

Mold Flow Analysis of Three phase Meter box using plastic Advisor-Part-II

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Abstract: In this paper we have tabulated different Case studies for mold flow analysis for meter box with thermo physical properties like pressure, temperature, melting points of the mold flow with fill analysis, wrap analysis and package analysis have been discussed. We have presented in this paper about maximum injection pressure of 120MPa and 130 MPa with melting point of 180 degree and 190 degree at constant mold temperature of 35 degree.

Keywords: mold flow, injection pressure and sink ability.

Introduction:

MOLD FLOW ANALYSIS:

Mould flow, 3D solids-based plastics flow simulation that allows plastics part designers to determine the manufacturability of their parts during the preliminary design stages and avoid potential downstream problems, which can lead to delays and cost overruns. Following are the benefits: Optimize the part wall thickness to achieve uniform filling patterns, minimum cycle time and lowest part cost Identify and eliminate cosmetic issues such as sink marks, weld lines and air traps. Determine the best injection locations for a given part design

With mold flow analysis, you will gain valuable insights into the dynamics of filling, cooling, packing and warpage.

• Fill • Cool • Wrap • Packaging

Fill analysis : Optimize gating • Optimize runner system • Predict fill pattern • Predict injection pressure • Determine clamping tonnage

• Predict temperature • Visualize shear rates • Determine fiber orientations • Avoid air traps • Predict sink

Mold flow cool analysis : Find hot spots • Calculate time to freeze • Visualize uneven cooling between core and cavity

• Defined required coolant flow rates • Measure pressure drop in cooling system • Optimize cooling lay out

Wrap Analysis ; Predict warpage • Find cause of warpage • Determine warpage due to orientation • Predict warpage due to differential shrinkage

Package Analysis • Calculate proper packing pressure • Define optimum packing profile

Mould flow analysis gives you the ability to maintain the integrity of your product designs. It provides you the tools to quickly optimize part designs and check the impact of critical design decisions on the manufacturability and quality of the product early in the design process. There is no need to: Compromise the aesthetics of your design concept for manufacturability;

Go through a lengthy trial and error process to find the most suitable material to produce the part with the highest possible quality and the lowest possible cost Find out during trial runs that the produced part has visual blemishes, such as sink marks, weld lines, air traps or burn marks.

PROBLEM DESCRIPTION

In this project, Mold flow analysis have been performed on three phase meter box bottom part by varying material and processing parameters .



Fig 1 Three phase meter bottom cover

Result and Discussion:**Case 1 Summary report for ABS 650****Summary report for Generic PP**

Material Grade:	Generic PP	Material Grade:	Generic PP
Max Injection Pressure:	120.00 MPa	Max Injection Pressure:	120.00 MPa
Mold Temperature:	30.00 deg.C	Mold Temperature:	30.00 deg.C
Melt Temperature:	180.00 deg.C	Melt Temperature:	180.00 deg.C
Confidence:	Low	Confidence:	Low
Injection Time:	10.46 sec	Injection Time:	8.16 sec
Injection Pressure:	120.00 MPa	Injection Pressure:	43.51 MPa
Weld Lines:	Yes	Weld Lines:	Yes
Air Traps:	Yes	Air Traps:	Yes
Shot Volume :	842.97 cu.cm	Shot Volume :	842.97 cu.cm
Filling Clamp Force:	124.03tonne	Filling Clamp Force:	174.51 tonne
Solver Warning	Mold surface temperature specified is outside the recommended range for the specified material.	Clamp Force Area:	1259.54 sq.cm
Cycle Time:	32.9 sec	Cycle Time:	24.97 sec
Surface Temperature Variance Range	-17.56 deg.C to 11.86 deg.C	Surface Temperature Variance Range	17.56 deg.C to 11.86 deg.C
Freeze Time Variance Range	7.51 sec to 29.56 sec	Freeze Time Variance Range	7.51 sec to 29.56 sec

Case 2 Summary report for ABS 650**Summary report for Generic PP**

Material Grade:	Generic PP	Material Grade:	Generic PP
Max Injection Pressure:	130.00 MPa	Max Injection Pressure:	130.00 MPa
Mold Temperature:	35.00 deg.C	Mold Temperature:	35.00 deg.C
Melt Temperature:	190.00 deg.C	Melt Temperature:	190.00 deg.C
Confidence:	Low	Confidence:	Low
Injection Time:	8.60 sec	Injection Time:	8.60 sec
Injection Pressure:	40.22 MPa	Injection Pressure:	40.22 MPa
Weld Lines:	No	Weld Lines:	No
Air Traps:	No	Air Traps:	No
Shot Volume :	842.97 cu.cm	Shot Volume :	842.97 cu.cm
Filling Clamp Force:	183.97 tonne	Filling Clamp Force:	183.97 tonne
Clamp Force Area:	1259.54 sq.cm	Clamp Force Area:	1259.54 sq.cm
Cycle Time:	26.26 sec	Cycle Time:	26.26 sec
Surface Temperature Variance Range	-17.56 deg.C to 11.86 deg.C	Surface Temperature Variance Range	-17.56 deg.C to 11.86 deg.C
Freeze Time Variance Range	7.51 sec to 29.56 sec	Freeze Time Variance Range	7.51 sec to 29.56 sec

Case 3 Summary report for ABS 650**Summary report for Generic PP**

Material Grade:	Generic PP	Material Grade:	Generic PP
Max Injection Pressure:	130.00 MPa	Max Injection Pressure:	130.00 MPa
Mold Temperature:	35.00 deg.C	Mold Temperature:	35.00 deg.C
Melt Temperature:	190.00 deg.C	Melt Temperature:	190.00 deg.C
Confidence:	Low	Confidence:	Low
Injection Time:	8.60 sec	Injection Time:	8.60 sec
Injection Pressure:	40.22 MPa	Injection Pressure:	40.22 MPa
Weld Lines:	No	Weld Lines:	No
Air Traps:	No	Air Traps:	No
Shot Volume :	842.97 cu.cm	Shot Volume :	842.97 cu.cm
Filling Clamp Force:	183.97 tonne	Filling Clamp Force:	183.97 tonne
Clamp Force Area:	1259.54 sq.cm	Clamp Force Area:	1259.54 sq.cm
Cycle Time:	26.26 sec	Cycle Time:	26.26 sec
Surface Temperature Variance Range	-17.56 deg.C to 11.86 deg.C	Surface Temperature Variance Range	-17.56 deg.C to 11.86 deg.C
Freeze Time Variance Range	7.51 sec to 29.56 sec	Freeze Time Variance Range	7.51 sec to 29.56 sec

Case 4 Summary report for ABS 650**Summary report for Generic PP**

Material Grade:	Generic PP	Material Grade:	Generic PP
Max Injection Pressure:	130.00 MPa	Max Injection Pressure:	130.00 MPa
Mold Temperature:	35.00 deg.C	Mold Temperature:	35.00 deg.C
Melt Temperature:	190.00 deg.C	Melt Temperature:	190.00 deg.C
Confidence:	Low	Confidence:	Low
Injection Time:	8.60 sec	Injection Time:	8.60 sec
Injection Pressure:	40.22 MPa	Injection Pressure:	40.22 MPa
Weld Lines:	No	Weld Lines:	No
Air Traps:	No	Air Traps:	No
Shot Volume :	842.97 cu.cm	Shot Volume :	842.97 cu.cm
Filling Clamp Force:	183.97 tonne	Filling Clamp Force:	183.97 tonne
Clamp Force Area:	1259.54 sq.cm	Clamp Force Area:	1259.54 sq.cm
Cycle Time:	26.26 sec	Cycle Time:	26.26 sec
Surface Temperature Variance Range	-17.56 deg.C to 11.86 deg.C	Surface Temperature Variance Range	-17.56 deg.C to 11.86 deg.C
Freeze Time Variance Range	7.51 sec to 29.56 sec	Freeze Time Variance Range	7.51 sec to 29.56 sec

Case 5 Summary report for ABS 650**Summary report for Generic PP**

Material Grade:	Generic PP	Material Grade:	Generic PP
Max Injection Pressure:	130.00 MPa	Max Injection Pressure:	130.00 MPa
Mold Temperature:	35.00 deg.C	Mold Temperature:	35.00 deg.C
Melt Temperature:	190.00 deg.C	Melt Temperature:	190.00 deg.C
Confidence:	Low	Confidence:	Low
Injection Time:	8.60 sec	Injection Time:	8.60 sec
Injection Pressure:	40.22 MPa	Injection Pressure:	40.22 MPa
Weld Lines:	No	Weld Lines:	No
Air Traps:	No	Air Traps:	No
Shot Volume :	842.97 cu.cm	Shot Volume :	842.97 cu.cm
Filling Clamp Force:	183.97 tonne	Filling Clamp Force:	183.97 tonne
Clamp Force Area:	1259.54 sq.cm	Clamp Force Area:	1259.54 sq.cm
Cycle Time:	26.26 sec	Cycle Time:	26.26 sec
Surface Temperature Variance Range	-17.56 deg.C to 11.86 deg.C	Surface Temperature Variance Range	-17.56 deg.C to 11.86 deg.C
Freeze Time Variance Range	7.51 sec to 29.56 sec	Freeze Time Variance Range	7.51 sec to 29.56 sec

Case 6 Summary report for ABS 650**Summary report for Generic PP**

Material Grade:	Generic PP	Material Grade:	Generic PP
Max Injection Pressure:	130.00 MPa	Max Injection Pressure:	130.00 MPa
Mold Temperature:	35.00 deg.C	Mold Temperature:	35.00 deg.C
Melt Temperature:	190.00 deg.C	Melt Temperature:	190.00 deg.C
Confidence:	Low	Confidence:	Low
Injection Time:	8.60 sec	Injection Time:	8.60 sec
Injection Pressure:	40.22 MPa	Injection Pressure:	40.22 MPa
Weld Lines:	No	Weld Lines:	No
Air Traps:	No	Air Traps:	No
Shot Volume :	842.97 cu.cm	Shot Volume :	842.97 cu.cm
Filling Clamp Force:	183.97 tonne	Filling Clamp Force:	183.97 tonne
Clamp Force Area:	1259.54 sq.cm	Clamp Force Area:	1259.54 sq.cm
Cycle Time:	26.26 sec	Cycle Time:	26.26 sec
Surface Temperature Variance Range	-17.56 deg.C to 11.86 deg.C	Surface Temperature Variance Range	-17.56 deg.C to 11.86 deg.C
Freeze Time Variance Range	7.51 sec to 29.56 sec	Freeze Time Variance Range	7.51 sec to 29.56 sec

Case 7 Summary report for ABS 650**Summary report for Generic PP**

Material Grade:	Generic PP	Material Grade:	Generic PP
Max Injection Pressure:	130.00 MPa	Max Injection Pressure:	130.00 MPa
Mold Temperature:	35.00 deg.C	Mold Temperature:	35.00 deg.C
Melt Temperature:	190.00 deg.C	Melt Temperature:	190.00 deg.C
Confidence:	Low	Confidence:	Low
Injection Time:	8.60 sec	Injection Time:	8.60 sec
Injection Pressure:	40.22 MPa	Injection Pressure:	40.22 MPa
Weld Lines:	No	Weld Lines:	No
Air Traps:	No	Air Traps:	No
Shot Volume :	842.97 cu.cm	Shot Volume :	842.97 cu.cm
Filling Clamp Force:	183.97 tonne	Filling Clamp Force:	183.97 tonne
Clamp Force Area:	1259.54 sq.cm	Clamp Force Area:	1259.54 sq.cm
Cycle Time:	26.26 sec	Cycle Time:	26.26 sec
Surface Temperature Variance Range	-17.56 deg.C to 11.86 deg.C	Surface Temperature Variance Range	-17.56 deg.C to 11.86 deg.C
Freeze Time Variance Range	7.51 sec to 29.56 sec	Freeze Time Variance Range	7.51 sec to 29.56 sec

Case 8 Summary report for ABS 650**Summary report for Generic PP**

Material Grade:	Generic PP	Material Grade:	Generic PP
Max Injection Pressure:	130.00 MPa	Max Injection Pressure:	130.00 MPa
Mold Temperature:	35.00 deg.C	Mold Temperature:	35.00 deg.C
Melt Temperature:	190.00 deg.C	Melt Temperature:	190.00 deg.C
Confidence:	Low	Confidence:	Low
Injection Time:	8.60 sec	Injection Time:	8.60 sec
Injection Pressure:	40.22 MPa	Injection Pressure:	40.22 MPa
Weld Lines:	No	Weld Lines:	No
Air Traps:	No	Air Traps:	No
Shot Volume :	842.97 cu.cm	Shot Volume :	842.97 cu.cm
Filling Clamp Force:	183.97 tonne	Filling Clamp Force:	183.97 tonne
Clamp Force Area:	1259.54 sq.cm	Clamp Force Area:	1259.54 sq.cm
Cycle Time:	26.26 sec	Cycle Time:	26.26 sec
Surface Temperature Variance Range	-17.56 deg.C to 11.86 deg.C	Surface Temperature Variance Range	-17.56 deg.C to 11.86 deg.C
Freeze Time Variance Range	7.51 sec to 29.56 sec	Freeze Time Variance Range	7.51 sec to 29.56 sec

Conclusion:

1. Mold ability: has not completed filling and is a short shot. Part quality will be unacceptable. View the Confidence of Fill plot and use the Dynamic Adviser to get help on how to improve the filling of the part , generic description was Your part will be extremely difficult to fill and part quality may be unacceptable.
2. Cooling Quality: Your part will have large problems cooling and may cause problems with ejection.
3. Sink ability: Less than 1% of your model was found to be prone to sink marks

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