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BAG 20

PLOMBA

SISTECH

P.Marszałek

Thursday, 14.05.2020

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Cavity

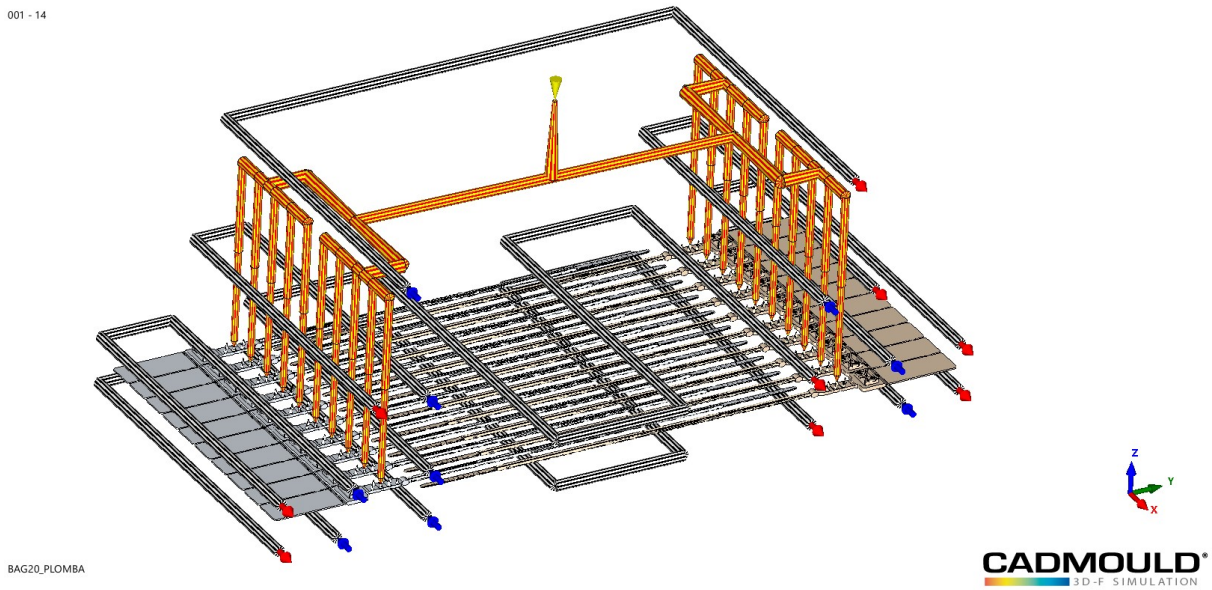

Fig. 1 Simulation 001 - 14 Group - Cavity

Wall Thickness

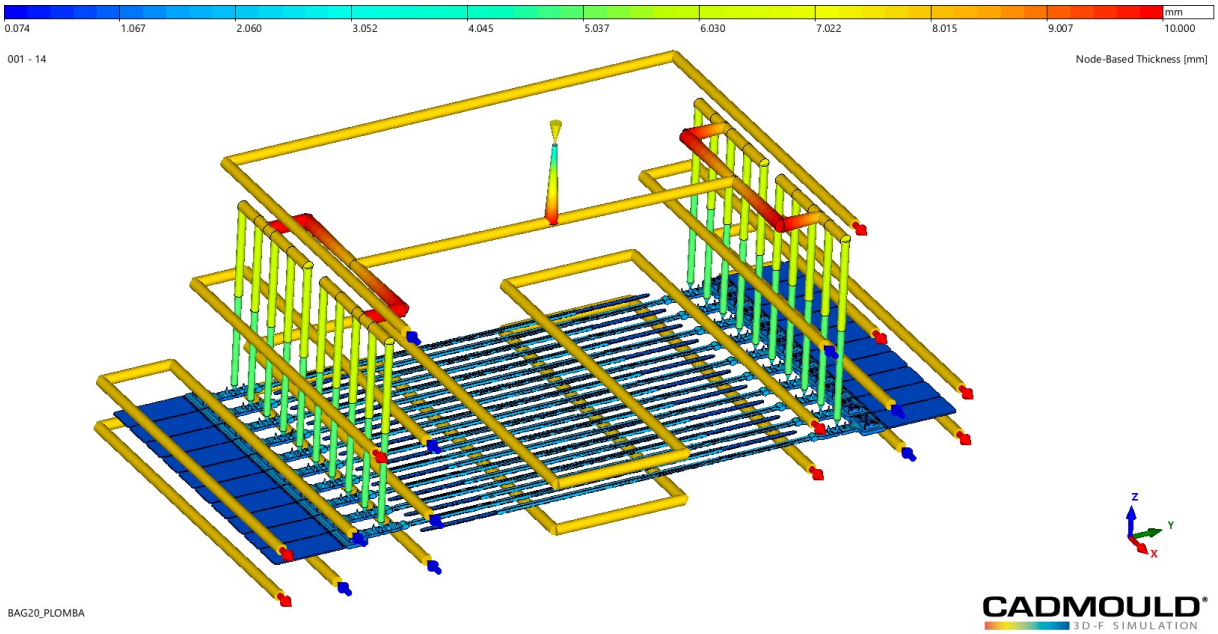

Fig. 2 Simulation 001 - 14 Group - Node-Based Thickness [mm]

Name	Value
Limits [mm]	0.074 - 10.000

Fluid Flow Rate

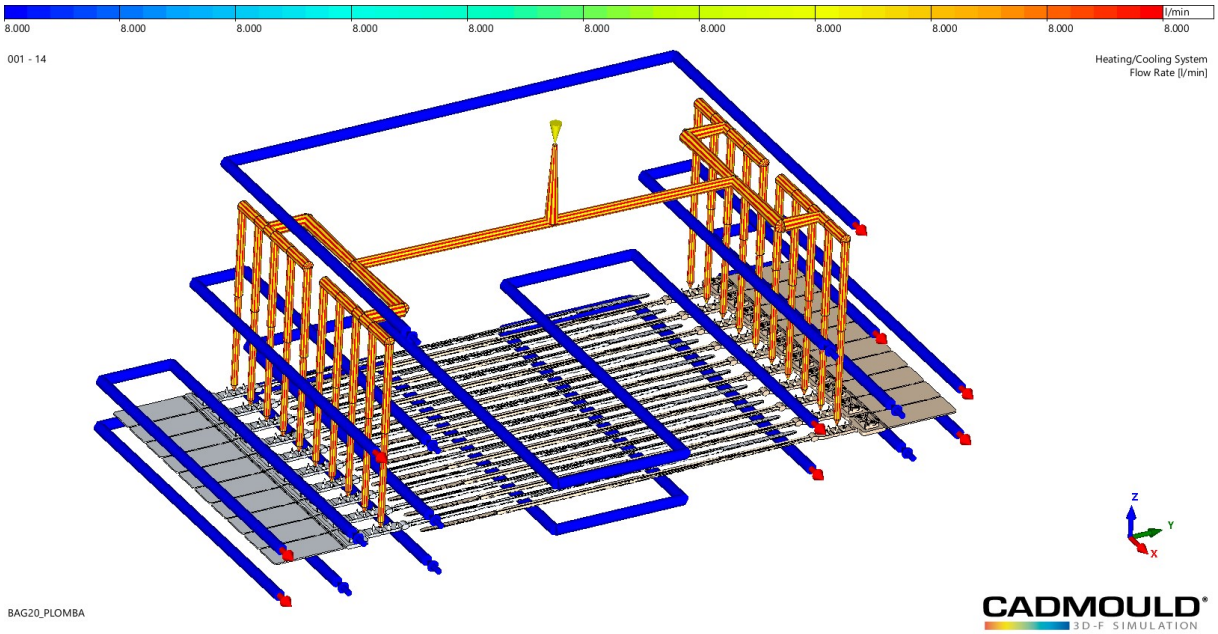

Fig. 3 Simulation 001 - 14 Group - Heating/Cooling System

Name	Value
Limits [l/min]	8.000 - 8.000
Time [s]	0.000
Time [s]	0.000
Time / Time [%]	-1.$
Level [%]	100.0

Fluid Temperature

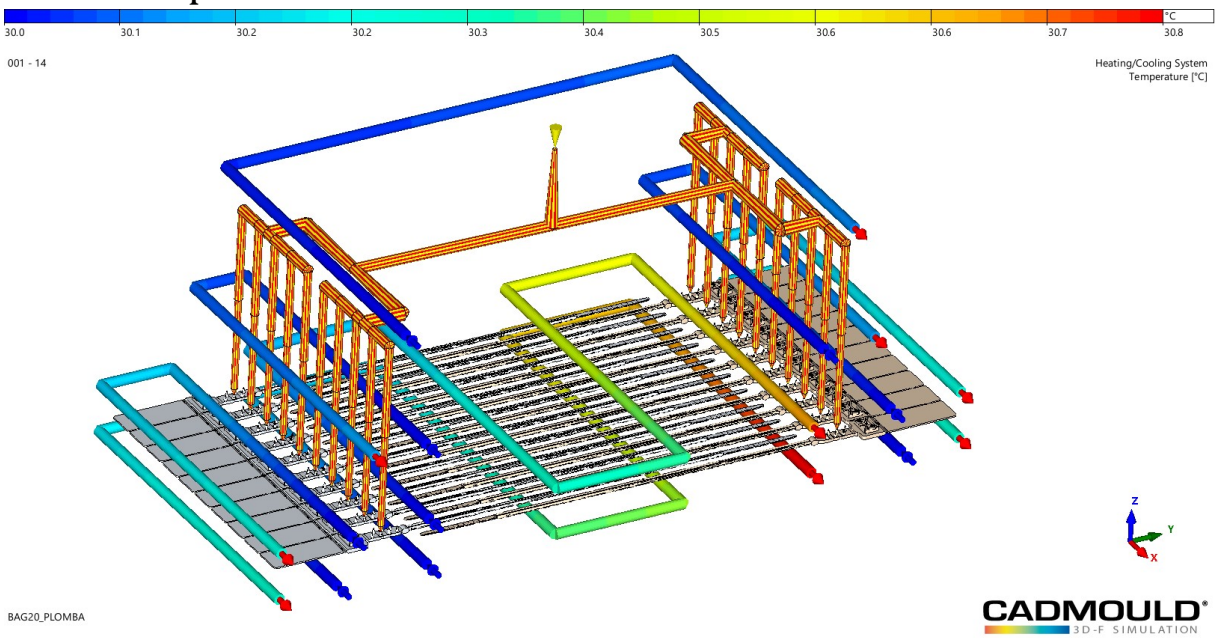

Fig. 4 Simulation 001 - 14 Group - Heating/Cooling System

Name	Value
Limits [°C]	30.0 - 30.8
Time [s]	0.000
Time [s]	0.000
Time / Time [%]	-1.$
Level [%]	100.0

Heat Flow Efficiency

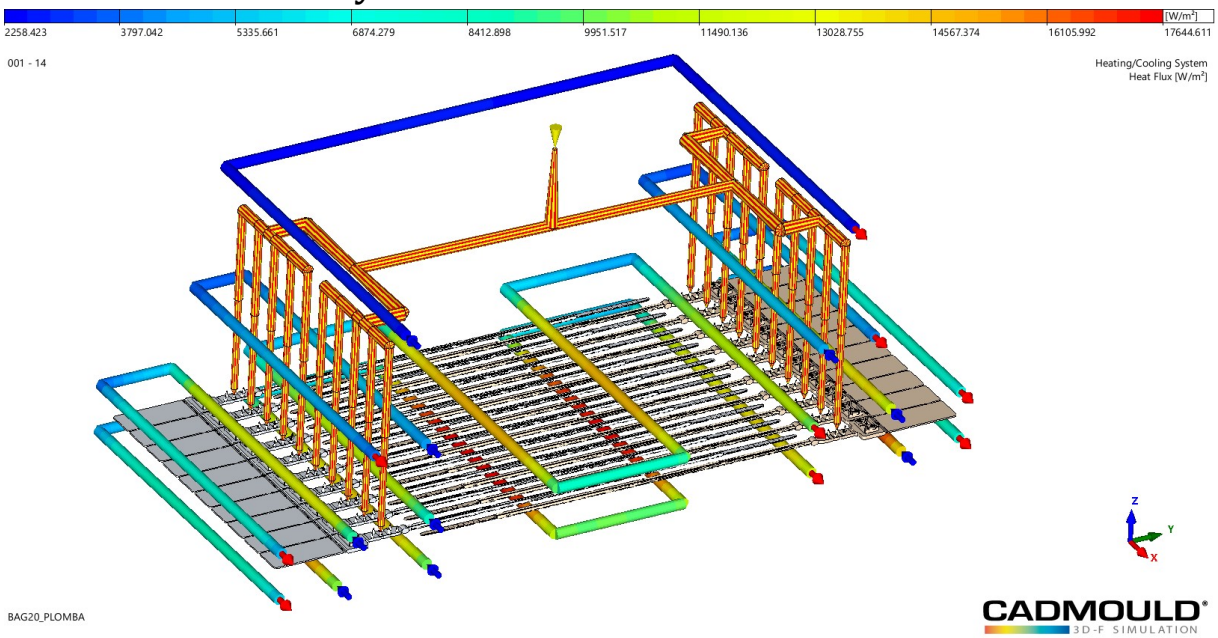

Fig. 5 Simulation 001 - 14 Group - Heating/Cooling System

Name	Value
Limits [[W/m²]]	2258.423 - 17644.611
Time [s]	0.000
Time [s]	0.000
Time / Time [%]	-1.$
Level [%]	100.0

Avg. Wall Temperature during Filling

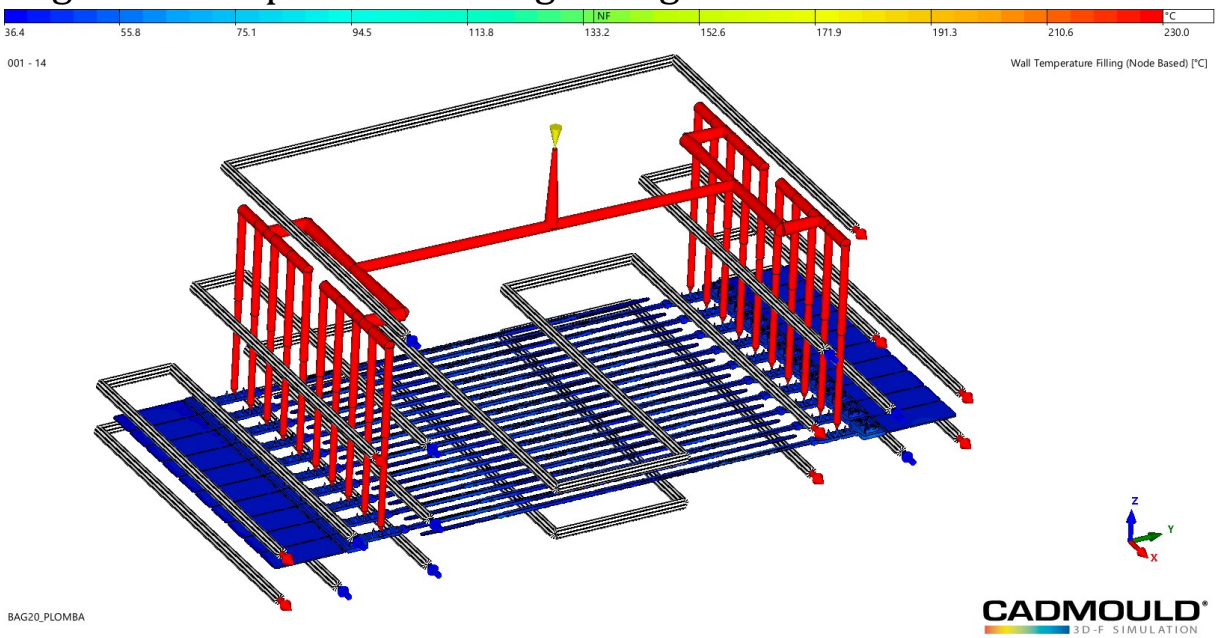

Fig. 6 Simulation 001 - 14 Group - Wall Temperature Filling (Node Based) [°C]

Name	Value
Limits [°C]	36.4 - 230.0

Avg. Wall Temperature during Cooling

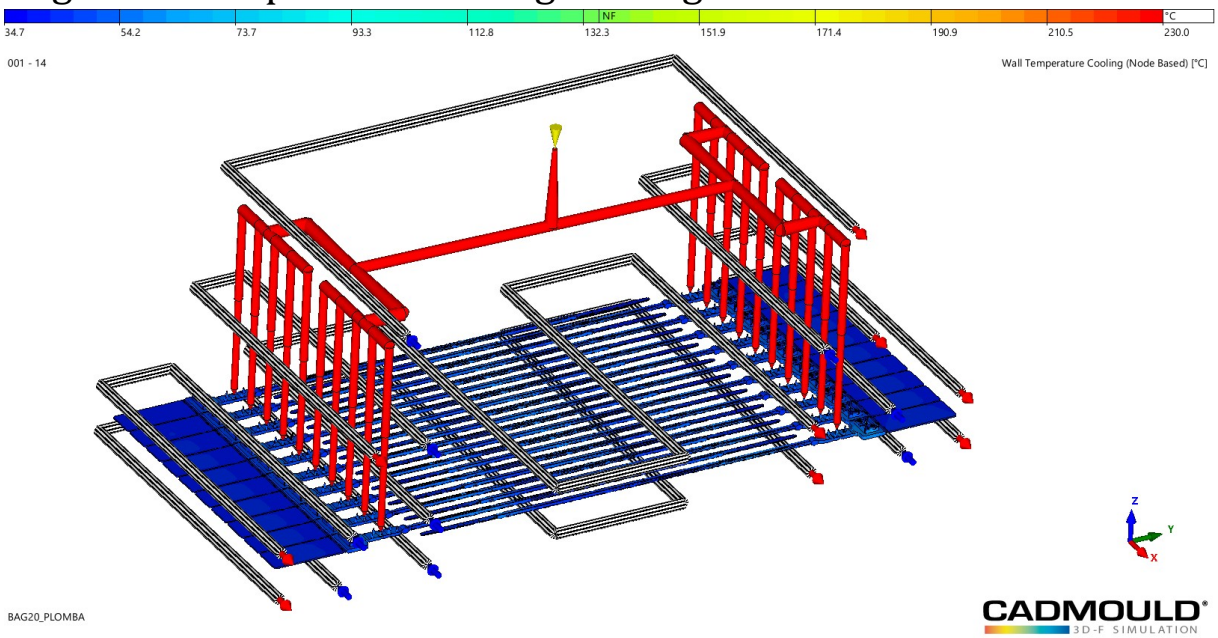

Fig. 7 Simulation 001 - 14 Group - Wall Temperature Cooling (Node Based) [°C]

Name	Value
Limits [°C]	34.7 - 230.0

Level-Based Filling Pattern

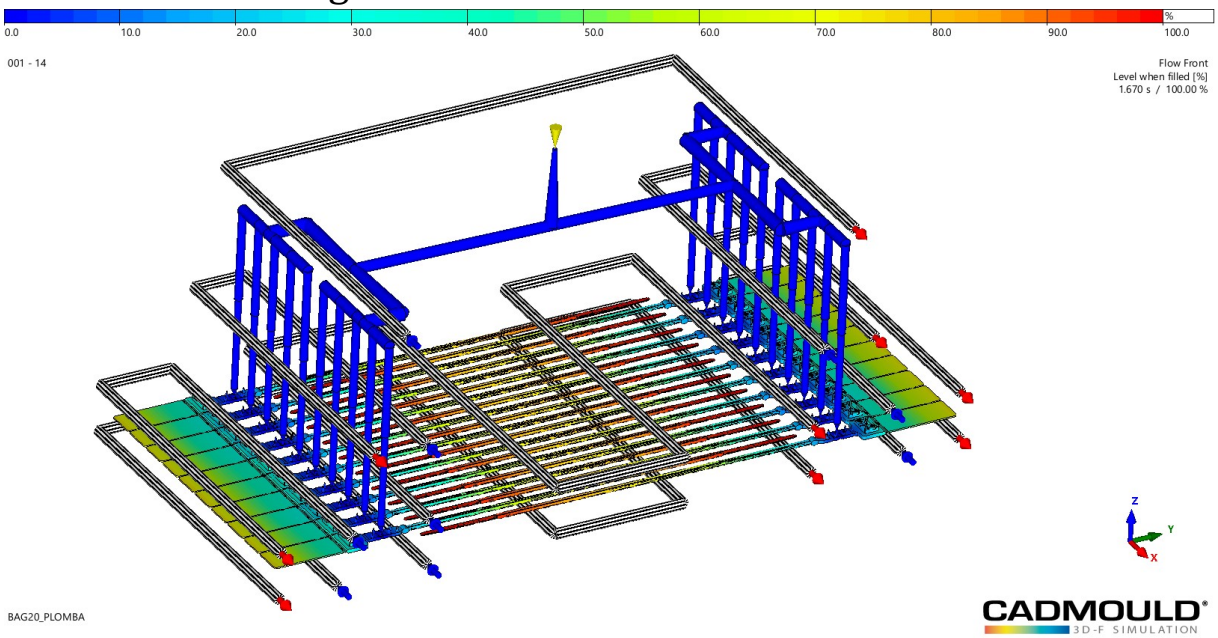

Fig. 8 Simulation 001 - 14 Group - Flow Front

Name	Value
Limits [%]	0.0 - 100.0
Filling Time [s]	1.670
Time [s]	1.670
Time / Filling Time [%]	100.0
Level [%]	100.0

The filling pattern shows the progress of the flow front during thefilling phase. It gives information about possible problems like unbalanced filling,air traps and weld lines.

Time-Based Filling Pattern

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Fig. 9 Simulation 001 - 14 Group - Flow Front

Name	Value
Limits [s]	0.000 - 1.670
Filling Time [s]	1.670
Time [s]	1.670
Time / Filling Time [%]	100.0
Level [%]	100.0

The filling pattern shows the progress of the flow front during thefilling phase. It gives information about possible problems like unbalanced filling,air traps and weld lines.

Weld Lines

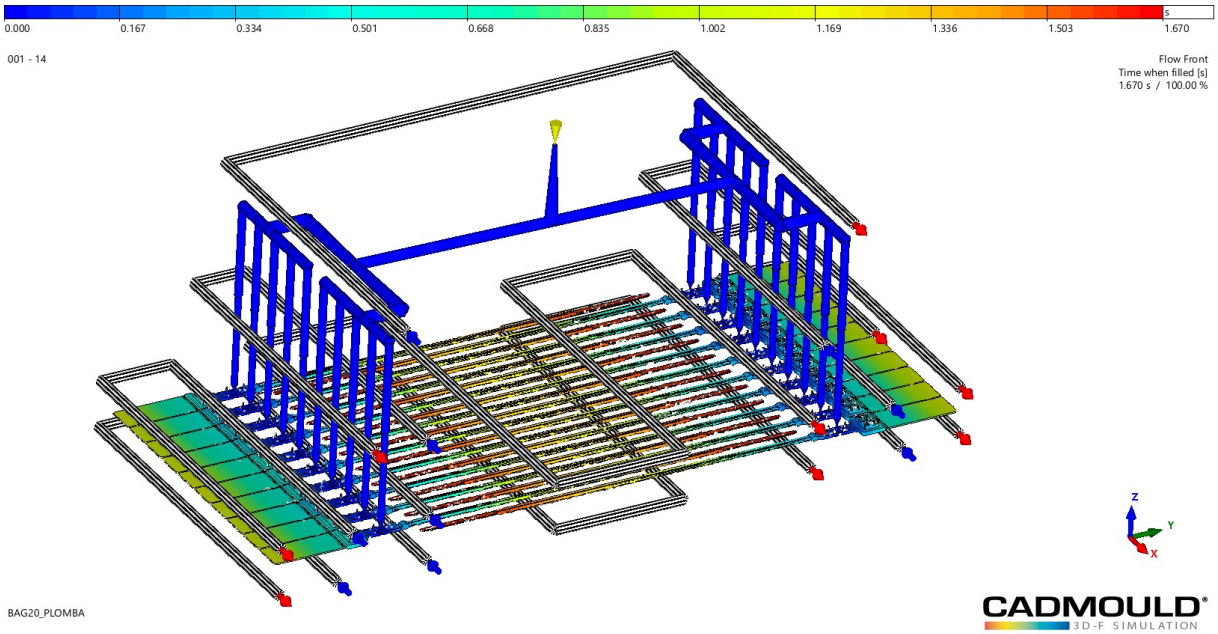

Fig. 10 Simulation 001 - 14 Group - Flow Front

Name	Value
Limits [s]	0.000 - 1.670
Filling Time [s]	1.670
Time [s]	1.670
Time / Filling Time [%]	100.0
Level [%]	100.0

The filling pattern shows the progress of the flow front during thefilling phase. It gives information about possible problems like unbalanced filling,air traps and weld lines.

Air Traps

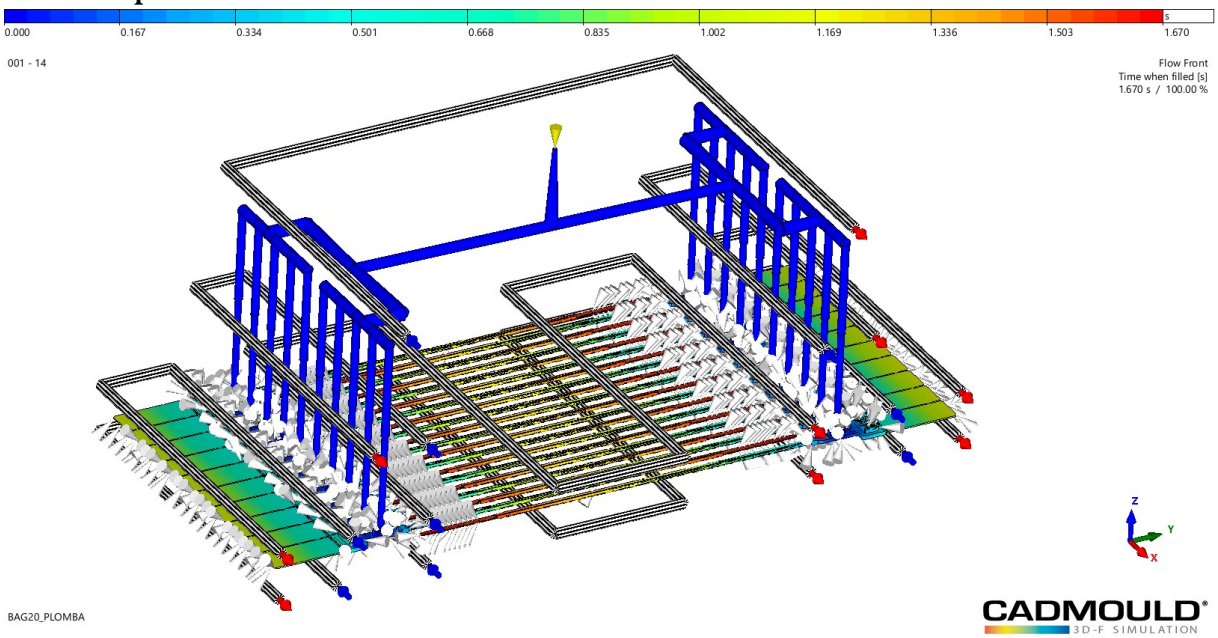

Fig. 11 Simulation 001 - 14 Group - Flow Front

Name	Value
Limits [s]	0.000 - 1.670
Filling Time [s]	1.670
Time [s]	1.670
Time / Filling Time [%]	100.0
Level [%]	100.0

The filling pattern shows the progress of the flow front during thefilling phase. It gives information about possible problems like unbalanced filling,air traps and weld lines.

Filling Problems

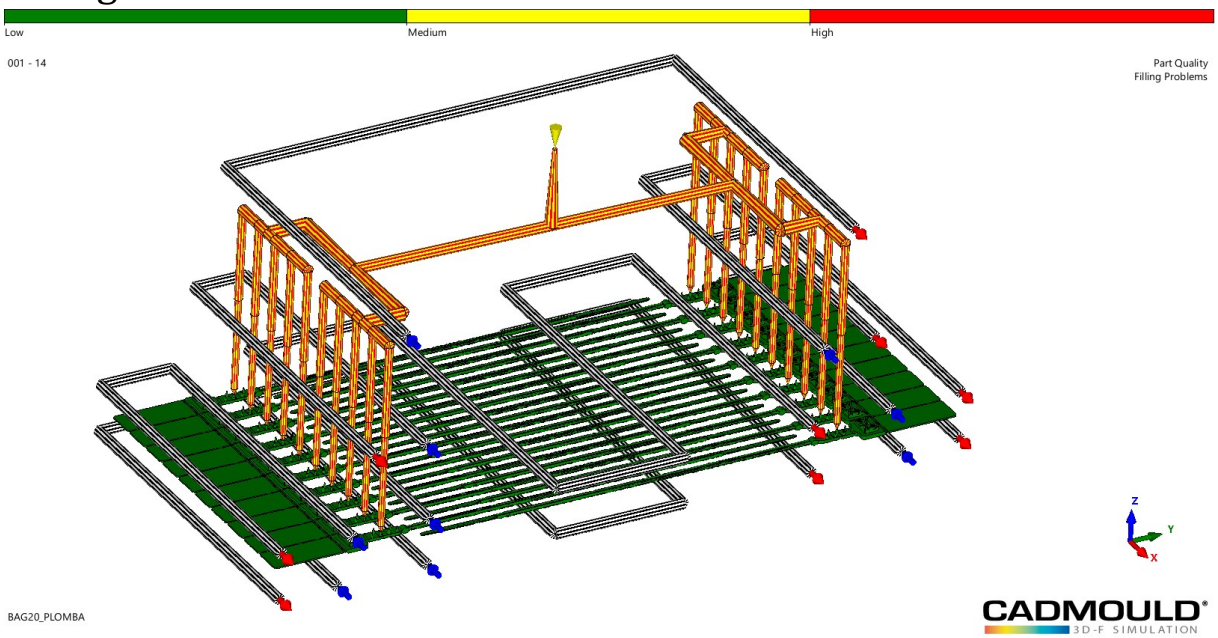

Fig. 12 Simulation 001 - 14 Group - Part Quality

Name	Value
Time in cycle [s]	0.000
Time [s]	0.000
Time / Time in cycle [%]	-1.$
Level [%]	100.0

The degree of difficulty of filling is characterized:

Criterion:	all part areas green, some yellow spots permissible
Solution:	change injection locations, increase wall thickness, increase mass Temperature, use material with lower viscosity

Pressure Distribution 98%

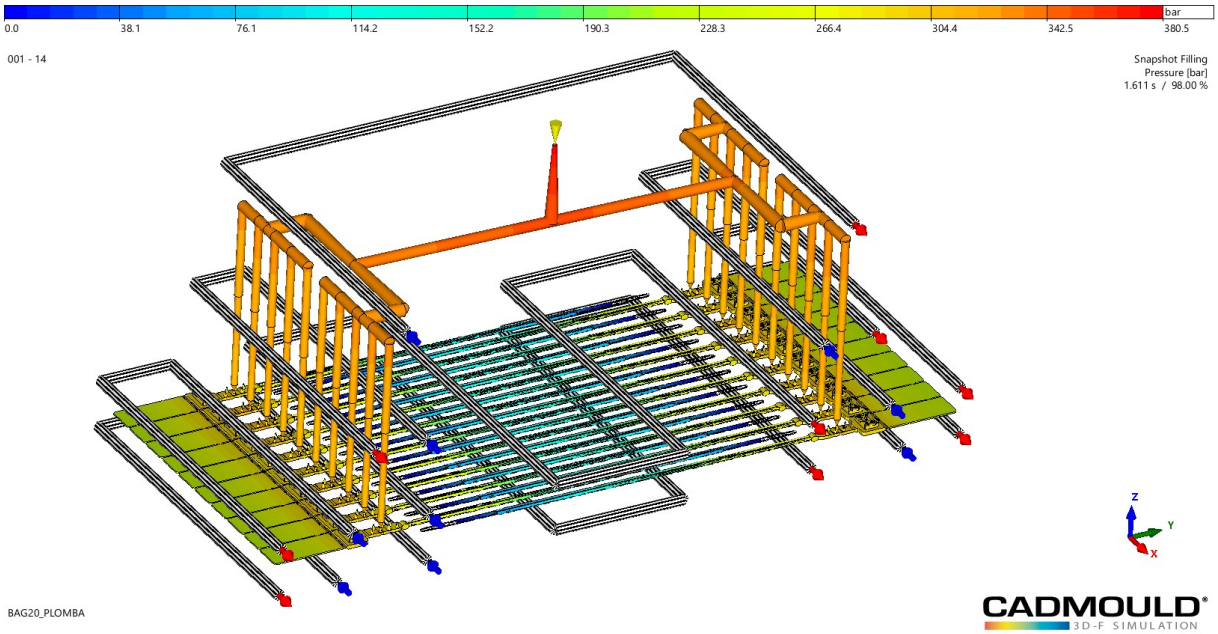

Fig. 13 Simulation 001 - 14 Group - Snapshot Filling

Name	Value
Limits [bar]	0.0 - 380.5
Filling Time [s]	1.670
Time [s]	1.611
Time / Filling Time [%]	96.5
Level [%]	98.0

The pressure distribution shows the distribution of the pressure inthe cavity to a certain time during to the filling phase. Smalldownward gradients very often indicate non moving melt.

Criterion:	The pressure should decrease from the gates up to the flow fronts as evenly as possible, in order to avoid uneven loaded tools, flashing and unfilled areas. Pressures over 800 bar in the cavity should be avoided if possible.
Solution:	Balancing the runner or the cavity by changes of part geometry (wall thickness) and/or by moving injection point location.

Increase or reduction of filling speed and/or use of profiled injecting flow rate.

Pressure Loss

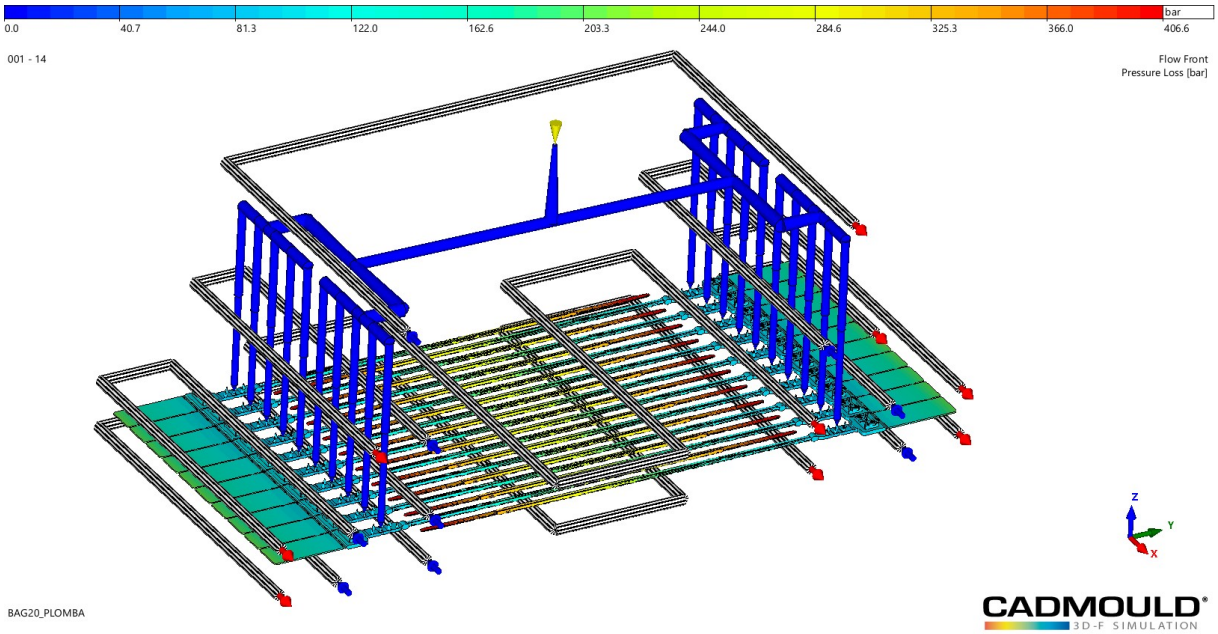

Fig. 14 Simulation 001 - 14 Group - Flow Front

Name	Value
Limits [bar]	0.0 - 406.6
Filling Time [s]	1.670
Time [s]	1.670
Time / Filling Time [%]	100.0
Level [%]	100.0

The pressure loss indicates, which pressure is necessary, in order to fill the cavity with the given process parameters up to the regarded place. The whole filling phase is represented, not the pressure distribution at a certain time (see for this pressure distribution). To high pressure loss can lead to not completely filled.

Criterion:	The pressure loss should not exceed generally 800 bar. <A HREF=Glossary.htm#Pressure_Peaks target=_blank>Pressure peaks</A> at the end of the filling phase should be avoided.
Solution:	If one varies the filling time, the pressure loss has a minimum usually, therefore increase or reduce filling time. Increase mass temperature.

Flow Front Velocity

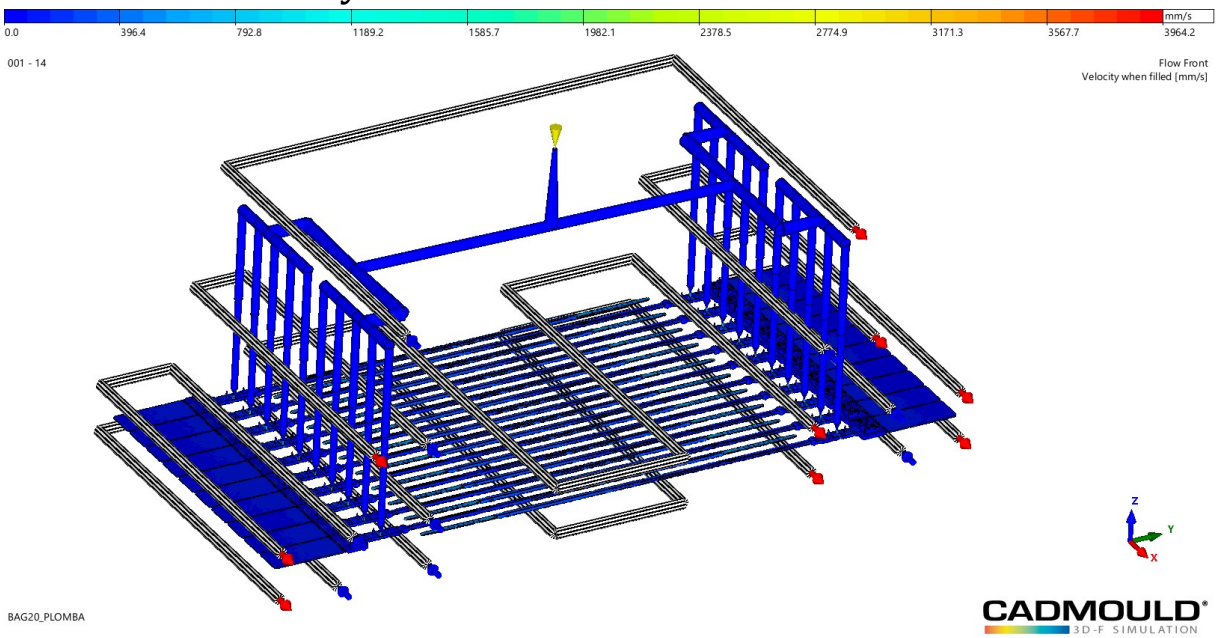

Fig. 15 Simulation 001 - 14 Group - Flow Front

Name	Value
Limits [mm/s]	0.0 - 3964.2
Filling Time [s]	1.670
Time [s]	1.670
Time / Filling Time [%]	100.0
Level [%]	100.0

The flow front velocity shows the local speed of the flow front during the filling phase. Too low flow front velocity can lead to freezing of the flow front (see also flow front temperatures). Too high flow front velocity lead to shear induced material temperature increase and can entail material damages (see also flow front temperatures).

Criterion:	The flow front velocity should essentially lie within range of the values indicated by the raw material manufacturer. Brief exceeding in gates, film hinges or at flow path ends is usually uncritical. The mass temperature and the flow front shear stress should be always examined.
Solution:	- Slow down or accelarate injection. - Use a gradated injecting flow rate profile

(available from Cadmould Fill and up).

Flow Front Temperature

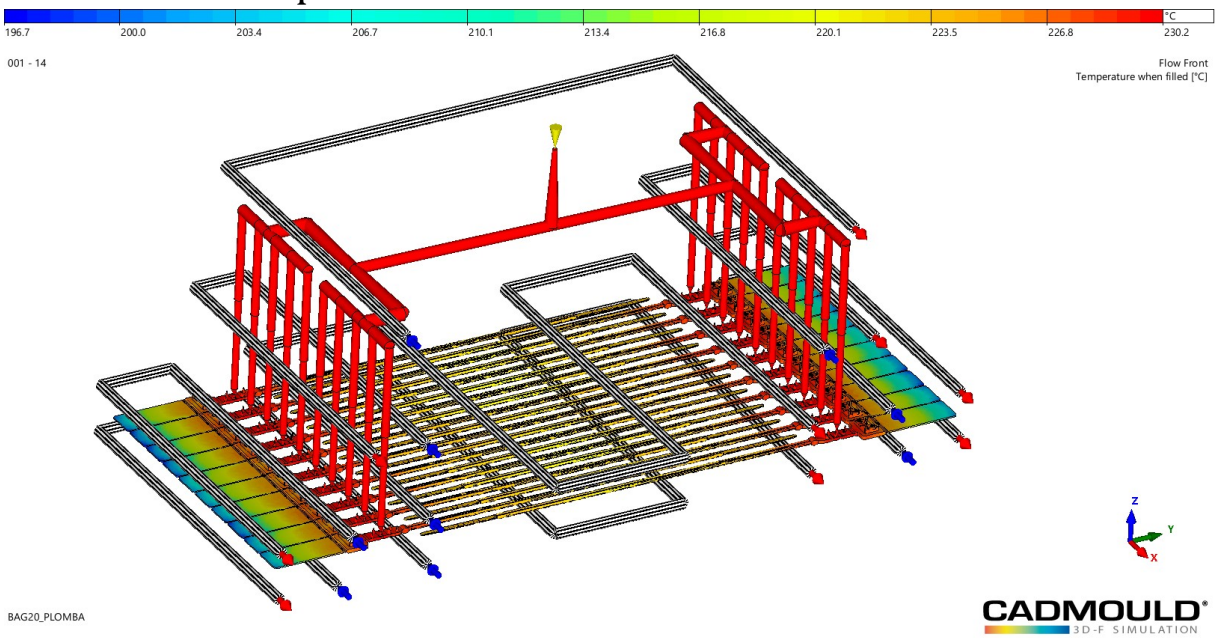

Fig. 16 Simulation 001 - 14 Group - Flow Front

Name	Value
Limits [°C]	196.7 - 230.2
Filling Time [s]	1.670
Time [s]	1.670
Time / Filling Time [%]	100.0
Level [%]	100.0

The flow front temperatures show the temperatures of the flow front averaged over the part thickness during the filling phase. To high flow front temperatures can lead to material damages. To low flow front temperatures can lead to e.g. short shots, record effects and/or not sufficient welded material at weld lines.

Criterion:	The mass temperature should not change during the filling procedure around any more than 10 - 15°C.
Solution:	Change mass temperature and/or injection time. If necessary increase wall thickness within thin areas of the part.

Temperature Distribution after Filling

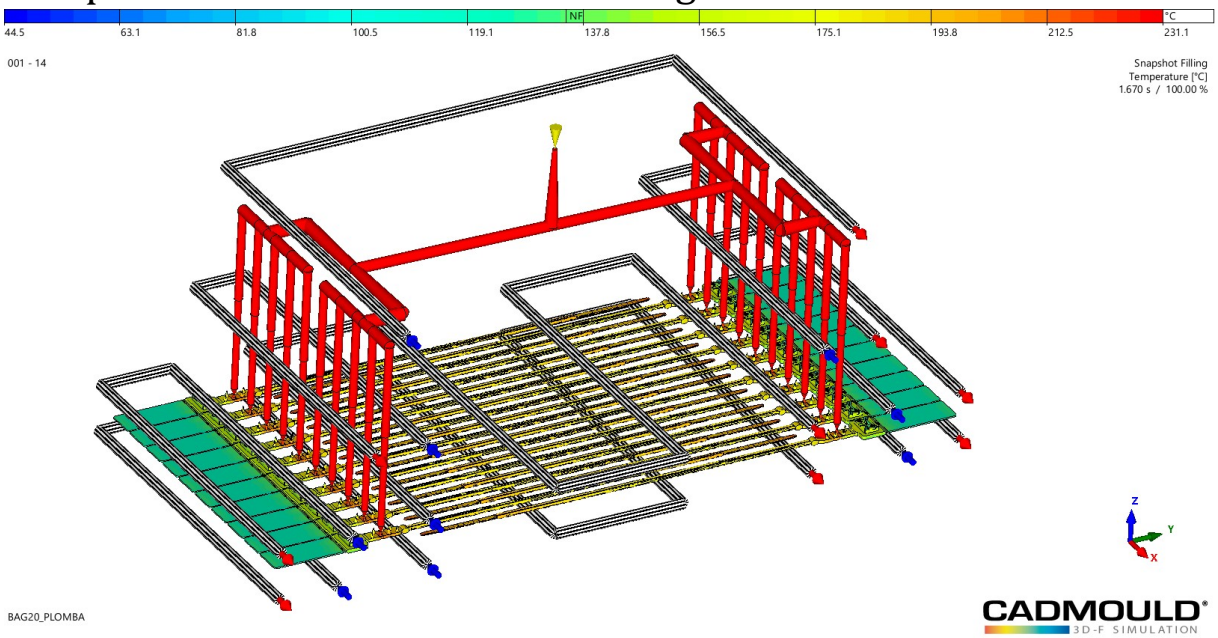

Fig. 17 Simulation 001 - 14 Group - Snapshot Filling

Name	Value
Limits [°C]	44.5 - 231.1
Filling Time [s]	1.670
Time [s]	1.670
Time / Filling Time [%]	100.0
Level [%]	100.0

The temperature distribution shows the local temperature distributionof the melt to a certain time of the filling.

Criterion:	Keep temperature differences as small as possible. Keep temperature above no-flow temperature for packing.
Solution:	Change mass temperature, change mold temperature locally, change part geometry.

Frozen Layer Thickness after Filling

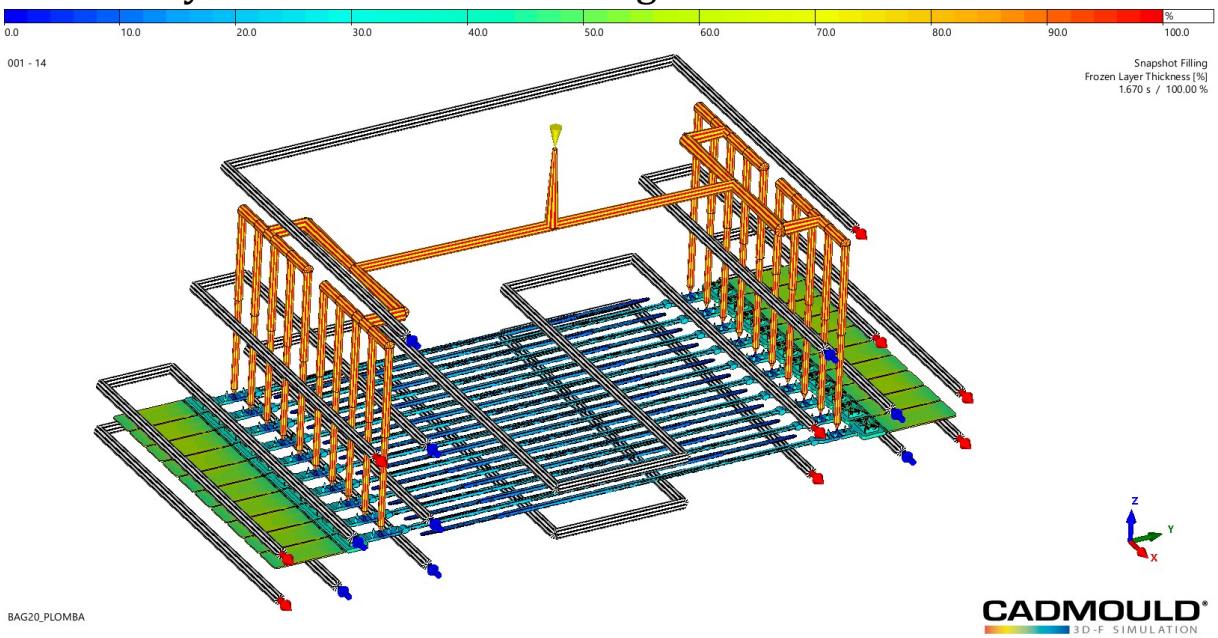

Fig. 18 Simulation 001 - 14 Group - Snapshot Filling

Name	Value
Limits [%]	0.0 - 100.0
Filling Time [s]	1.670
Time [s]	1.670
Time / Filling Time [%]	100.0
Level [%]	100.0

Frozen layers show the portion of the no longer liquid plastic over the cross section. The frozen layers reduce the available flow channel thickness for melt flow.

Criterion:

Avoid hot areas in the cavity, since these cannot be supplied with packing. Thereby <A HREF=Glossary.htm#Sinkmarks target=_blank>sink marks</A> and lunker can develop.

Freezing from flow path end back to the gate is to be aimed at.

Solution:

- change injection point location

- change wall thickness

- change mold temperatures locally

Volume Shrinkage after Filling

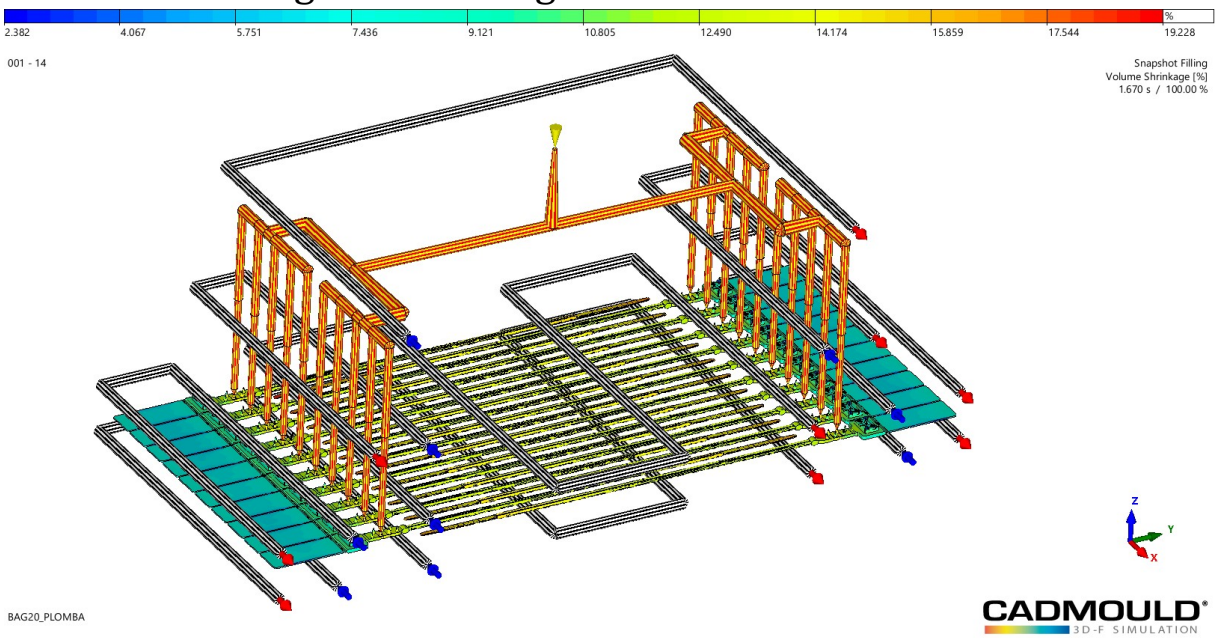

Fig. 19 Simulation 001 - 14 Group - Snapshot Filling

Name	Value
Limits [%]	2.382 - 19.228
Filling Time [s]	1.670
Time [s]	1.670
Time / Filling Time [%]	100.0
Level [%]	100.0

Volume shrinkage is the shrinking potential of the plastic melt at a certain time during the filling and packing phase. The volume shrinkage contains apart from linear shrinkage also the thickness shrinkage and therefore can have irelatively high values in comparison to linear shrinkage. Volume shrinkage differences in the part lead to different local shrinkage and thus to warpage.

Criterion:	Volume shrinkage differences in the part should be as small as possible at the end of the packing phase. (main criterion for the packing phase)
Solution:	Define a packing profile which keeps volume shrinkage differences as small as possible.

Avg. Temperature after Cooling

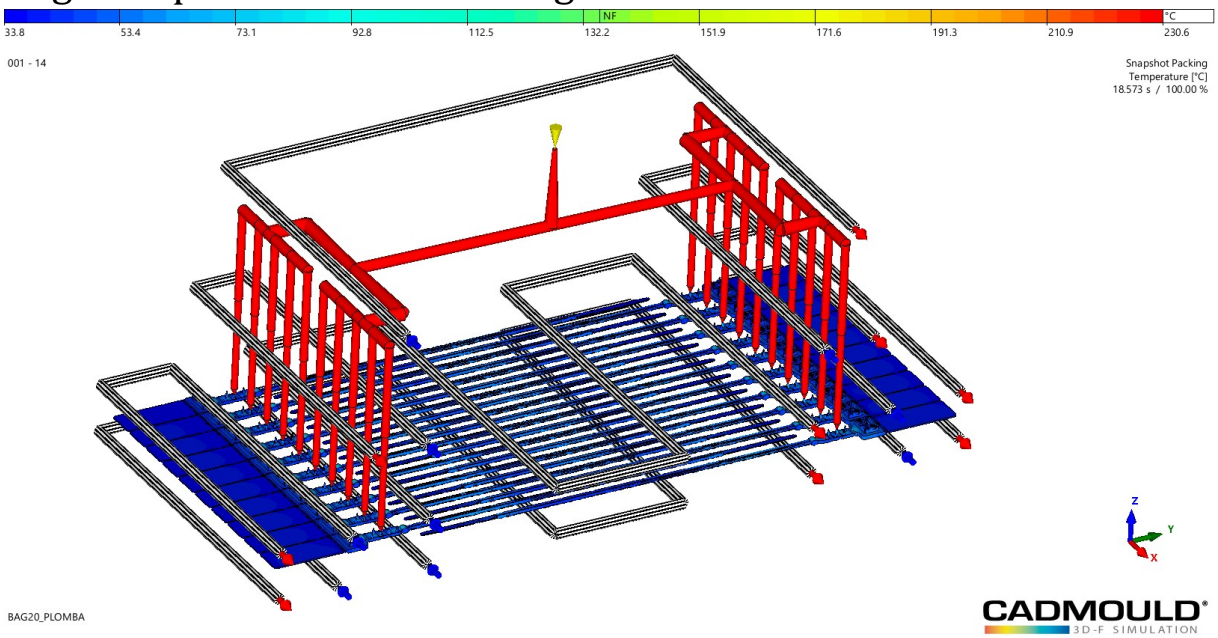

Fig. 20 Simulation 001 - 14 Group - Snapshot Packing

Name	Value
Limits [°C]	33.8 - 230.6
Packing Time [s]	16.903
Time [s]	18.573
Time / Packing Time [%]	100.0
Level [%]	100.0

The packing temperature shows the local average temperature distribution of the melt and the frozen layers.

Criterion:	Avoid from flow movements at low temperatures e.g. high <A HREF=Glossary.htm#Packing_Pressure target=_blank>packing pressure</A> with already strongly frozen flow channel. See also for this <A HREF=Glossary.htm#Frozen_Layer_Thickness target=_blank>frozen layer thickness</A> and flow velocities.
Solution:	Define a packing profile which ensures little flow velocities within areas of large <A HREF=Glossary.htm#Frozen_Layer_Thickness

target=_blank>frozen layer thickness</A> and only small <A HREF=Glossary.htm#Volume_Shrinkage target=_blank>volume shrinkage</A> differences.

Surface Temperature after Cooling

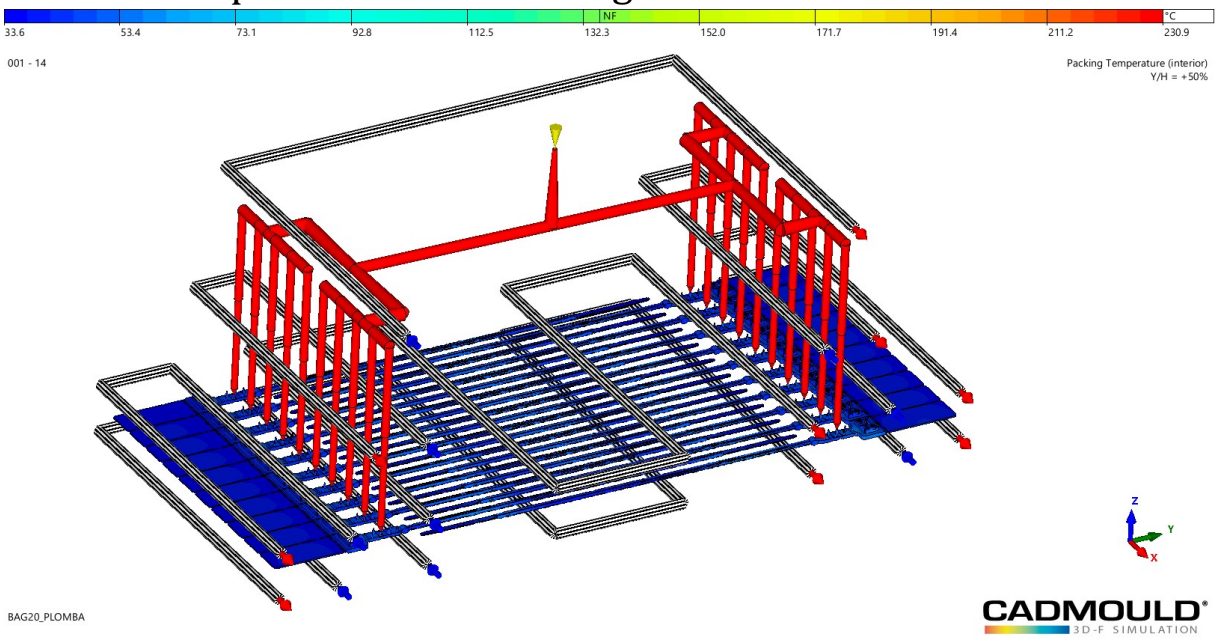

Fig. 21 Simulation 001 - 14 Group - Packing Temperature (interior)

Name	Value
Limits [°C]	33.6 - 230.1
Packing Time [s]	0.000
Time [s]	18.573
Time / Packing Time [%]	-1.$
Level [%]	100.0

Frozen Layer Thickness after Cooling

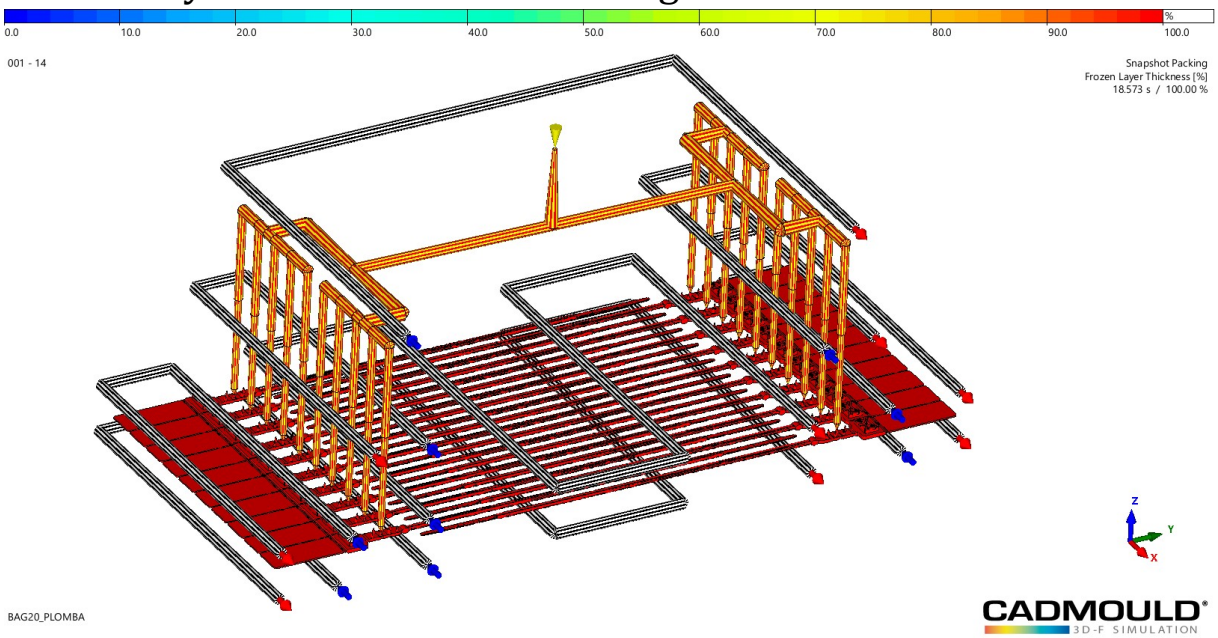

Fig. 22 Simulation 001 - 14 Group - Snapshot Packing

Name	Value
Limits [%]	0.0 - 100.0
Packing Time [s]	16.903
Time [s]	18.573
Time / Packing Time [%]	100.0
Level [%]	100.0

Frozen layers show the portion of the no longer liquid plastic over the cross section. The frozen layers reduce the available flow channel thickness for melt flow.

Criterion:

Avoid hot areas in the cavity, since these cannot be supplied with packing. Thereby <A HREF=Glossary.htm#Sinkmarks target=_blank>sink marks</A> and lunker can develop.

Freezing from flow path end back to the gate is to be aimed at.

Solution:

- change injection point location

- change wall thickness

- change mold temperatures locally

Sinkmarks

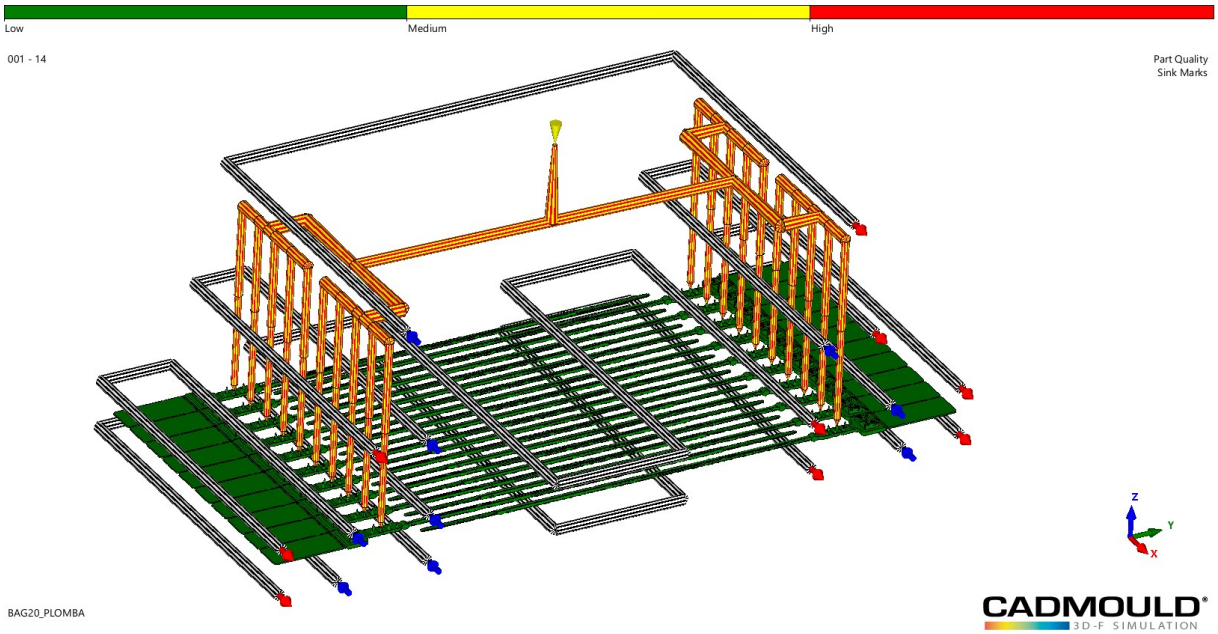

Fig. 23 Simulation 001 - 14 Group - Part Quality

Name	Value
Time in cycle [s]	0.000
Time [s]	0.000
Time / Time in cycle [%]	-1.$
Level [%]	100.0

The danger of arising sinkmarks is characterized without consideration of packing:

Criterion:	all part areas green, some yellow spots permissible
Solution:	Eliminate thick areas, change mold temperatures locally.

Seal-off Time

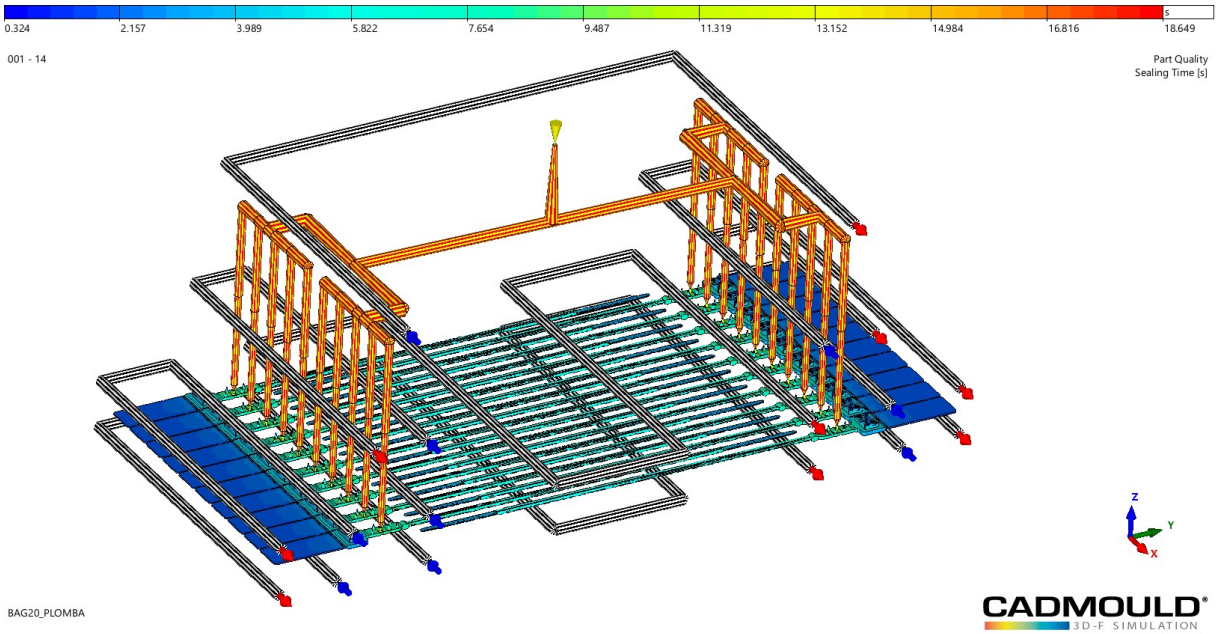

Fig. 24 Simulation 001 - 14 Group - Part Quality

Name	Value
Limits [s]	0.324 - 18.649
Time in cycle [s]	0.000
Time [s]	0.000
Time / Time in cycle [%]	-1.$
Level [%]	100.0

The seal time is the local time measured from beginning of injection until all connections to the gate are frozen (melt temperature below no-flow temperature).

Criterion:	Avoid hot areas in the cavity, since these cannot be supplied with packing. Thereby <A HREF=Glossary.htm#Sinkmarks target=_blank>sink marks</A> and lunker can develop. Freezing from flow path end back to the gate is to be aimed at.
Solution:	- change wall thickness - change positions of injection - change mold temperature locally.

Ejection Time

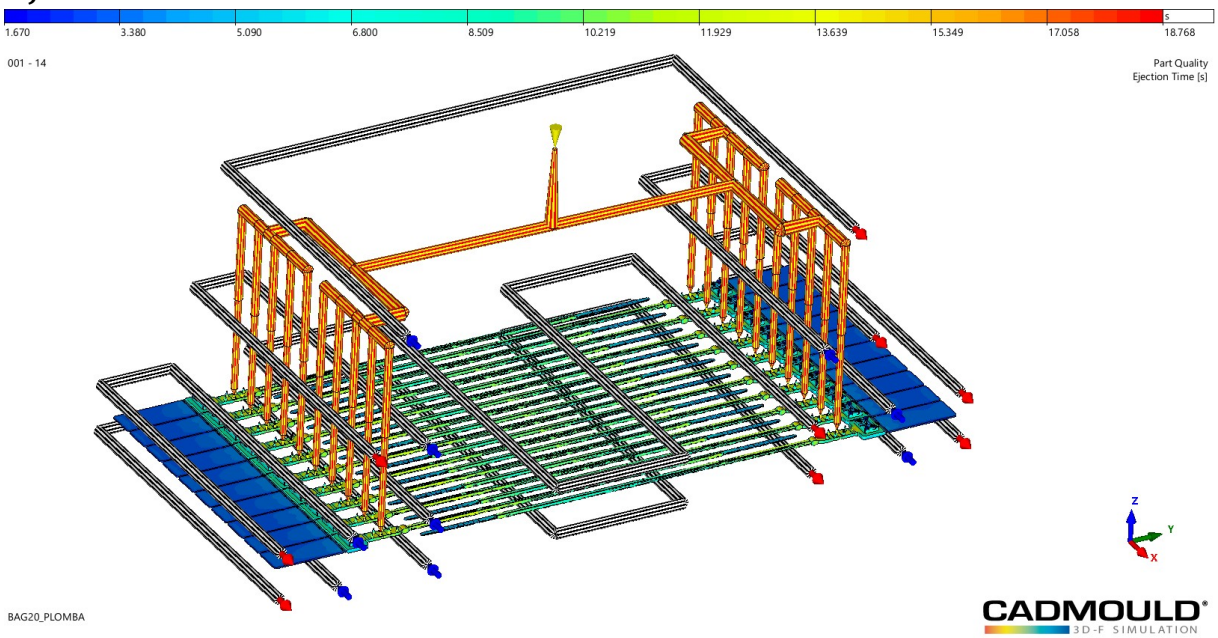

Fig. 25 Simulation 001 - 14 Group - Part Quality

Name	Value
Limits [s]	1.670 - 18.768
Time in cycle [s]	0.000
Time [s]	0.000
Time / Time in cycle [%]	-1.$
Level [%]	100.0

Ejection time is the local time measured from beginning of injection during which the temperature of the melt over the wall thickness is fallen below ejection temperature.

Criterion:

achieve as little ejection times as possible, avoid differences in ejection time

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<TD ID=normalTD VALIGN=TOP><I>Solution:</I>

change wall thickness, change mold temperatures locally, change mass temperature