Moldflow Analysis Report

Part Name 产品名称: FB01a Lower Chin Moulding

Mold Number 模具编号:JKP01-0350 / J04186

Prepared by 报告制作:LGZ

Date Prepared 日期: 2022.5.13

Version 版本 : Rev.1

分析要求

Project Summary

Analysis Purpose	➢ Validate potential problem after the part and mold design 验证可能存在的问题在产品和模具设计完成后 ➢ Check the filling pattern, weld line, air traps, and predict the needed clamp force and injection pressure, warpage. 指出流动模式，熔接线位置，困气位置，所需锁模力和注塑压力，产品变形 ➢ Estimate cycle time 评估周期
Input Model Description	➢ The runner system is simulated as the mold design. 根据模具设计建立流道分析
Result Required	➢ Filling result 流动结果 ➢ Cycle time result 周期结果 ➢ Warpage result 变形结果

Actual No. of cavities 实际出模数: IE: 1x1

Number of cavity analysis 分析时出模数: IE 1x1

Part Material 塑胶材料: IE:PC+PBT

Type of analyses 分析类型 : IE: Fill + Pack + Warp

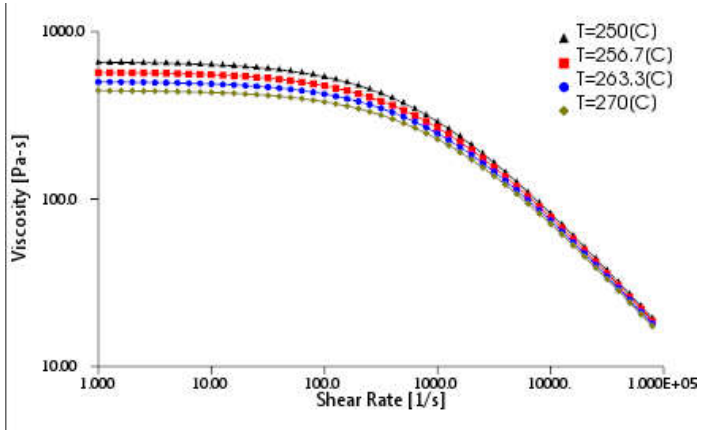
材料描述

Material Data

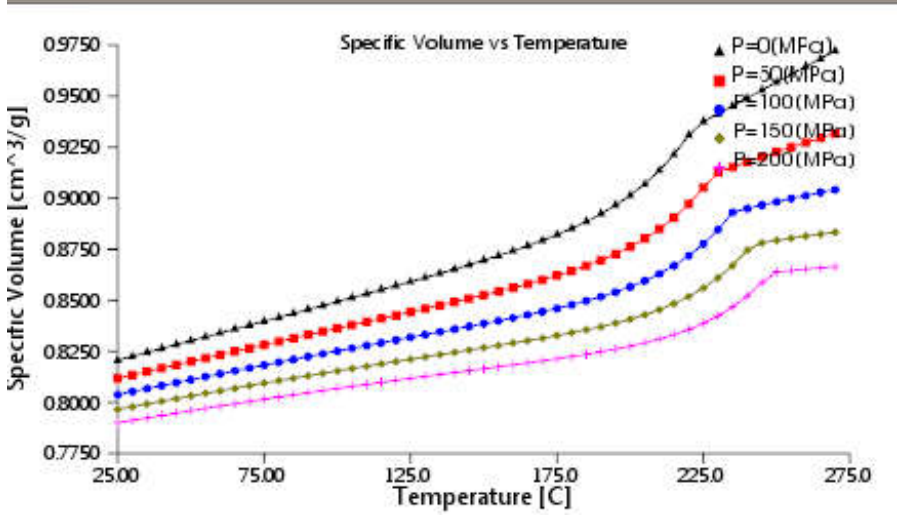
Family name	BLENDS (PC+PBT, PC+ABS, ...)
Trade name	Makroblend UT3907
Manufacturer	Covestro
Link	
Family abbreviation	PC+PBT
Material structure	Crystalline
Data source	Autodesk Moldflow Plastics Labs : p
Date last modified	09-JUL-12
Date tested	09-JUL-12
Data status	Non-Confidential
Material ID	30831
Grade code	SN6534
Supplier code	COVESTRO
Fibers/fillers	Unfilled

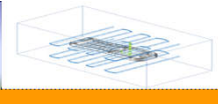
Mold surface temperature	70	C
Melt temperature	260	C
Mold temperature range (recommended)		
Minimum	60	C
Maximum	80	C
Melt temperature range (recommended)		
Minimum	250	C
Maximum	270	C
Absolute maximum melt temperature	300	C
Ejection temperature	122	C
	Vie	
Maximum shear stress	0.4	MPa
Maximum shear rate	20000	1/s

Rheology:



PVT properties:





产品信息及成型参数设置

Part、Tool、Setup

Part Details and Tool Description 产品和模具描述

Part Name:产品名称	FB01a Lower Chin Moulding
CAD File / Version/ Date 模型格式和版本	JKP01-0350(J04186)
Part Volume 产品体积	**948.2958**cm^3
Nominal Wall Thickness 产品平均厚度	3.2mm
Tool Description 出模数	1x1 Cavities
Injection machine Tonnage 注塑机台	/

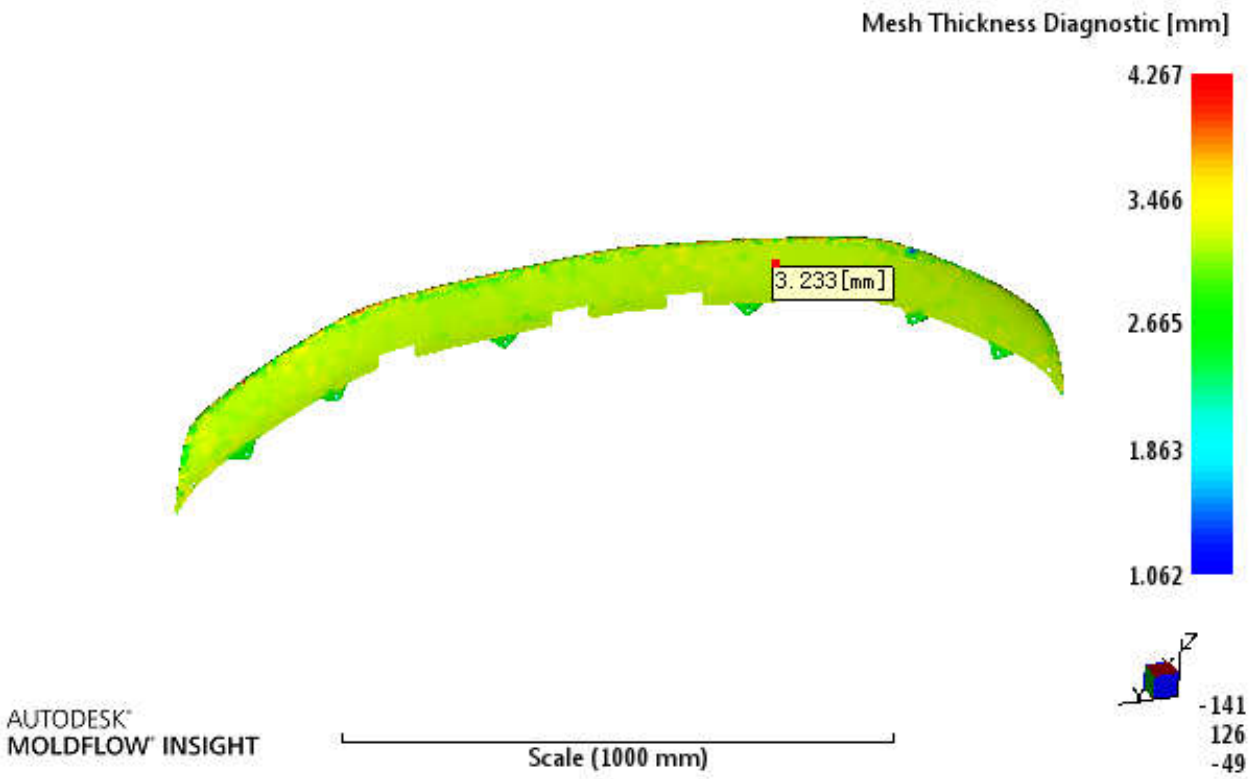
Process Setup 成型设置

Material 塑胶材料	PC+PBT
Injection time 注塑时间	3.59s
Material temp 材料温度	260 [deg.c]
Mold temp 模具温度	70 [deg.c]
Velocity/Pressure Transfer (% volume) 转保压体积	98 %
Packing Pressure 保压压力	80%filling pressure /10s
Project Area 产品投影面积	**1169.492**cm^2

4

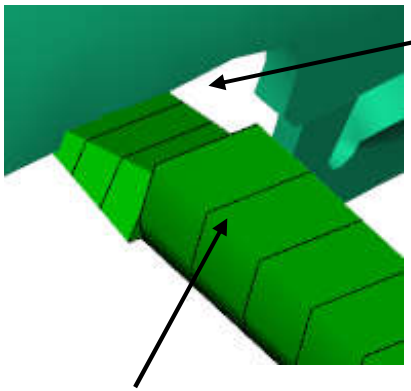
产品厚度

Wall thickness



■ This above plot used different color to show the thickness of this part.
■The average wall thickness of part is 3.2mm . 产品的平均厚度是3.2mm
■ The weight of part is 1130.5g.

Gate Location and size

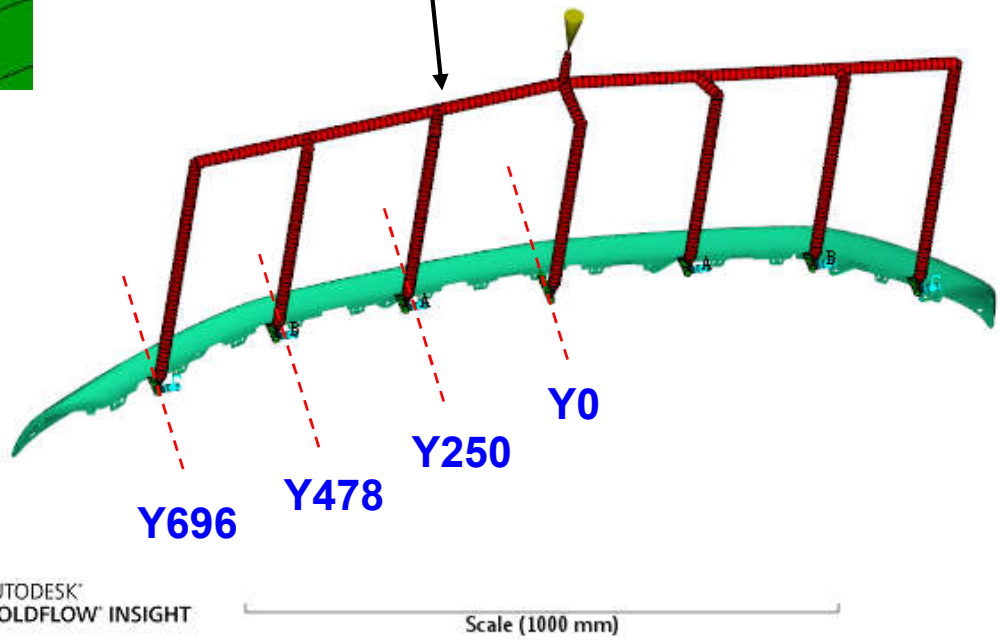


Tapered rectangular shape by ei
Start width 12 mm
Start height 2 mm

Other 6 gate are tab gate 12*2

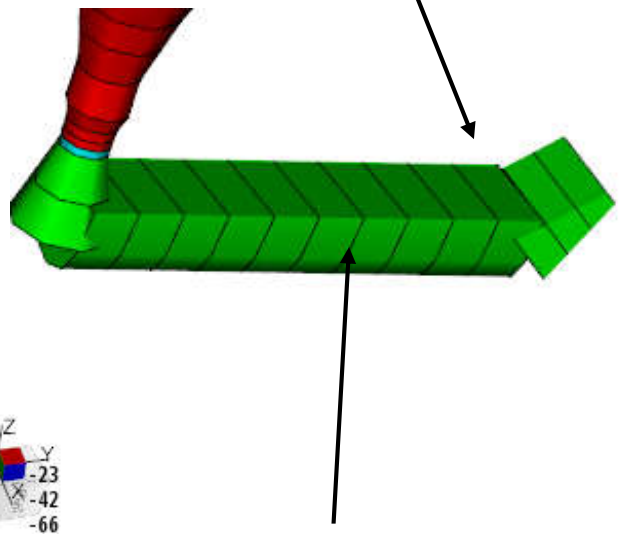
Cold runner.
Ø12*10mm

Hot runner.
Ø22mm



Only middle gate
sub gate 6*2

Tapered rectangular shape by ei
Start width 6 mm
Start height 2 mm



Cold runner.
Ø12*10mm

流道布局基于3d图纸

- ■Filling the mold is 7 SVG hot nozzle, filling start middle gate.
- ■ The runner layout was based on the drawing.

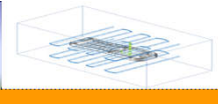
网格统计

Preprocess and Mesh statistics

■ **Specification: the type of model used for this analysis are dual-Domain meshes**

双层面网格质量较好，使用双层面分析

```
Entity counts:
    Triangles             22498
    Connected nodes       11205
    Connectivity regions 1

    Invisible triangles            0

Area:
(Mold blocks and cooling channels are not
included)
    Surface Area:       6194.44 cm^2

Volume by element types:
    Triangle:   948.296 cm^3

Aspect Ratio:
    Maximum     Average     Minimum
      18.00        1.96        1.16

Edge details:
    Free edges                    0
    Manifold edges                33747
    Non-manifold edges            0

Orientation details:
    Elements not oriented         0

Intersection details:
    Element intersections         4
    Fully overlapping elements    0

Match percentage:
    Match percentage              92.5%
    Reciprocal percentage         90.1%
```



分析结果项目

Simulation results list

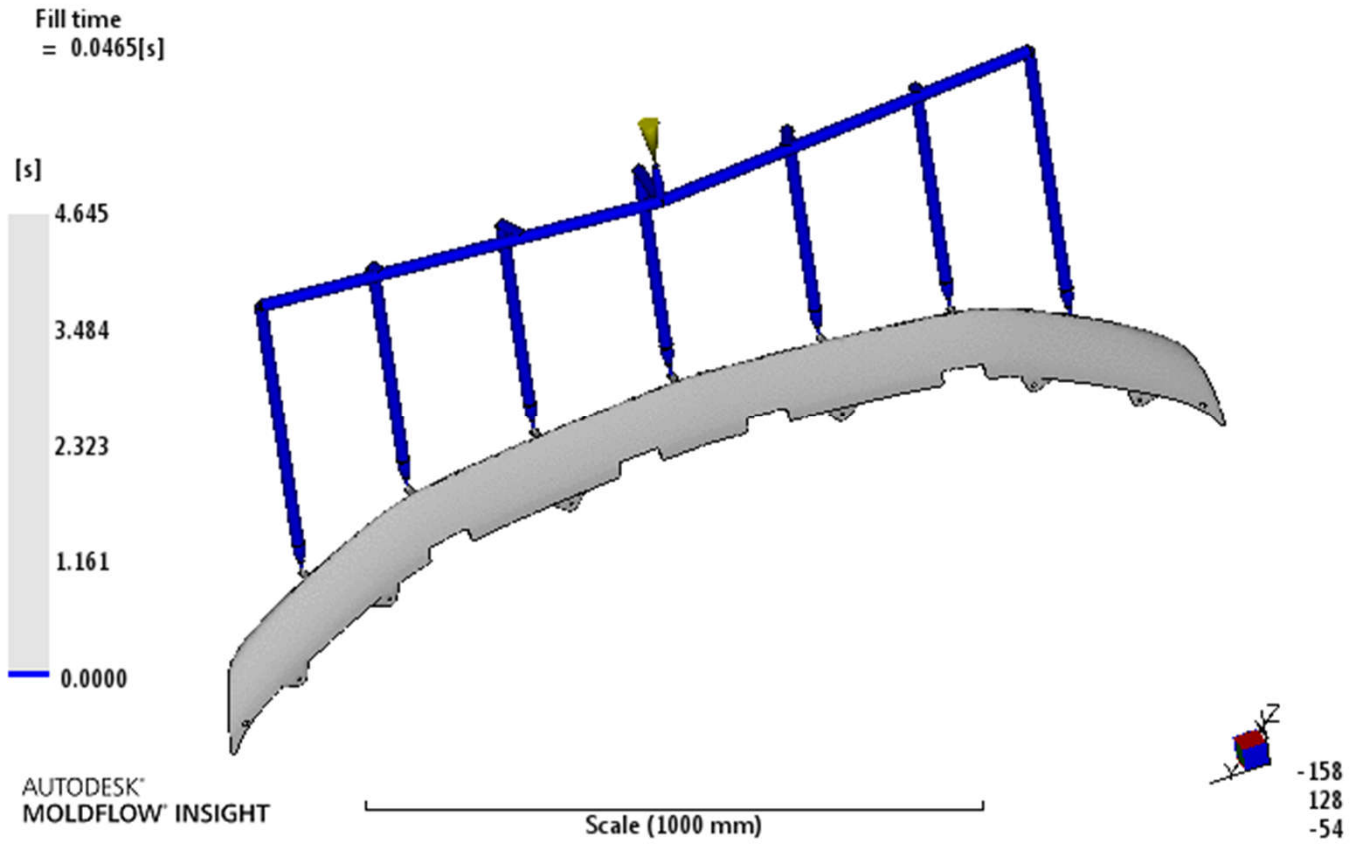
- Fill time (Animate & Contour) 填充时间 (动态+轮廓)
- Bulk temperature at end of fill 填充末端总体温度
- Pressure at the V/P switchover 转保压压力
- Pressure at end of fill 填充末端压力
- Injection pressure 压力XY曲线图
- Flow Front Temperature 前端温度
- Clamp Force 锁模力
- Air Traps 困气
- Weld lines 熔接线
- Time to reach ejection temperature 达到顶出温度的时间
- Sink marks estimate 缩痕估算
- Deflection 变形
- Conclusions and suggestions 结论和建议

动态流动

Fill result – Fill animate

- This result shows how the melt flows through the cavity. Fill time is about: 4.64sec.

  Shift+F5, you will see the animated flow



Filling balance,not have hesitation effect

动态流动

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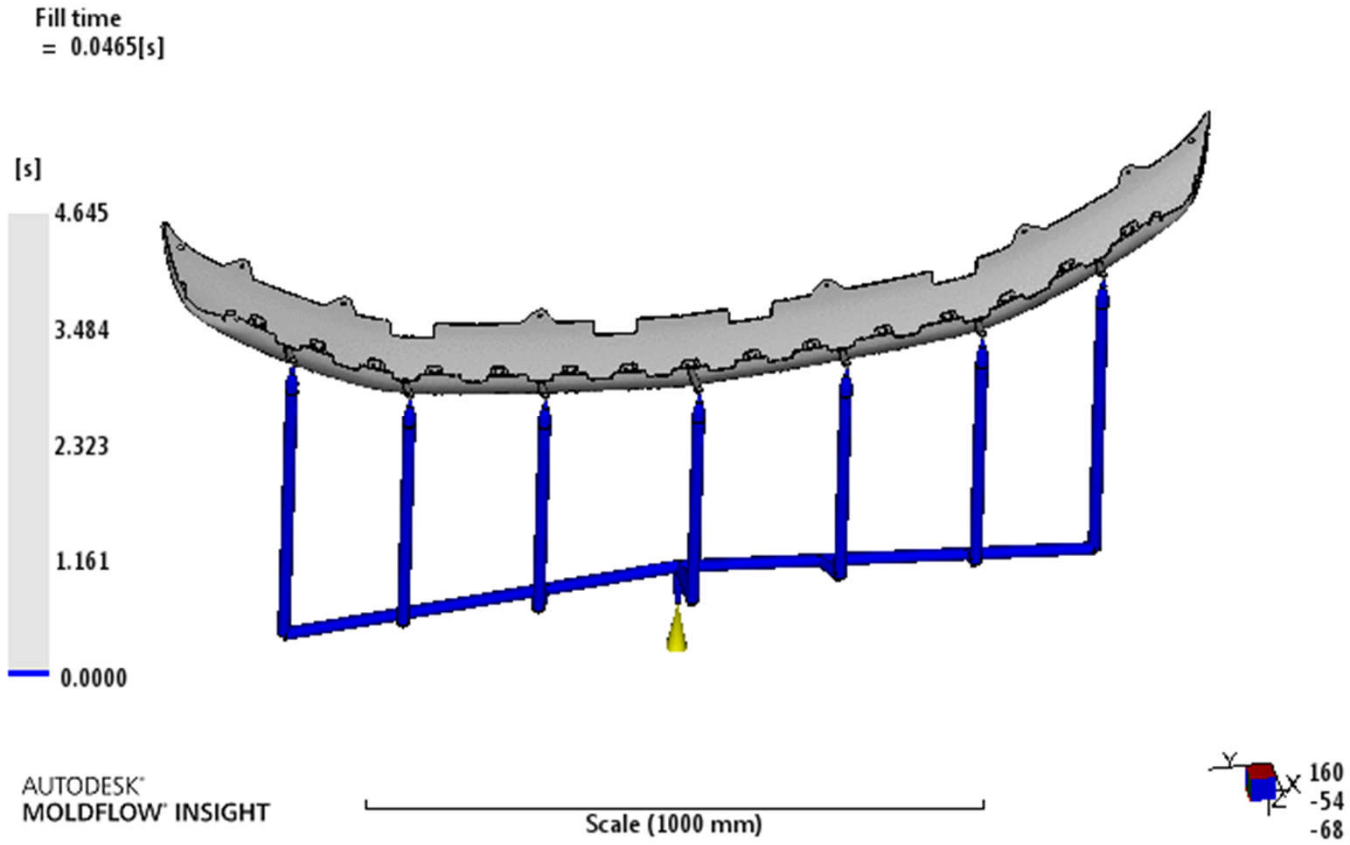
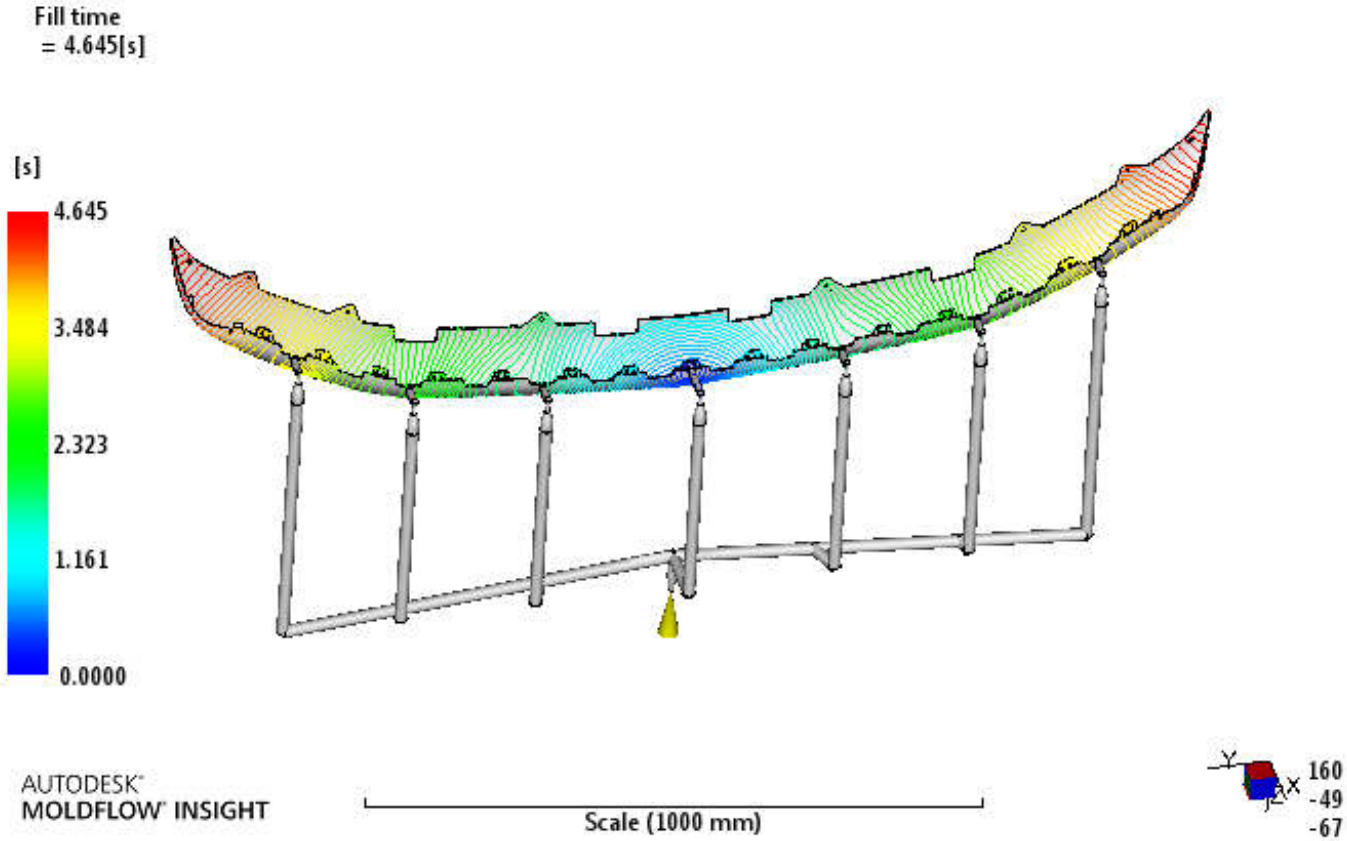


Filling balance,not have hesitation effect

流动轮廓图

Fill result – Filling Contour



Filling balance,not have hesitation effect

填充时间等高线图。红色为最后填充位置。

■**The area with dense lines in the above picture represents the area with lower flow velocity; and the area with sparse lines represents the area with higher flow velocity.**

转保压压力

Pressure at V/P switchover

■ Above figure shows the pressure distribution through the flow path inside the mold, at the V/P switchover of the filling phase.

填充末端压力

Pressure at end of fill

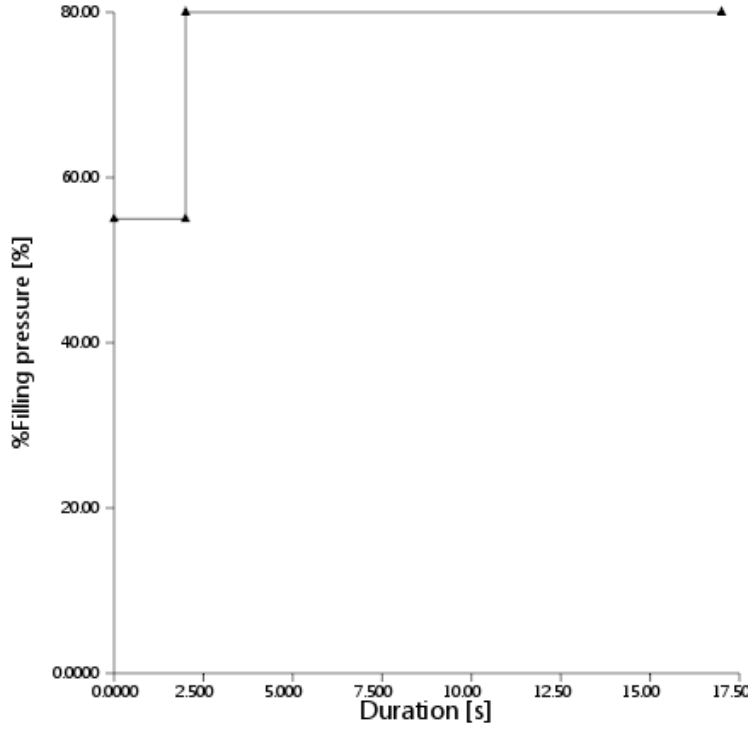
■The pressure at the end of filling Max is 35.94MPa and the cavity pressure is 30Mpa Max that are all less than 100Mpa, So the pressure are ok。

Injection pressure

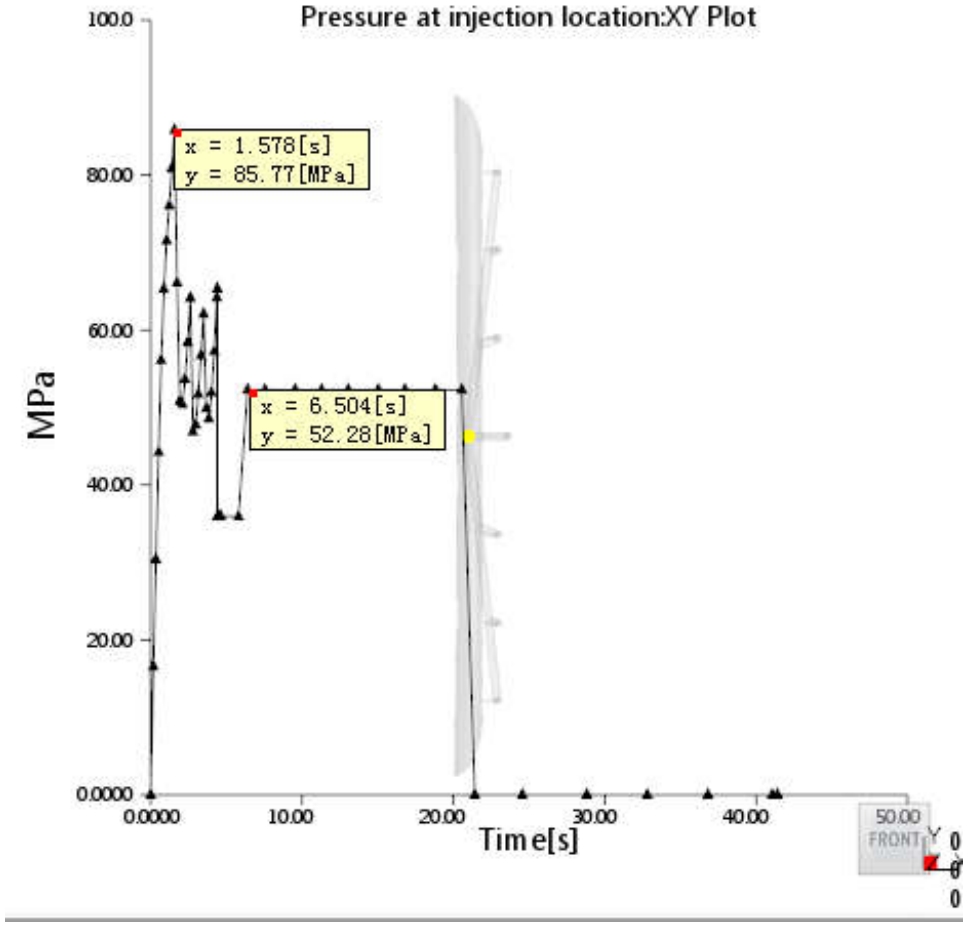
压力XY曲线图

- The maximum value is 85.77Mpa, Injection pressure specified at Packing is 52.28Mpa.
- The filling pressure are within moldflow recommend value range

压力分布结果表明:射胶压力在MF推荐范围内

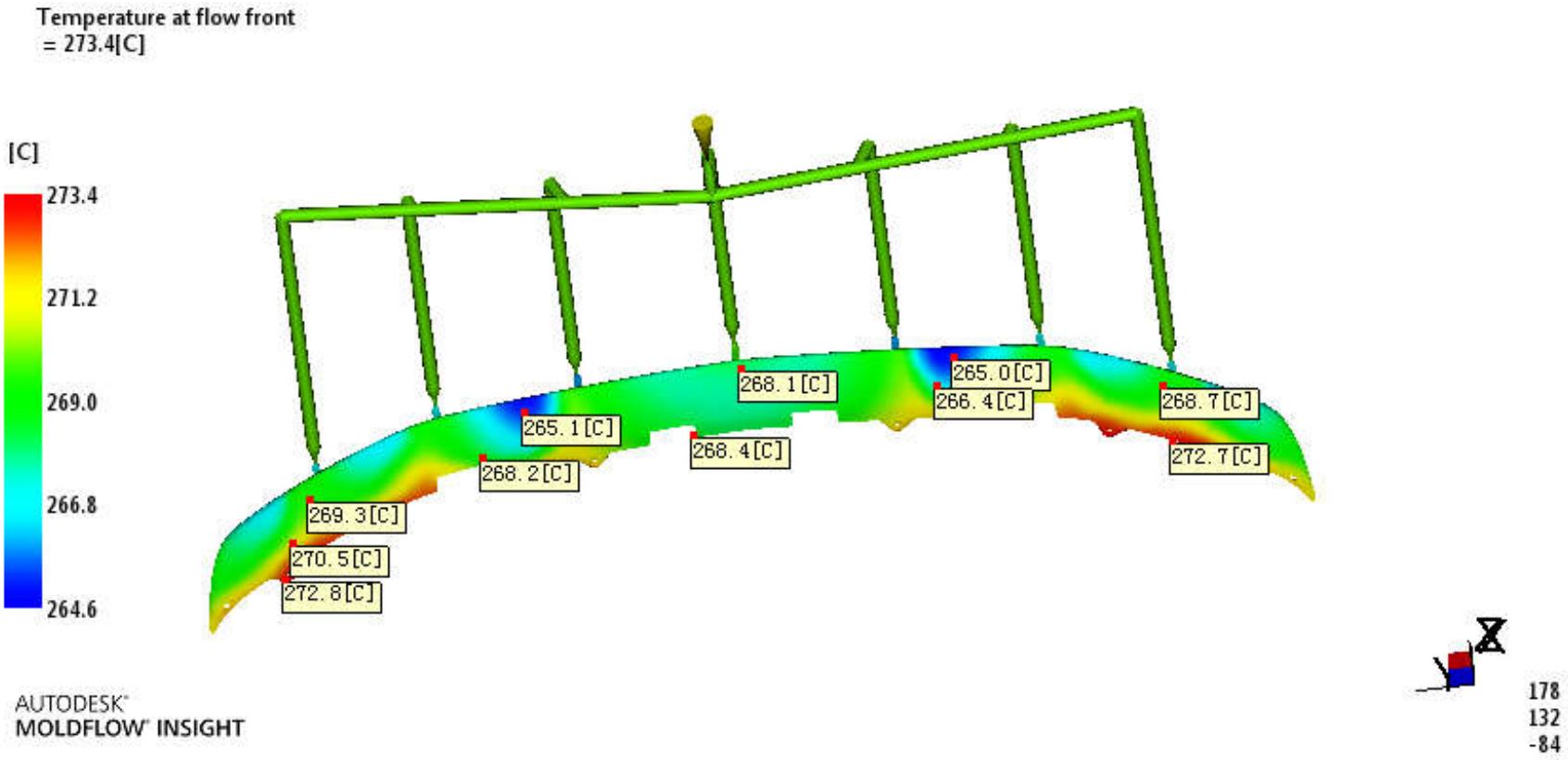


Packing profile plot



前端温度分布

Temperature at flow front



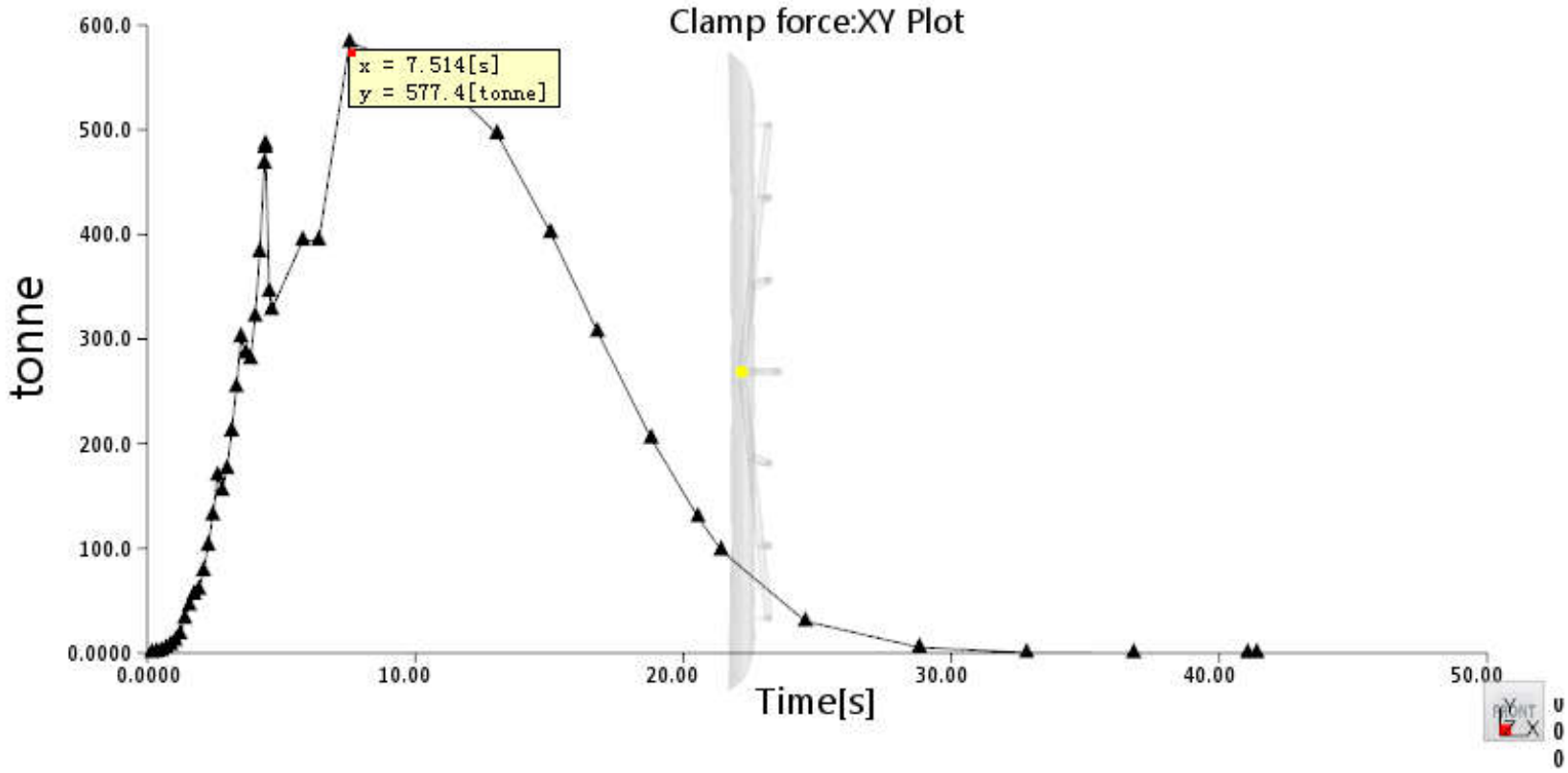
- Above figure showed the temperature at the part. Melt enters cavity at 270C
- The polymer recommended temperature range: 250~270C
- From above plot we can see that the temperature drop on the part are in this polymer recommend rang.

锁模力XY曲线图

Clamp force

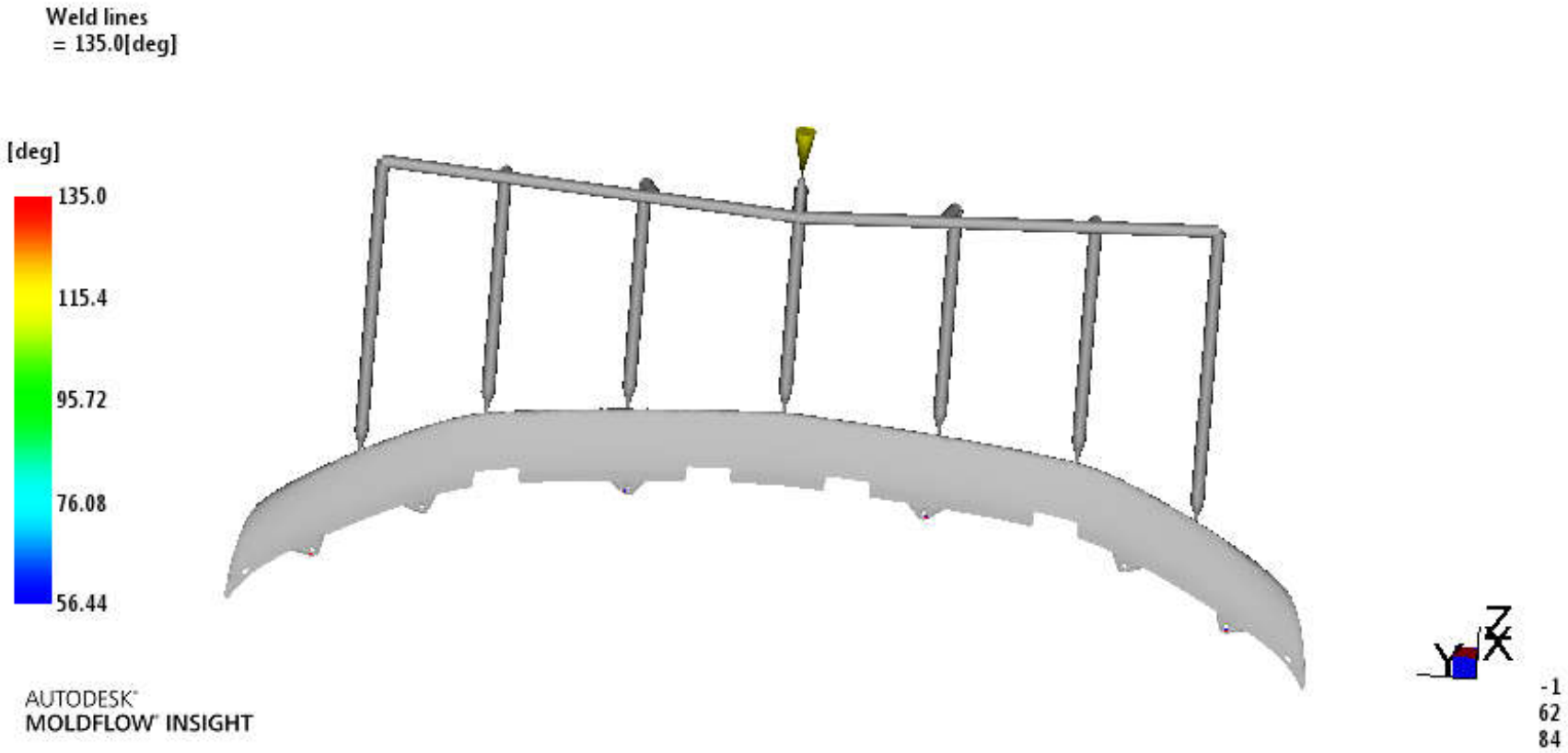
■ The maximum clamp force is 577Tons， machine Tonnage :1700T，

最大锁模力为 577tonne.机台的吨位为1700T ,.



熔接线位置

Weld lines locations



The weld lines is visible at hole, adding the vent at the weld lines position.

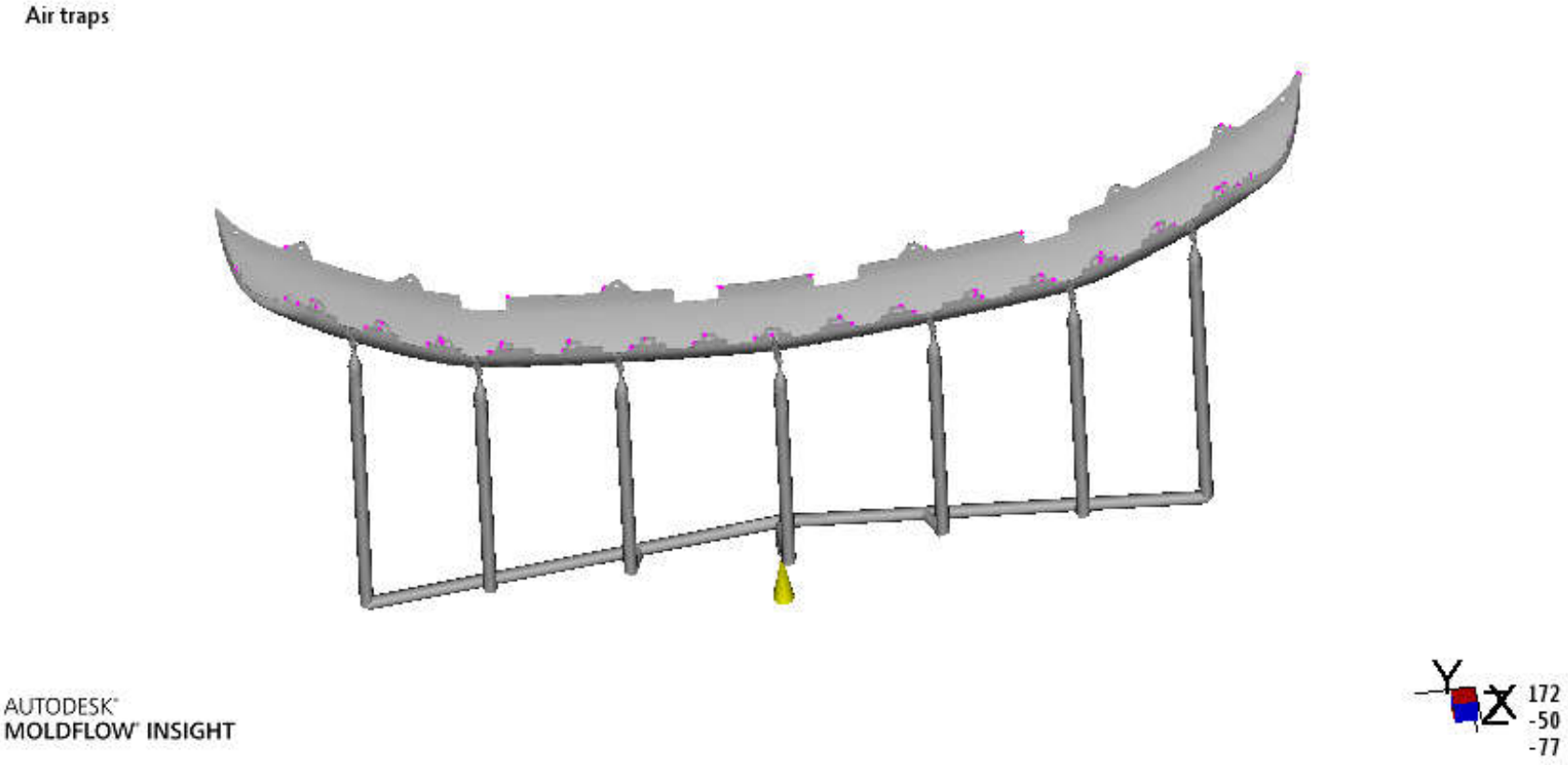
- Above figure shows the location of weld-line on the part.
- The weld lines form less than 75 degree of the two melt were expected have a bad quality.

困气位置

Air traps area

■ The result shows areas of the cavity that may require additional venting, it should be viewed in combination with the filling

pattern result.

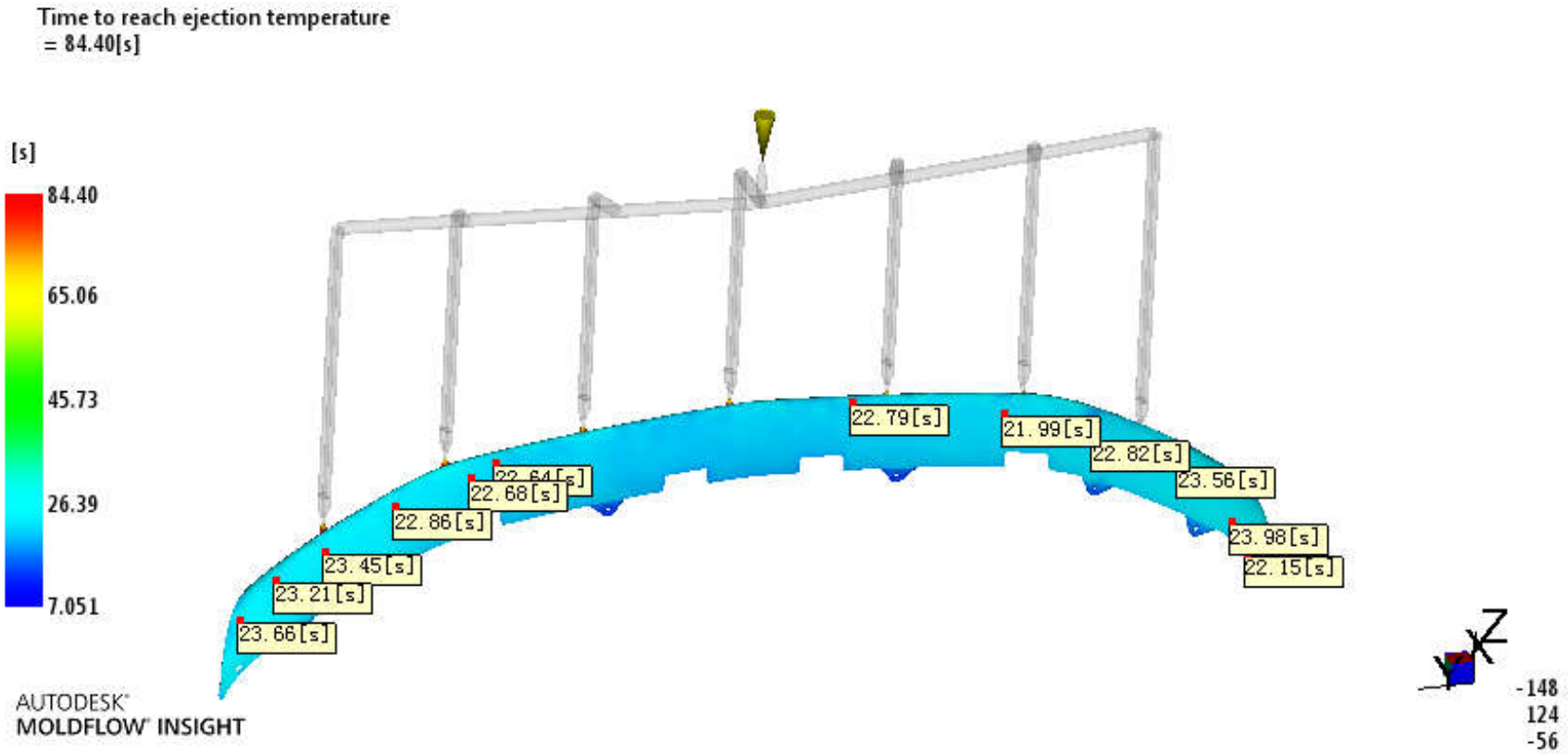


困气发生在孔位处 和熔接线上，注意加强排气。

■ Air traps occurs at hole and weld line, please pay attention to improve vent.

达到顶出温度的时间

Time to reach ejection temperature

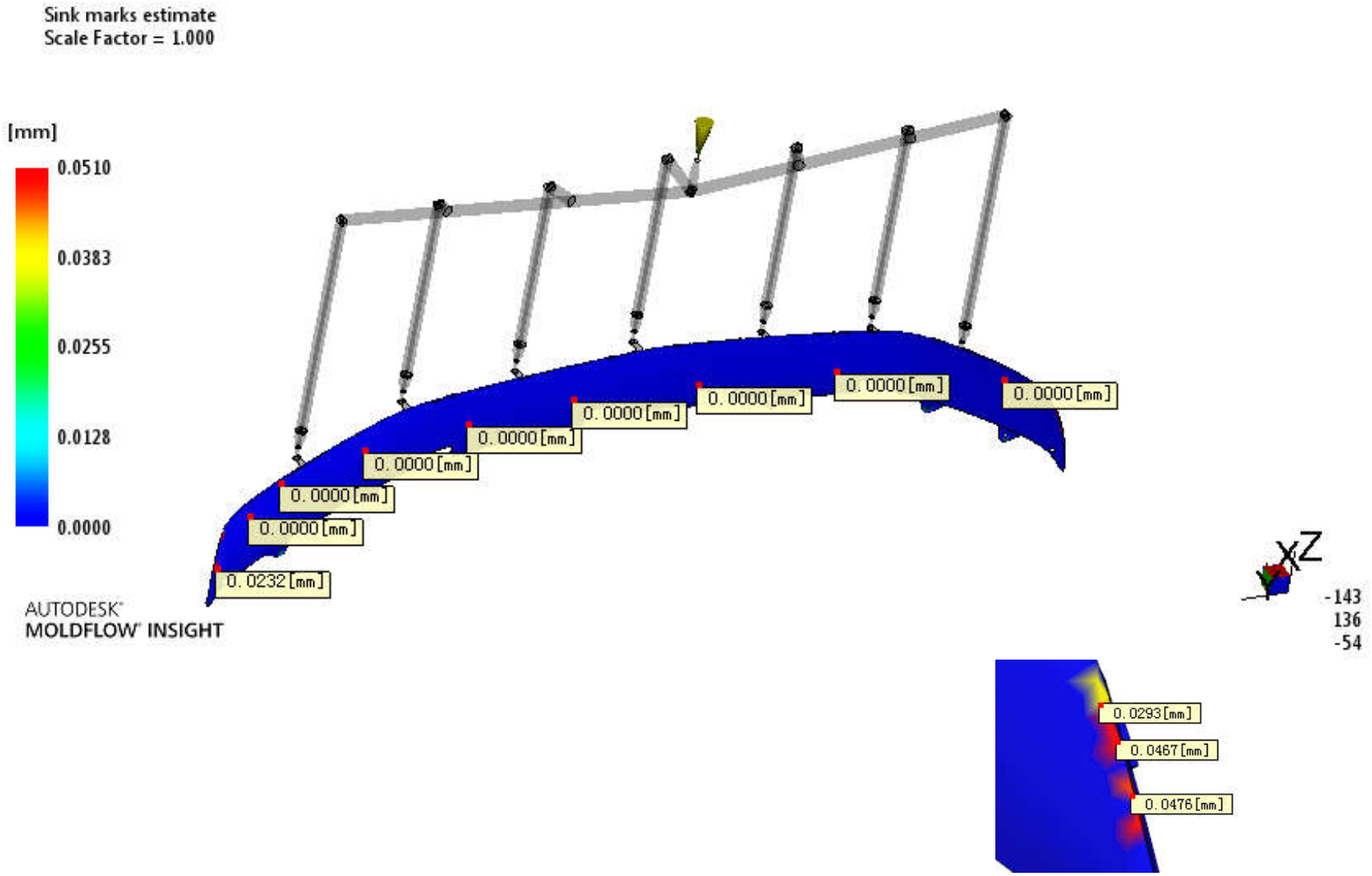


产品达到顶出温度的时间为**26s.**（不包括开合模时间）

■ **at 22s ,the part freeze 99.5% can be ejection.(except mold close and open time).**

缩痕估算

Sink marks estimate



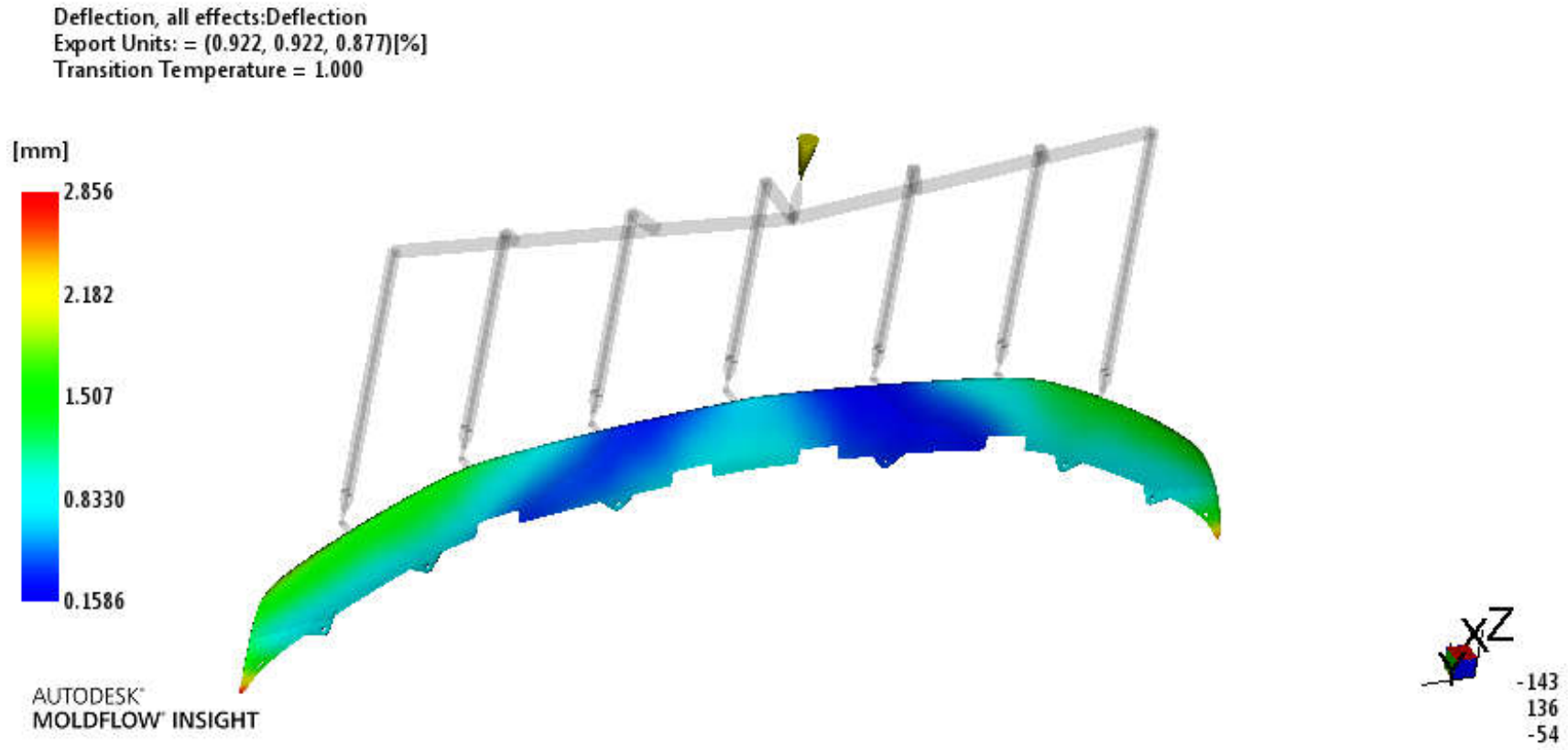
■ The product sink marks is not greater than 0.03mm, which is considered invisible. At present, the depth of the product sink marks is 0.0654mm,Have risk of shrinkage.

产品整体收缩+变形，放大1倍

Deflection-All

■ Note : warpage shape magnified 1X for display purposes. (The undeformed part display transparen

产品整体最大变形 +缩水在红色区域 2.85mm,

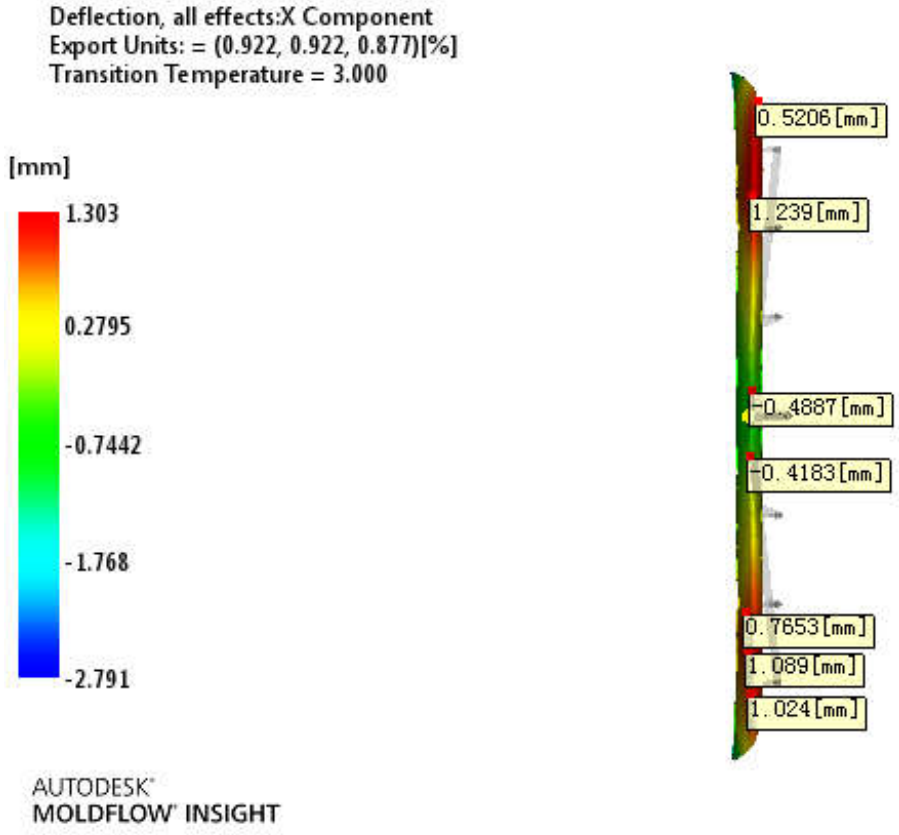


■ The maximum shrinkage and deflection value is about 2.85mm.

产品X方向变形，放大3倍

X-deflection

■ Note : warpage shape magnified 3X for display purposes. (The undeformed part display transparen
产品X方向最大变形 +缩水在红色和深蓝色区域 -2.78~1.30mm,



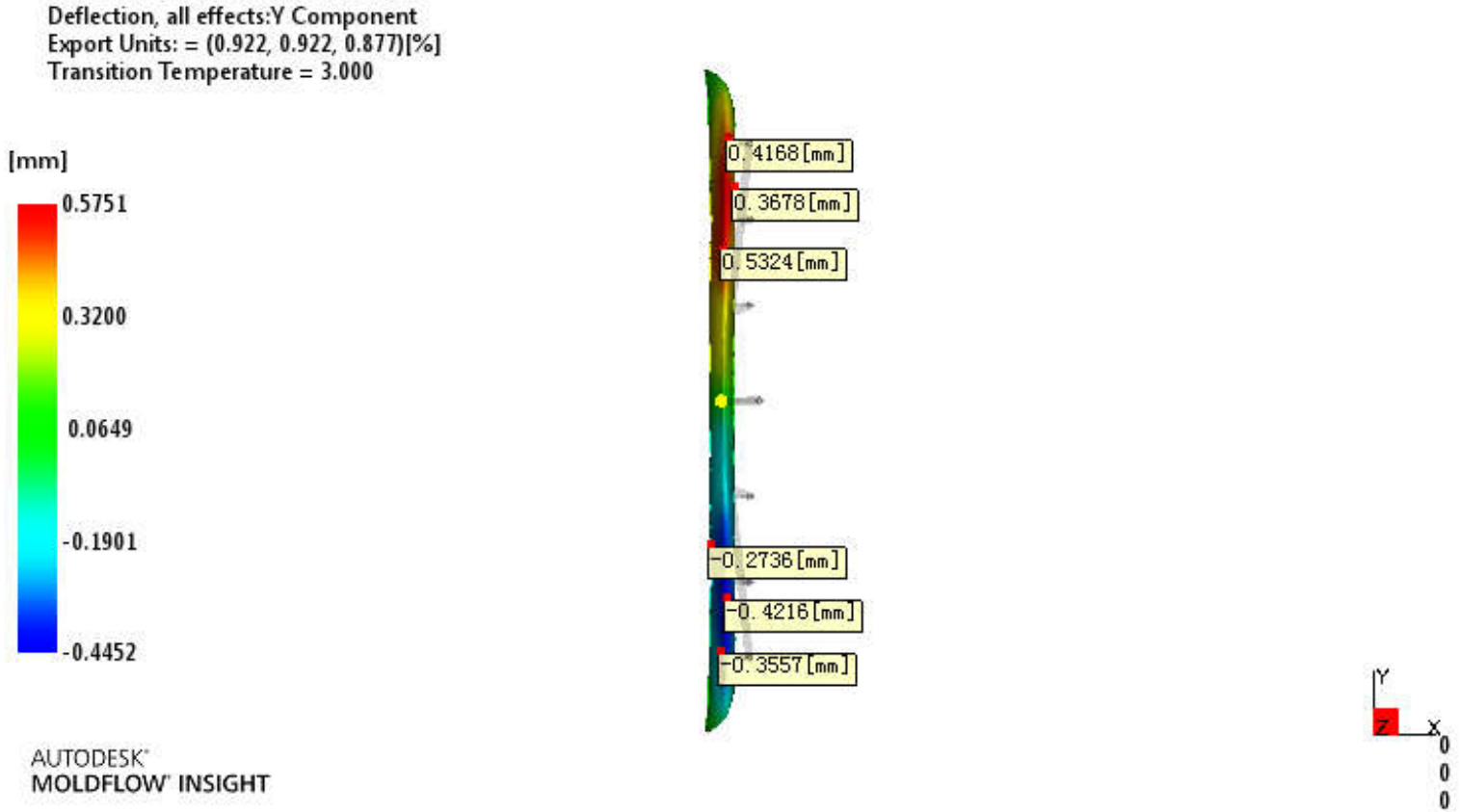
■ The black arrow indicates shrinkage and deflection moved inward about -2.79mm.

■ The red arrow indicates shrinkage and deflection moved inward about 1.30mm.

Y-deflection

产品Y方向变形，放大3倍

■ Note : warpage shape magnified 3X for display purposes. (The undeformed part display transparen
产品Y方向最大变形 +缩水在红色和深蓝色区域 -0.44~0.57mm,



■ The black arrow indicates shrinkage and deflection moved inward about -0.44mm.

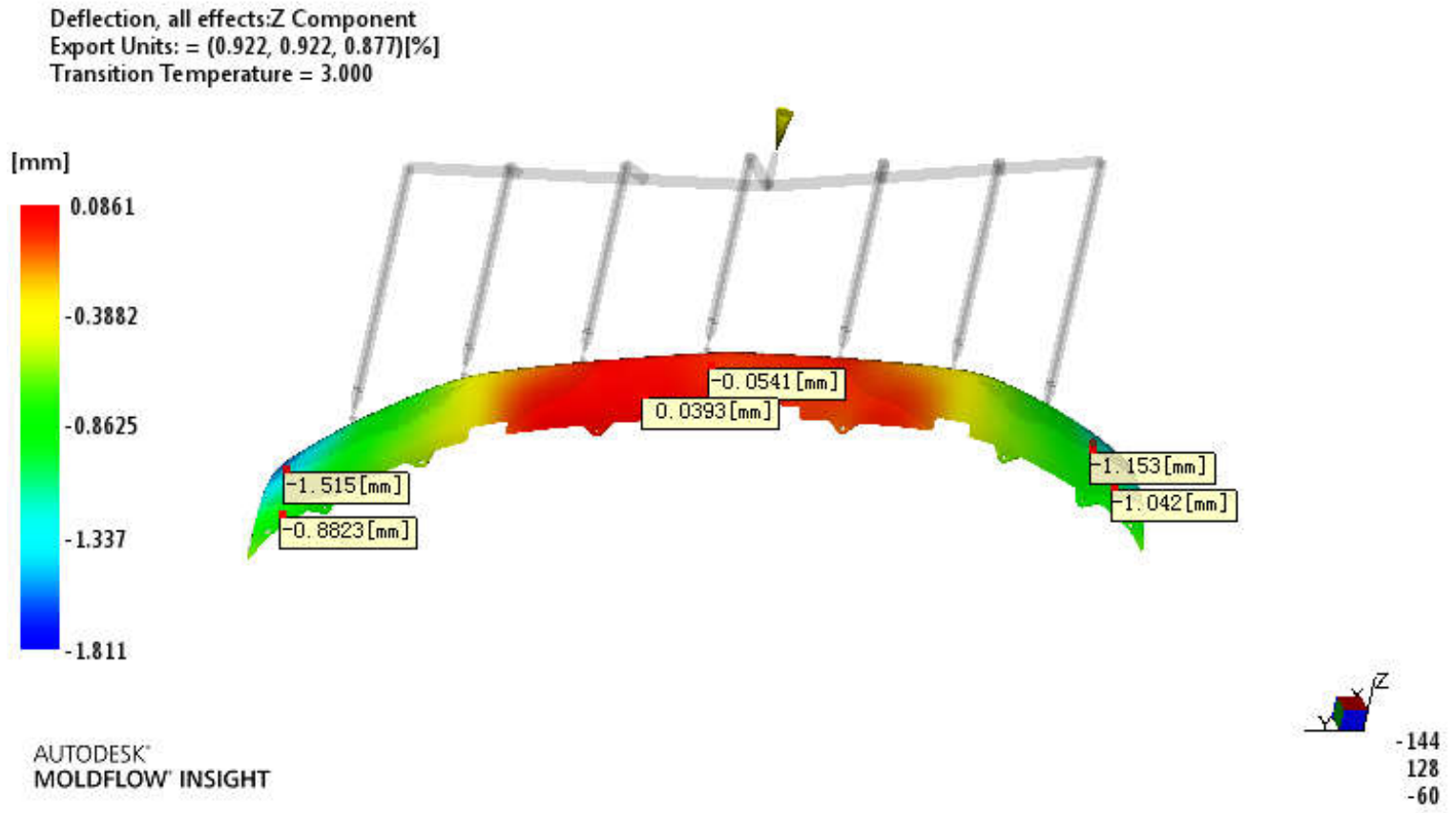
■ The red arrow indicates shrinkage and deflection moved inward about 0.57mm.

产品Z方向变形，放大3倍

Z –deflection

■ Note : warpage shape magnified 3X for display purposes. (The undeformed part display transparen

产品Z方向最大变形 +缩水在红色和深蓝色区域 -1.81~0.08mm,



■ The black arrow indicates shrinkage and deflection moved downward about -1.81mm.

■ The red arrow indicates shrinkage and deflection moved upward about 0.08mm.

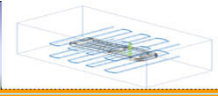
Conclusions & Suggestions

From the above analysis

- **The cycle time is about: 4.64(filling) + 35(cooling + packing)（predict） + 15 (open & eject) =55sec**
- **The pressure is reasonable and there will be no filling problem in this part. (refer page 14.15)**
- **The weld lines is visible at the hole location, adding the vent at the weld lines position. (refer page 17)**
- **The end of ribs and weild line have air trap .need to improve vent. (refer page 18)**
- **This part have uneven shrinkage at the X,Y,Z direction, and volumetric shrinkage result in the warpage.**

Fill time	Injection pressure	Volumetric shrinkage
4.64sec	85.77Mpa	-1.56~15.46%

Deflection: X Component	Deflection: Y Component	Deflection: Z Component
-2.78~1.30mm	-0.44~0.57mm	-1.81~0.08mm



Thanks