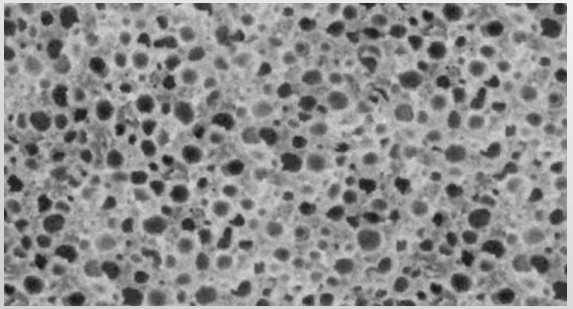
GK CONCEPT

Engineering Factory.

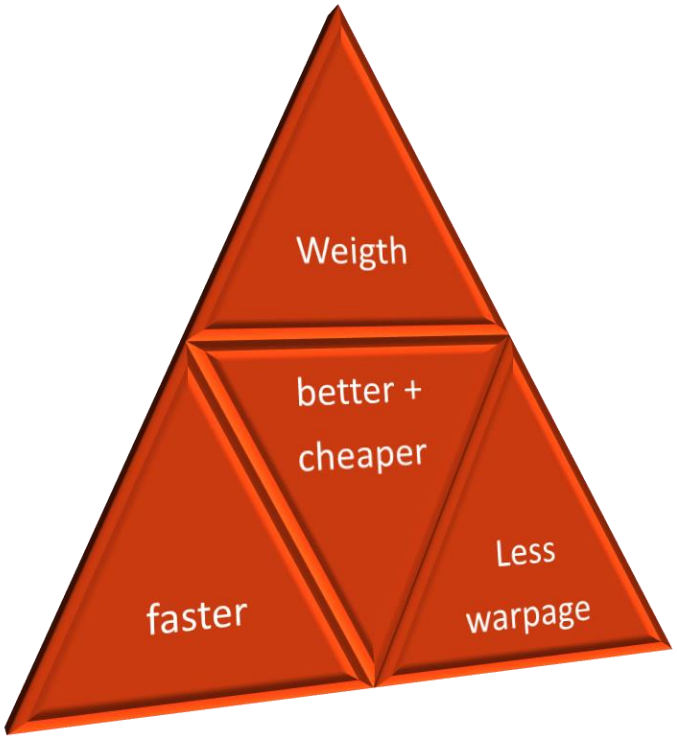


MuCell® Engineering - Thermoplastic Foaming

22.03.2018

GK CONCEPT

Why thermoplastic Foaming?



-10% Part Weigth

-30% Clamp Force

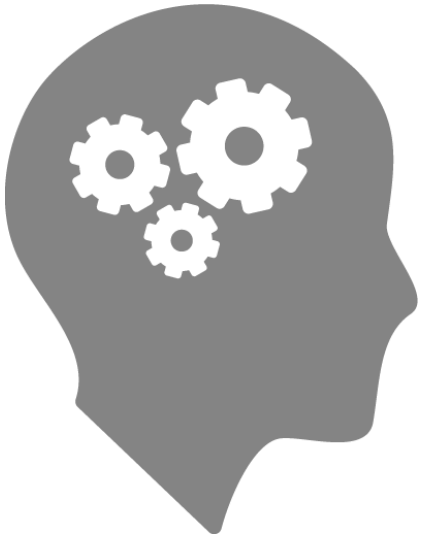
-10% Cicle Time

-70% Warpage

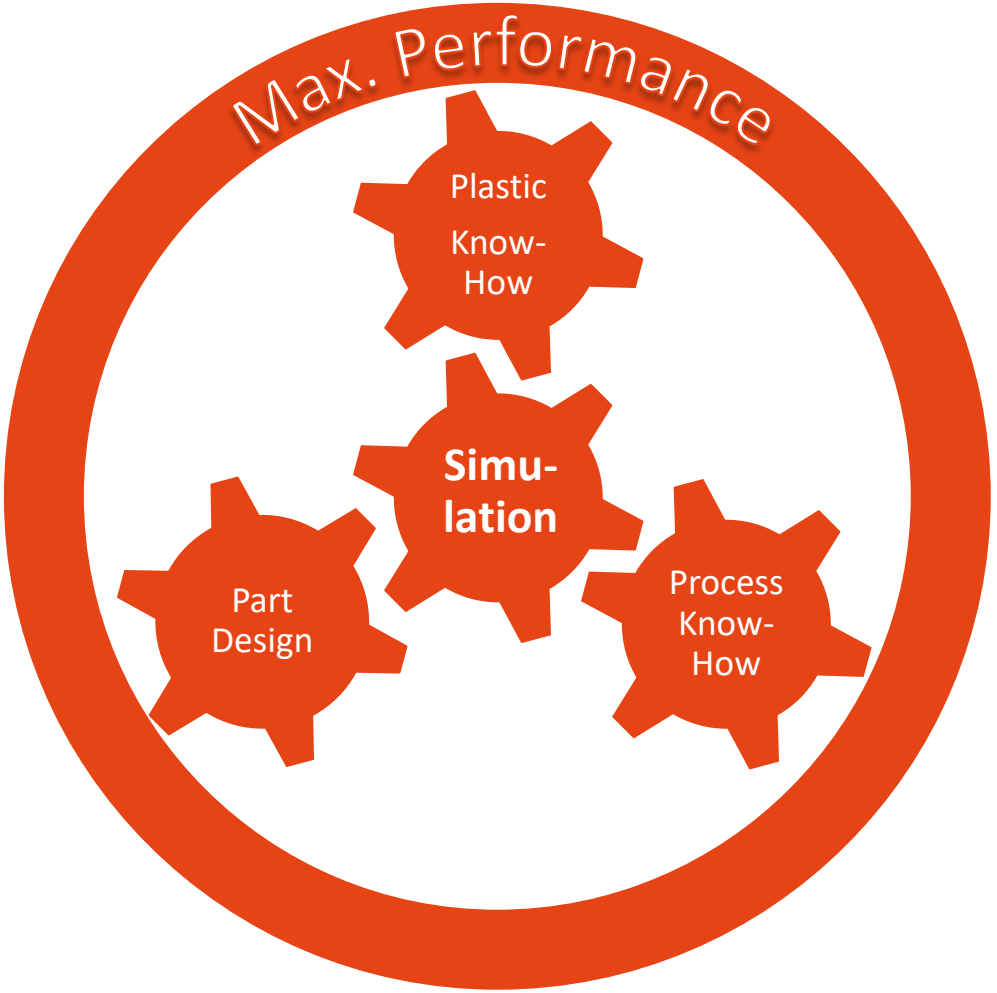
BUT .....

GK CONCEPT

… this works not automaticly

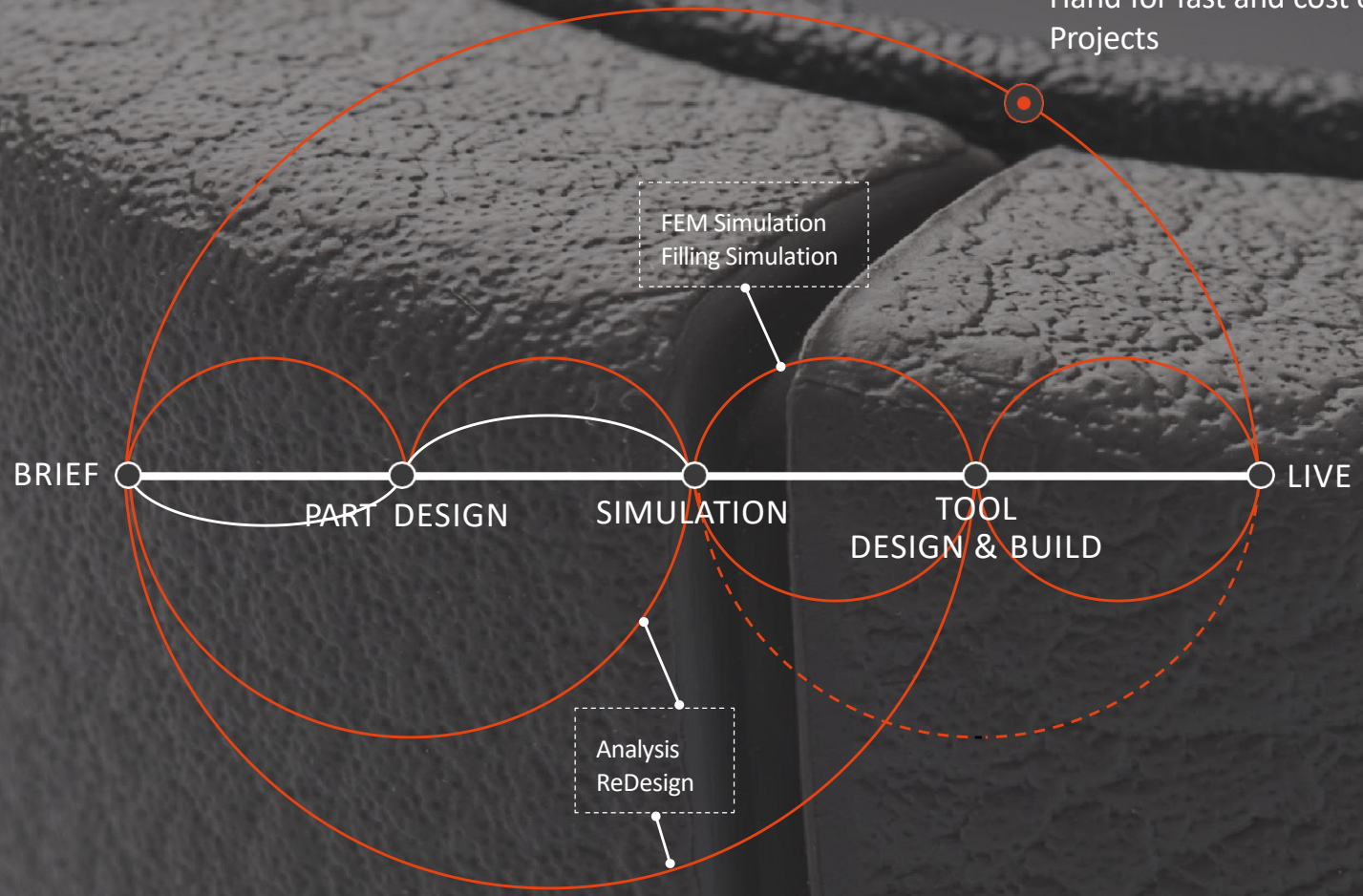


…

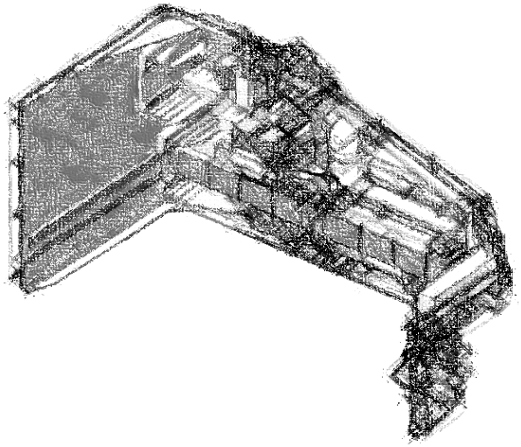


The Way to a perfect Part in the rigth Technologie

Project Management out of 1 Hand for fast and cost effective Projects

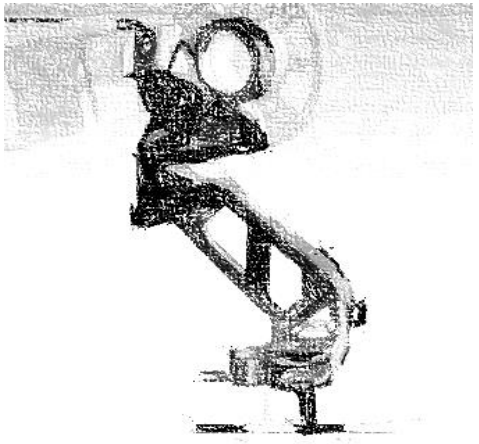


ENGINEERING FACTORY.



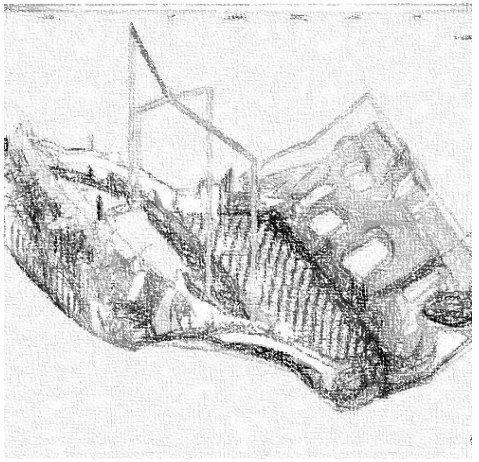
Part Design

- Automotive Part Design
- 1 up to 3K Design
- Structural Parts
- Material Substitution
- Hybrid Design
- Kinematic Part Design



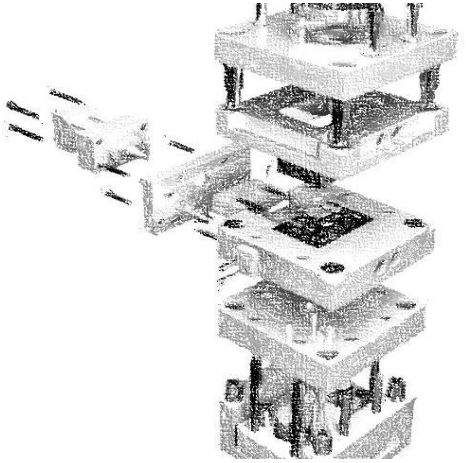
FEM

- Simulation by Ansys
- static-linear and nonlinear FEM-simulations
- strenght- and stiffness verifications
- calculation of kinematic assemblies
- simulation of heat storage at elevated temperatures



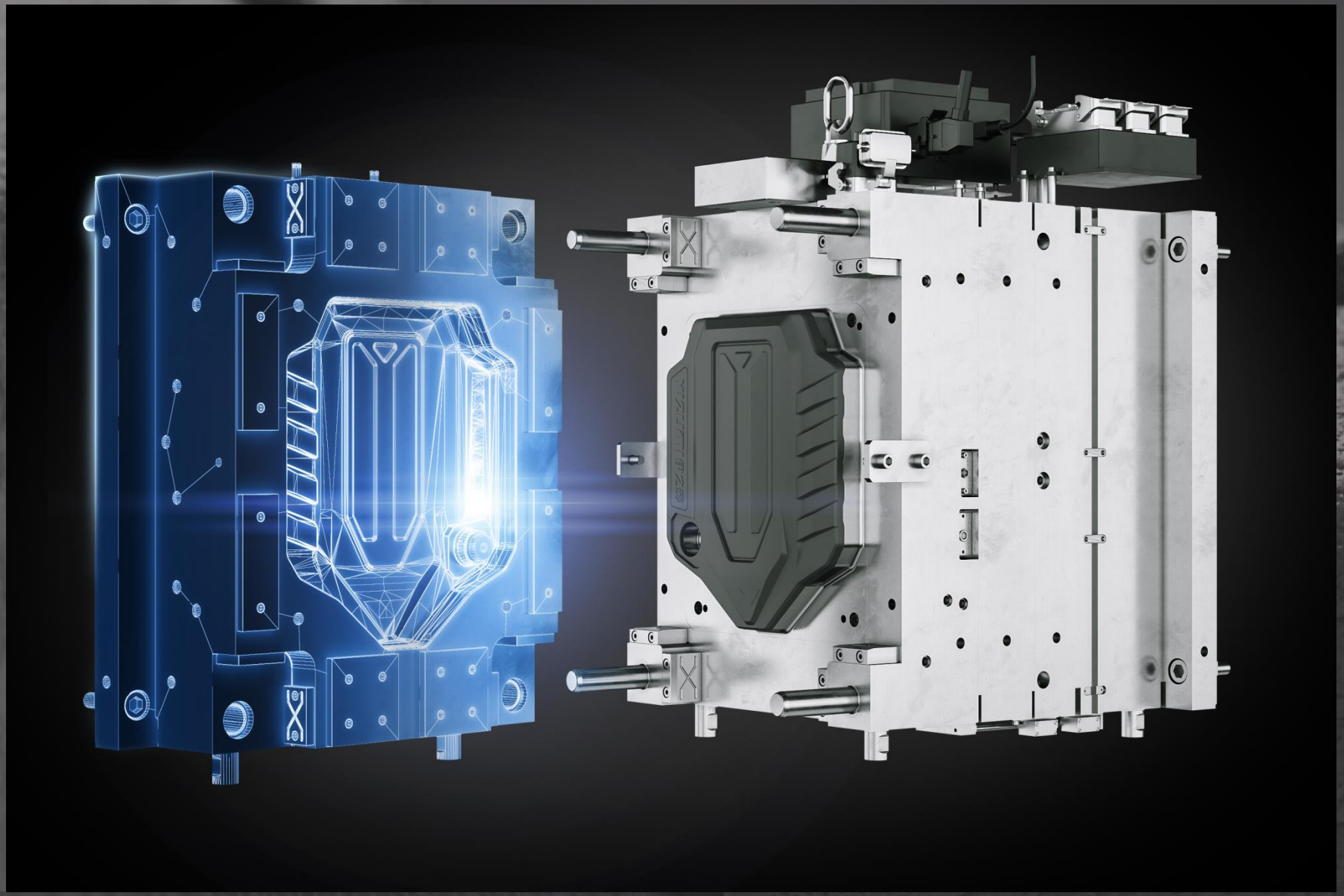
Filling Simulation

- Simulation by Cadmould & Moldex 3D
- Stress & warpage simulation
- Cooling Simulation
- Flow Line Simulation
- Filling Simulation



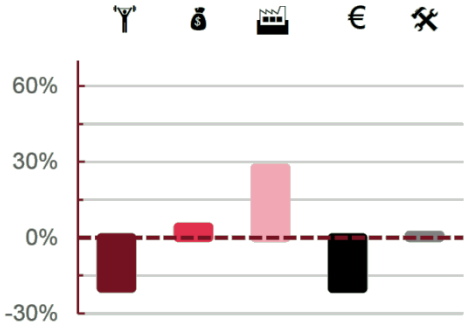
Tool Design & Build

- Tooldesign by Catia V5
- Tool Build from 40T up to 3500T clamping Force
- Injection & Pressmouldings
- Physical Foaming Foam Tools



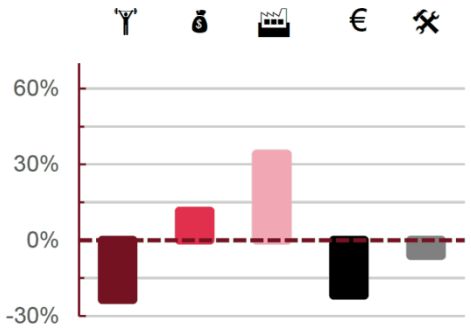
GK CONCEPT

IP - Carrier



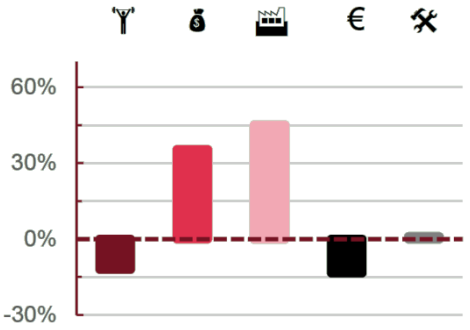
- Reduced Wall Thickness
- Same Rigidity

Ventilation - Frame



- Reduced Wall Thickness
- Homogenised Wall Thickness
- Sligth reduced stiffness

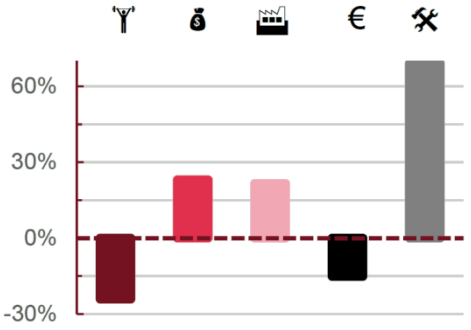
Oil - Tray



- Reduced Wall Thickness
- Homogenised Wall Thickness
- Same stiffness

Under Body Cover

Tool with opening stroke

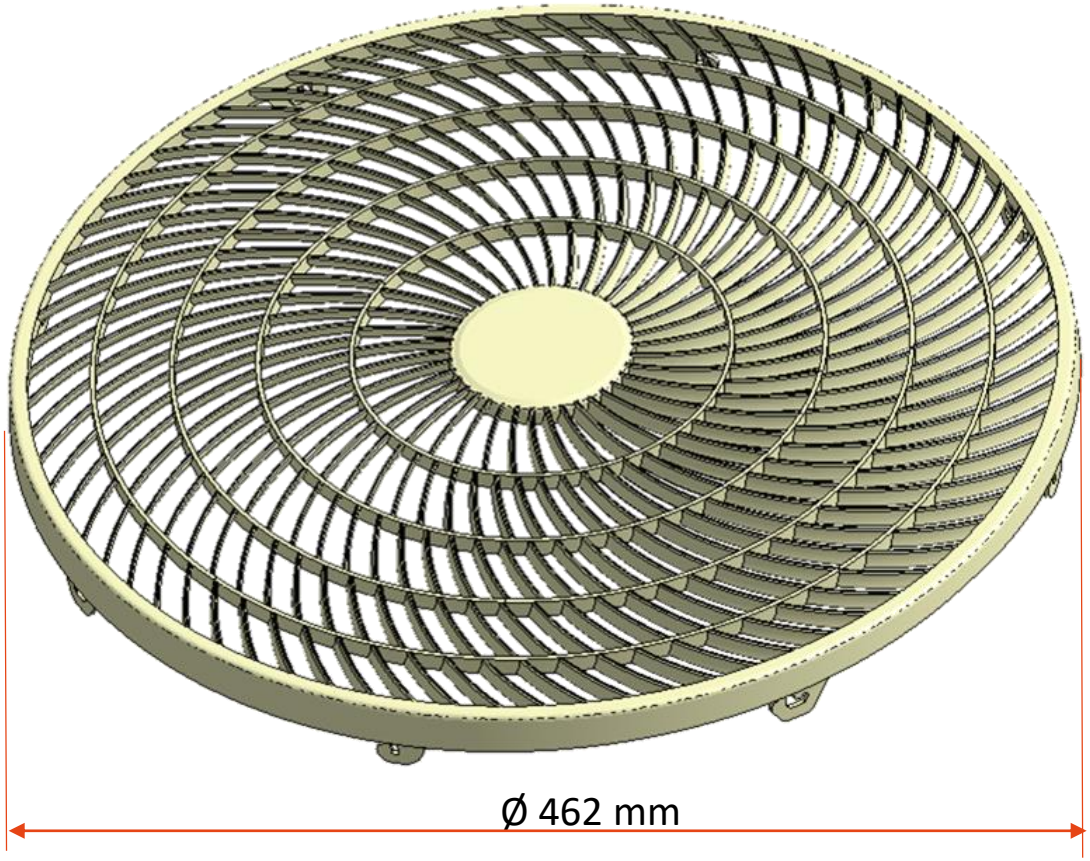


- Large Wall-Thickness
- High Foam Content
- Highly increased Stiffness

Weigth Investment Produktivität € Part Cost[1] Important mechanical Behavior

[1] Calculation in Relation of 300´000 Parts/Year

Example: Vent Cover



Part Information
- Ø 462 mm
- h= 44 mm
- Volume: 310 cm³
- 8 Sliders

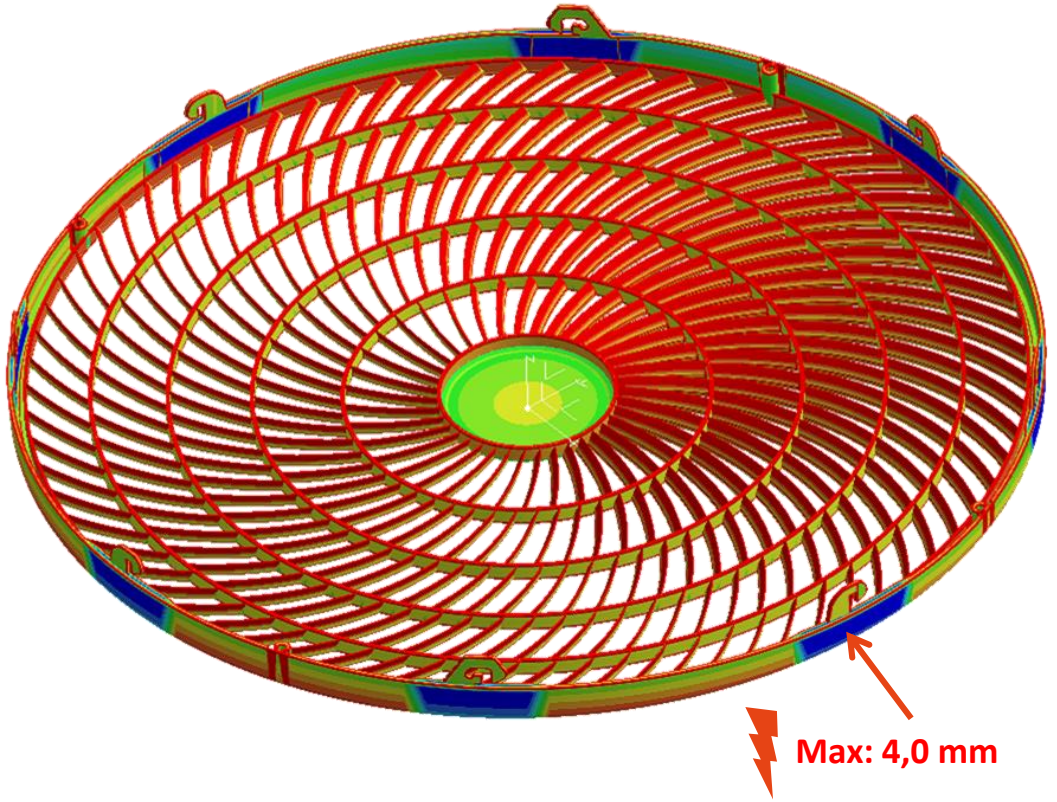
Part Design Evaluated in Coperation with

YIZUMI

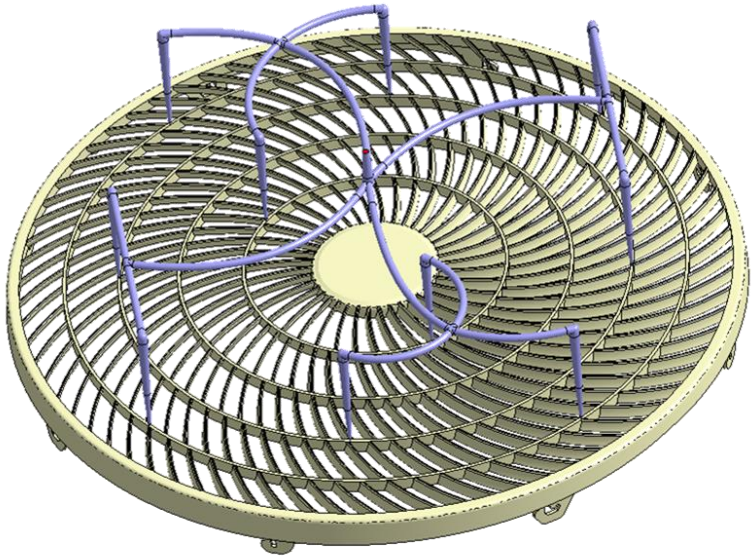
Example: Vent Cover – Start Level – Part Analyzing

Analyzing Wall Thickness Distribution:
- Basic Thickness: 2,2 mm
- Thinest Wall Dimension: 1 mm
- Thickest Wall Dimension: 4 mm

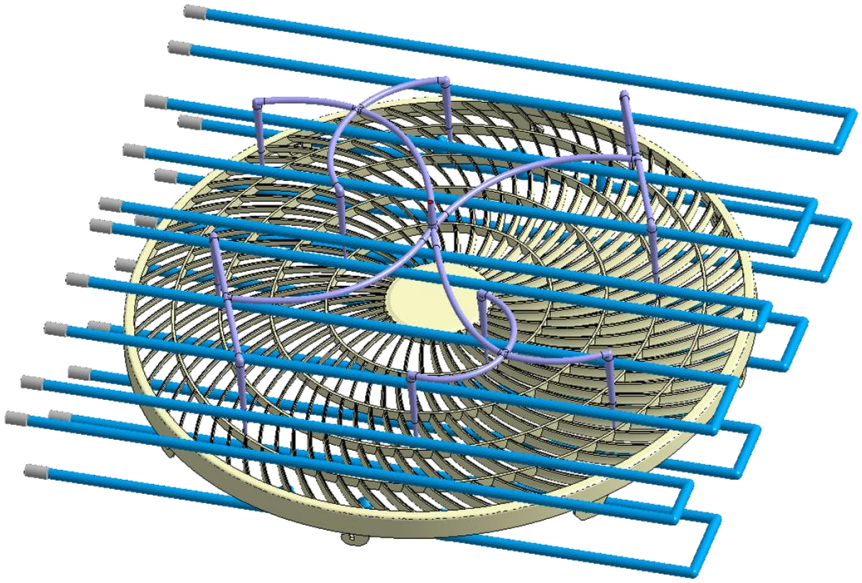
Primar Goal in Part Re-Design:
Homogeneneous Wall Thickness
- Reducing of Thickest Wall Dimension
- Reducing of Basic Thickness



Example: Vent Cover – Start Level – Tool Analyzing



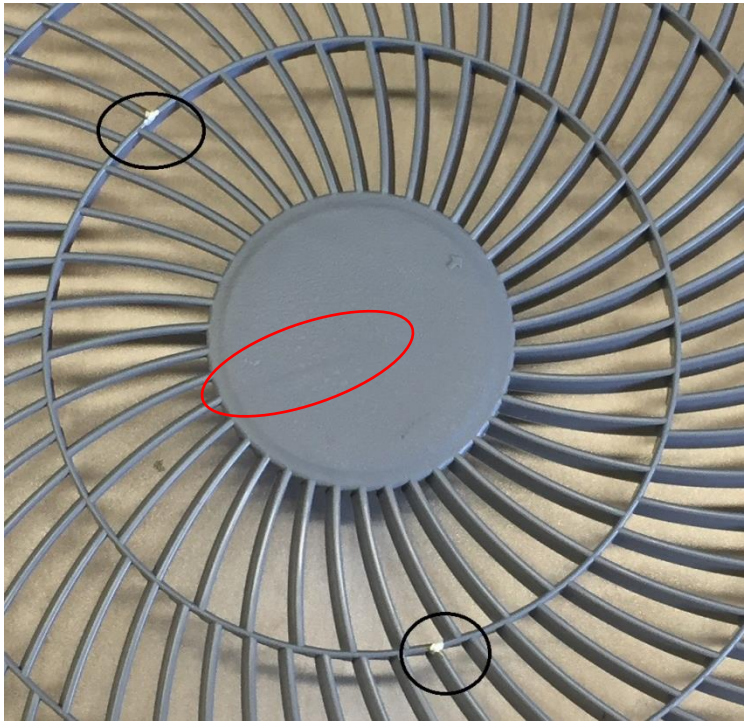
Cold Chanel Injection with 10 Drops
→ 3-Platen Tool required



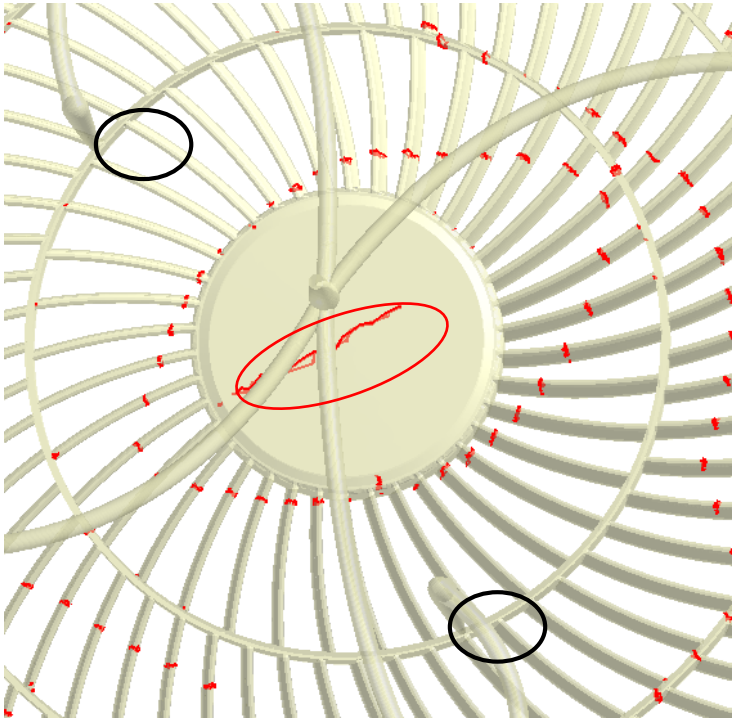
Standard Cooling

Example: Vent Cover – Start Level – Validation of Flow Charasteristics

Flow Line in the Part



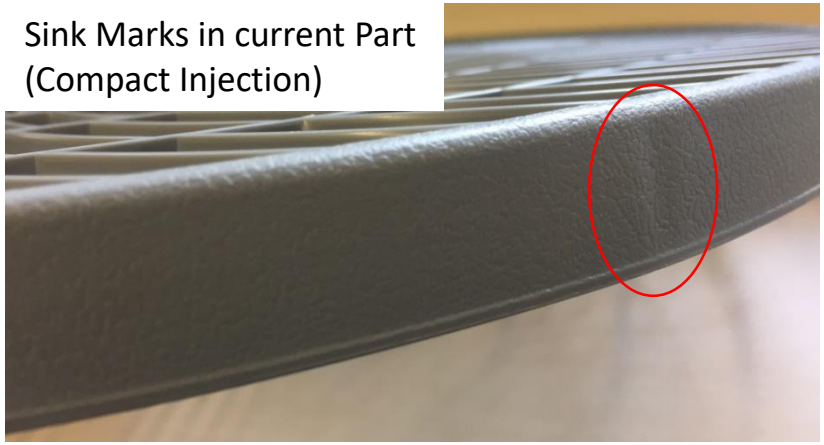
Simulated Flow Line



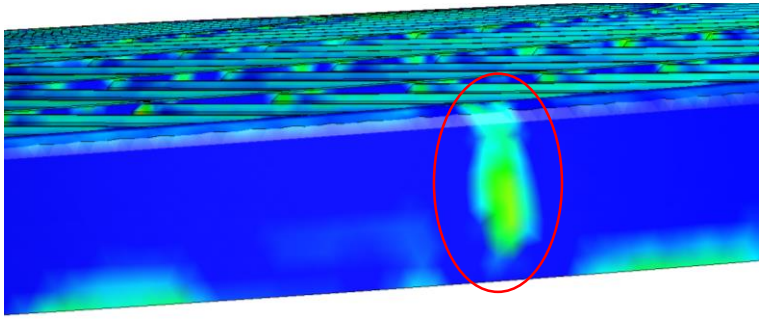
Simulated Flow Line shows the same charasteristic as real Part

Example: Vent Cover – Validation Sink Marks

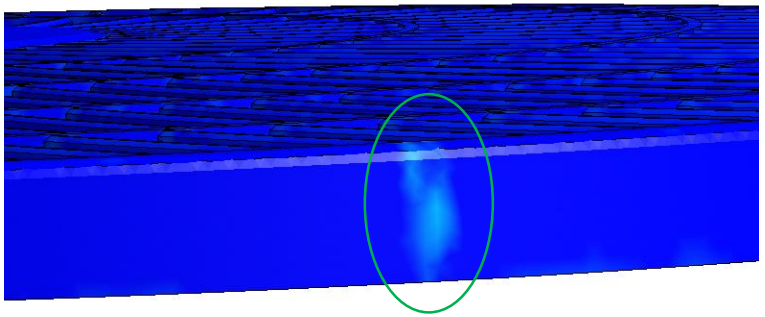
Sink Marks in current Part
(Compact Injection)



Simulated Sink Marks (Compact Injection)



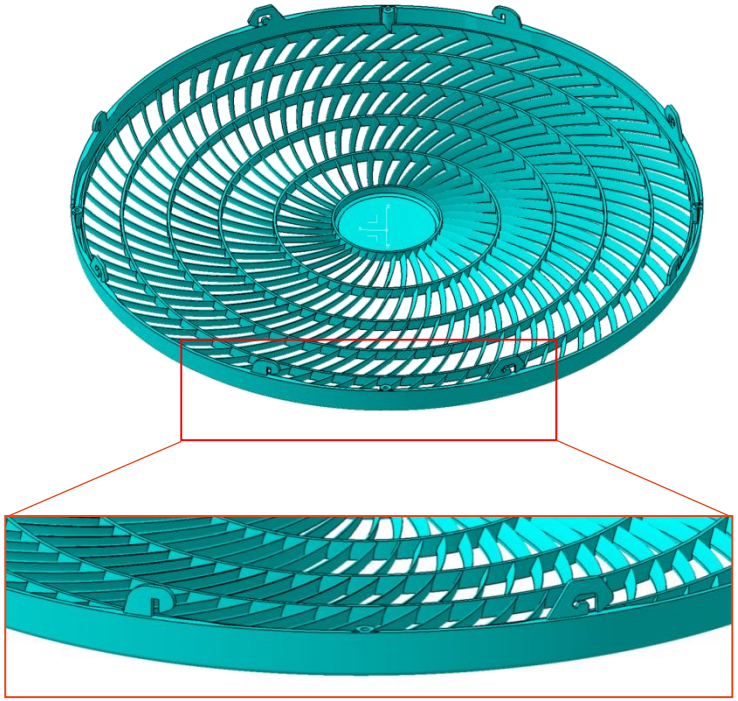
Simulated Sink Marks (MuCell®)



Sink Marks will be reduced
after foaming intesivly

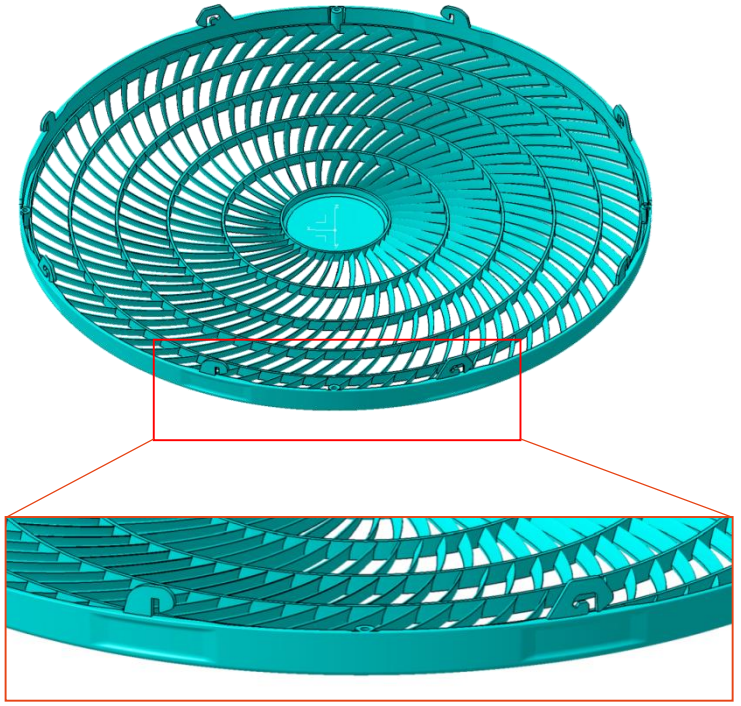
Example: Vent Cover – Part Re-Design

Original Design



- Wall Thickness up to 4 mm
- Standard Thickness 2,2 mm

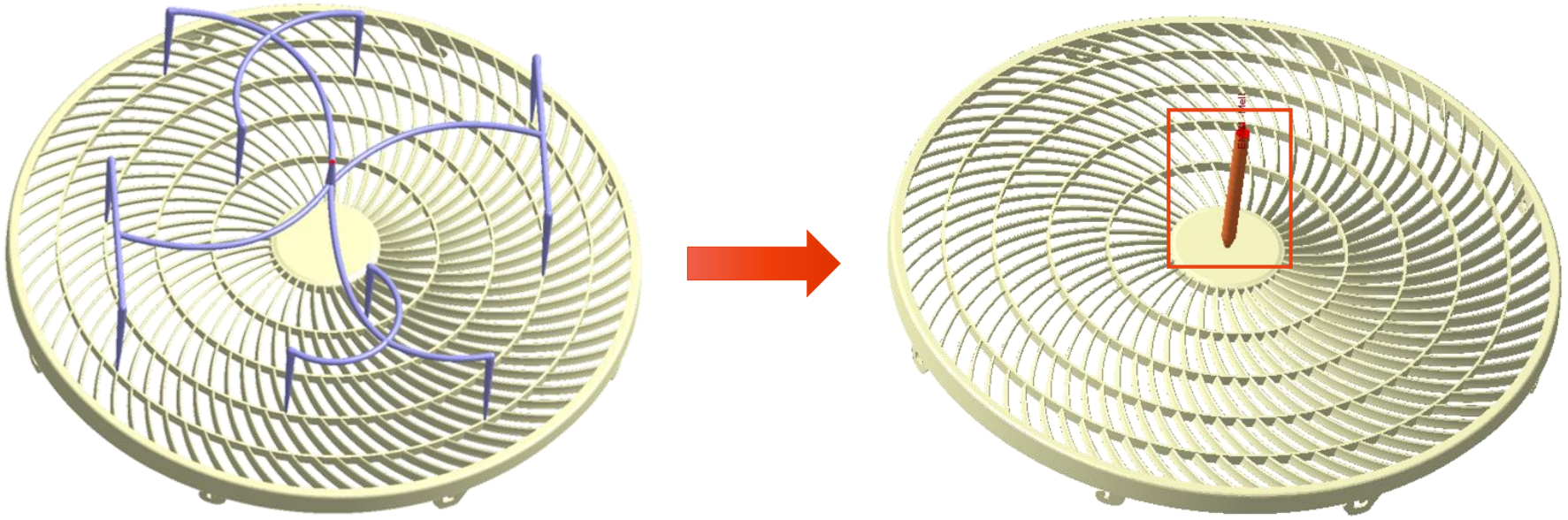
MuCell Design



- Thick Walls thinned out
- Reduction of Standard Thickness (2,2 mm → 2,0 mm)

GK CONCEPT
YIZUMI

Example: Vent Cover – Gating Concept

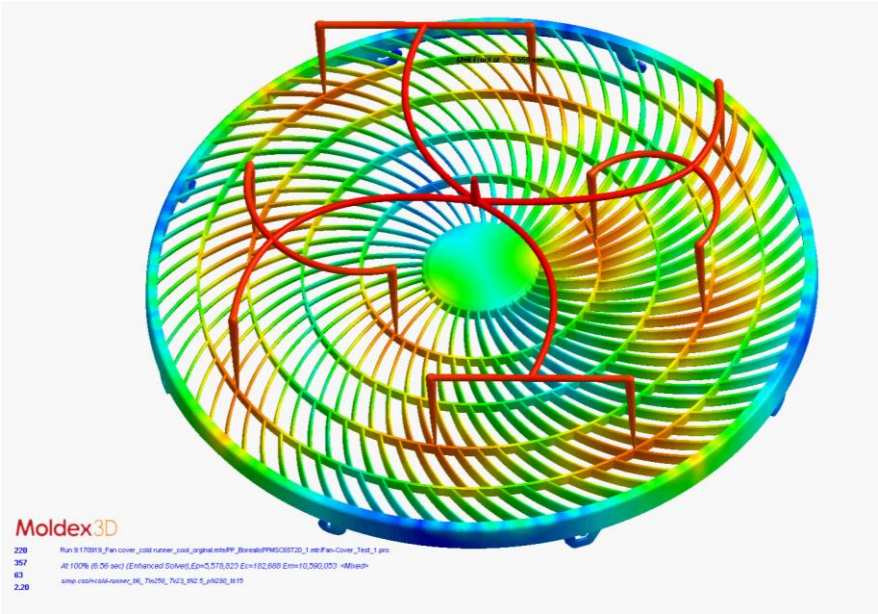


Complex Cold Runner System replaced by 1 Hot Runner Nozzle with Valve Gate

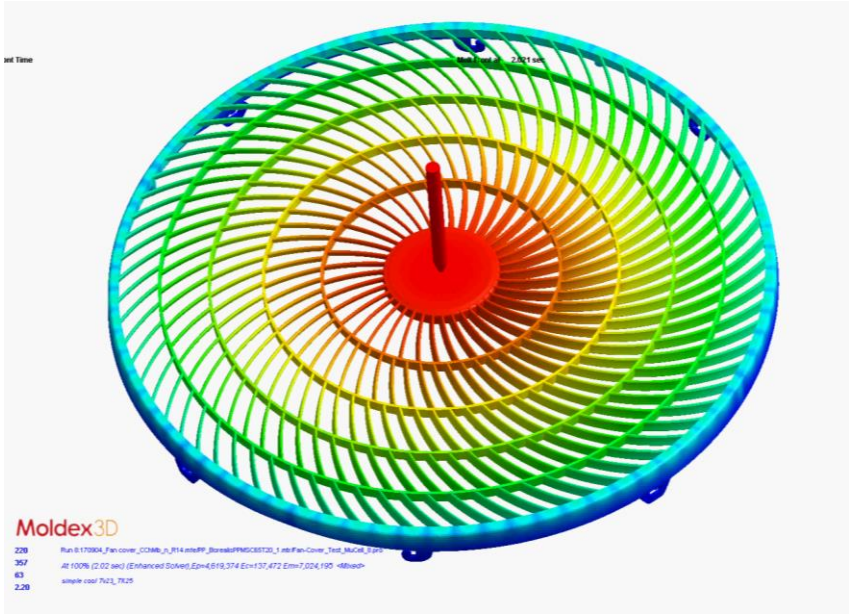
- More Simple Tooling
- Reduced Shot Weigth
- Balanced Filling of the Part

Example: Vent Cover – Filling Behavior

Filling with Cold Channel

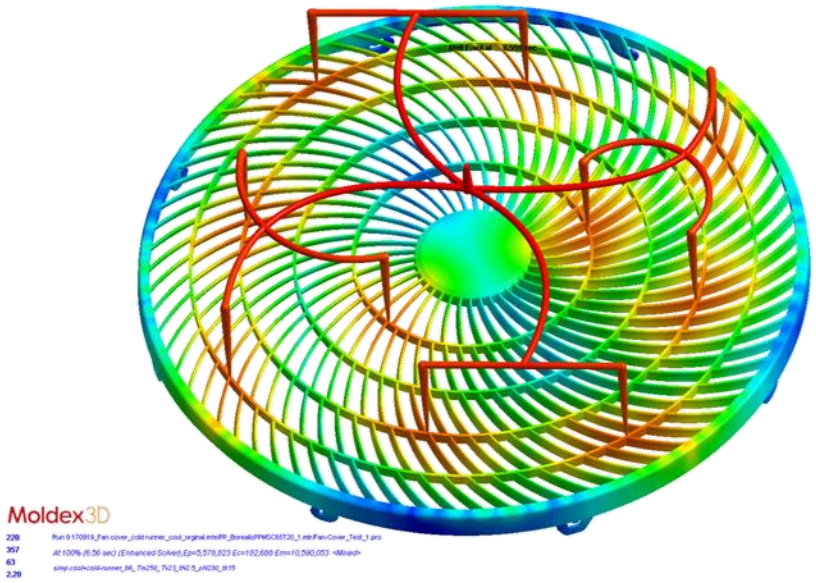


Filling with Valve Gated Hot Runner

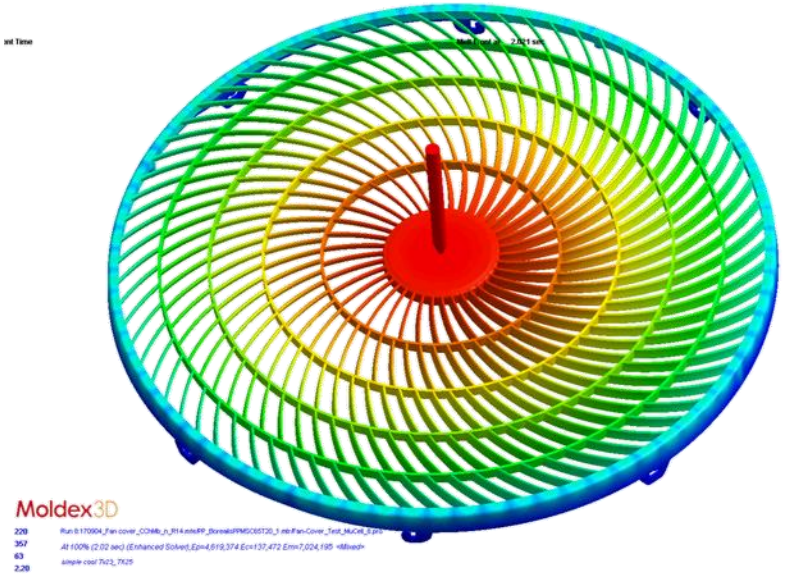


Example: Vent Cover – Filling Behavior

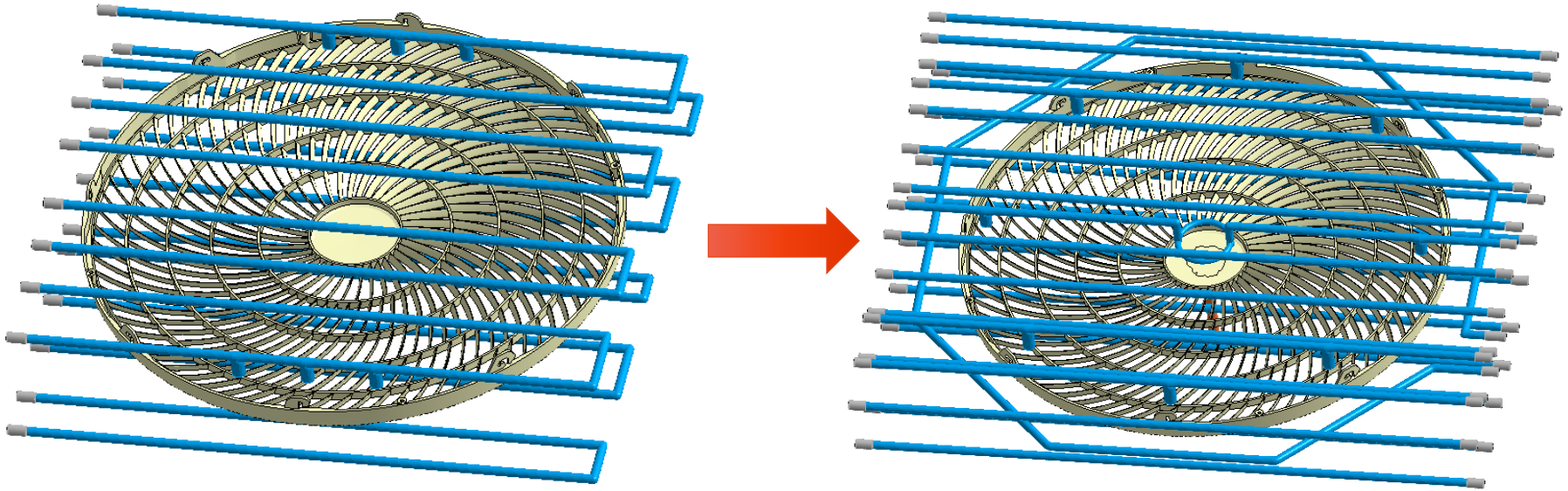
Filling with Cold Channel



Filling with Valve Gated Hot Runner



Example: Vent Cover – Tool Cooling

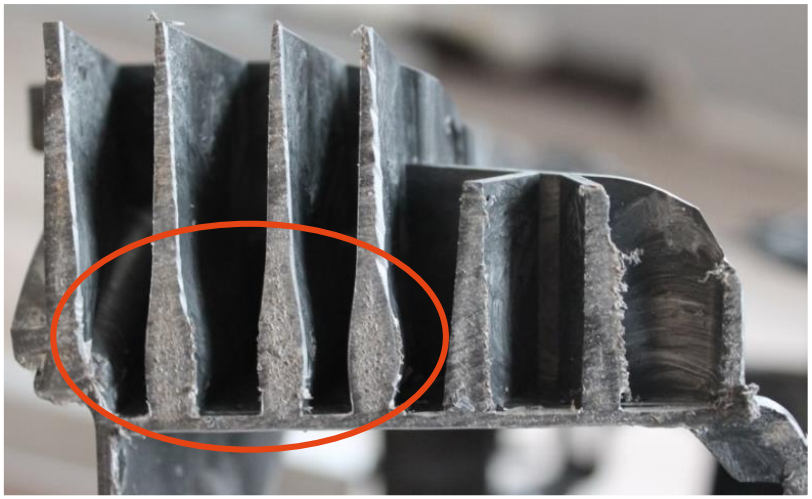


Re-Designed Cooling Structure for

- Reduced Cycle Time
- Elimination of Hot-Spots (Post Blow)
- Better Surface Quality

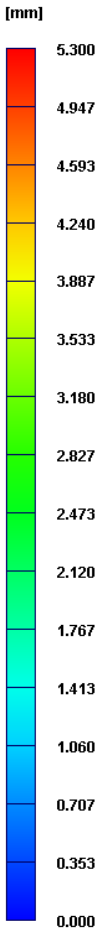
What is so bad about Hot Spots?

Post Blow Effect on Thick Part Areas

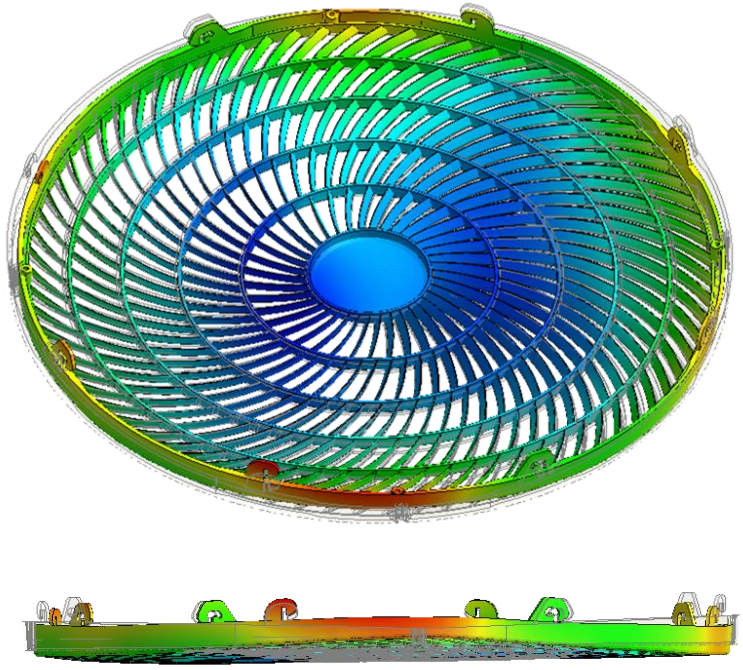


Post Blow Effect on Thick Part Areas

Example: Vent Cover – Warpage Behavior

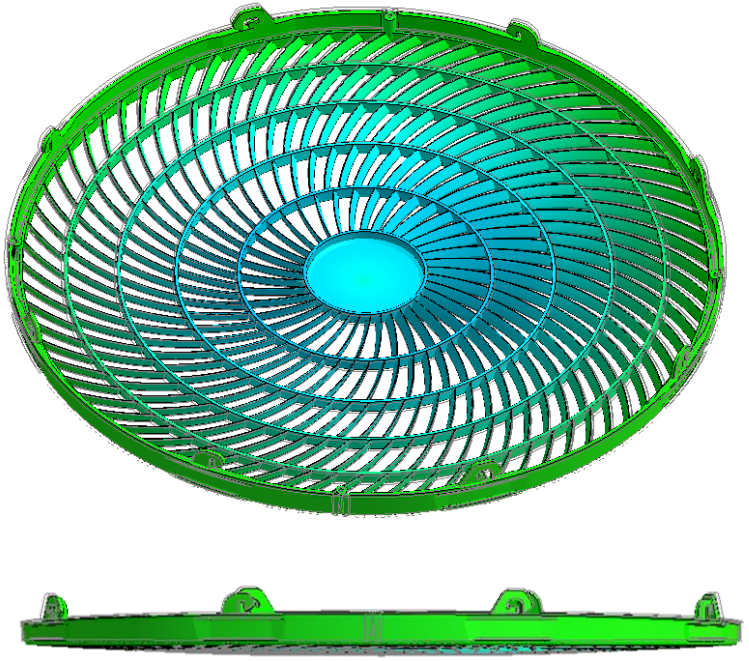


Normal Injection Molding
(Injection Molding with Cold Channel System)



5,3 mm

MuCell® Process
After optimiced Part Design, Hotrunner & cooling



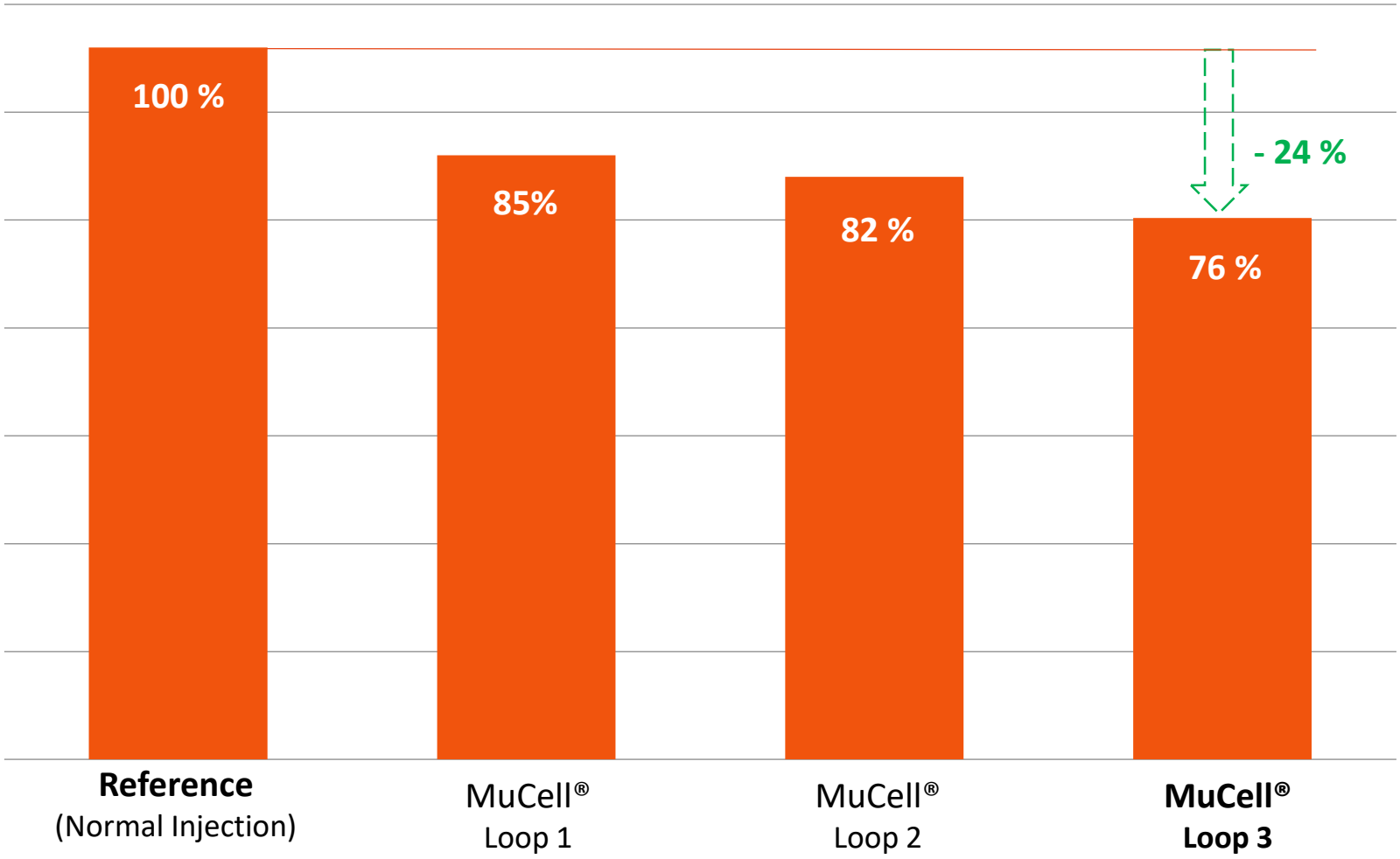
2,7 mm

Example: Vent Cover – Benefits

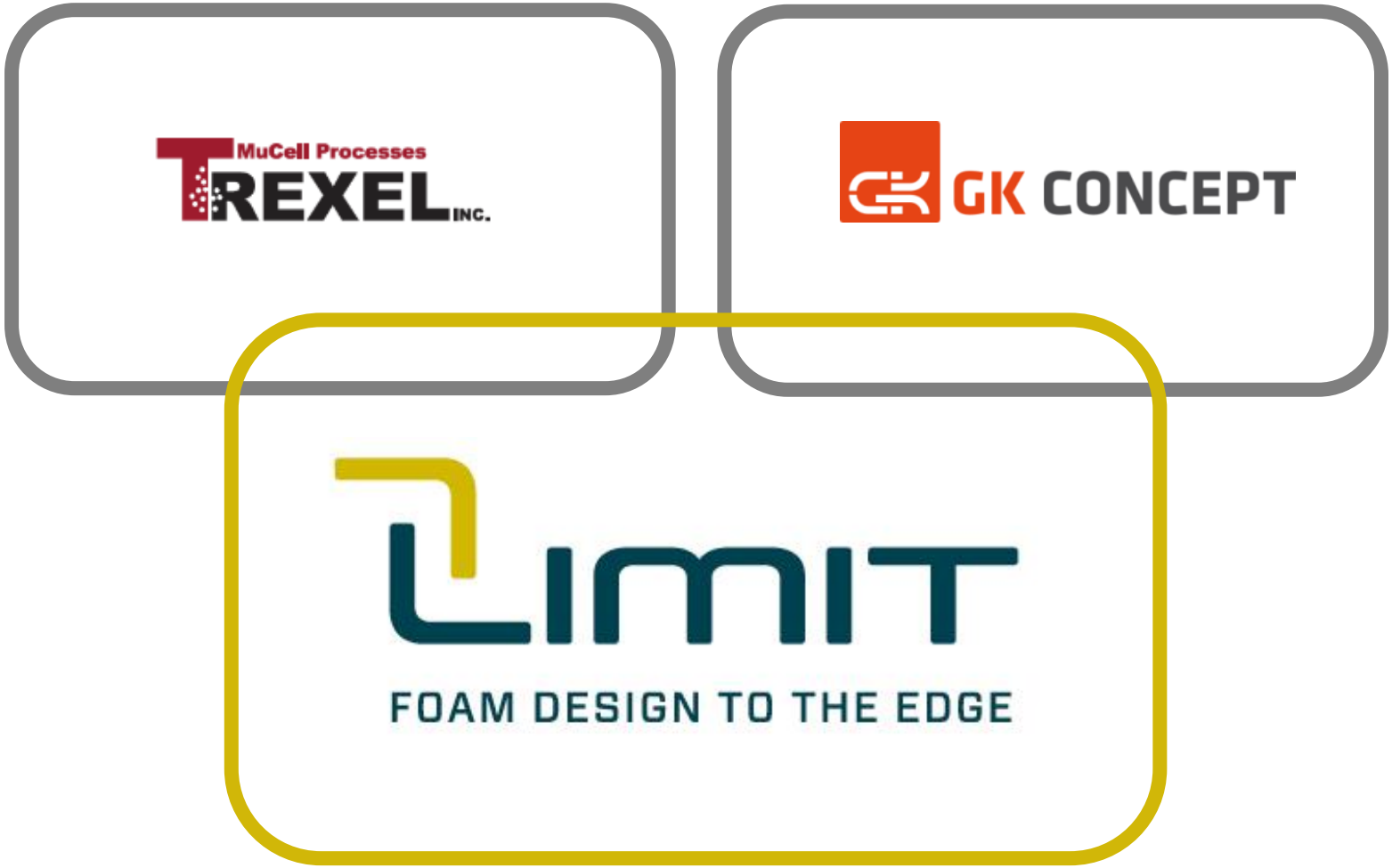
	Original Design (Compact Inj.)	MuCell® – Design	Difference
Max. Inj. Pressure	1000 bar	670 bar	- 33 %
Clamping Force	457 t	260 t	- 43 %
Part Weigth	349 g	283 g	- 19 %
Shot Weigth	430 g	283 g	- 34 %
Cycle Time	36 s	30 s	- 17 %
Max. Warpage	5,3 mm	2,7 mm	- 48 %

Optimisation only Possible because of:
- Changing the Part Design
- Changing the Injection System
- Changing the Cooling System

Changes of the Part Costs during the Re- Design Phase



2LIMIT – Joint Venture from TREXEL & GK Concept



Thank You For Your Attention

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Mobil: +49 152 0966 66 67

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