FORMTEKNIK
Your Solution Partner

ESI Report Large

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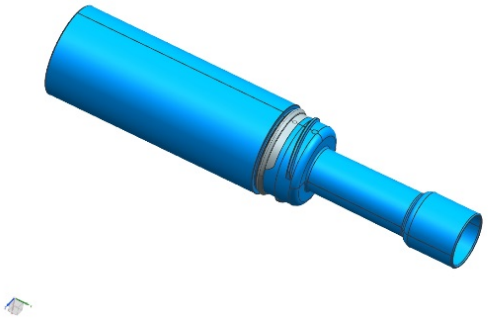
Scope

- This report scope is to provide alternative ideas to optimize the part quality and archive lowest possible cycle time, by optimizing the part thickness.



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General Parameter

Project name:	XXXXX	Tool concept:	2K with index plate.
Part name:	XXXX	Number of cavities:	8
Version / Revision:	N/A	Injection concept:	VG direct on part.
Design – Status:	Pilot/Production	Number of drops:	8 + 8
Material:	1’st shot - PP 2’nd shot – Dryflex		
Shrinkage:	N/A	Texture (VDI) cavity:	N/A
Part weight: 1’st shot	8,86 gram	Texture (VDI) core:	N/A
Part weight: 2’nd shot	0,14 gram	Special area texture:	N/A
Runner weight:	0 gram	Shot weight: 1’st shot	70,8 gram
Moulding machine optimal screw size:	Ø40 – for 1’st shot Ø10/Ø12 – for 2’nd shot	Shot weight: 2’nd shot	1,12 gram
Tot. projected surface:	160 cm²	Requirements:	100 Ton with 600 BAR holding presure.

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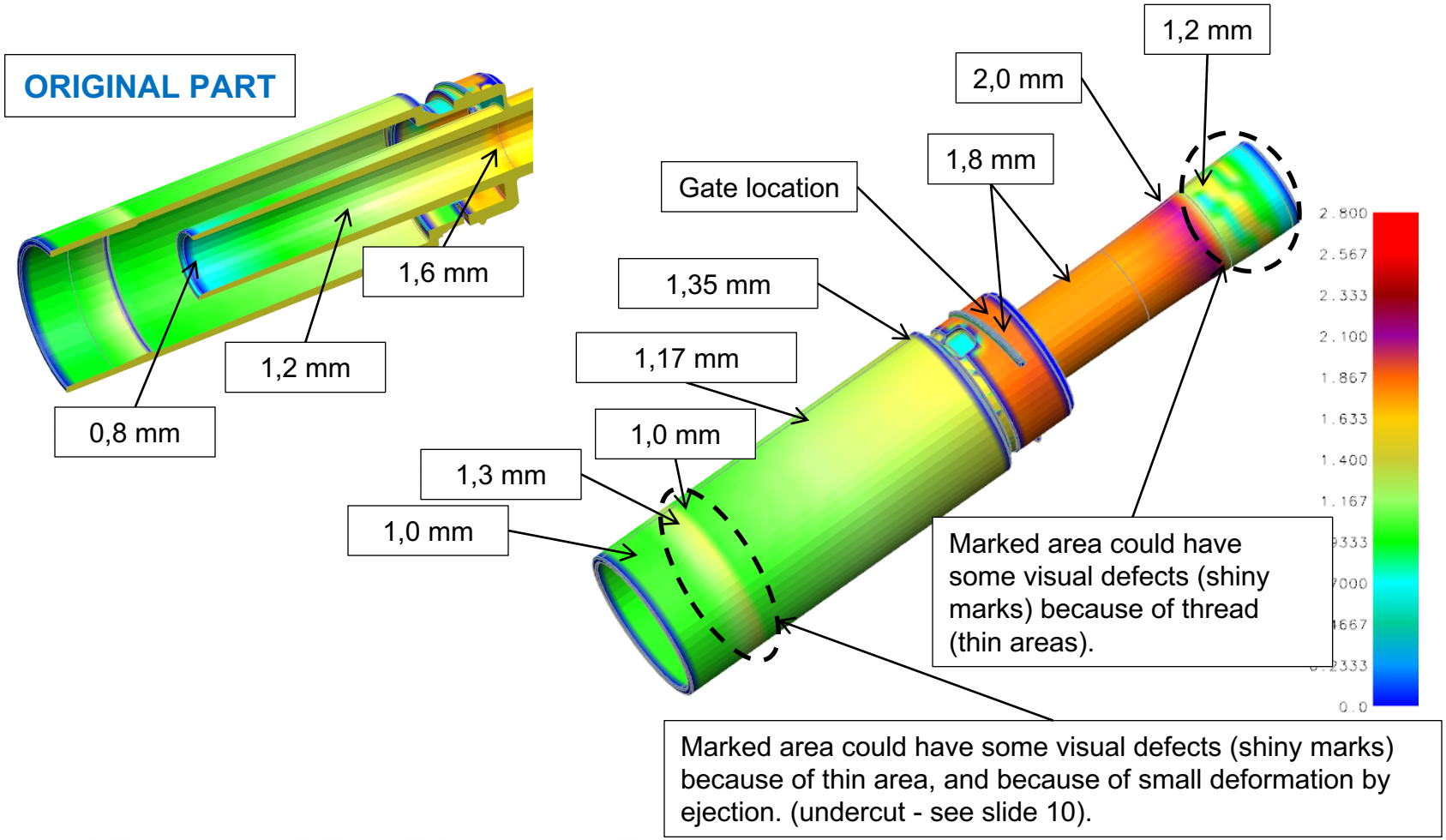
Wall Thickness Analysis 1st Shot



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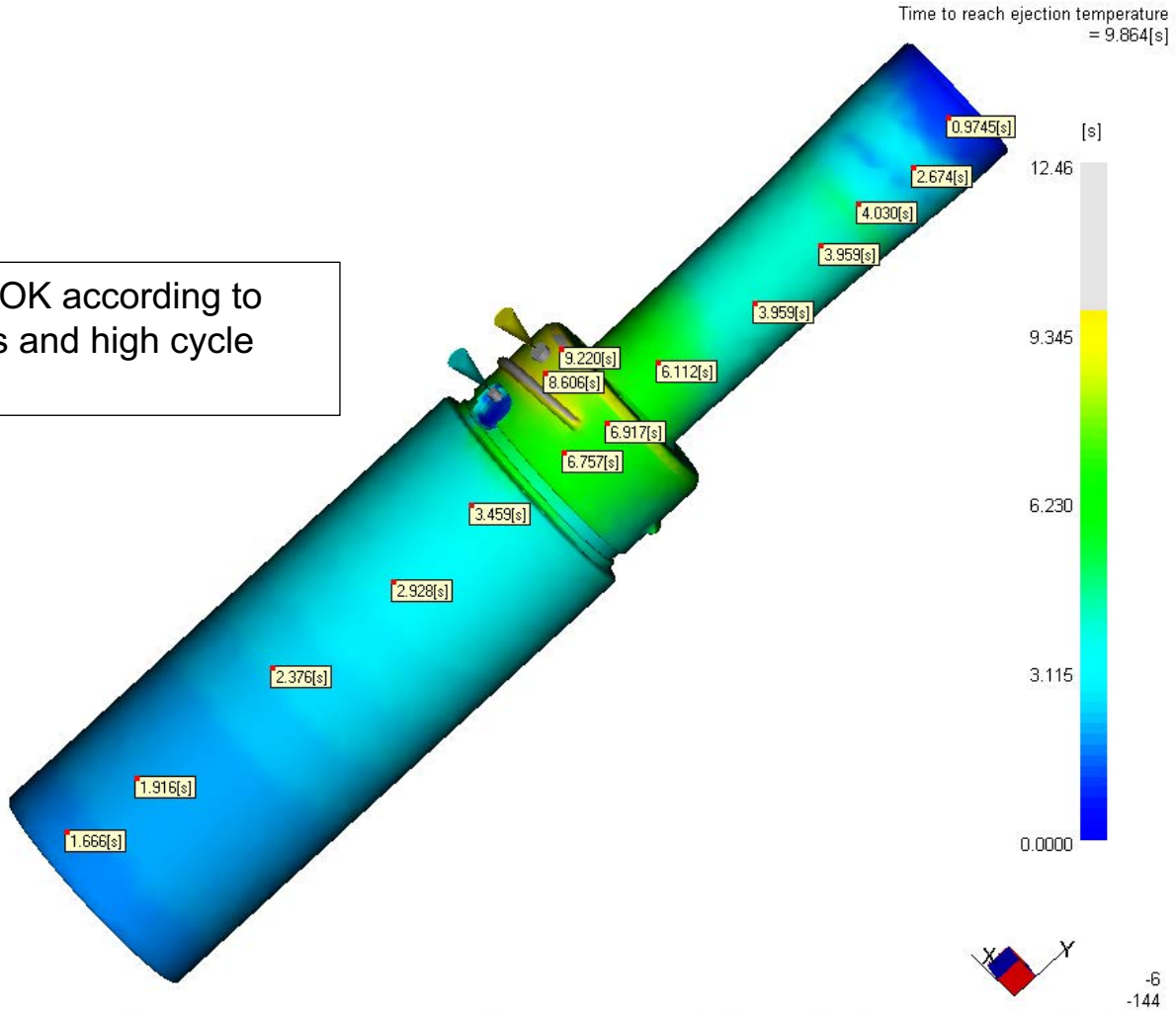
Wall Thickness Analysis 1st Shot

General thickness is OK according to eventually sink marks and high cycle time.



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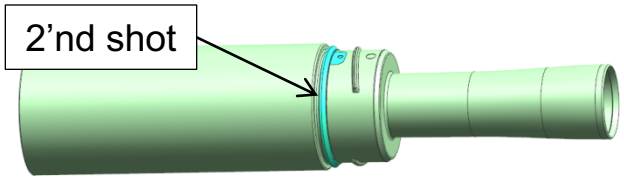
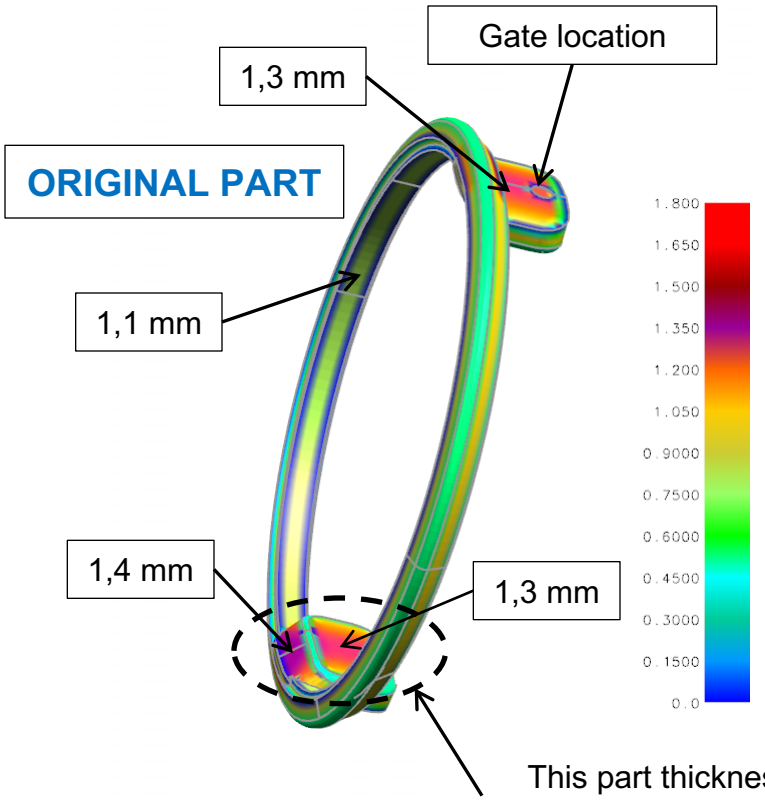
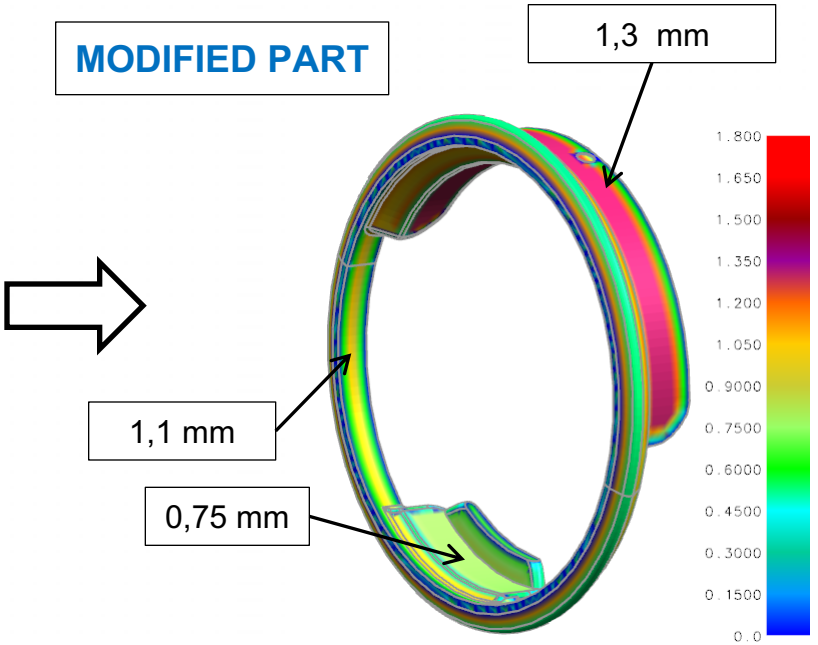
Wall Thickness Analysis 2nd Shot



ORIGINAL PART



MODIFIED PART

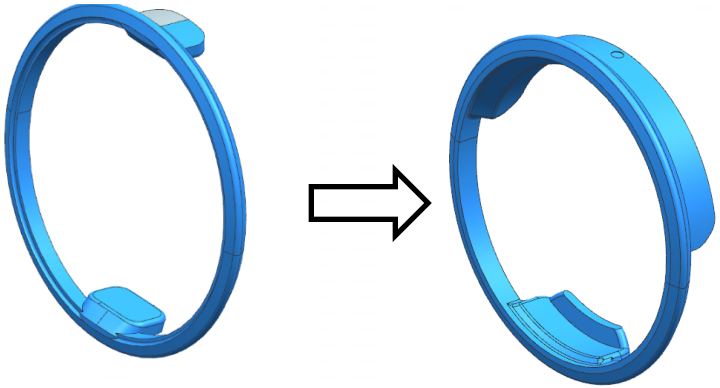


This part thickness will give locally Sink marks. See next slide.

Wall Thickness Analysis 2nd Shot

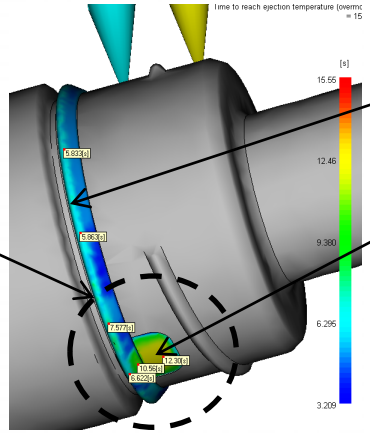
Marked area (end of fill) have relative large part thickness. This could give unwanted shrink in this area. Suggest to core out. (see 3d step file).

ORIGINAL PART

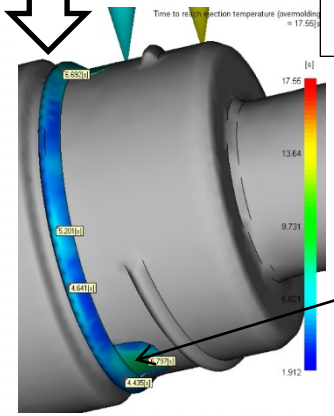


MODIFIED PART

ORIGINAL PART



MODIFIED PART



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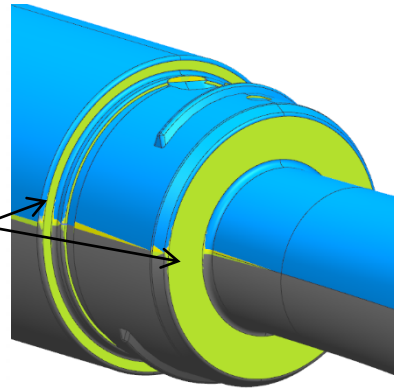
Draft analysis MH and FH side 1st shot

Blue surfaces = MH side.
Gray surfaces = FH side.
Yellow surfaces = No draft.

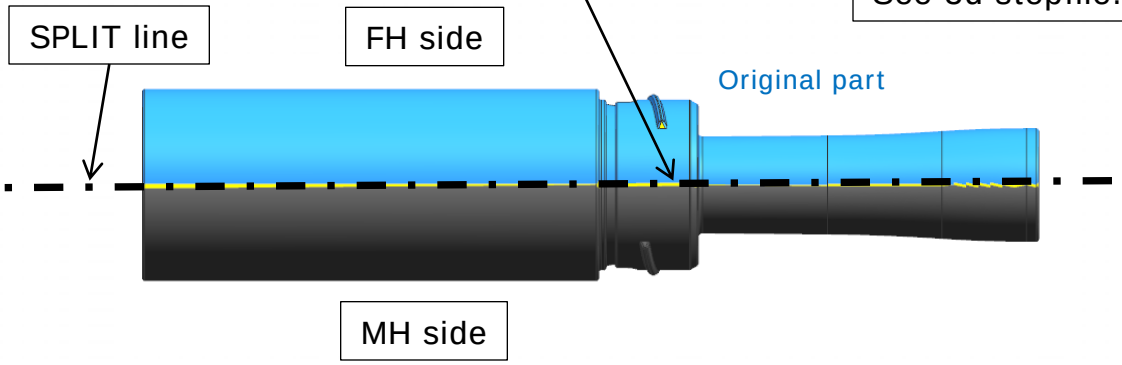
Suggest to divide these 2 end surfaces by the split line and make 0,5 degrees draft to each side to avoid scratch marks.

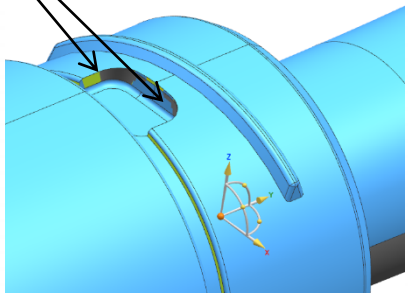


Minor scratch marks could occur in the parting line.

Grey is undercut (on both sides of the part). Please add draft.

See 3d stepfile.





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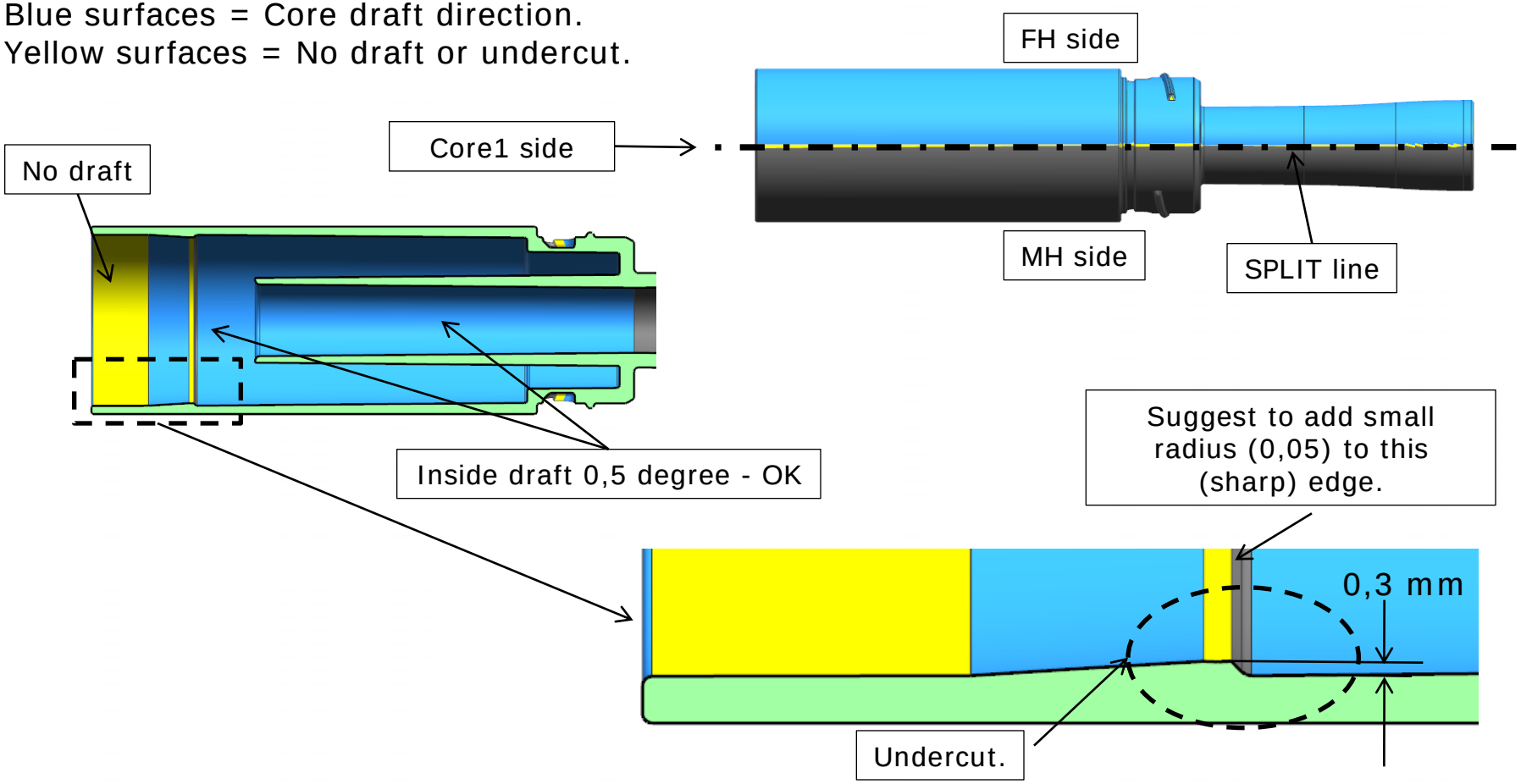
Draft analysis Core1 side 1st shot

Blue surfaces = Core draft direction.
Yellow surfaces = No draft or undercut.



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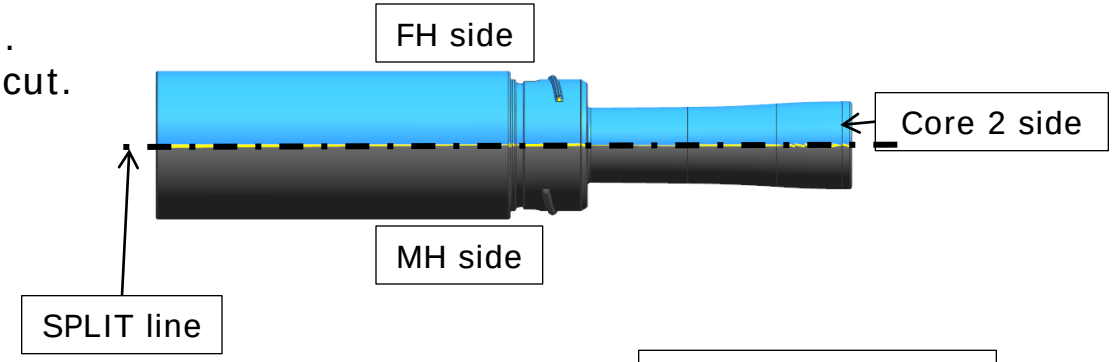
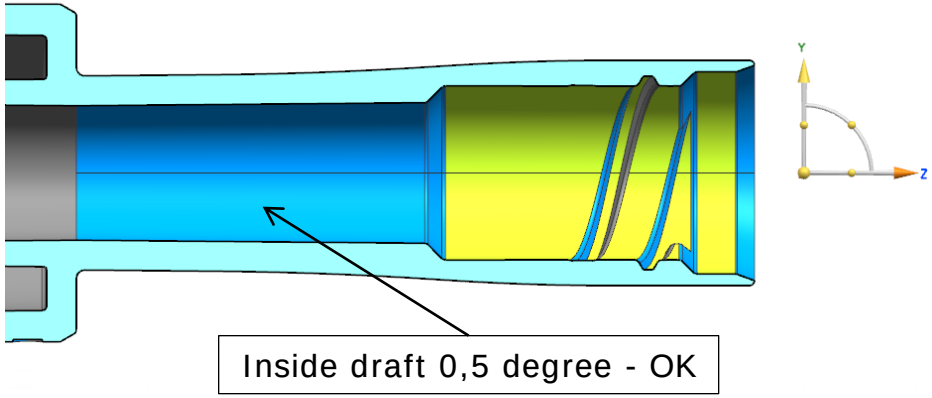
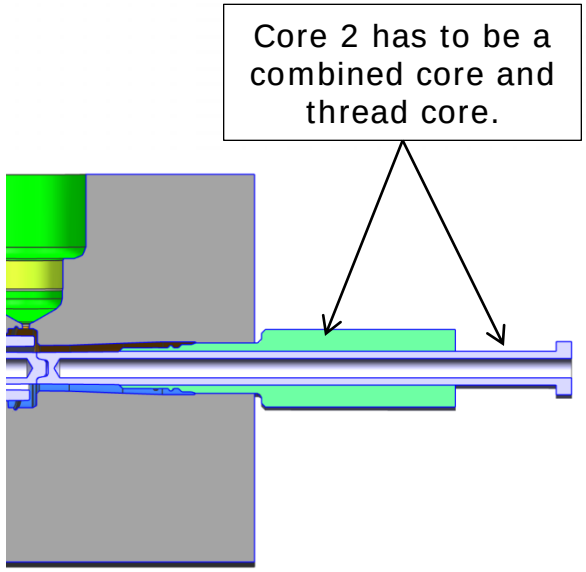
Draft Analysis

Blue surfaces = Core draft direction.
Yellow surfaces = No draft or undercut.







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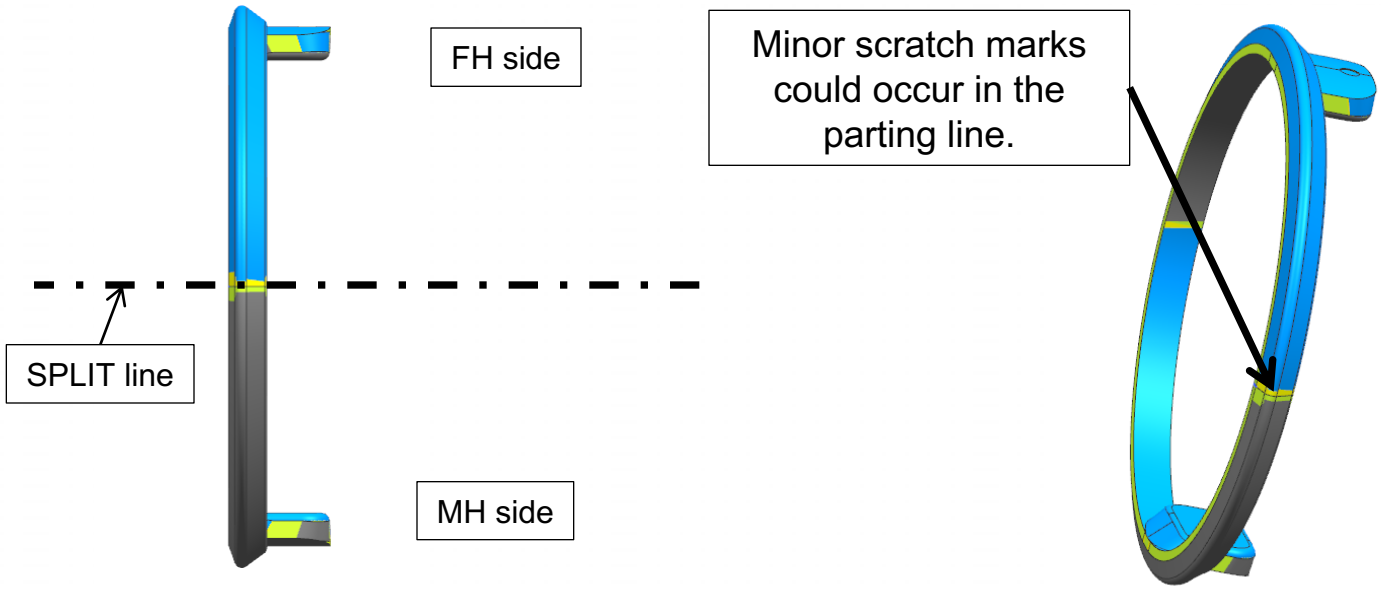
Draft analysis MH and FH side 2nd shot

Blue surfaces = MH side
Grey surfaces = FH side
Yellow surfaces = No draft.



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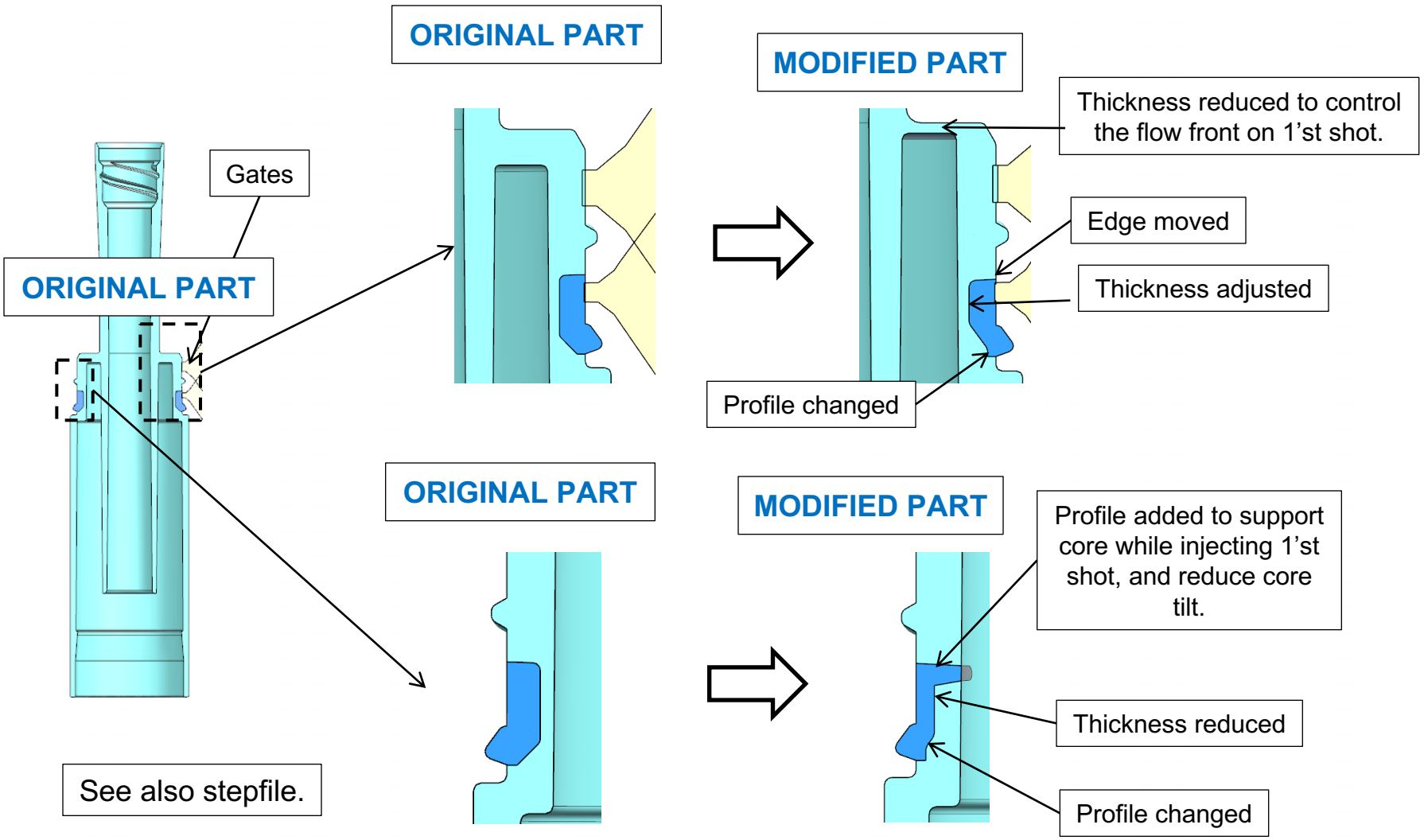
General Remarks



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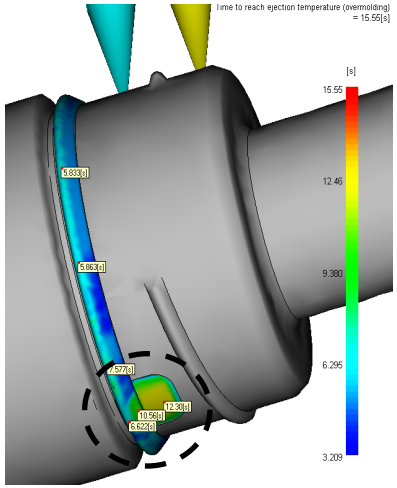
General Remarks

Based on the results from Mould flow regarding ”time to reach ejection temp.” and to reduce risk of core tilt - 2’nd shot is modified in area1.

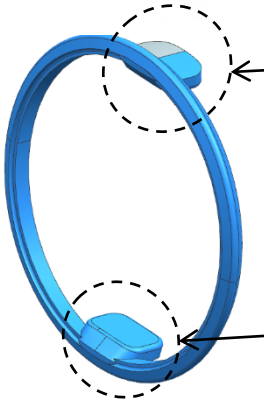
Area2 is modified to adjust the flow front on 1’st shot.

These modifications also has an improving effect on the 2’nd shot size. (8cav. Original shot size was 1,12 gram raised to 1,85 gram).



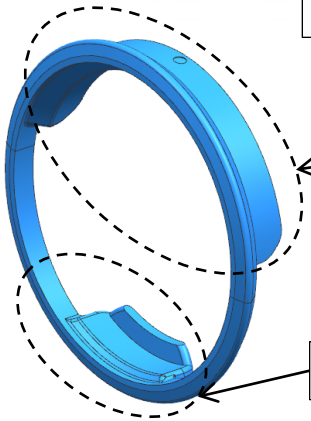
ORIGINAL PART

0,14 gram



MODIFIED PART

0,23 gram



See also stepfile.

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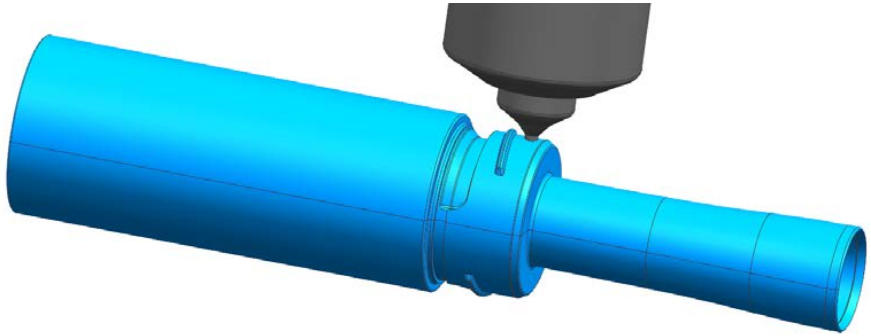
Gate Location

Valve gate direct on part
1’st shot.



Valve gate direct on part
2’nd shot.

We recommend valve gate on both shots. Cold slugs is a potential risk if hot tip nozzles is used, especially on 2’nd shot.

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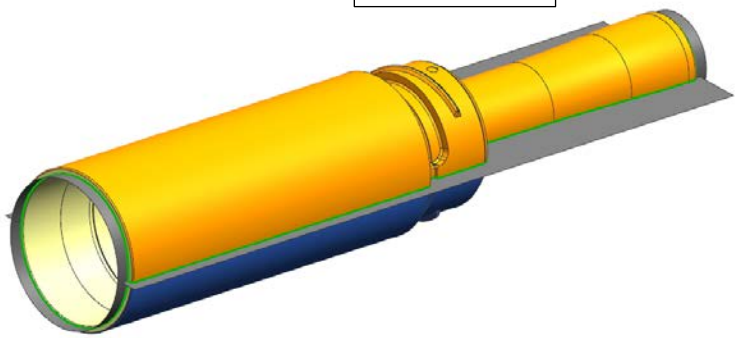
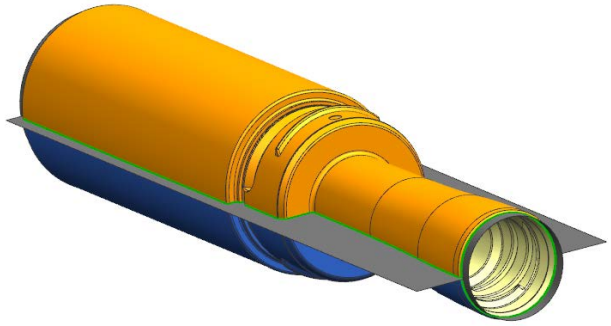
Parting Line

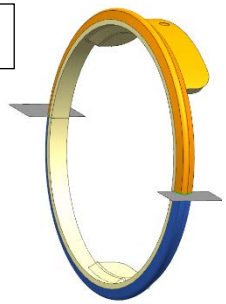
Grey Shot off surfaces and flash direction. Green is parting line.
Orange surfaces is FH side and Blue is MH side.

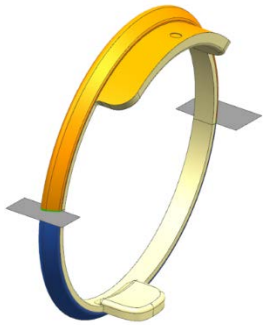
1’st shot





2’nd shot





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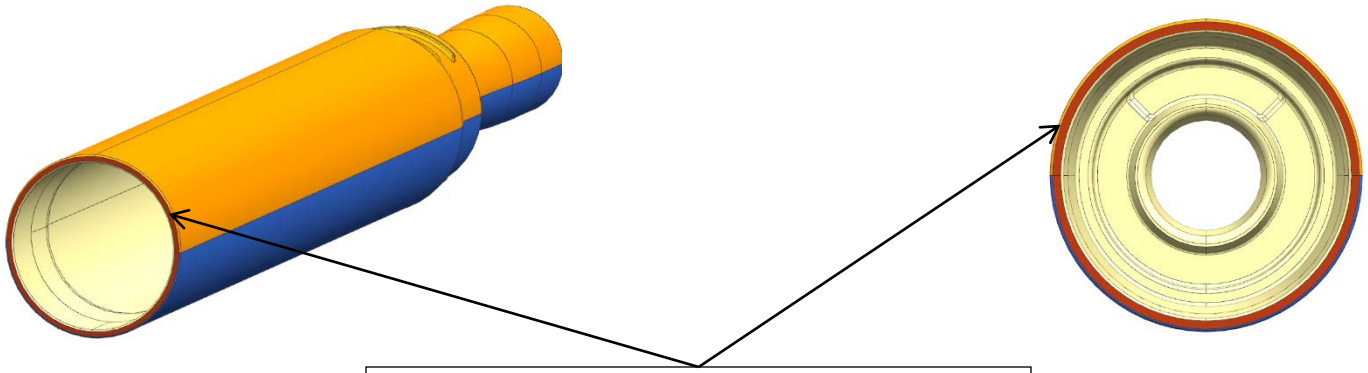
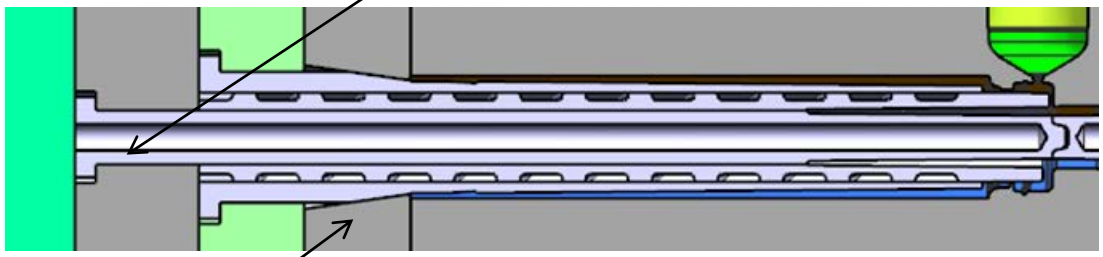
Ejector Placement



Stripper plate on red surface

Suggest to let inner core move 2-5 mm along the part by ejection. This will ease ejection force, and keep the needed venting open/clean.



Stripper plate

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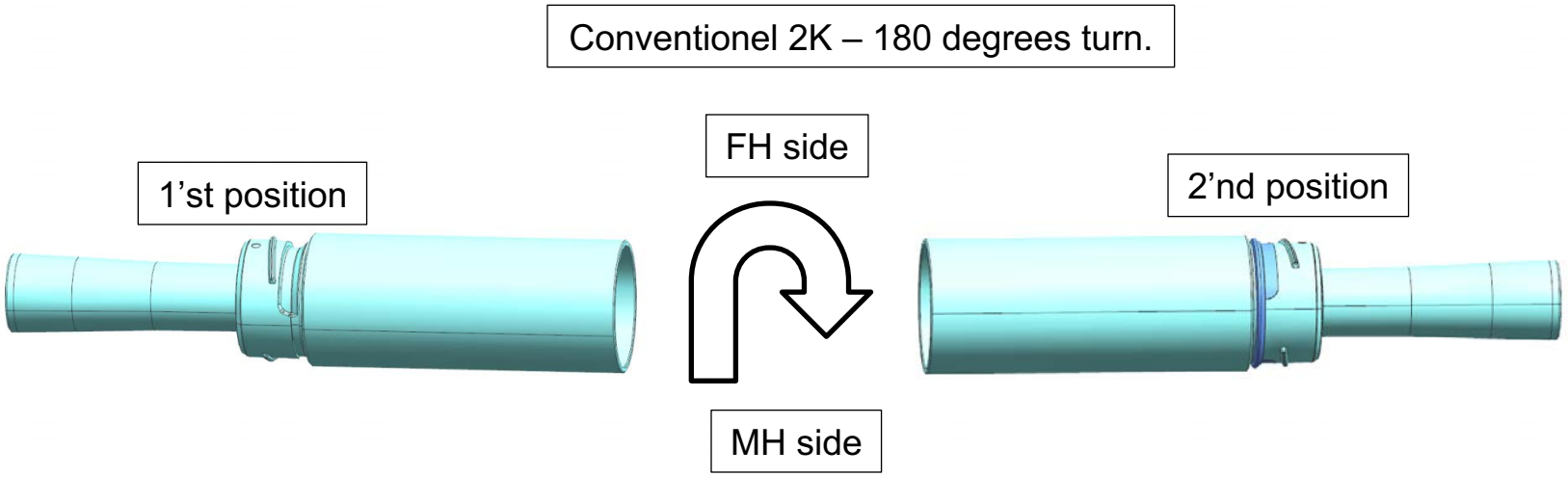
Tool Concept



Mould sequence:

1. 1’st shot will be moulded in 1’st position.
2. Thread core2 (in FH side) unscrews thread.
3. Mould opens.
4. Index plate move forward with the part of 1’st shot .
5. Index plate will turn 180 degree
6. Index plate move back with part into 2’nd shot inserts on MH side.
7. Mould close. Injection….
8. Mould opens
9. Index plate move forward with the complete part.
10. Part ejected by stripper plate. (Will only be activated in one side of the mould).

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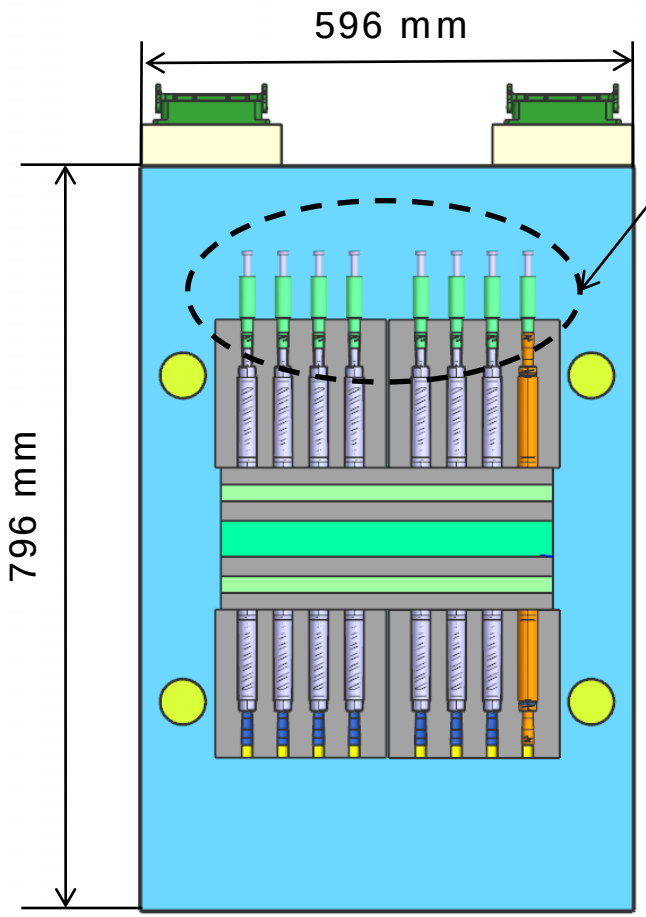
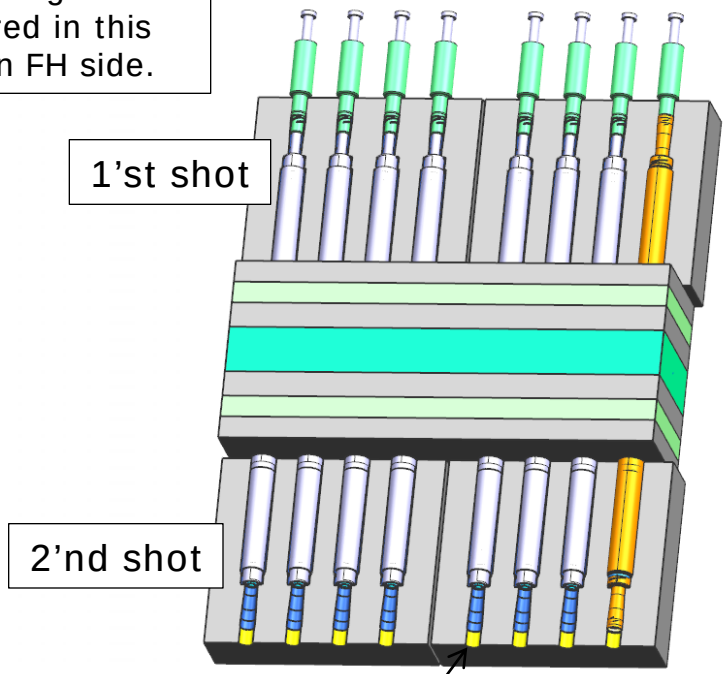
Conventionel 2K – 8+8 – 180 Degrees Turn



Slider with unscrewing unit is required in this area in FH side.

Inserts foot print 415 x 415 mm



FH inserts and MH inserts needs to be guided together individually by small straight square locks.

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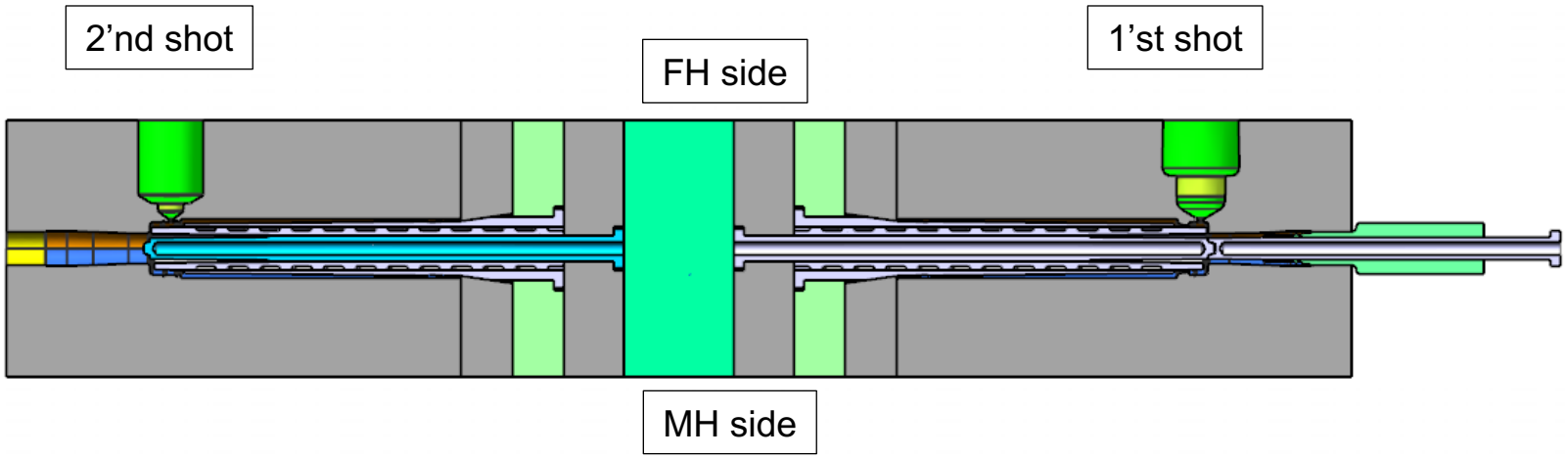
Conventionel 2K – 180 Degrees Turn.



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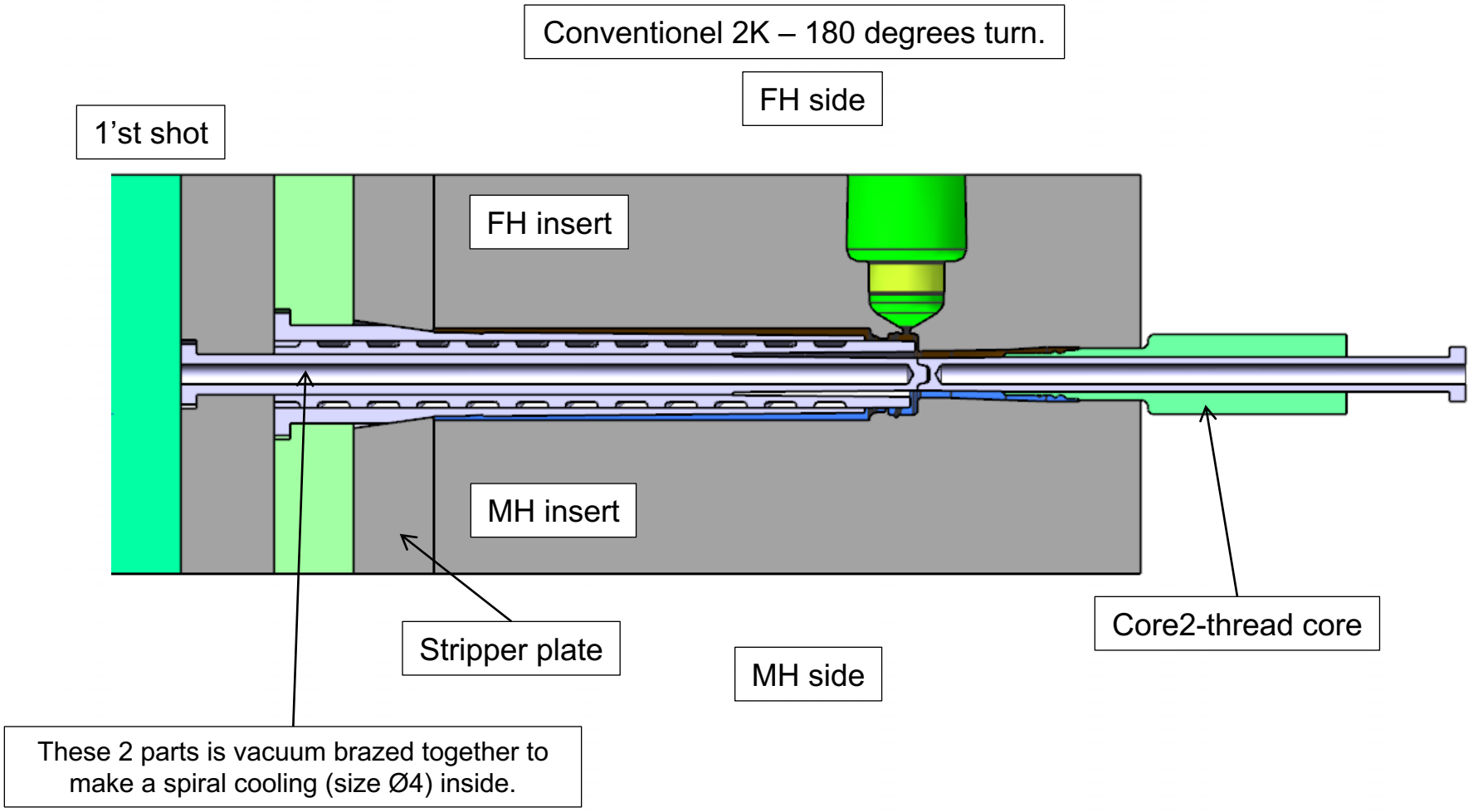
Tool Layout



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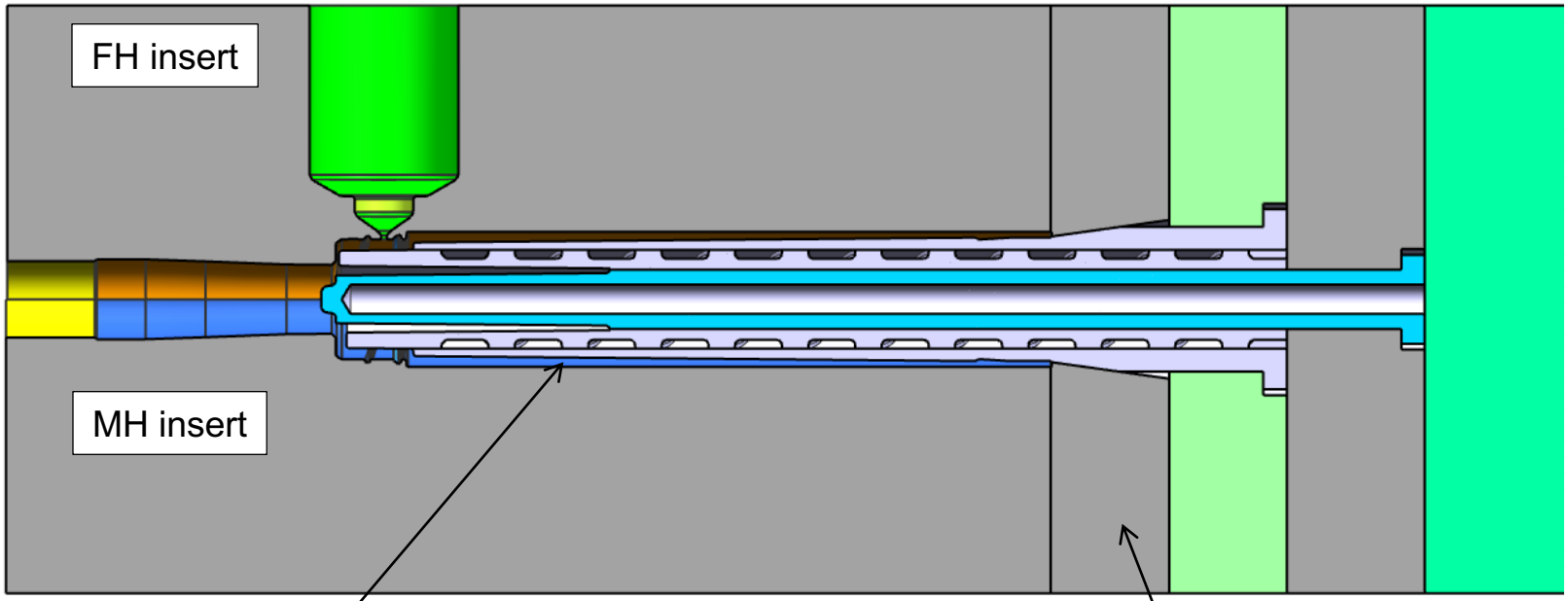
Tool Layout

Conventional 2K – 180 degrees turn.

2’nd shot

FH side



These 2 parts is vacuum brazed together to make a spiral cooling (size Ø4) inside.

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Gate location used in MoldFlow

Gate 1: Option

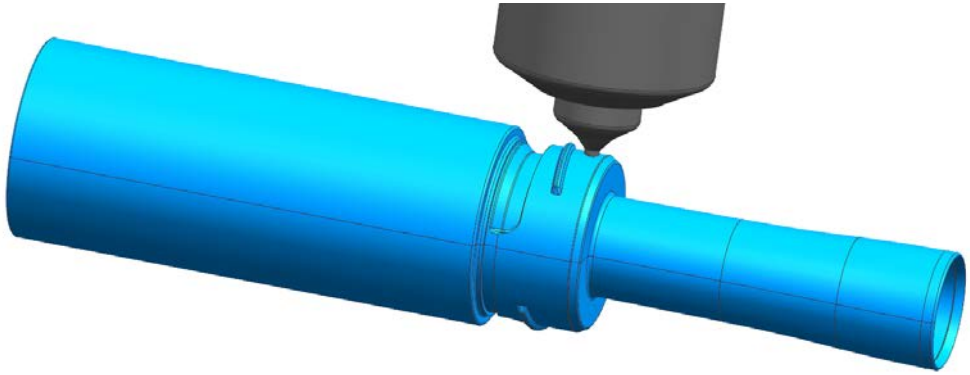
1st shot gate

Specified:

Hot gate

Ø 1,6 mm

Direct Gate located on part.



Gate 2: Option

2nd shot gate

Specified:

Hot gate

Ø 1,0 mm

Direct Gate located on part.

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Material Specifications

Customer Specified material in mold flow

Description: 1st shot				
Trade Name	Eltex B4020N 1343			
Supplier				
Type	HDPE			
Recommended Processing:		**Nom.**	**Min.**	**Max.**
Melt temperature	°C	**188**	**120**	**255**
Mold temperature	°C	**40**	**20**	**60**
T-tranz temperature	°C	**110**		
Ejection temperature	°C	**85**		
Maximum shear stress	Mpa	**0,2**		
Maximum shear rate	1/s	**40.000**		
Rheological Properties:				
MoldFlow Viscosity Index				
MFR	g/10min	**2.2**	**190°C / 2,16 Kg**	

Description: 2nd shot				
Trade Name	Eltex B4020N 1343			
Supplier				
Type	HDPE			
Recommended Processing:		**Nom.**	**Min.**	**Max.**
Melt temperature	°C	**188**	**120**	**255**
Mold temperature	°C	**40**	**20**	**60**
T-tranz temperature	°C	**110**		
Ejection temperature	°C	**85**		
Maximum shear stress	Mpa	**0,2**		
Maximum shear rate	1/s	**40.000**		
Rheological Properties:				
MoldFlow Viscosity Index				
MFR	g/10min	**2.2**	**190°C / 2,16 Kg**	

Material used in all calculations.

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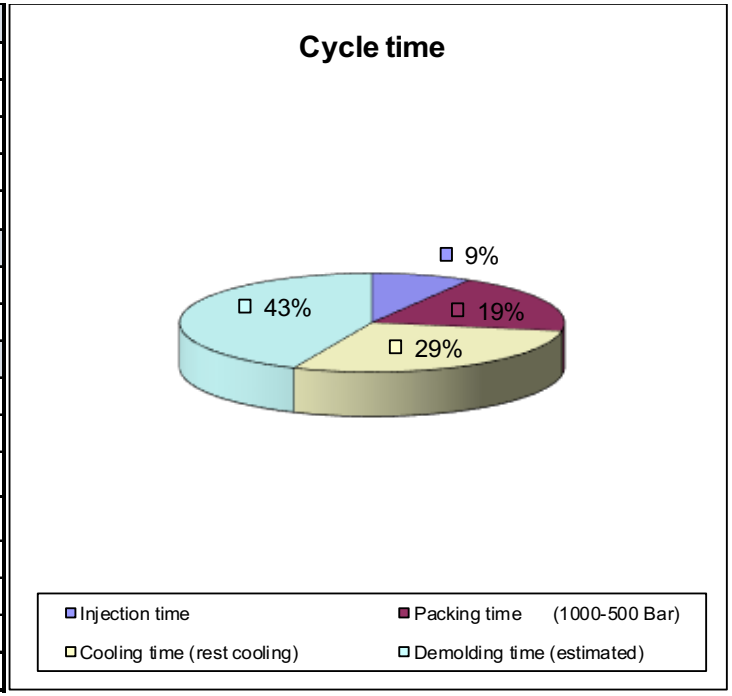
Process Data for Simulation

Process Conditions:		
Injection time	0,35	sec.
Packing time (1000-500 Bar)	0,80	sec.
Cooling time (rest cooling)	1,20	sec.
Demolding time (estimated)	1,80	sec.
Cycle time	**4,15**	**sec.**
Melt temperature	220	°C
Mold temperature	13	°C
Clamp Tonnage (estimated)	300	ton
Clamp Tonnage, Safety factor 25%	375	ton
Shot Volume (one cavity)	1,5	cm^3
Injection Rate (one cavity)	4,3	cm^3/sec
Injection Pressure (estimated)	400	bar
Switch over point	99	%
Part weight	1,43	g



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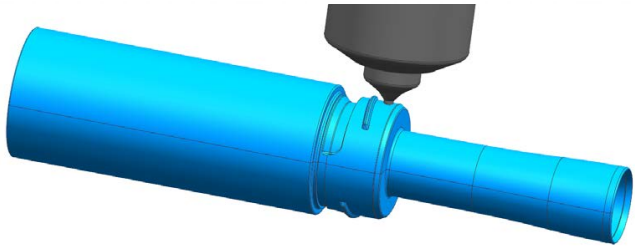
Gate Shear Rate – 1’st Shot

Date
09-maj-11

Customer			
Tool no			
Component			
Material	HDPE		
**Recommended Shear Rate	40.000		
Gate Diameter mm	1,60	Estimate if unknown then adjust to achieve rec. shear rate	
Injection Time (secs)	0,65		
Part Weight (g)	8,86		
Runner Weight (g)	0,00	divide by number of cavities	0
Number of cavities	1		
Full Shot Weight (g)	8,86		
Material Density / SG	0,96		
*Melt Density conv. Factor	0,9		

Calculated shear rate through gate
39.233
OK ADJUSTMENT PERMISSABLE

Gate Area mm	2,512	Convert cm	0,025
Gate Radius mm	0,80	Convert cm	0,08
One Part + Runner Weight	8,86	grms	
% Part to Part + Runner Wt	100,00	%	
Part Fill Time	0,65	secs	
Volume of Part	10,25	ccm/s	
Melt Density	0,864		



When using HDPE for 1’st shot
Recommended Gate size on VG nozzle: Ø 1,6
Injection time – 0,65 sec.
Shear in gate is OK.

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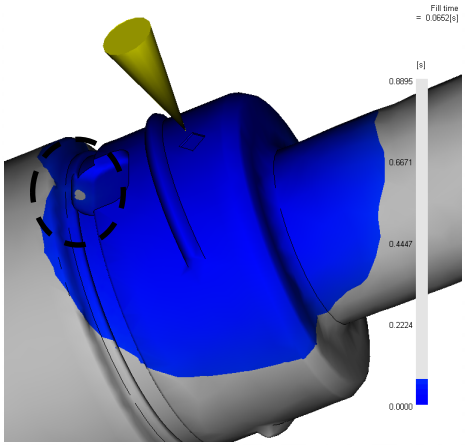
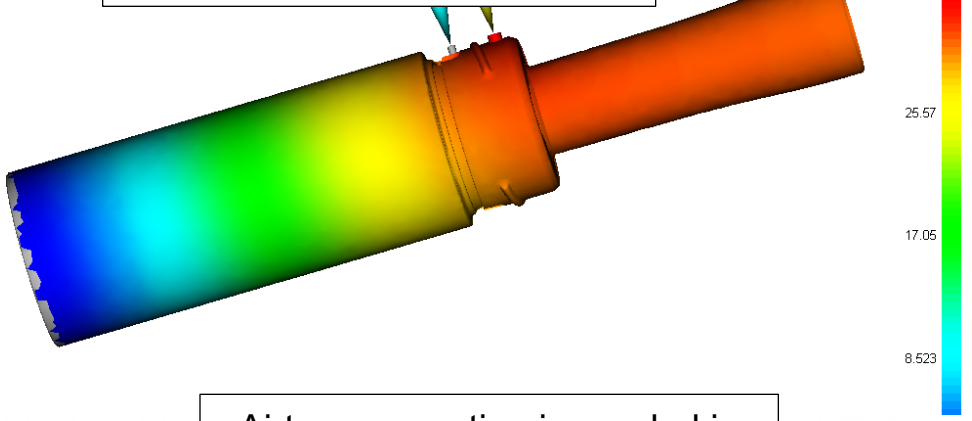
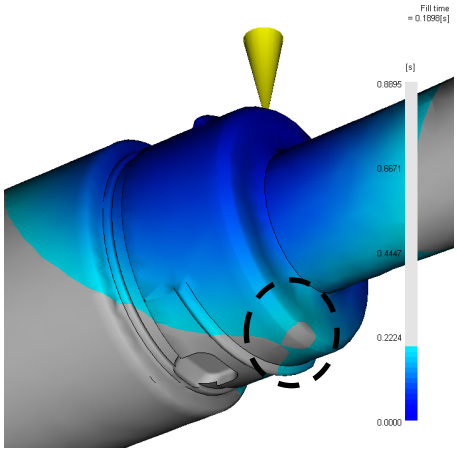
MoldFlow - 1’st Shot

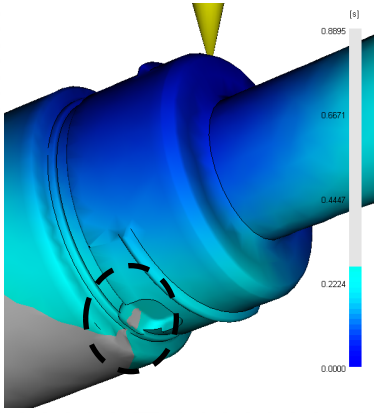
MoldFlow is done in the ORIGINAL 3D part.



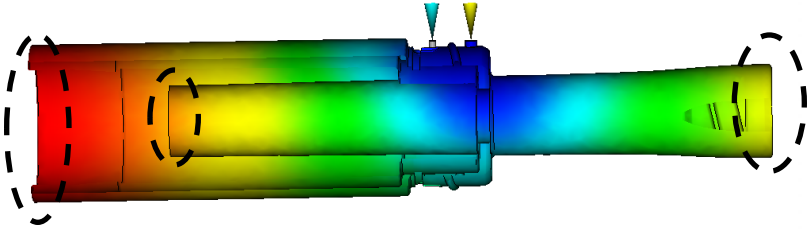
Pressure at end of fill 340 BAR







Airtraps – venting is needed in marked locations



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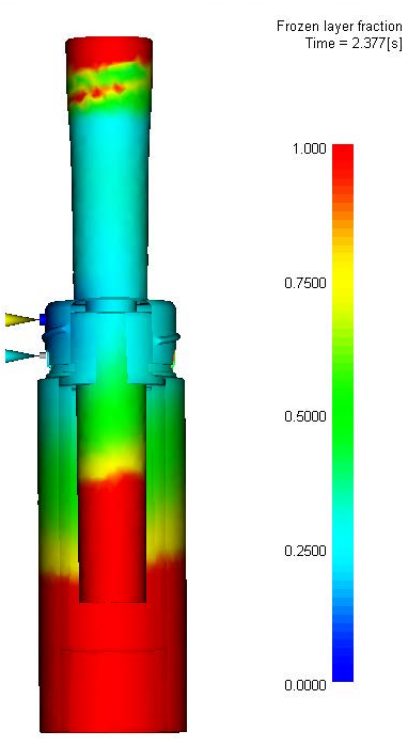
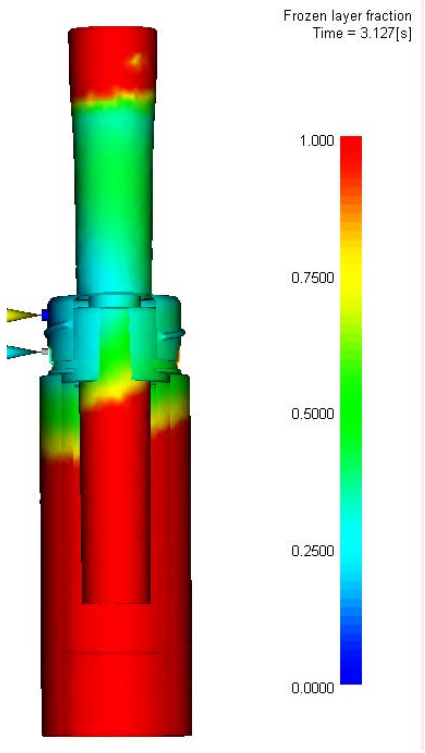
MoldFlow - 1’st Shot

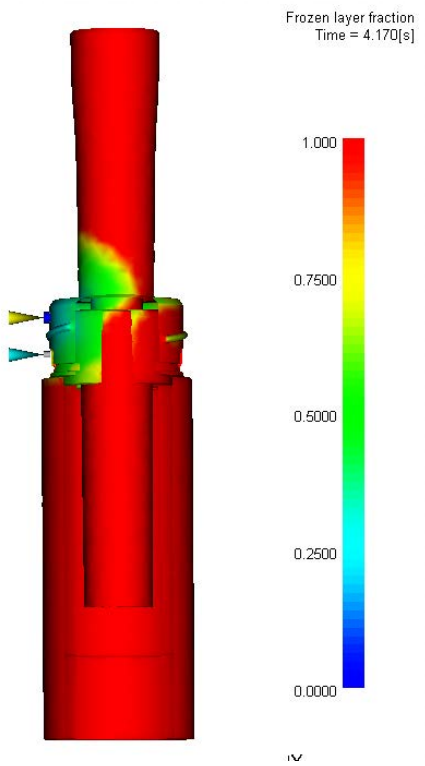
MoldFlow is done in the ORIGINAL 3D part.



Frozen layer fraction 2,4 sec.



Frozen layer fraction 3,1 sec.



Frozen layer fraction 4,1 sec.

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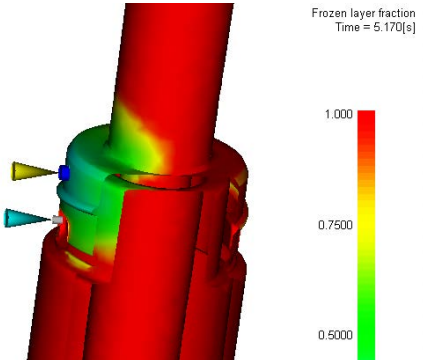
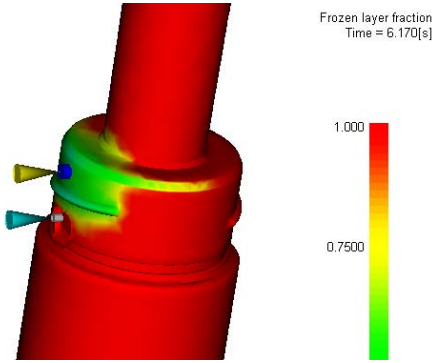
MoldFlow - 1’st Shot

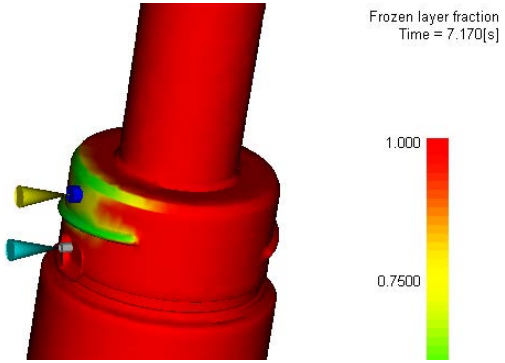
MoldFlow is done in the ORIGINAL 3D part.



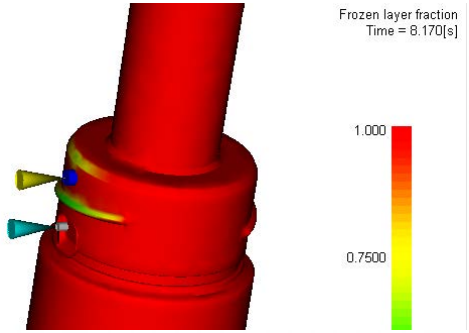
Frozen layer fraction 5,1 sec.



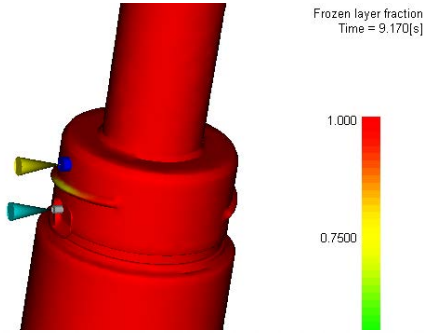
Frozen layer fraction 6,1 sec.



Frozen layer fraction 7,1 sec.



Frozen layer fraction 8,1 sec.



Frozen layer fraction 9,1 sec.

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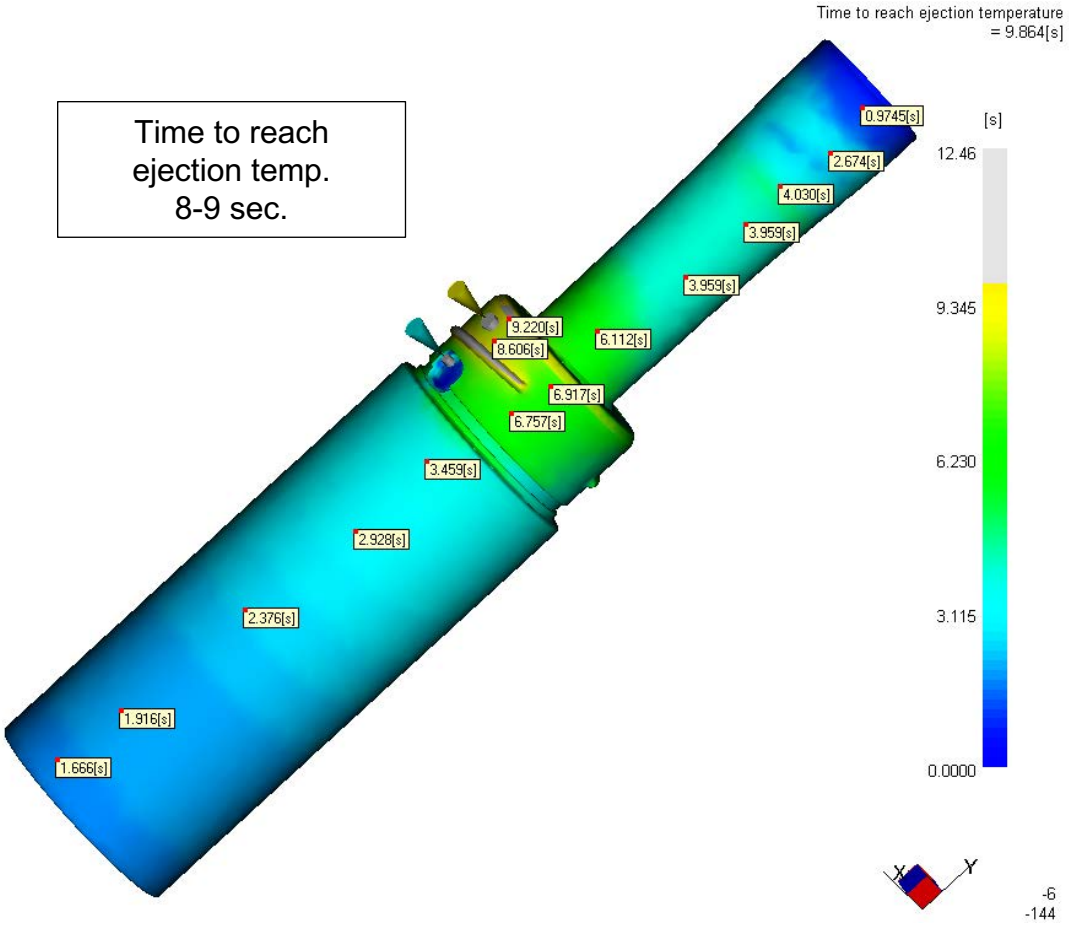
MoldFlow - 1’st Shot

MoldFlow is done on the ORIGINAL 3D part.

Time to reach ejection temp. 8-9 sec.



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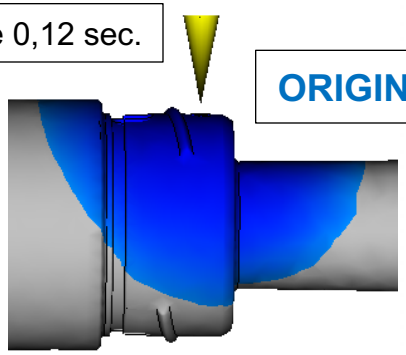
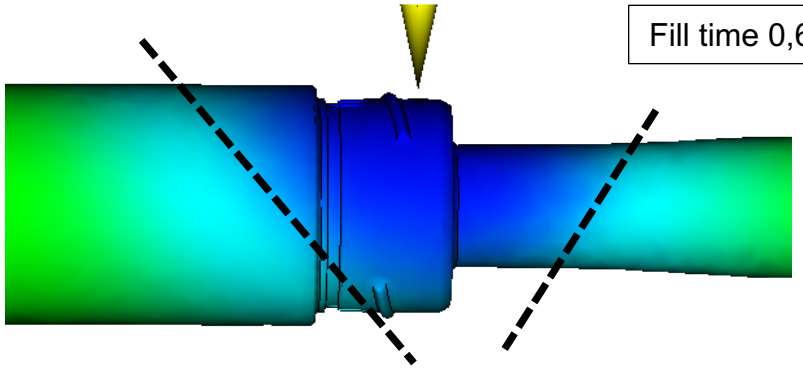
MoldFlow - 1’st Shot

Fil time 0,12 sec.

ORIGINAL PART

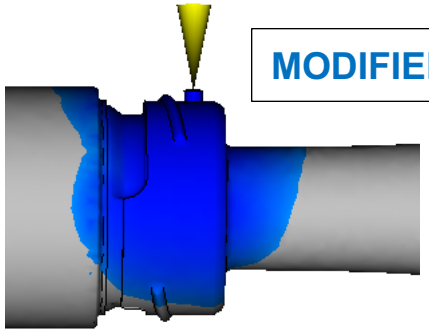


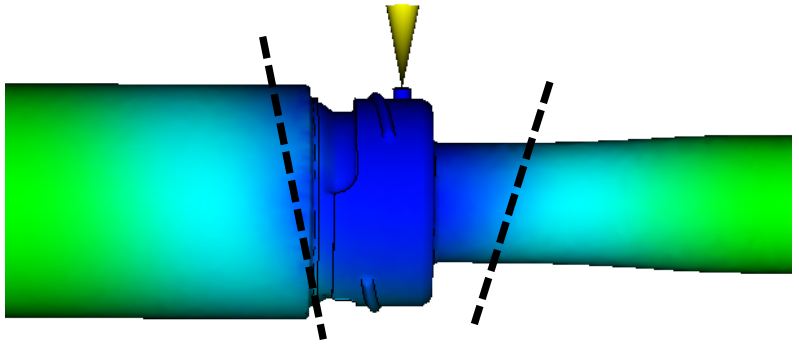


Fill time 0,68 sec.

Thickness manipulation of 1’st and 2’nd shot results in a more straight flow front an more homogeny filling on 1’st shot.

MODIFIED PART





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Gate Shear Rate – 2’nd Shot

Date
09-maj-11

Customer				
Tool no				
Component				
Material	TPE			
**Recommended Shear Rate	35.000			
Gate Diameter mm	1,00	Estimate if unknown then adjust to achieve rec. shear rate		
Injection Time (secs)	0,20			
Part Weight (g)	0,12			
Runner Weight (g)	0,00	divide by number of cavities	0	
Number of cavities	1			
Full Shot Weight (g)	0,12			
Material Density / SG	0,9			
*Melt Density conv. Factor	0,9			

Calculated shear rate through gate
7.545
OK ADJUSTMENT PERMISSABLE

Gate Area mm	1,570	Convert cm	0,016
Gate Radius mm	0,50	Convert cm	0,05
One Part + Runner Weight	0,12	grms	
% Part to Part + Runner Wt	100,00	%	
Part Fill Time	0,20	secs	
Volume of Part	0,15	ccm/s	
Melt Density	0,81		

Recommended Gate size on VG nozzle: Ø 1,0
Gate diameter could be smaller (down to Ø 0,6) but we recommend not to go below Ø1,0 to have a more rigid gate hole and valve stem.

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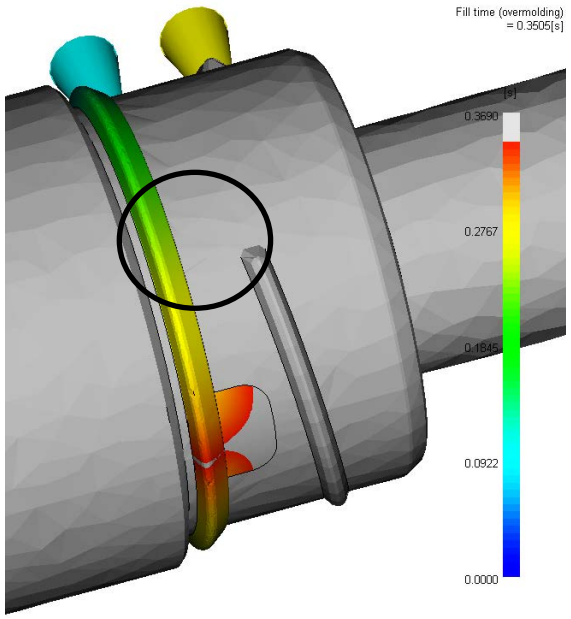
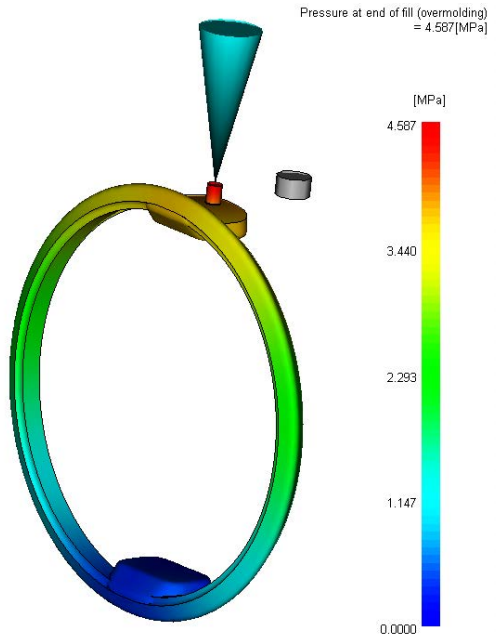
MoldFlow – 2’nd Shot

Mould flow is done on the ORIGINAL 3D part.

Air traps – venting is needed in marked locations



Pressure at end of fill 46 BAR



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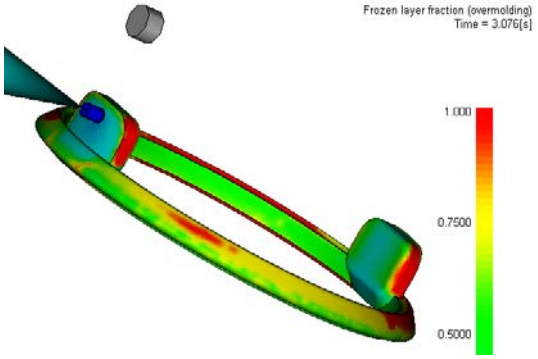
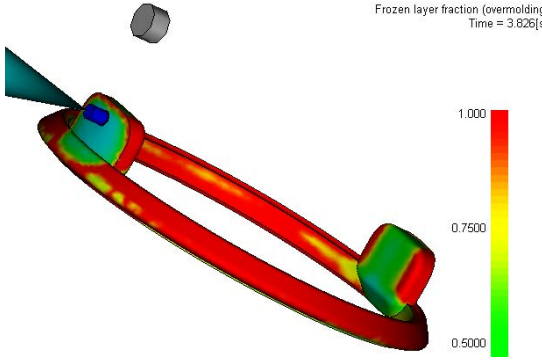
MoldFlow – 2'nd Shot

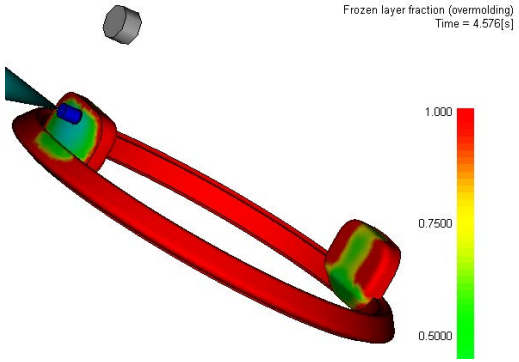
MoldFlow is done on the ORIGINAL 3D part.



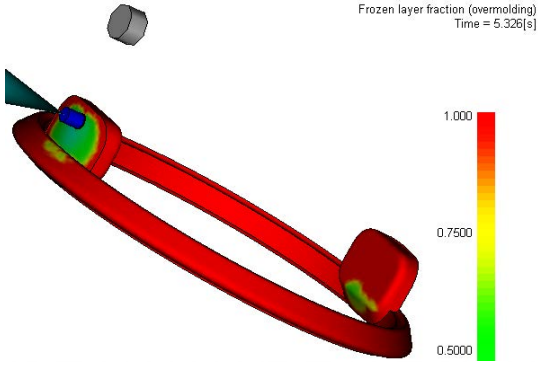
Frozen layer fraction 3,1 sec.



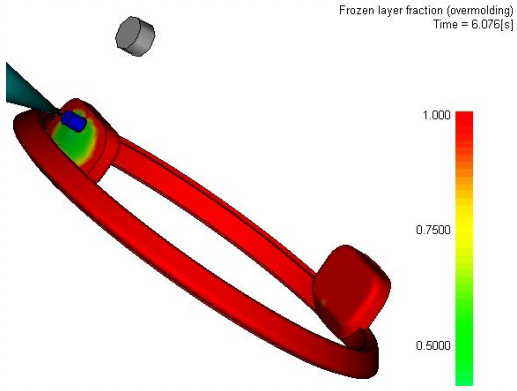
Frozen layer fraction 3,8 sec.



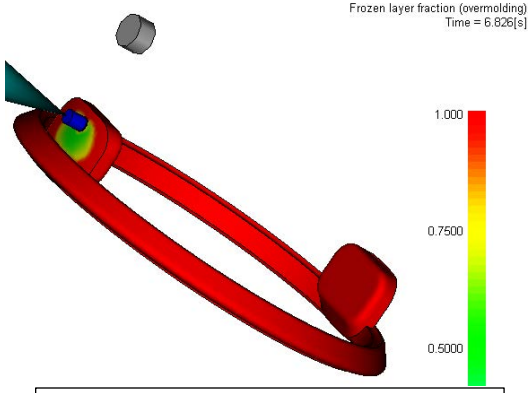
Frozen layer fraction 4,5 sec.



Frozen layer fraction 5,3 sec.



Frozen layer fraction 6,1 sec.



Frozen layer fraction 6,8 sec.

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