Designing Better Molds by Using Simulation Early in the Design Process

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Your presenters today

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Project engineer with custom injection molder

Joined Autodesk in 2013
- Moldflow Technical Support
- Technical Marketing

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Joined Delcam 1984
- UK Sales & Support
- International Support
- Marketing

Joined Autodesk 2016
- Technical Marketing (PowerShape & Netfabb)

CLASS OUTLINE & AGENDA

- Challenges facing mold designers
- What is PowerShape?
- What is Moldflow?
- How simulation helps avoid costly errors
- Autodesk – the complete solution
- See it in Action: Conformal Cooling Example
- Questions?

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What is the most expensive type of mold?

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CHALLENGES FACING MOLD MANUFACTURERS

Ever increasing pressure to improve quality while shortening lead times

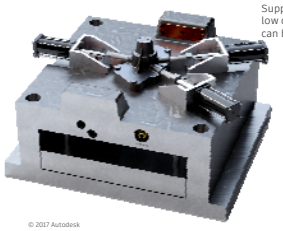
CATCH 22. Mold design must often begin *before* part design is finalized.

Supplied part geometry is often low quality, or incomplete (IGES) and can be in a wide variety of formats.

Parts are getting ever more complex, and so are the tools that make them.

New tools and technologies are emerging all the time, and many companies struggle to keep pace.

Moldmakers typically do not get paid until the tool has been commissioned; right first time is critical.



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WHAT IS POWERSHAPE?

A suite of CAD tools, specifically designed for preparing parts for manufacture

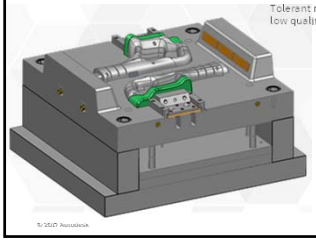
Integrated wireframe, surface, solid, mesh and assembly modeling

Tolerant modeling that can handle low quality data (IGES)

Integrated specialist tools for mold and press die design.

EDM electrode design, including automated machine setting

Windows 'Ribbon' interface, shortening learning times.



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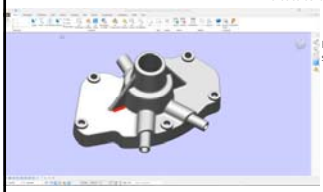
WHAT MAKES POWERSHAPE GOOD AT MODELING FOR MANUFACTURE

Unique 'Solid Doctor' to repair poor quality geometry without extensive re-modeling.

Powerful Direct Modeling tools to address common molding issues (inadequate draft, uneven wall-thickness etc.)

Multi-direction solid splitting, to create cores, cavities and slides.



Easy to use surface modelling to create split surfaces and shut-outs.

True 'hybrid' modeling – use surfaces, solids, and meshes in *any* combination

Direct connection to PowerMill, to speed up machining

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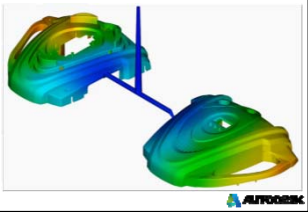
WHAT IS MOLDFLOW?

An advanced simulation tool for part, tooling, and process development of injection and compression molded parts

Material database houses 10,000+ thermoplastic and thermoset materials and 100+ mold materials

Integrated CAD kernal for direct import of native and non-native files



Cool, flow, and warp simulation of 12+ molding processes

Advanced analysis and optimization tools including transient cooling, valve gating, fiber, stress, and optimizations

Result, mesh, and CAD export for post-processing in FEA, milling, or visualization software

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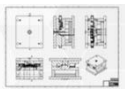
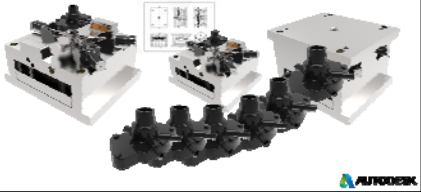
Traditional mold design workflow

Full Design → Manufacture → Try-out → Re-design & Re-build → Use





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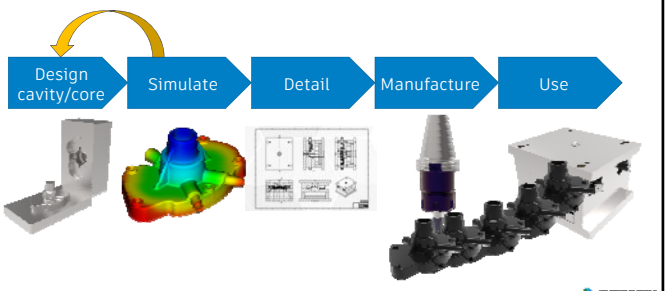
Mold design workflow with simulation



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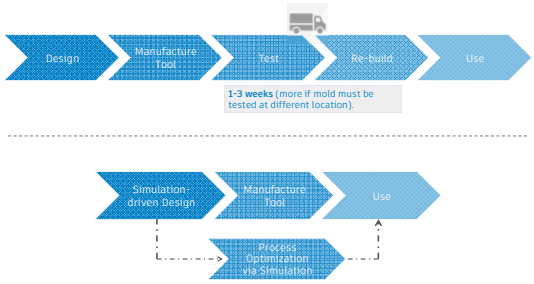
Where is the benefit?



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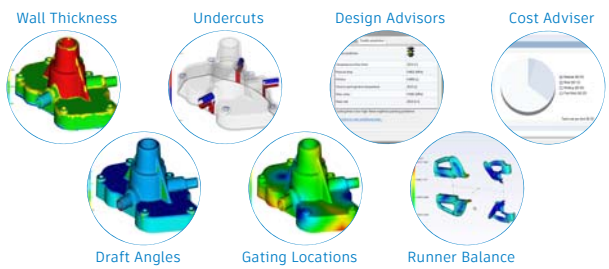
Sim for the Tool Designer: Moldflow Adviser



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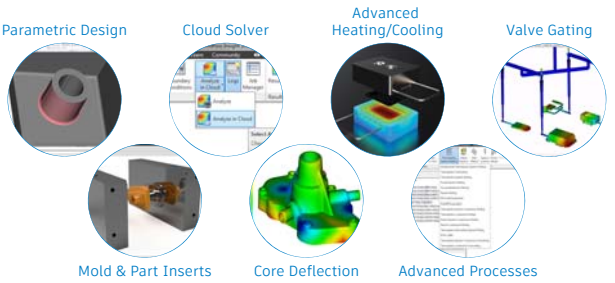
Sim for the Tool Designer: Moldflow Insight



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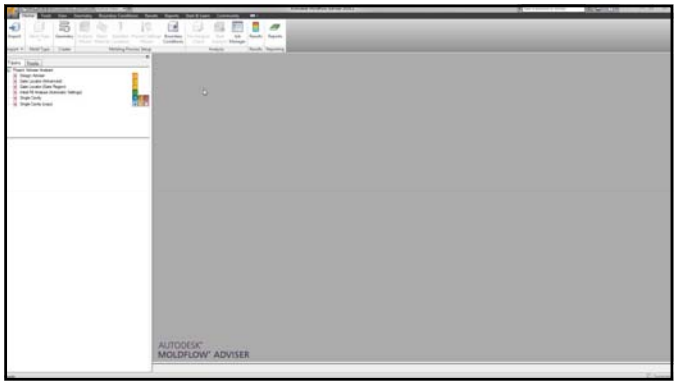

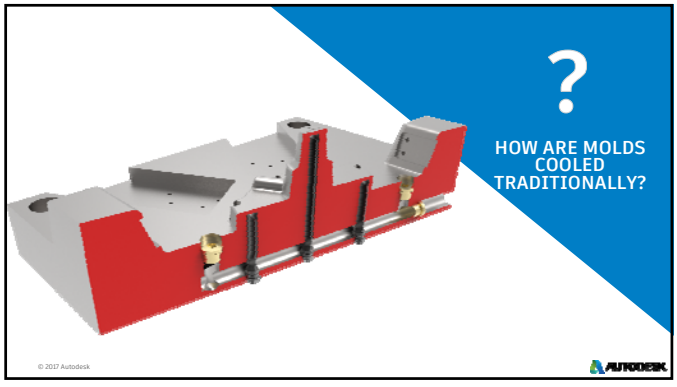

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Machined Cooling Channels

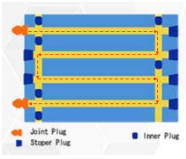
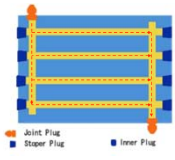


Image Credit: http://mould-technology.blogspot.com



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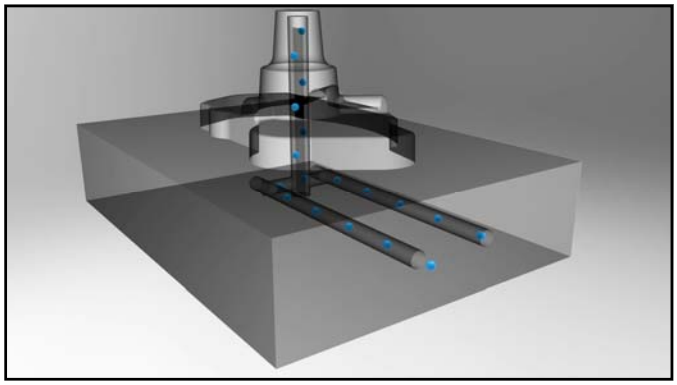
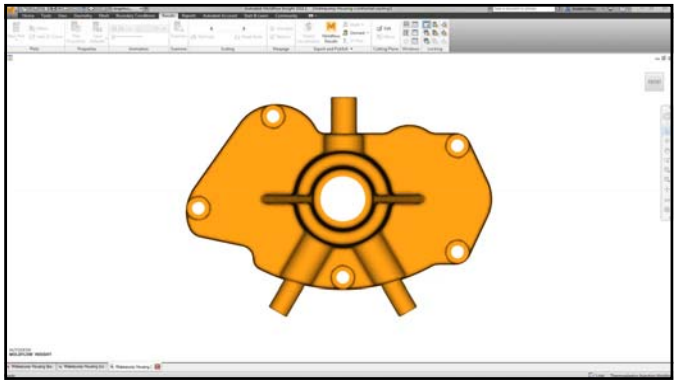
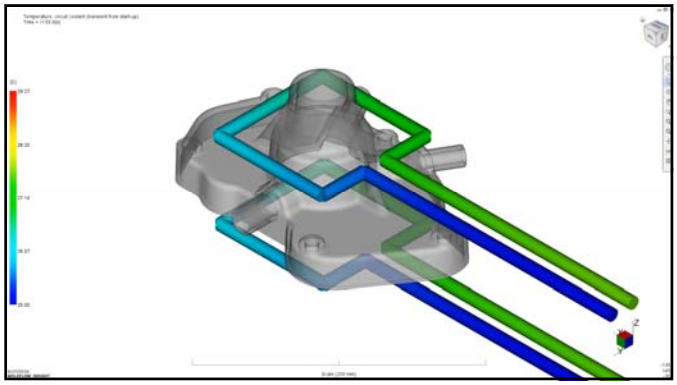
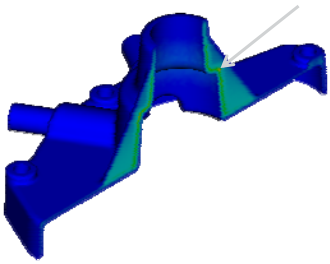






Basic Machined Cooling: Simulation Summary

Time to reach Ejection Temperature: **248 s**



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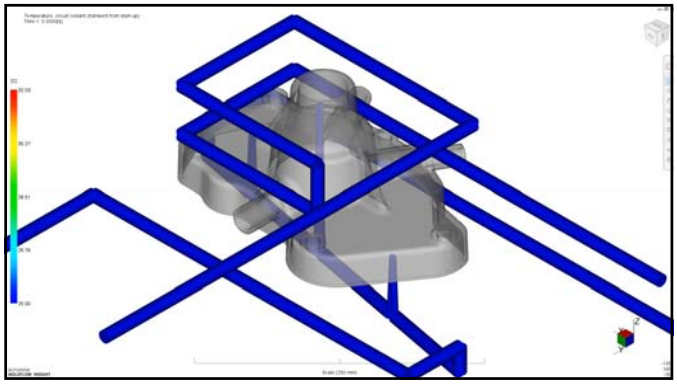
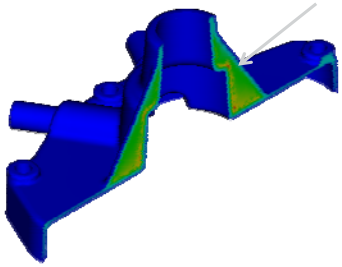


Complex, Machined Cooling: Simulation Summary

Time to reach Ejection Temperature:	134 s



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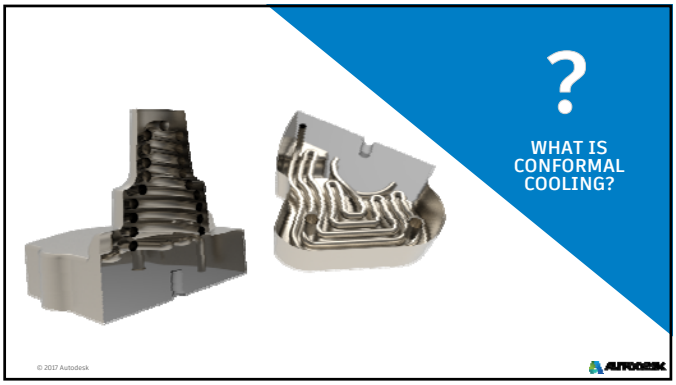

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Conformal Cooling

Conformal cooling channel is a cooling passageway that follows the shape or profile of the mold core or cavity to perform rapid, uniform cooling.

https://en.wikipedia.org/wiki/Conformal_cooling_channel

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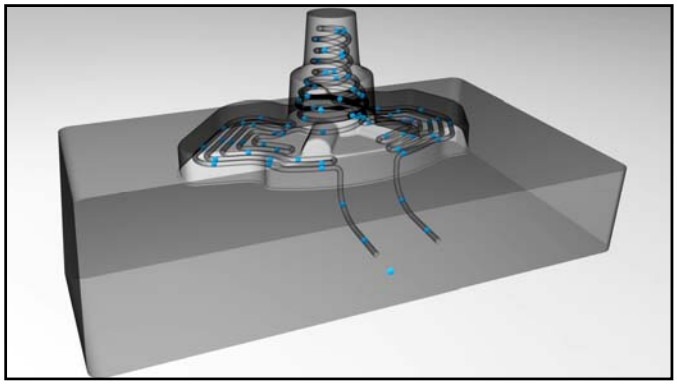
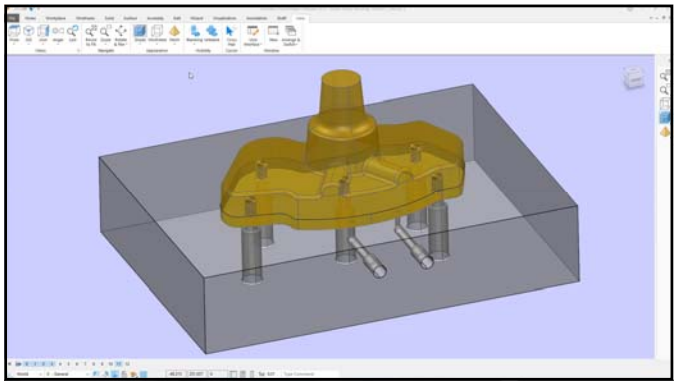
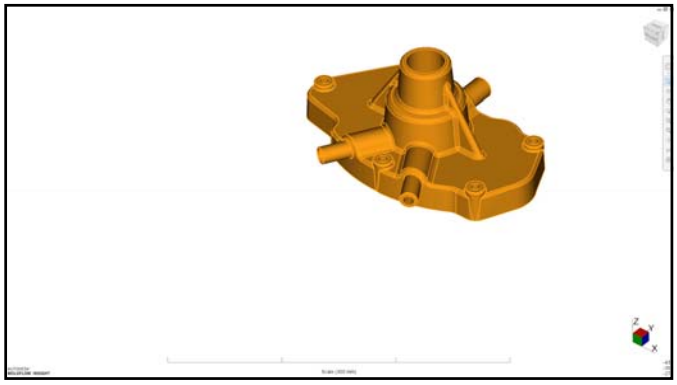
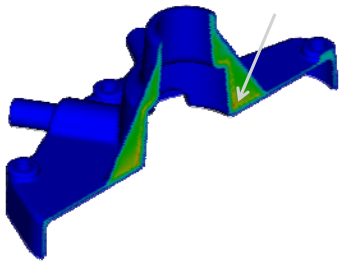






Conformal Cooling: Simulation Summary

Time to reach Ejection Temperature:	124.4 s



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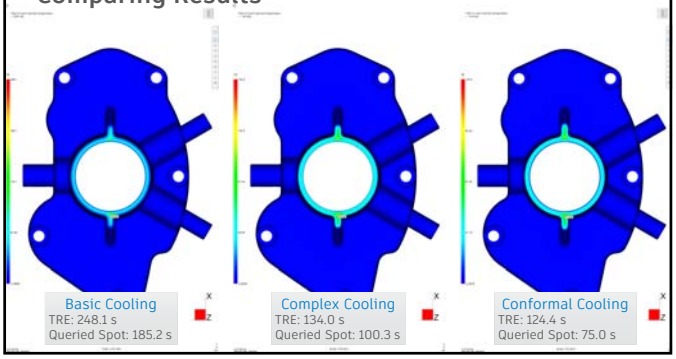
Comparing Results



Basic Cooling
TRE: 248.1 s
Queried Spot: 185.2 s

Complex Cooling
TRE: 134.0 s
Queried Spot: 100.3 s

Conformal Cooling
TRE: 124.4 s
Queried Spot: 75.0 s

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Conclusions

Including simulation early in the mold design process can help you:

- Ensure that molds will work correctly, before you begin cutting steel
- Explore different design options, and choose the one that will deliver the best mold possible
- Reduce lead times
- Avoid costly re-working of molds

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Questions?

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