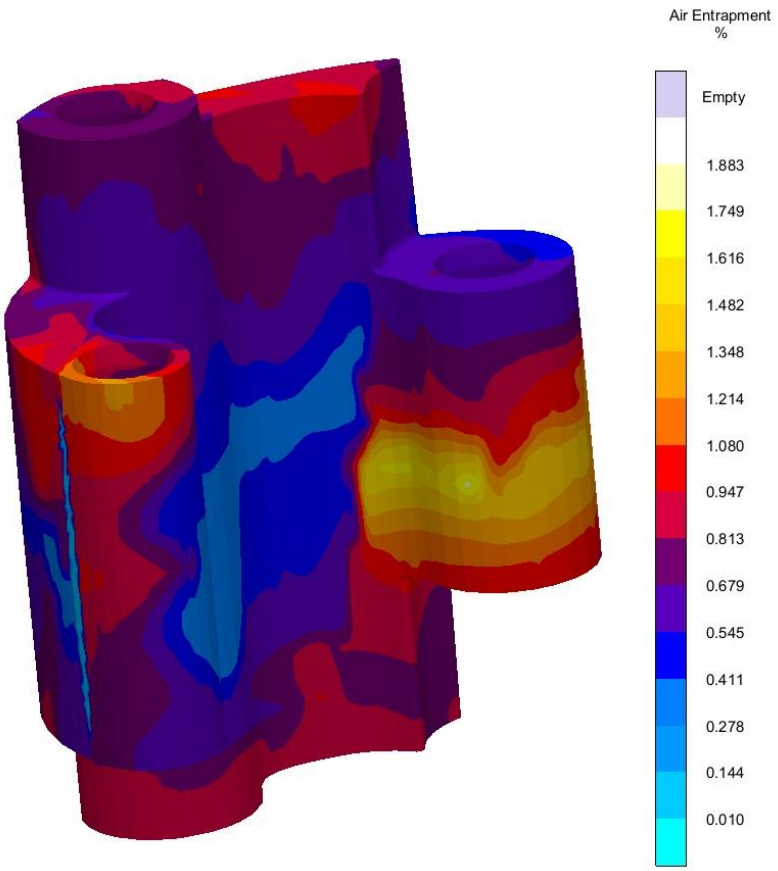
Project goals were to minimize defects that may influence mechanical characteristics of the part such as for example porosity. The part needed to be free of air entrapment, it must be filled correctly, there must be no missing details and low or tend to zero shrinkage porosity both internally and in proximity of feeders.



Experience with mass production of similar components has shown how porosity could become an extremely critical aspect due to metal shrinkage in feeder proximity where the material solidifies later and contracts while cooling. The simulation analysis focuses mainly on the solidifying phase, with the objective of finding a configuration that allows homogeneous cooling of the part avoiding the creation of hot areas.

Results

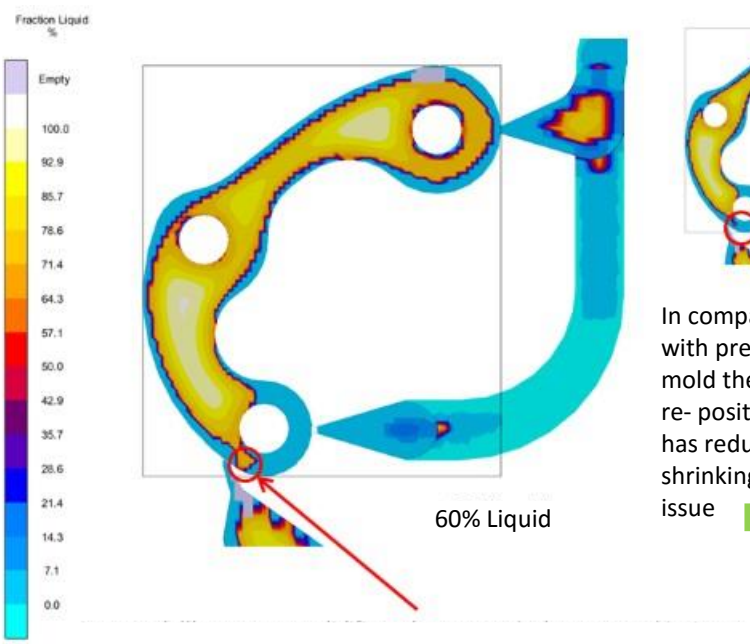
Analysis on filling phase is focused on air entrapped identification. As you may observe, the quantity of air is minimal and evenly distributed in small amounts across the part.



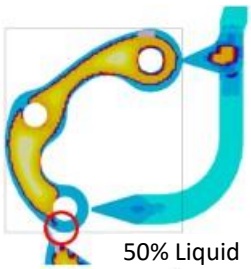
The porosity is analyzed observing part behavior during the solidifying phase.

With simulation software is possible to analyze porosity directly during the solidifying phase. In this case, focused on hinges mechanical characteristics, the most suitable solution was to change configuration. In fact, in previous simulation, the feeder duct was perpendicular to the axis of the holes causing defects but, after tests, in this simulation the duct is orientated parallel to them and its geometrical configuration is optimized to avoid the creation of hot spots on the part surface.

As can be observed in new configuration image the surface closed to the feeders solidifies much more rapidly with subsequently diminished risk of material shrinkage porosity by alloy flowing back into the feeder ducts or into the part itself. The problem of shrinkage porosity, typical for this type of product, has been fully eliminated.

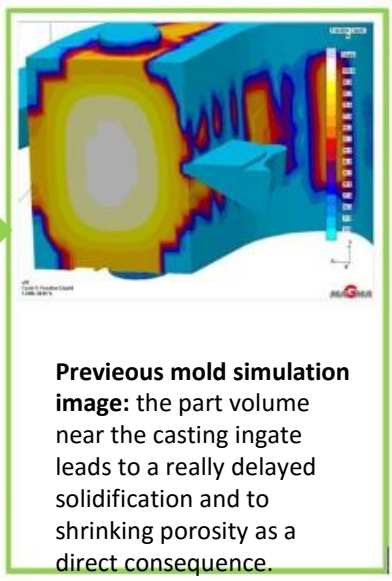


60% Liquid



50% Liquid

In comparison with previous mold the Junction re- positioning has reduced the shrinking porosity issue



Previeous mold simulation image: the part volume near the casting ingate leads to a really delayed solidification and to shrinking porosity as a direct consequence.

The junction area solidifies fast (colored in light blue), together with the rest of the product surface, lowering the surface shrinking porosity risk. The most critical area is the one right below the junction (red circle) where the cooling is much slower because of the proximity to the feeder. That should not be a problem as the next picture (50% liquid) shows the above mentioned area is solid while the core of the part is still liquid (colored in yellow).

About Bruschi

For over 70 years Bruschi has been working in industrial production in the field of zinc die casting. Over time the company distinguished itself for efficiency, accuracy, ability to listen to its customers' needs and innovative drive in technology, co-design and mass production.

Bruschi technicians apply know-how acquired by working in many sectors of industry during co-design activities with the client. In fact it is an interdisciplinary knowledge placed at the service of the client's engineers. A huge expertise in the zinc alloy die casting industry allows to anticipate customers' needs and expectations, by providing engineering solutions to accelerate time of delivery, improve performances, and simplify integrations.

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