



HIGH DYNAMIC VACUUM CONTROL

**Revolutionizing Aluminum Casting - The
Introduction of ROBOCAST V for Greater Efficiency**

FILL your future

- Founded 1966
- 1000 employees
- 210 million Euros in annual sales
- Competence Centers
 - Automotive
 - Aerospace
 - Sports
 - Construction and housing
 - Renewable energies
 - Specialist machine engineering



Competence Center Foundry Technology

- Simulations
- Core automation
- Casting plants
- Cooling plants
- De-coring plants
- Raw part machining plants
- Automation solutions
- Customized special solutions
- Offline programming
- Cybernetics



...for aluminum and iron casting



ROBOCAST V – DEVELOPMENT'S MOTIVATION

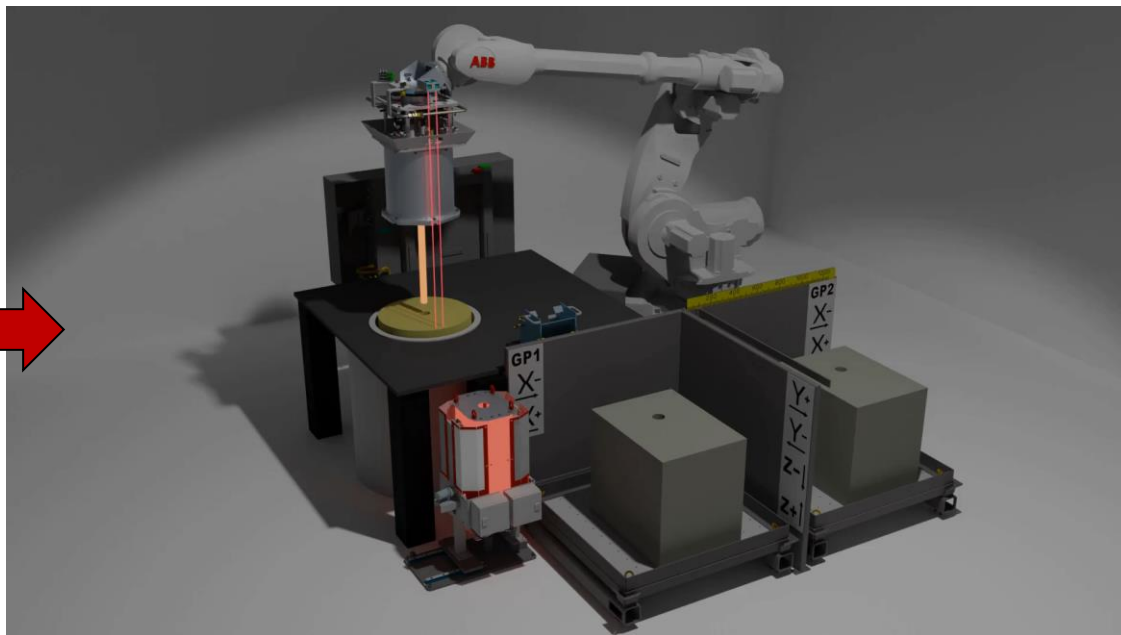
Manual Pouring



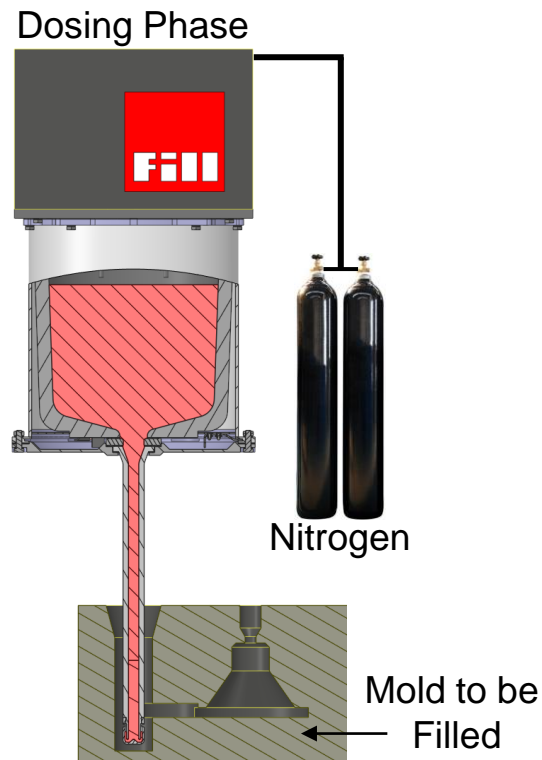
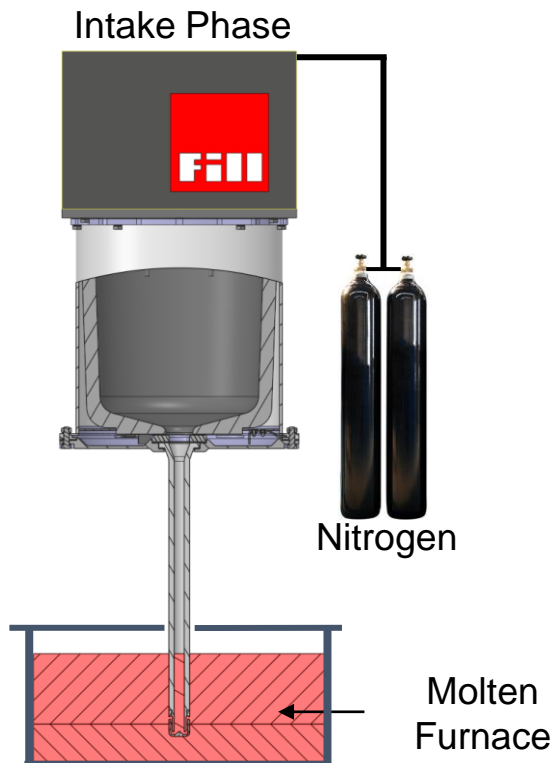
Automated Pouring



ROBOCAST V



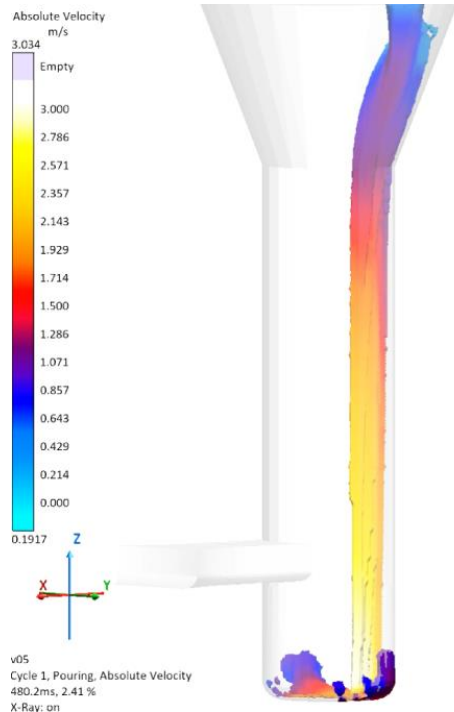
ROBOCAST V – DESCRIBED PROCESS



System advantages:

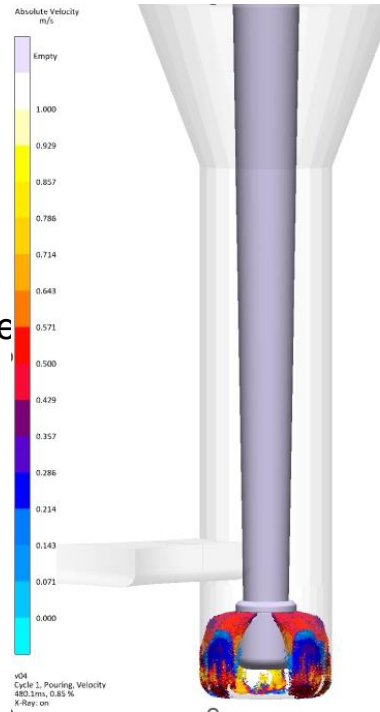
- Intake Phase
 - Controllable intake
 - Reduction of oxide due to inert operating gas
 - No external filling ladle
 - High thermal isolated reservoir
- Dosing Phase
 - Laminar flow into the gates
 - Filling quantity parametrizable
 - No drop of molten aluminum

ROBOCAST V – DOSING PROCESS



Manual Pouring

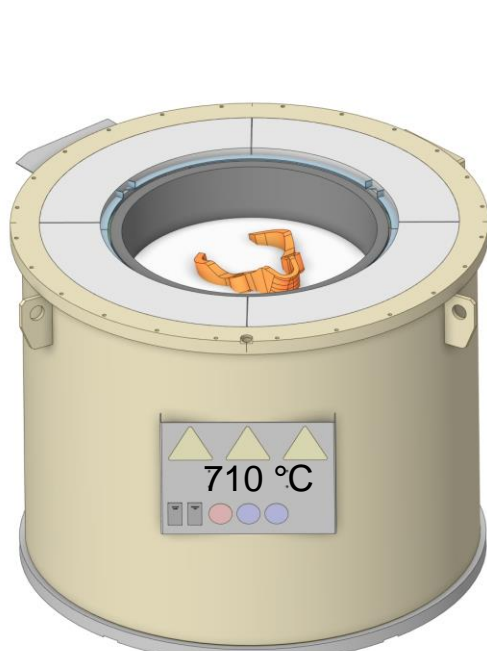
- Waterfall effect
- High turbulence before gates
- High temperature loss
- Not controllable pouring
- Poor process consistency



ROBOCAST V Pouring

- No waterfall effect
- Calm free surface before gates
- Minimizes temperature loss
- Controllable pouring
- High process consistency

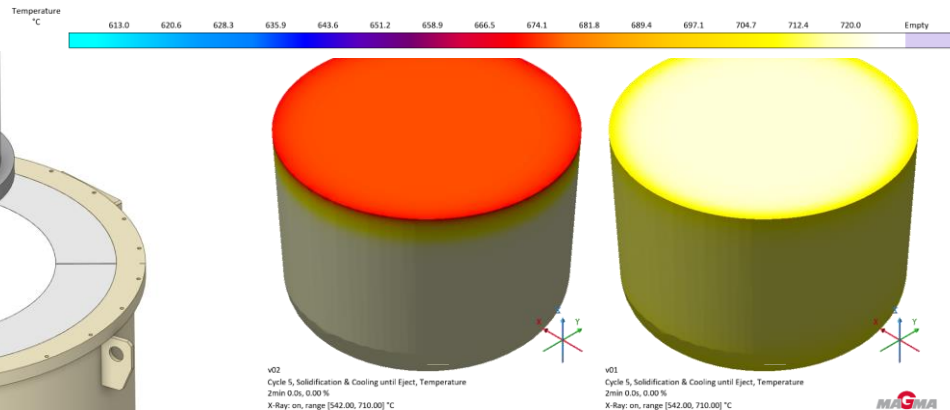
Evolution in energy efficiency and operator comfort



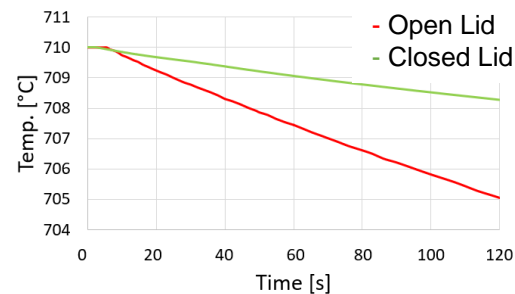
ROBOCAST V



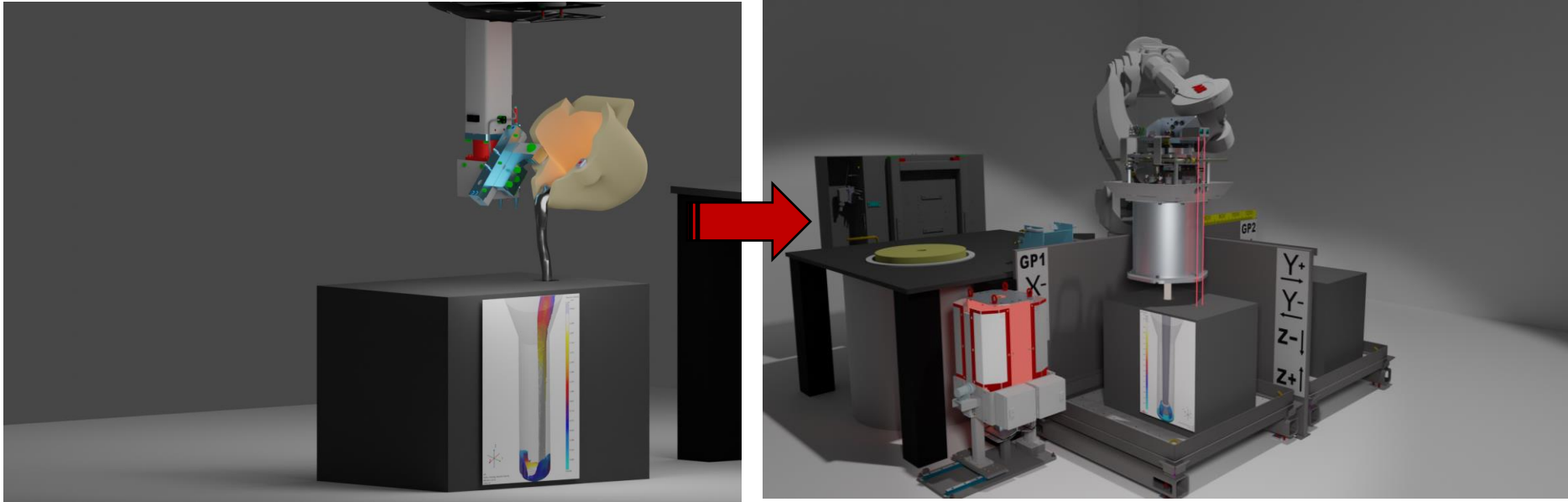
LADLE



AVG First-Layer-Molten Temp.



FILL GOAL



The goal for of the company Fill is to replace conventional pouring method of aluminum alloy with the ROBOCAST V.

USE OF MAGMASOFT IN THE DEVELOPMENT PROCESS.



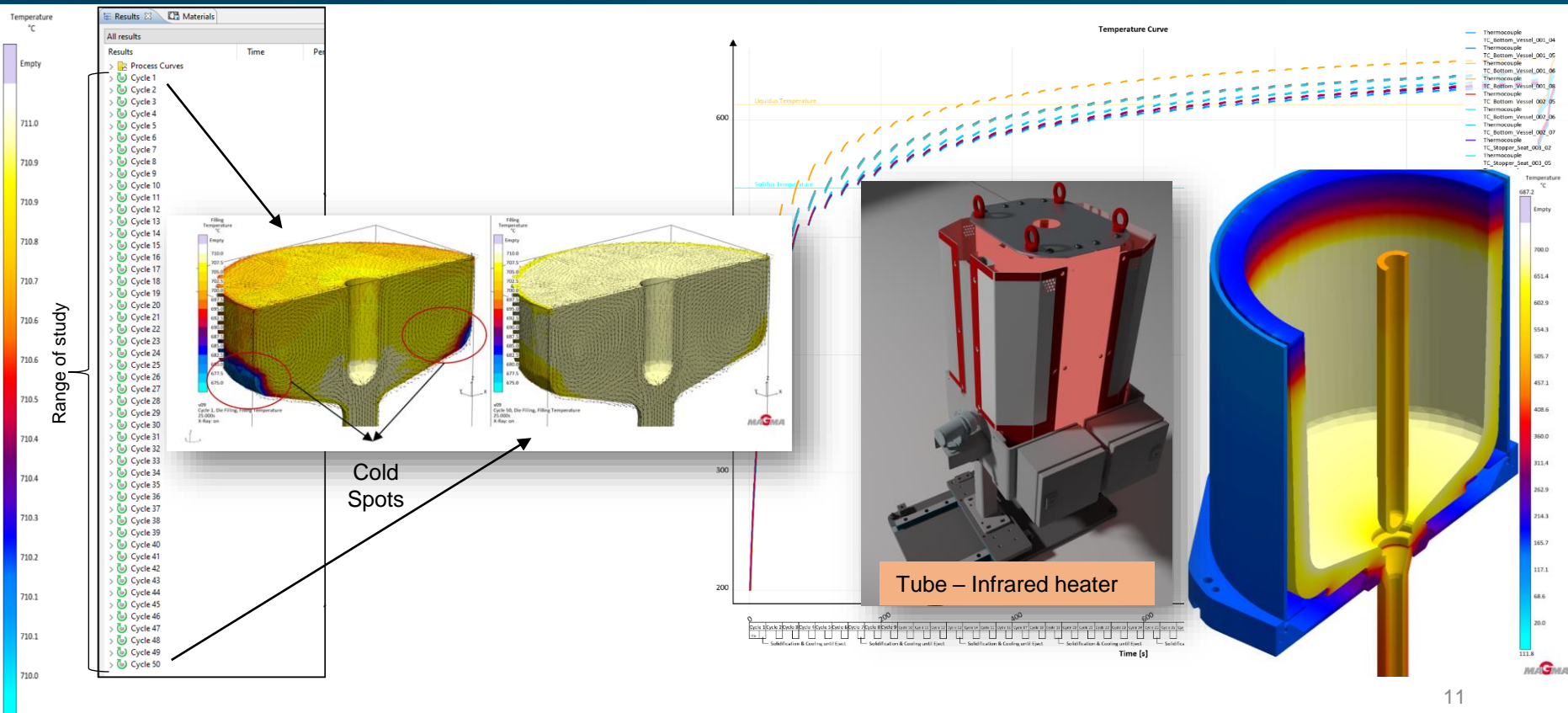
Casting Knowledge.
In a Software.

 **MAGMASOFT**
autonomous engineering

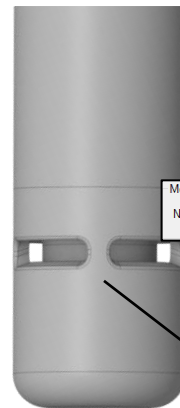
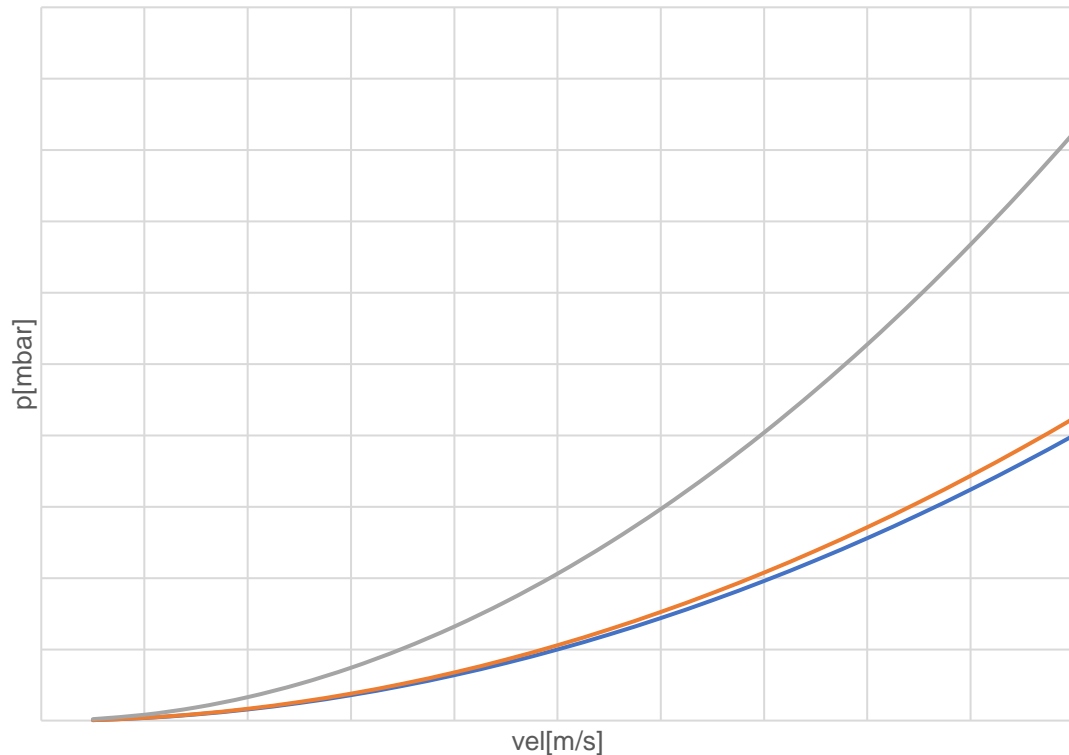
OPTIMIZING THE INTAKE PROCESS OF MOLTEN ALUMINUM.



IDEAL COMPONENTS TEMPERATURE – WARM UP PROCESS



INTAKE PROCESS – SIMPLIFY MESHING

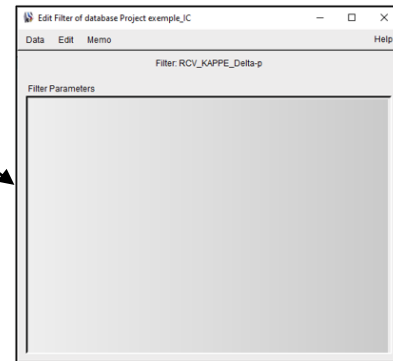


Options

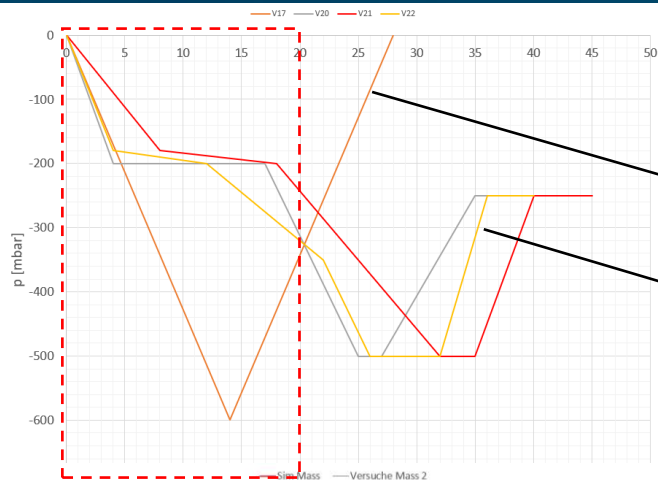
- ☒ Mesh for solver 5
- ☐ Generate core

Mesh Size

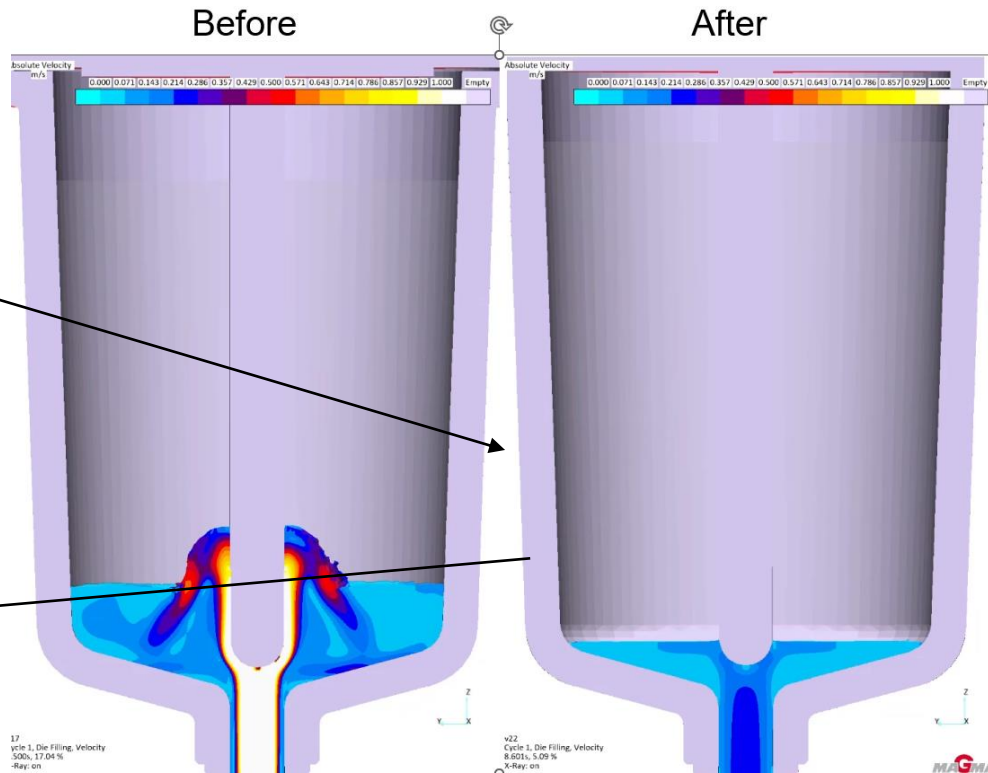
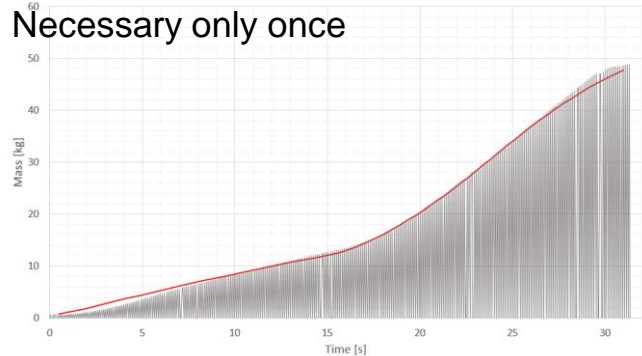
Number of cartesian cells Number of cartesian cavity cells



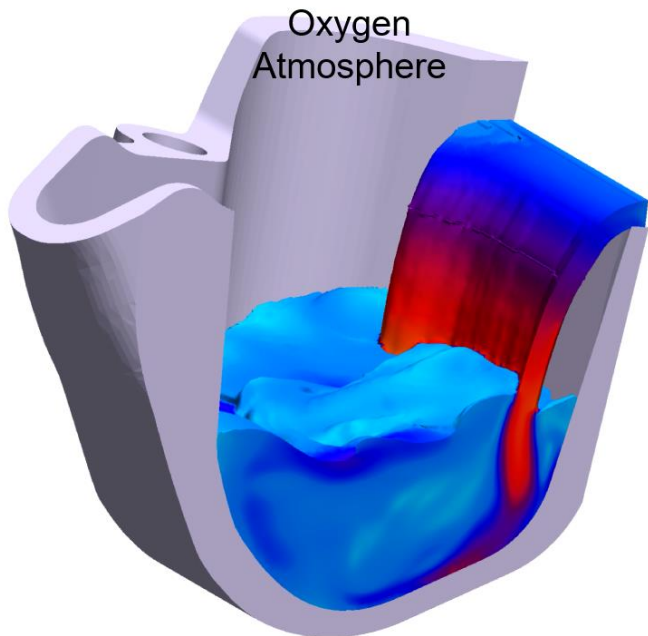
INTAKE PRESSURE CURVE – RESORVOIR FILLING



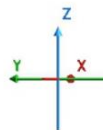
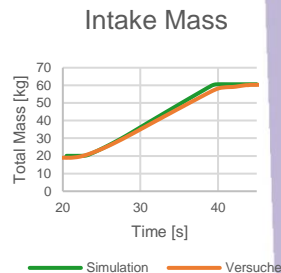
Necessary only once



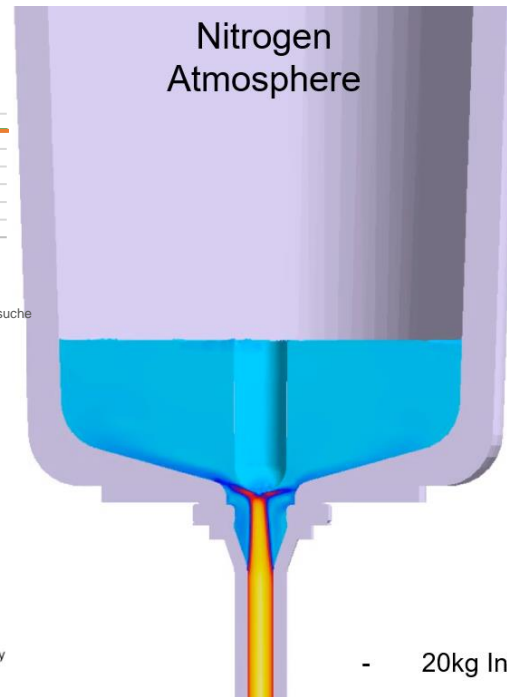
END RESULTS – COMPARISON WITH CASTING LADLE FILLING



v33
Cycle 1, Pouring, Absolute Velocity
3.500s, 35.01 %
X-Ray: on



v01
Cycle 1, Pouring, Absolute Velocity
24.200s, 22.07 %
X-Ray: on

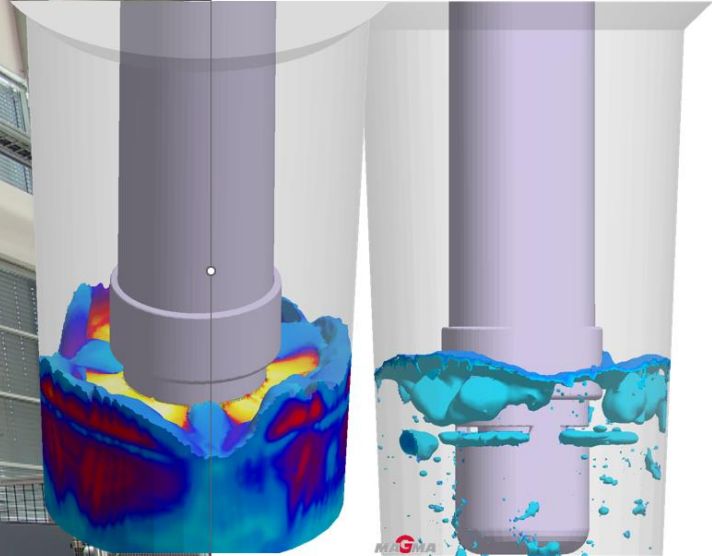
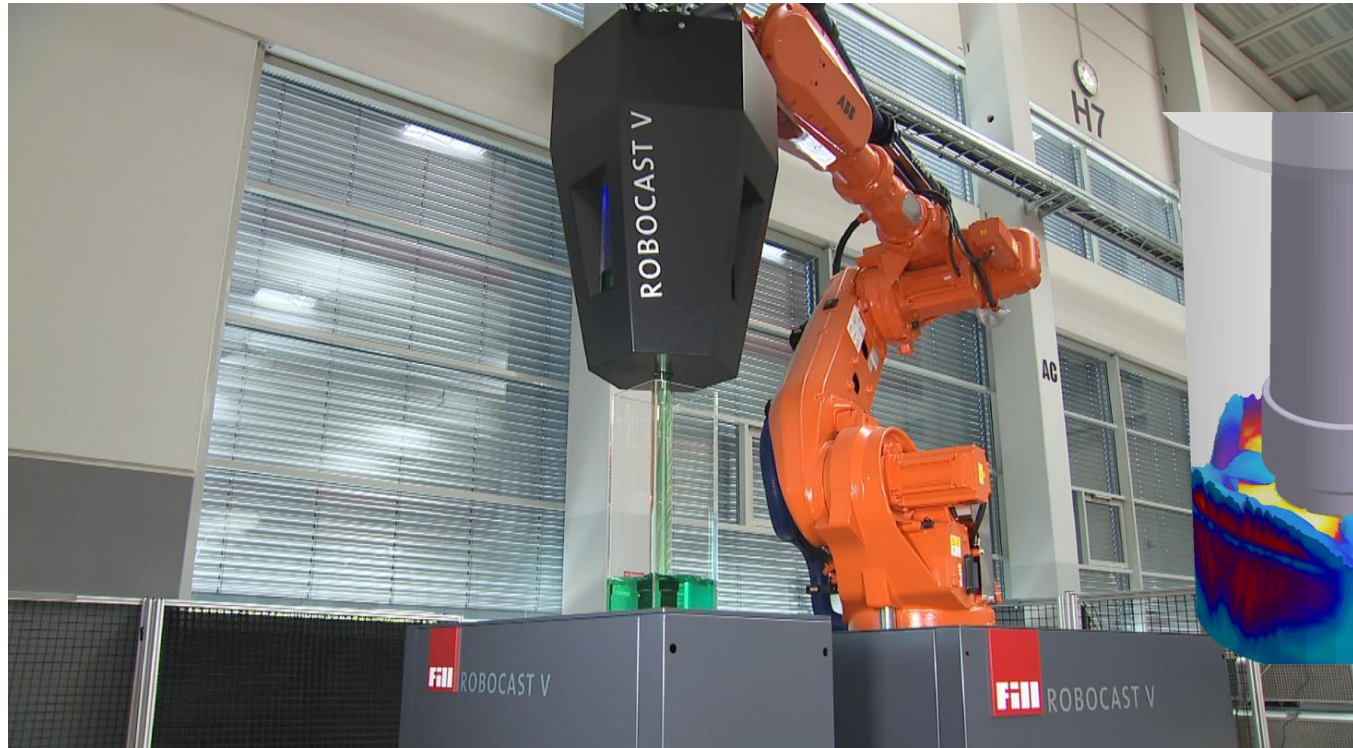


- 20kg Initial Volume

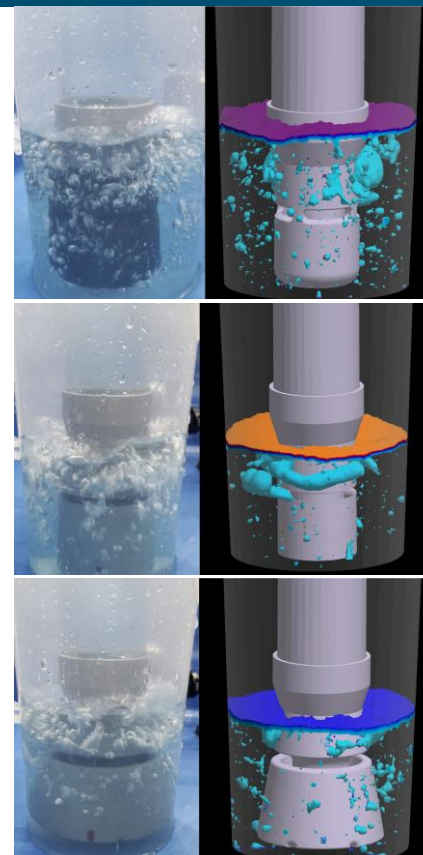
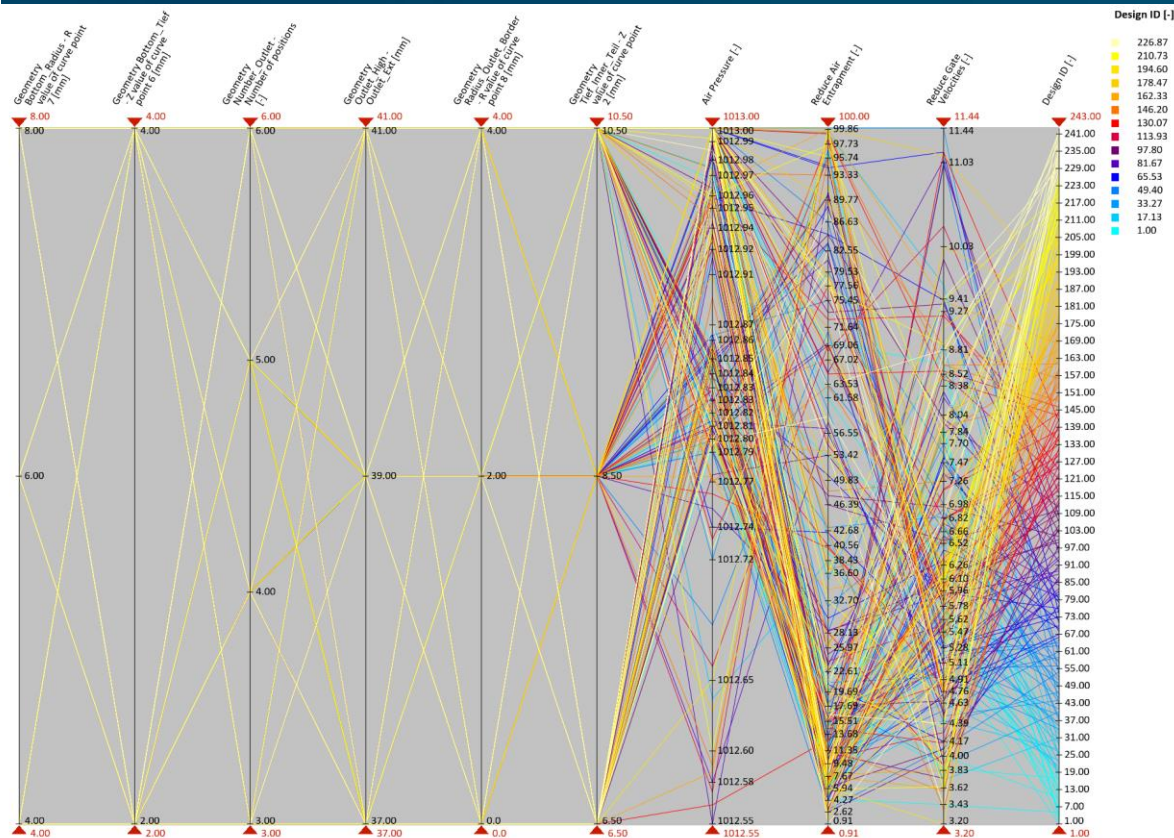
OPTIMIZING THE DOSING PROCESS OF MOLTEN ALUMINUM.



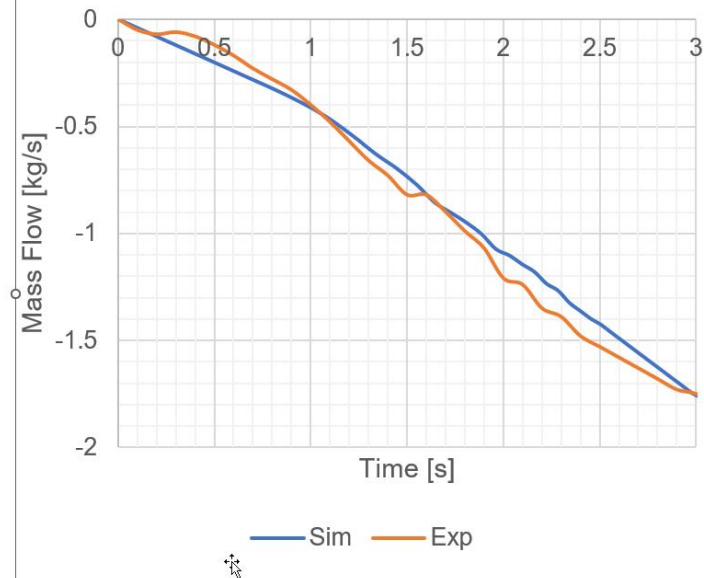
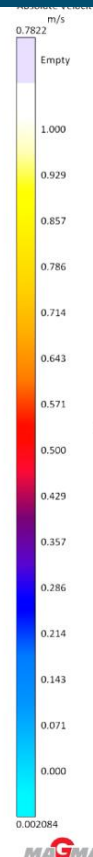
FIRST TUBE GEOMETRY



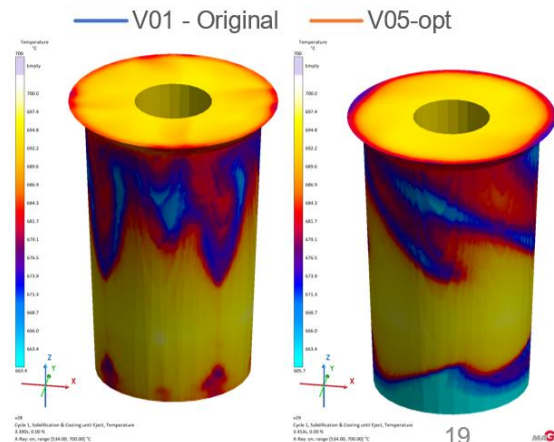
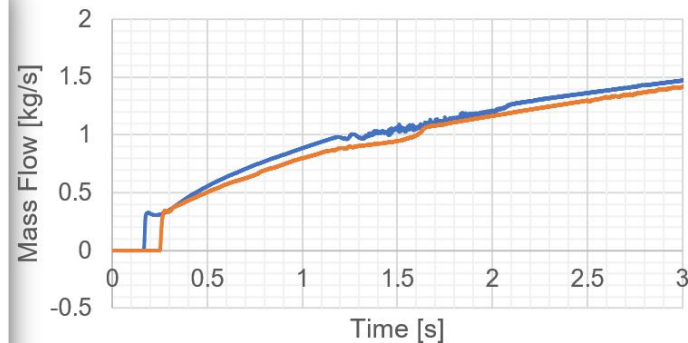
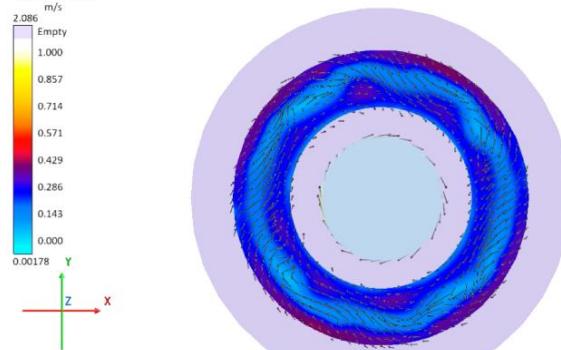
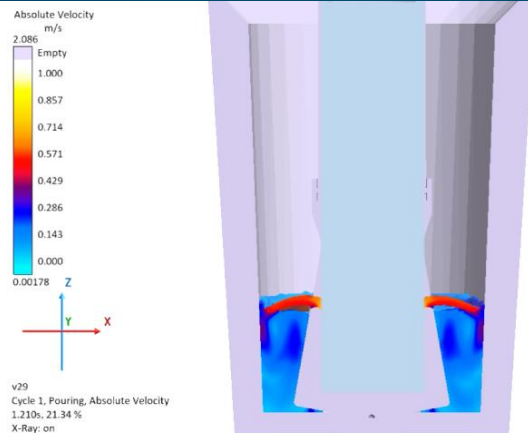
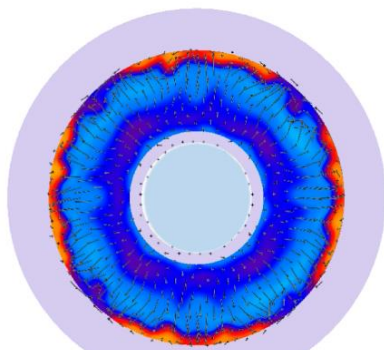
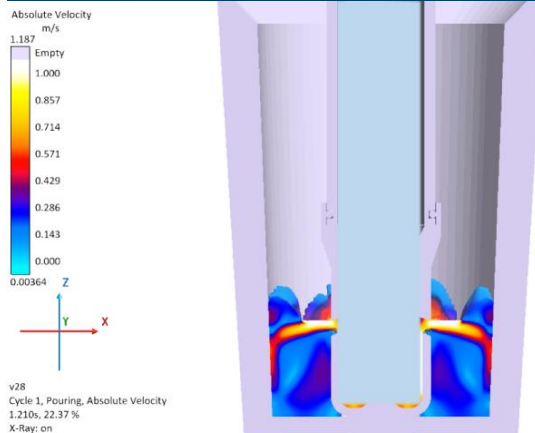
OPTIMIZATION MAGMA® Autonomous Eng.



INITIAL DOSING PROCESS – Restrict customer geometry



FURTHER OPTIMIZATION FOR FILLING TUBE CAP



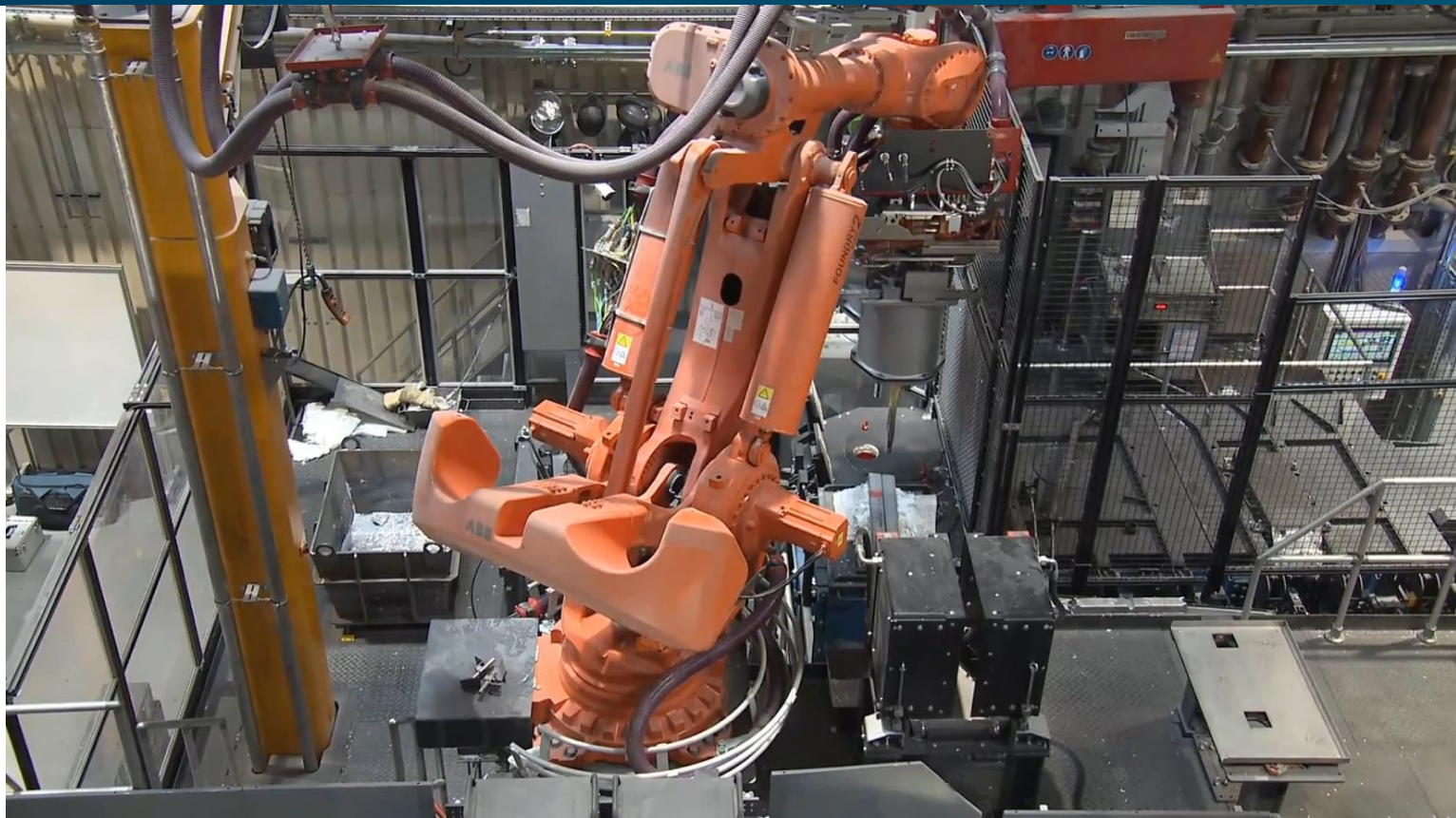
PROCESS SIMULATION WITH ROBOCAST V.



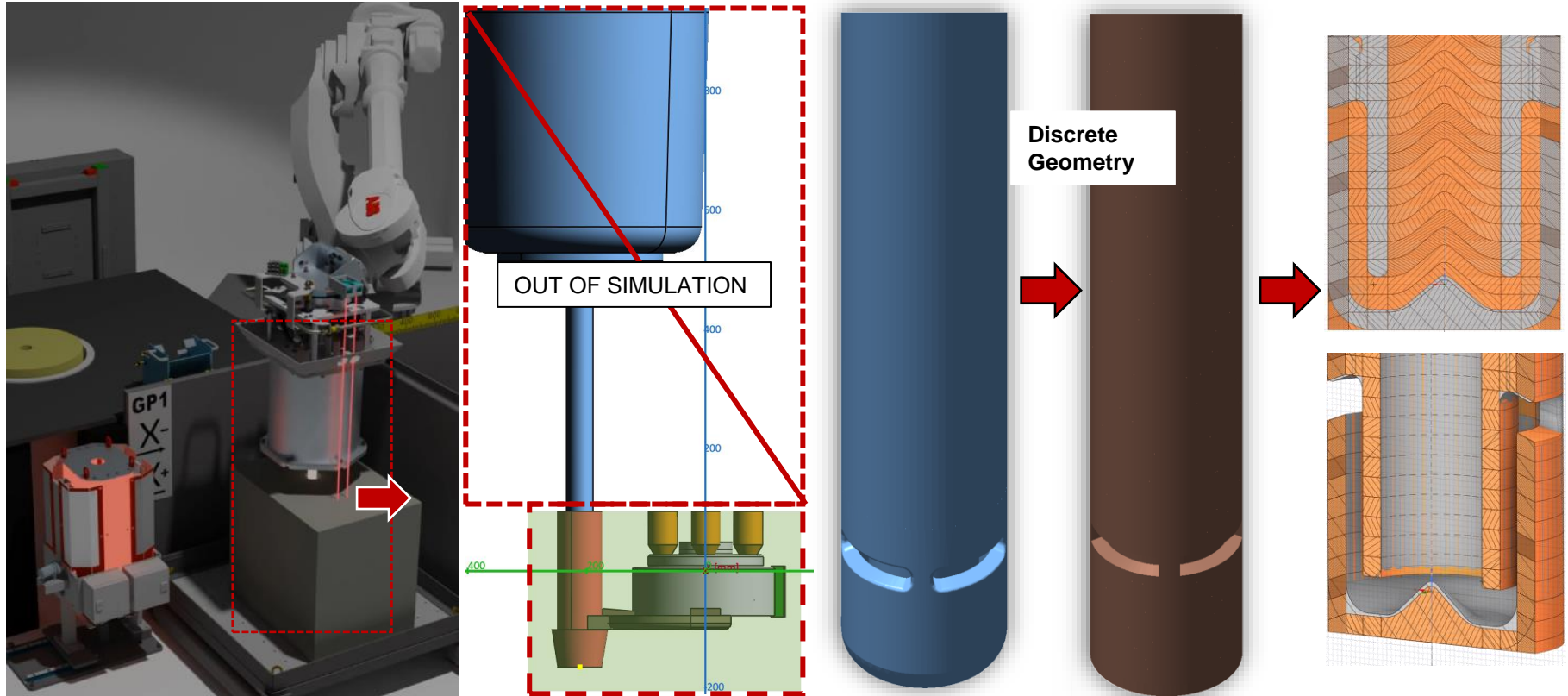
Casting Knowledge.
In a Software.

 **MAGMASOFT**[®]
autonomous engineering

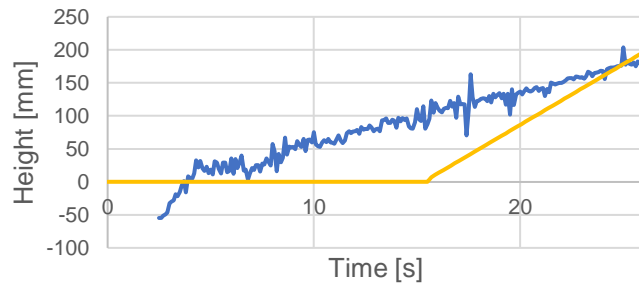
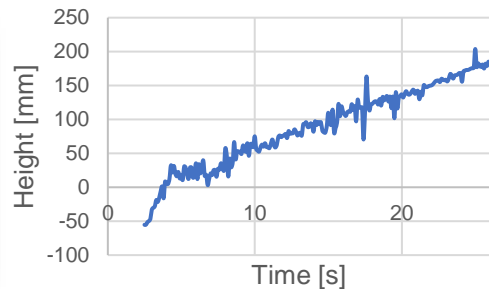
VIDEO ROBOCAST V – OPERATIONAL



SIMULATION METHODS – ROBOCAST V

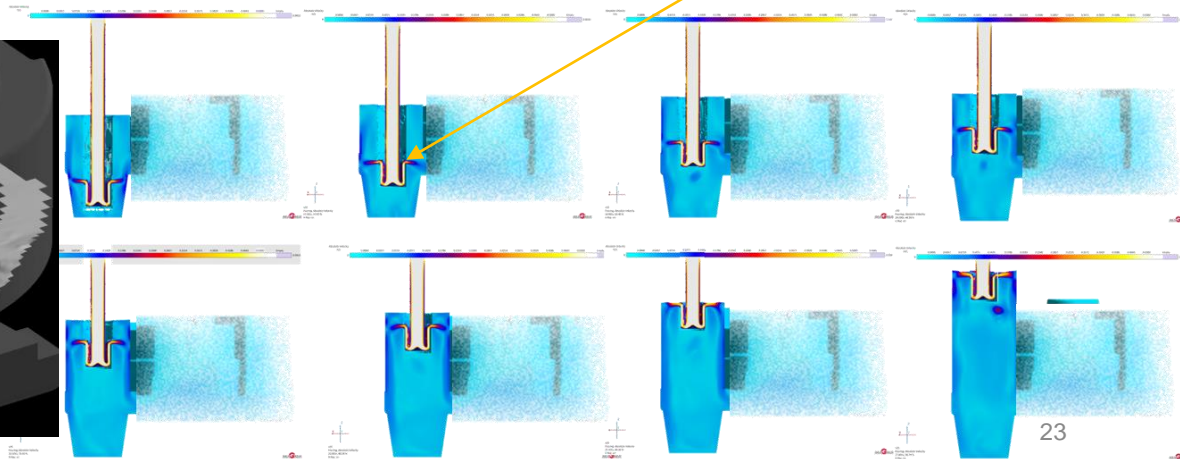
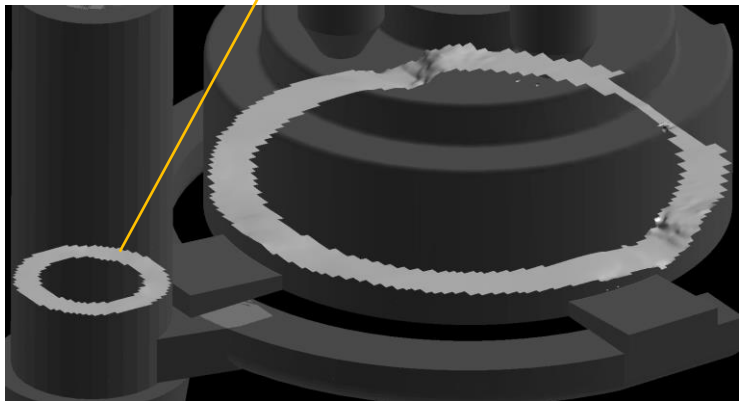


SETUP FOR FILTER CONTROL MAGMASOFT®



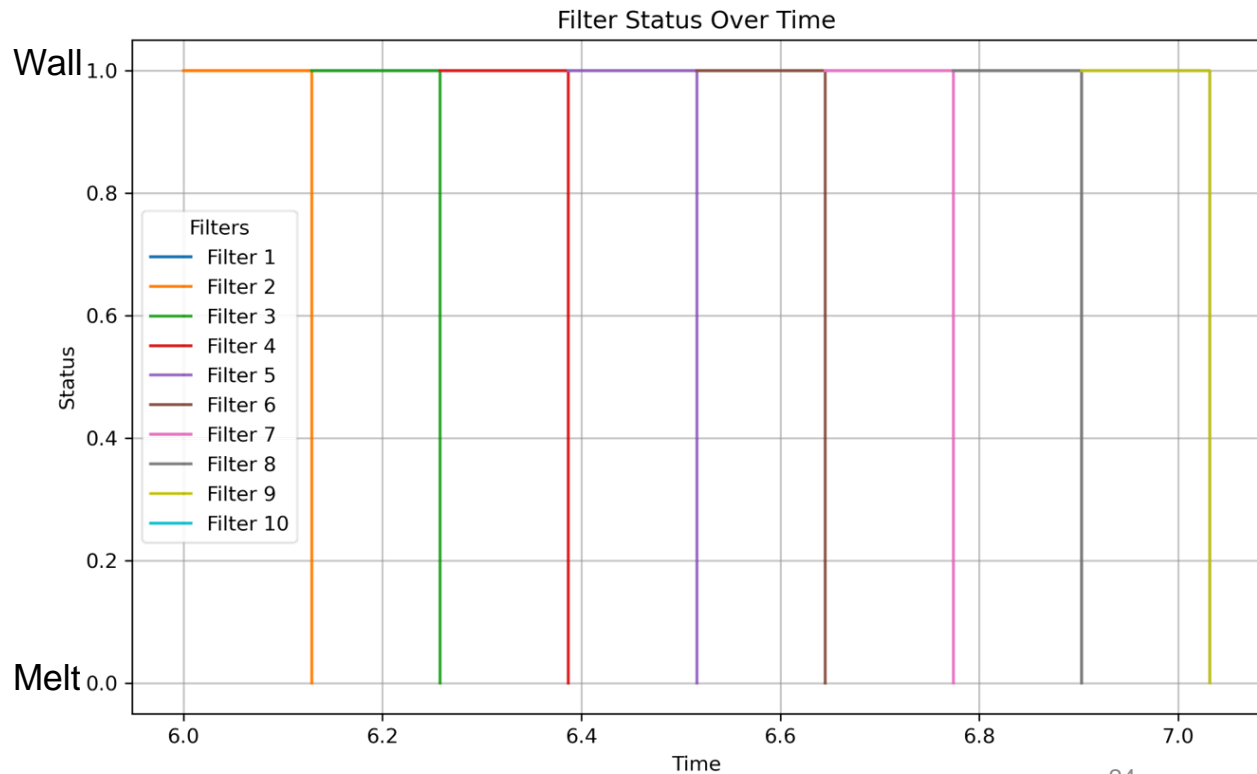
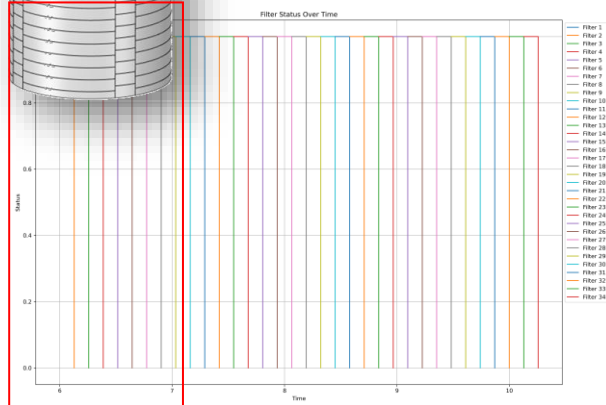
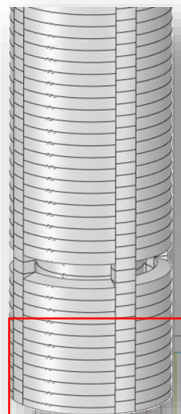
— Free Surface

— Free Surface — Siphon Outlet



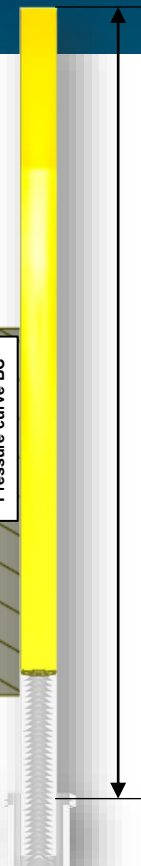
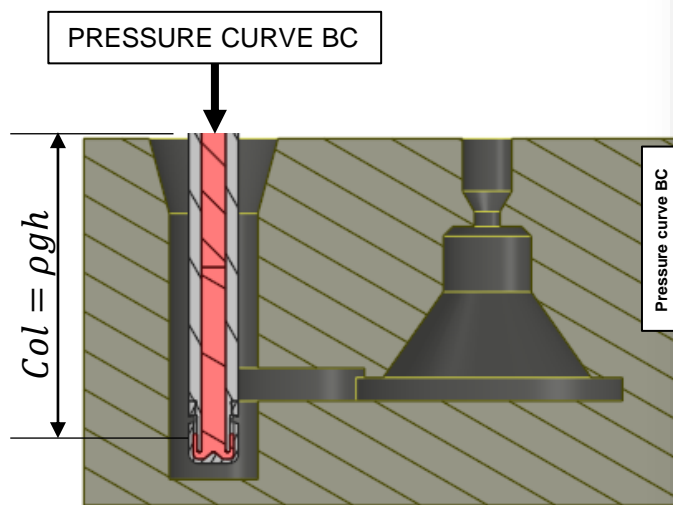
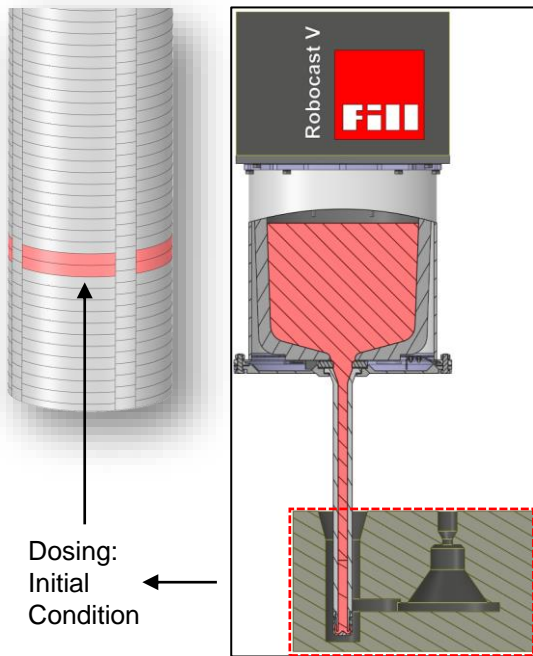
CONVENTIONAL FILTER CONTROL (Filter.ctrl)

Filter ON/OFF $\Delta p = \frac{1}{0} \Delta p$



CONVENTIONAL FILTER CONTROL (Filter.ctrl)

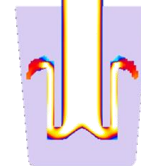
Filter ON/OFF $\Delta p = \frac{1}{0} \Delta p$



Volume Flow BC

Pressure curve BC

Volume Flow BC



— On/Off — Proportional

Melt

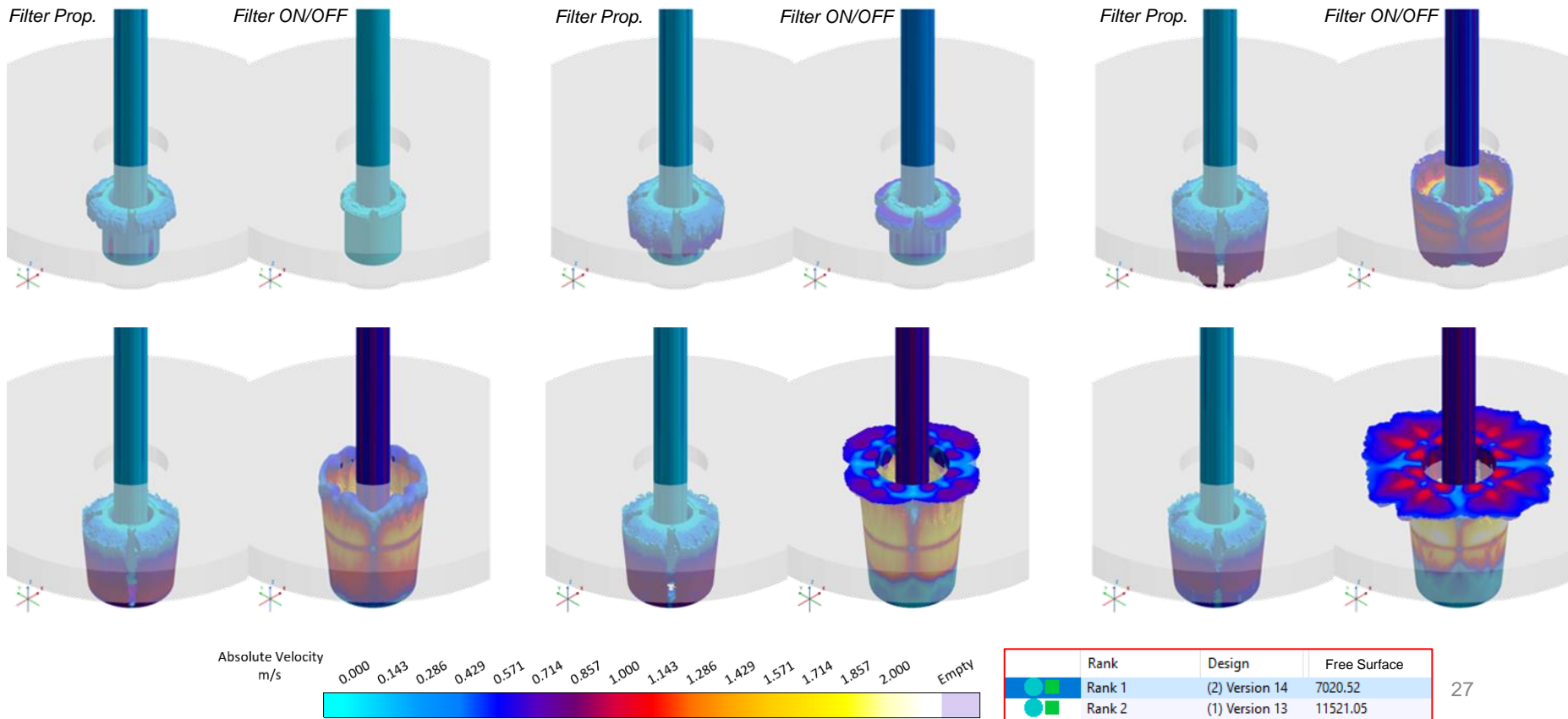
Proportional control



Filter ON/OFF — $\Delta p = \frac{1}{0} \} \Delta p$

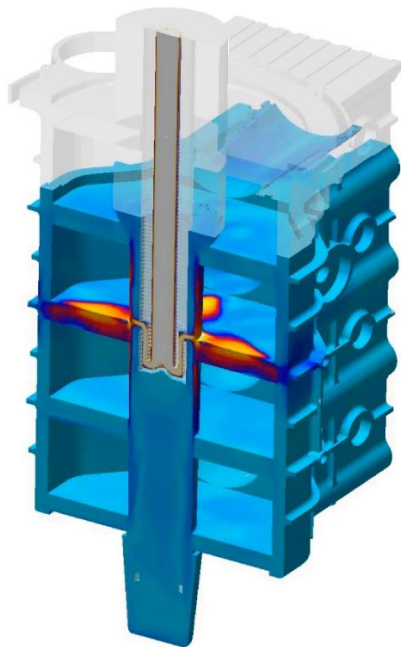
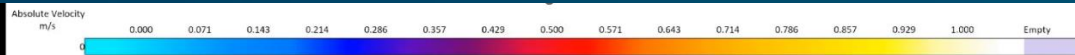
~~Filter Proportional~~ — $\Delta p = K_1 v + K_2 v^2$

PROPORTIONAL FILTER vs CONV. FILTER

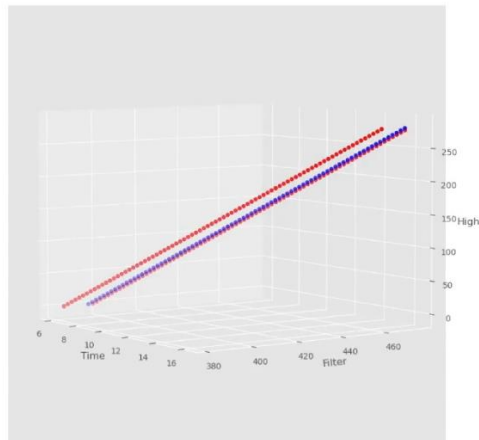


FILLING SIMULATION

FILL



v10
Cycle 1, Pouring, Absolute Velocity
14.300s; 70.84 %
X-Ray: on, range [0.00, 1.00] m/s



```
run - Editor
Datei Bearbeiten Format Ansicht Hilfe
20 cycle=1 >> Step=7824 (7839) Time=6.3726 (10.3726)[s]: Filled=21.81%
23 cycle=1 >> Step=7825 (7840) Time=6.3734 (10.3734)[s]: Filled=21.81%
24 cycle=1 >> Step=7826 (7841) Time=6.3741 (10.3741)[s]: Filled=21.81%
27 cycle=1 >> Step=7827 (7842) Time=6.3749 (10.3749)[s]: Filled=21.82%
29 cycle=1 >> Step=7828 (7843) Time=6.3757 (10.3757)[s]: Filled=21.82%
31 cycle=1 >> Step=7829 (7844) Time=6.3765 (10.3765)[s]: Filled=21.82%
34 cycle=1 >> Step=7830 (7845) Time=6.3773 (10.3773)[s]: Filled=21.83%
37 cycle=1 >> Step=7831 (7846) Time=6.3781 (10.3781)[s]: Filled=21.83%
39 cycle=1 >> Step=7832 (7847) Time=6.3789 (10.3789)[s]: Filled=21.83%
42 cycle=1 >> Step=7833 (7848) Time=6.3797 (10.3797)[s]: Filled=21.84%
44 cycle=1 >> Step=7834 (7849) Time=6.3805 (10.3805)[s]: Filled=21.84%
46 cycle=1 >> Step=7835 (7850) Time=6.3813 (10.3813)[s]: Filled=21.84%
48 cycle=1 >> Step=7836 (7851) Time=6.3821 (10.3821)[s]: Filled=21.85%
50 cycle=1 >> Step=7837 (7852) Time=6.3829 (10.3829)[s]: Filled=21.85%
52 cycle=1 >> Step=7838 (7853) Time=6.3837 (10.3837)[s]: Filled=21.86%
54 cycle=1 >> Step=7839 (7854) Time=6.3845 (10.3845)[s]: Filled=21.86%
58 cycle=1 >> Step=7840 (7855) Time=6.3853 (10.3853)[s]: Filled=21.86%
00 cycle=1 >> Step=7841 (7856) Time=6.3861 (10.3861)[s]: Filled=21.87%
02 cycle=1 >> Step=7842 (7857) Time=6.3869 (10.3869)[s]: Filled=21.87%
04 cycle=1 >> Step=7843 (7858) Time=6.3877 (10.3877)[s]: Filled=21.87%
04 cycle=1 ### Filters SwitchOn: Time = 10.387659
04 cycle=1 ### Filter #143 (Filter, ID 397)
04 cycle=1 ### Filter #259 (Filter, ID 5)
04 cycle=1 ### Filter #385 (Filter, ID 133)
04 cycle=1 ### Filter #513 (Filter, ID 260)
04 cycle=1 ### Filters SwitchOff: Time = 10.387659
04 cycle=1 ### Filter #125 (Filter, ID 633)
04 cycle=1 ### Filter #132 (Filter, ID 386)
04 cycle=1 ### Filter #145 (Filter, ID 399)
04 cycle=1 ### Filter #258 (Filter, ID 4)
04 cycle=1 ### Filter #383 (Filter, ID 132)
04 cycle=1 ### Filter #398 (Filter, ID 145)
04 cycle=1 ### Filter #512 (Filter, ID 259)
04 cycle=1 ### Filter #515 (Filter, ID 262)
06 cycle=1 >> Step=7844 (7859) Time=6.3885 (10.3885)[s]: Filled=21.88%
09 cycle=1 >> Step=7845 (7860) Time=6.3892 (10.3892)[s]: Filled=21.88%
11 cycle=1 >> Step=7846 (7861) Time=6.3900 (10.3900)[s]: Filled=21.88%
```

Zeile 1, Spalte 1 100% Windows (CRLF) UTF-8

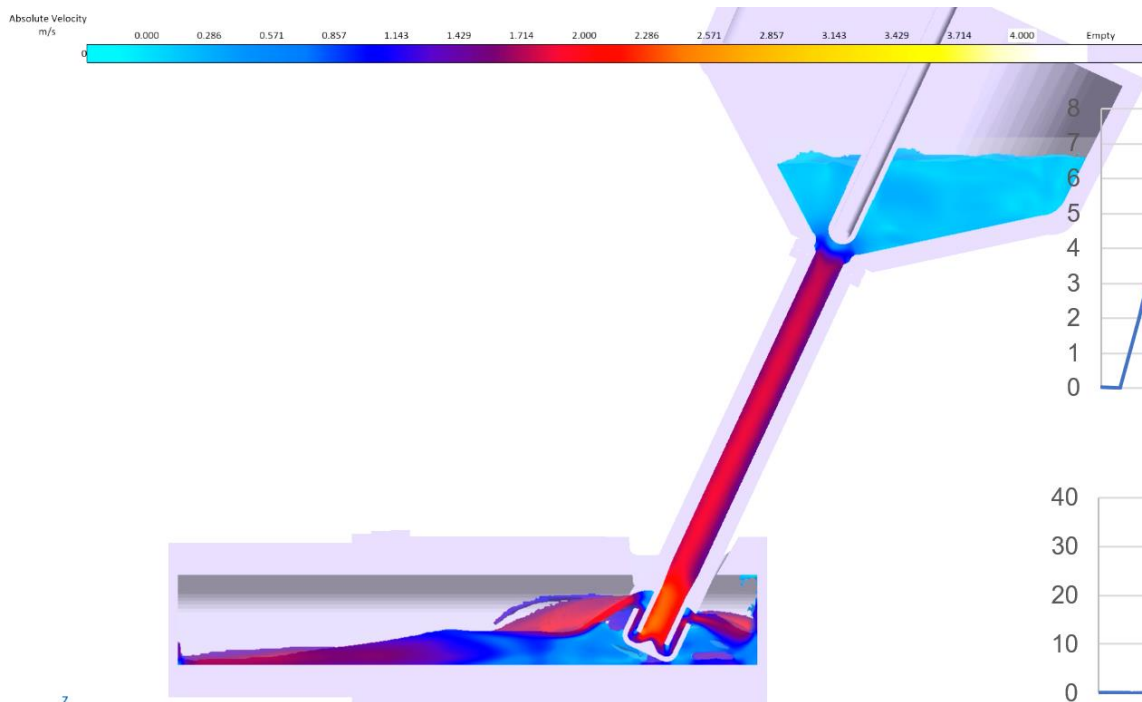
MAGMA

FILE29

PRODUCT MARKETING.

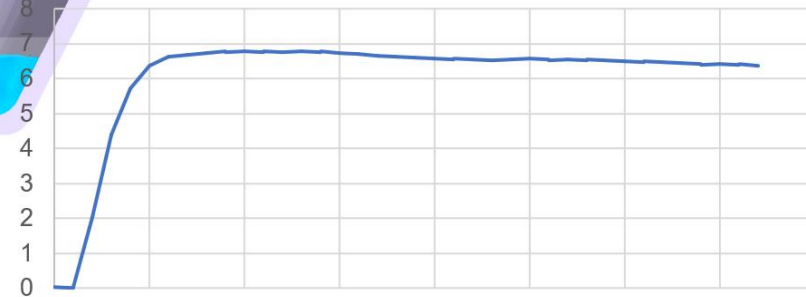


SHOT-SLEEVE FILLING

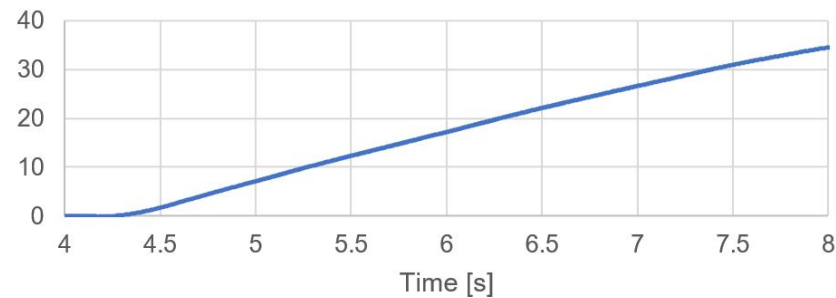


v19
Cycle 1, Pouring, Absolute Velocity
5.001s, 48.21 %
X-Ray: on

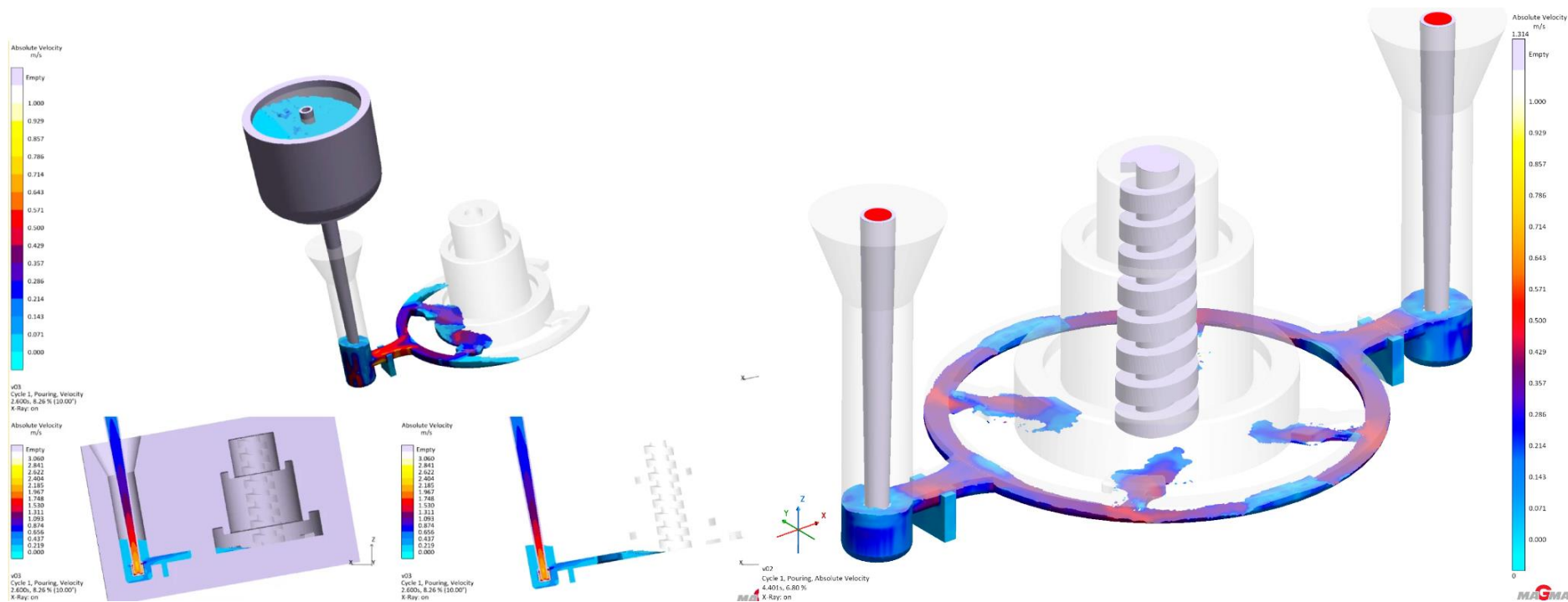
Mass Flow



Mass

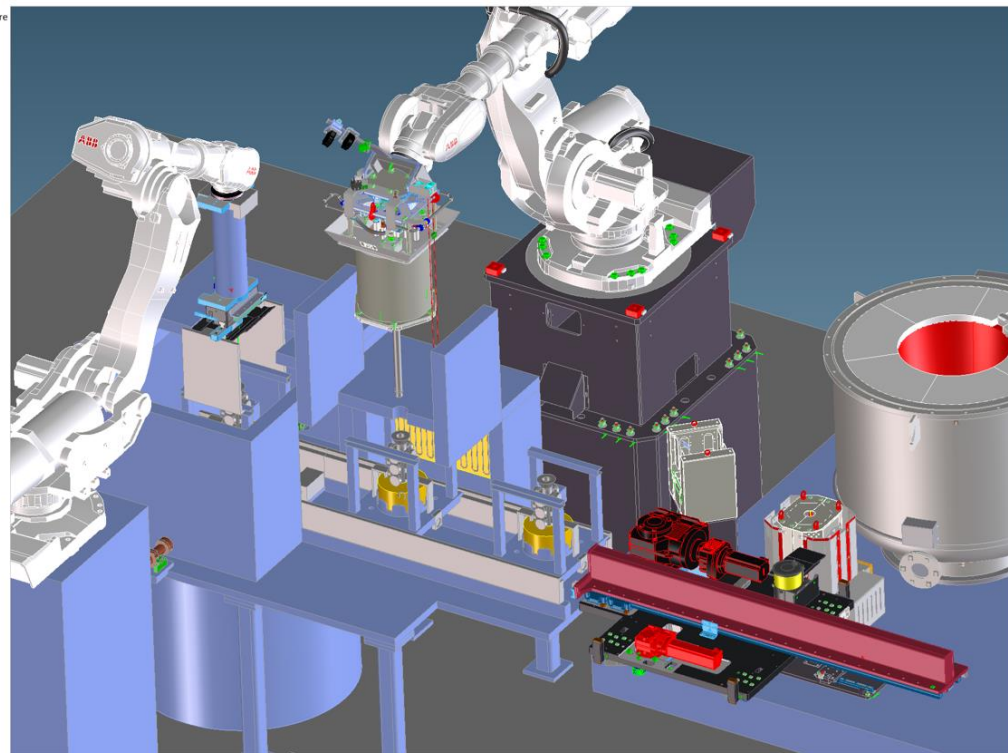
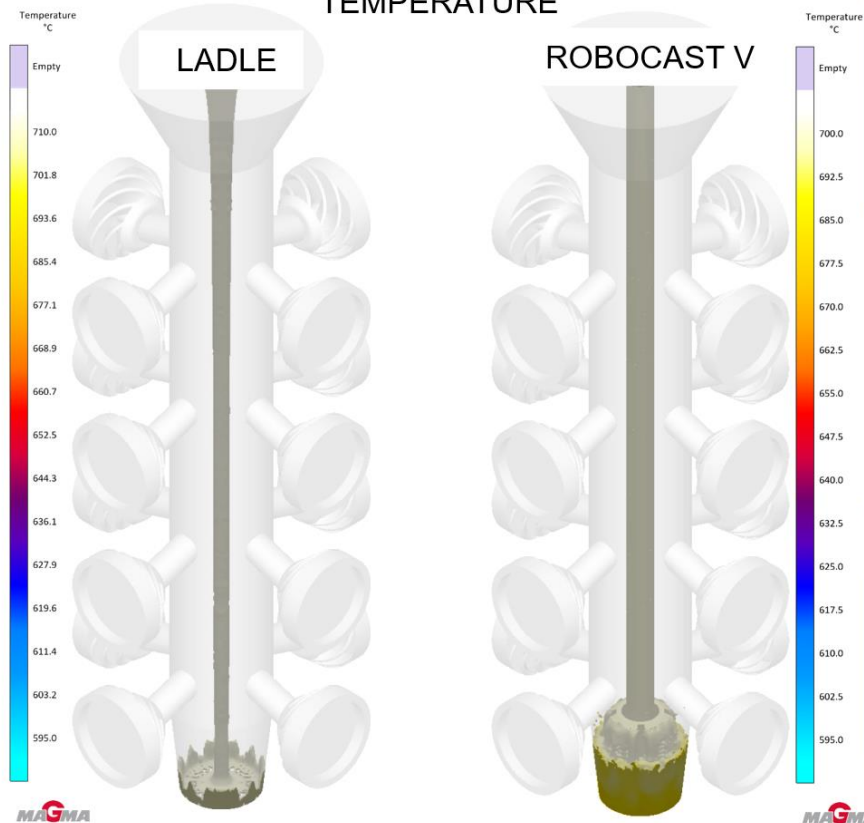


TILT-CASTING & Multi Injection Points



INVESTMENT CASTING

TEMPERATURE



CASTING CELL – CONCEPT FROM FILL

If you are seeking the best solution,
shape your future with Fill.

Edmundo Oliveira
15.09.2024

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