Material Testing Report

SN 7487

ISOGLASS HGV 6002D NA

Prepared for:

SIRMAX SPA

VIA DELL'ARTIGIANATO 42

CITTADELLA, 35013

ITALY

Prepared by:

Autodesk Moldflow Plastics Labs

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Ithaca, NY 14850

USA

Prepared on:

19 June, 2015

Report Authorized By:

Andrew Kostuk

Laboratory Technician

19 June, 2015

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ACCREDITED

Testing Cert. 2399.01

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Contents

Summary

Description

Family name	POLYPROPYLENES (PP)
Trade name	ISOGLASS HGV 6002D NA
Manufacturer	Sirmax SpA
Family abbreviation	PP
Material structure	Crystalline
Data source	Autodesk Moldflow Plastics Labs : pvT-Measured : mech-Measured
Date last modified	19-JUN-15
Date tested	26-MAY-15
Data status	Non-Confidential
Material ID	31792
Grade code	SN7487
Supplier code	SIRMAX
Fibers/fillers	30% Glass Fiber Filled

Recommended Processing

Mold surface temperature	40	°C
Melt temperature	235	°C

Mold temperature range (recommended)		
Minimum	20	°C
Maximum	60	°C

Melt temperature range (recommended)		
Minimum	220	°C
Maximum	250	°C

Absolute maximum melt temperature	300	°C

Ejection temperature	115	°C

Maximum shear stress	0.25	MPa
Maximum shear rate	100000	1/s

Maximum shear stress and maximum shear rate values have been supplemented with generic estimates.

Rheological Properties

Cross WLF Viscosity Model		
n	0.21613	
Tau	50112.7	Pa
D1	4.27843e+011	Pa-s
D2	263.15	K
D3	0	K/Pa
A1	24.539	
A2	51.600	K

Juncture loss method coefficients		
C1	3.7e-005	Pa^(1-c2)
C2	2.095	

Transition temperature		
Ttrans	124	°C

Moldflow Viscosity Index	VI(240)76	

Melt mass-flow rate (MFR)		
Temperature	230	°C
Load	2.16	Kg
Measured MFR	20.0	g/10min

Thermal Properties

Specific heat data		
Temperature (T) °C	Specific heat (Cp) J/Kg-°C	Heating/Cooling rate °C/s
244	2244.0	-0.33
211	2150.0	-0.33
170	2049.0	-0.33
131	1968.0	-0.33
124	3795.0	-0.33
120	14200.0	-0.33
115	3076.0	-0.33
113	2403.0	-0.33
94	1855.0	-0.33
72	1666.0	-0.33
55	1511.0	-0.33

Thermal conductivity data		
Temperature (T) °C	Thermal conductivity (k) W/m-°C	Heating/Cooling rate °C/s
256.2	0.208	0.0
234.8	0.200	0.0
214	0.196	0.0
193.1	0.193	0.0
172.1	0.192	0.0
150.9	0.190	0.0
134.2	0.178	0.0
109.6	0.219	0.0
88.7	0.220	0.0
67.8	0.220	0.0
46.9	0.216	0.0
25.9	0.216	0.0

PVT Properties

Melt density	0.9318	g/cm^3
Solid density	1.1445	g/cm^3

2-domain Tait PVT model coefficients		
b5	426.15	K
b6	8.451e-008	K/Pa
b1m	0.001013	m^3/Kg
b2m	7.346e-007	m^3/Kg-K
b3m	9.22368e+007	Pa
b4m	0.004936	1/K
b1s	0.000919	m^3/Kg
b2s	3.534e-007	m^3/Kg-K
b3s	2.10996e+008	Pa
b4s	0.005629	1/K
b7	0.000094	m^3/Kg
b8	0.069271	1/K
b9	1.078e-008	1/Pa

Mechanical Properties

Mechanical properties data		
Elastic modulus, 1st principal direction [E1]	5552	MPa
Elastic modulus, 2nd principal direction [E2]	3421	MPa
Poisson's ratio [v12]	0.4420	
Poisson's ratio [v23]	0.4420	
Shear modulus [G12]	1211	MPa

Transversely isotropic coefficient of thermal expansion [CTE] data		
Alpha1	2.870e-005	1/°C
Alpha2	7.350e-005	1/°C

Shrinkage Properties

Corrected residual in-mold stress (CRIMS) model coefficients	
A1	0.92753
A2	-0.015828
A3	0.000795
A4	1.806468
A5	-0.5000
A6	0.003257

Residual strain model coefficients		
	Parallel	Perpendicular
A1	0.014265	0.16446
A2	-0.000375	-0.000689
A3	-6.4629e-006	-0.00015
A4	1.6763e-009	2.8294e-007
A5	0.001309	0.005147

The shrinkage models shown above are valid for Autodesk Simulation Moldflow Insight 2015. Shrinkage models for previous software versions are included in the 21000.udb file.

Filler Properties

Filler data	
Description	Weight %
Glass Fiber	30

Viscosity

Method:
MPL Test Method
(Method falls outside the scope of A2LA Accreditation)

Instrument:
Arburg Allrounder 270S Injection Molding Machine

Test Specifications:

Sample Form:		Pellets
Pre-Processing:		Dried at 70°C for 1 hour in a hopper dryer
Moisture Level:		Not Measured
Capillary A:	Length:	32.3889 mm
	L/D:	16.19445
	Die Entry Angle:	90 degrees
Capillary B:	Length:	8.0249 mm
	L/D:	4.01245
	Die Entry Angle:	90 degrees
Barrel Diameter:		30 mm
Plastication Time:		20 sec
Dwell Time:		20 sec
Corrections:		Bagley, Rabinowitsch and shear heating
Date Received:		6-APR-15
Date Tested:		26-MAY-15

Operator's Notes:
Testing was performed per standard testing procedures.
No anomalies were noted during the course of testing.

Apparent Viscosity Data

Temperature (°C)	Apparent Shear Rate (sec^{-1})	Apparent Viscosity (Pa-s)	Die Diameter (mm)	Die L/D
219.7	195	298.77	2	16.19
219.7	314	225.25	2	16.19
219.7	25563	11.43	2	16.19
220.2	767	128.57	2	16.19
220.7	12755	18.86	2	16.19
220.8	1345	89.56	2	16.19
220.8	2592	58	2	16.19
220.8	63140	6.17	2	16.19
221.4	6478	30.64	2	16.19
230.3	196	278.79	2	16.19
230.4	314	210.55	2	16.19
230.7	769	120.42	2	16.19
230.7	12762	17.61	2	16.19
230.7	25579	10.75	2	16.19
230.8	1346	83.59	2	16.19
230.8	2590	54.22	2	16.19
230.8	61703	5.94	2	16.19
231.4	6478	28.6	2	16.19
240.7	25563	10.24	2	16.19
240.8	62926	5.51	2	16.19
240.9	195	263.86	2	16.19
241.1	1345	78.94	2	16.19
241.1	2590	51.29	2	16.19
241.7	314	195.16	2	16.19
241.7	768	112.97	2	16.19
241.8	6477	27.09	2	16.19
242.1	12754	16.77	2	16.19
250.7	196	243.35	2	16.19
250.7	314	183.11	2	16.19
250.7	770	106.16	2	16.19
250.7	1346	74.69	2	16.19
250.7	25586	9.78	2	16.19
250.7	62823	5.28	2	16.19
251	2591	48.69	2	16.19
251.1	12764	16.03	2	16.19
251.3	6480	25.89	2	16.19
217.9	12755	32.25	2	4.01
218	63140	11.6	2	4.01
218.3	314	286.62	2	4.01
218.4	195	350.83	2	4.01
218.4	767	184.31	2	4.01
218.6	25563	20.49	2	4.01
219	6478	50.53	2	4.01
219.2	1345	134.68	2	4.01
219.9	2592	90.68	2	4.01
228.3	314	257.99	2	4.01
228.5	12762	30.3	2	4.01
228.9	25579	19.2	2	4.01
229	196	318.68	2	4.01
229	769	168.51	2	4.01
229	61703	11.18	2	4.01

Temperature (°C)	Apparent Shear Rate (sec^{-1})	Apparent Viscosity (Pa-s)	Die Diameter (mm)	Die L/D
229.1	6478	46.84	2	4.01
229.2	1346	123.8	2	4.01
229.9	2590	83.73	2	4.01
237	195	291.22	2	4.01
238.4	314	232.12	2	4.01
238.9	62926	10.28	2	4.01
239	12754	28.42	2	4.01
239	25563	18.12	2	4.01
239.2	768	153.63	2	4.01
239.5	1345	114.69	2	4.01
239.6	6477	44	2	4.01
239.9	2590	78.04	2	4.01
248.9	12764	26.8	2	4.01
248.9	25586	17.1	2	4.01
248.9	62823	9.77	2	4.01
249.1	314	208.76	2	4.01
249.2	196	254.38	2	4.01
249.3	770	140.46	2	4.01
249.9	2591	73.1	2	4.01
250	1346	106.24	2	4.01
250.5	6480	41.34	2	4.01

Calculated Viscosity Data

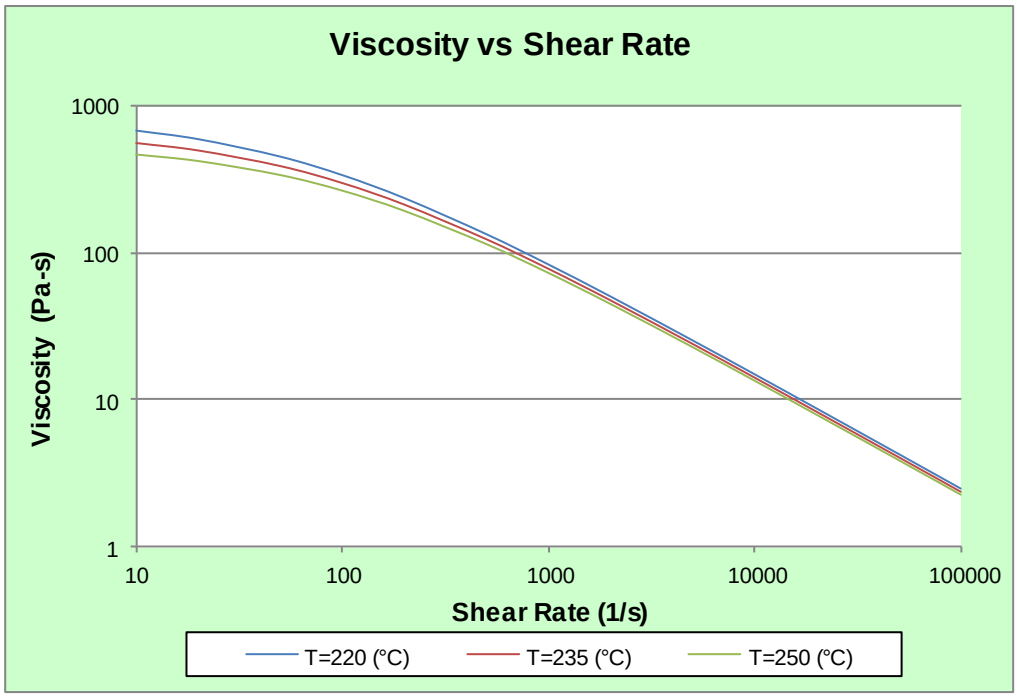
Temperature (°C)	Shear Rate (sec^{-1})	Calculated Viscosity (Pa-s)
217.9	12755	12.46
218	63140	3.59
218.3	314	181.95
218.4	195	241.25
218.4	767	100.95
218.6	25563	7.25
219	6478	20.89
219.2	1345	67.57
219.7	195	239.07
219.7	314	180.39
219.7	25563	7.22
219.9	2592	41.61
220.2	767	100.05
220.7	12755	12.33
220.8	1345	67.09
220.8	63140	3.56
220.8	2592	41.45
221.4	6478	20.7
228.3	314	171.25
228.5	12762	11.99
228.9	25579	6.99
229	769	95.7
229	61703	3.52
229	196	223.57
229.1	6478	20.13
229.2	1346	64.65
229.9	2590	40.01
230.3	196	221.6
230.4	314	169.12
230.7	25579	6.95
230.7	769	94.93
230.7	12762	11.9
230.8	61703	3.5
230.8	2590	39.87
230.8	1346	64.21
231.4	6478	19.96
237	195	212.4
238.4	314	161.35
238.9	62926	3.36
239	25563	6.77
239	12754	11.58
239.2	768	91.32
239.5	1345	61.95
239.6	6477	19.41
239.9	2590	38.53
240.7	25563	6.73
240.8	62926	3.34
240.9	195	206.97
241.1	1345	61.55
241.1	2590	38.36
241.7	314	158.29

Temperature (°C)	Shear Rate (sec^{-1})	Calculated Viscosity (Pa-s)
241.7	768	90.28
241.8	6477	19.27
242.1	12754	11.47
248.9	25586	6.56
248.9	12764	11.22
248.9	62823	3.26
249.1	314	151.75
249.2	196	195.52
249.3	770	87.09
249.9	2591	37.16
250	1346	59.37
250.5	6480	18.73
250.7	62823	3.25
250.7	196	193.64
250.7	314	150.39
250.7	770	86.55
250.7	25586	6.53
250.7	1346	59.21
251	2591	37.02
251.1	12764	11.15
251.3	6480	18.68

Rheological Data

Cross WLF Viscosity Model		
n	0.21613	
Tau	50112.7	Pa
D1	4.27843e+011	Pa-s
D2	263.15	K
D3	0	K/Pa
A1	24.539	
A2	51.600	K

Juncture loss method coefficients		
C1	3.7e-005	Pa^(1-c2)
C2	2.095	



Thermal conductivity

Method:

ASTM D 5930, Standard Test Method for Thermal Conductivity of Plastics by Means of a Transient Line-Source Technique.
(Method falls outside the scope of A2LA Accreditation)

Instrument:

Moldflow K-System II

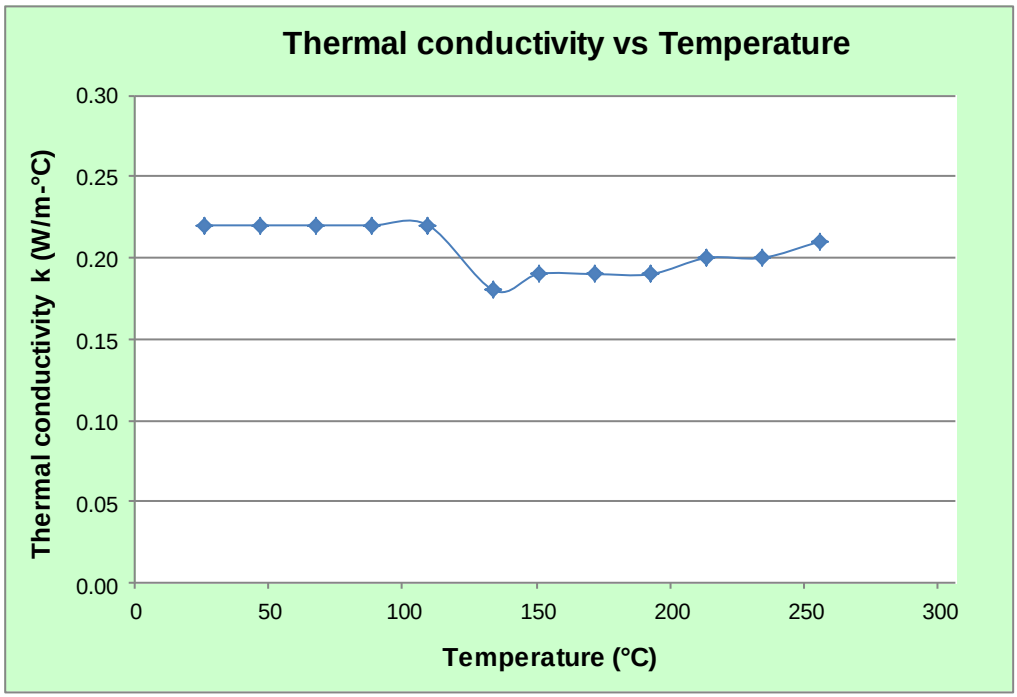
Test Specifications:

Sample Form:	Pellets
Pre-Processing:	Dried at 70°C for 1 hour in a hopper dryer
Moisture Level:	0.0134%
Probe Constant:	0.784
Probe Length:	50 mm
Data acquisition time:	45 sec
Probe Voltage:	4.0 V
Date Received:	6-APR-15
Date Tested:	12-JUN-15

Operator's Notes:

Testing was performed at our Kilsyth facility per standard testing procedures.
No anomalies were noted during the course of testing.

Thermal conductivity data		
Temperature (T) °C	Thermal conductivity (k) W/m-°C	Heating/Cooling rate °C/s
256.2	0.208	0.0
234.8	0.200	0.0
214	0.196	0.0
193.1	0.193	0.0
172.1	0.192	0.0
150.9	0.190	0.0
134.2	0.178	0.0
109.6	0.219	0.0
88.7	0.220	0.0
67.8	0.220	0.0
46.9	0.216	0.0
25.9	0.216	0.0



Specific heat

Method:

ASTM E 1269, Standard Test Method for Determining Specific Heat Capacity by Differential Scanning Calorimetry
ASTM D 3418, Standard Test Method for Transition Temperatures and Enthalpies of Fusion and Crystallization of Polymers by Differential Scanning Calorimetry

Instrument:

Perkin Elmer Pyris Diamond Differential Scanning Calorimeter

Test Specifications:

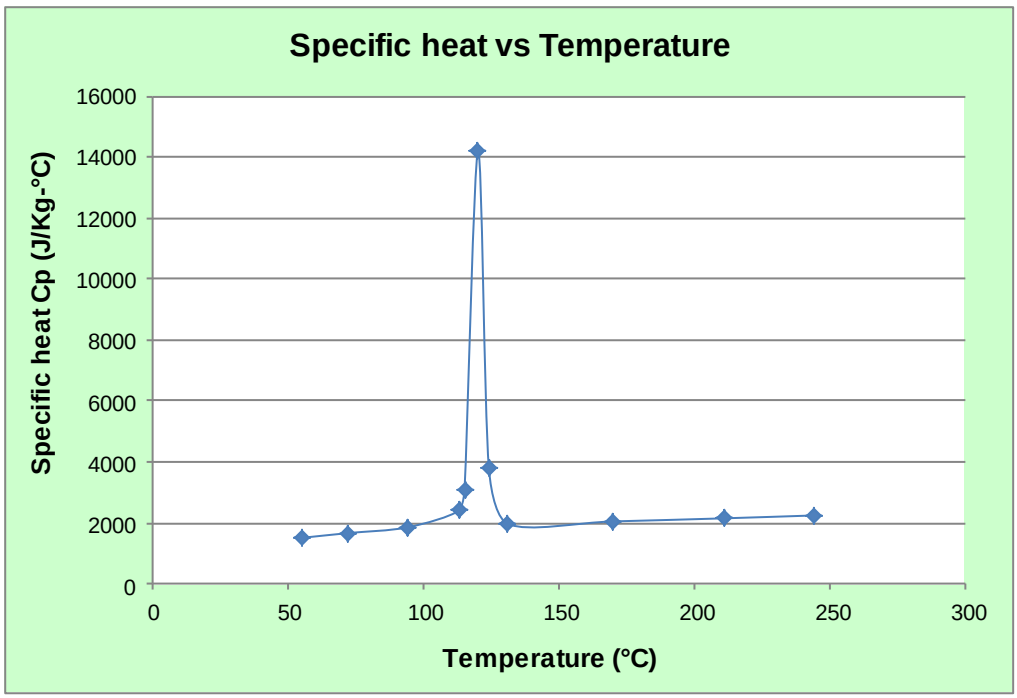
Sample Form:	Pellets
Pre-Processing:	Dried at 70°C for 1 hour in a hopper dryer
Moisture Level:	Not Measured
Initial Temperature:	250°C
Final Temperature:	40°C
Cooling Rate:	20°C/min
Equilibrium Time:	3 min
Sample holder material:	Aluminum
Sample holder dimensions:	6.7 mm diameter, 1.6 mm tall
Sample holder mass:	25 mg (pan + lid)
Purge gas:	99.99% pure nitrogen
Purge gas flow rate:	30 cm^3/sec
Date Received:	6-APR-15
Date Tested:	26-MAY-15

Operator's Notes:

Testing was performed per standard testing procedures.
No anomalies were noted during the course of testing.

Specific heat data		
Temperature (T) °C	Specific heat (Cp) J/Kg-°C	Heating/Cooling rate °C/s
244	2244.0	-0.33
211	2150.0	-0.33
170	2049.0	-0.33
131	1968.0	-0.33
124	3795.0	-0.33
120	14200.0	-0.33
115	3076.0	-0.33
113	2403.0	-0.33
94	1855.0	-0.33
72	1666.0	-0.33
55	1511.0	-0.33

Ttrans	124	°C
Ejection temperature	115	°C



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Pressure-Volume-Temperature

Method:
High Pressure Indirect Dilatometry

Instrument:
Gnomix pvT Apparatus

Test Specifications:

Sample Form**:**	Molded Plaque
Pre-Processing**:**	Not required
Scan type**:**	Isothermal Cooling
Date Received:	6-APR-15
Date Tested**:**	29-MAY-15

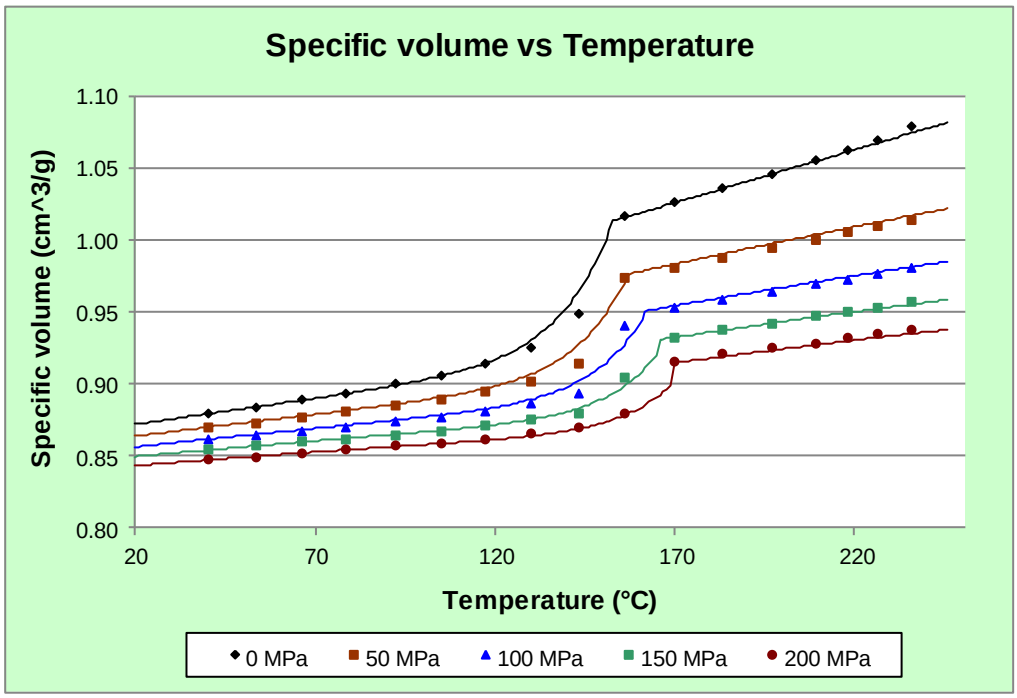
Operator's Notes:
Testing was performed per standard testing procedures.
No anomalies were noted during the course of testing.

pvT Experimental Data

Temperature (°C)	Pressure (MPa)				
	0MPa	50MPa	100MPa	150MPa	200MPa
40.06	0.8797	0.8697	0.8616	0.8545	0.8479
53.51	0.8840	0.8728	0.8641	0.8566	0.8496
66.2	0.8891	0.8765	0.8673	0.8594	0.8521
78.63	0.8938	0.8802	0.8702	0.8619	0.8542
92.22	0.8998	0.8844	0.8735	0.8648	0.8566
104.9	0.9059	0.8886	0.8766	0.8674	0.8589
117.3	0.9141	0.8943	0.8811	0.8709	0.8620
130.	0.9255	0.9017	0.8866	0.8751	0.8654
143.4	0.9487	0.9137	0.8935	0.8798	0.8692
156.4	1.0170	0.9733	0.9399	0.9046	0.8789
170.3	1.0260	0.9802	0.9528	0.9326	0.9158
183.5	1.0360	0.9869	0.9584	0.9375	0.9203
197.	1.0460	0.9939	0.9637	0.9421	0.9244
209.6	1.0550	1.0000	0.9688	0.9465	0.9284
218.2	1.0620	1.0050	0.9726	0.9498	0.9313
226.5	1.0690	1.0100	0.9765	0.9533	0.9344
236.1	1.0780	1.0140	0.9803	0.9562	0.9369

Melt density	0.9318	g/cm^3
Solid density	1.1445	g/cm^3

2-domain Tait PVT model coefficients		
b5	426.15	K
b6	8.451e-008	K/Pa
b1m	0.001013	m^3/Kg
b2m	7.346e-007	m^3/Kg-K
b3m	9.22368e+007	Pa
b4m	0.004936	1/K
b1s	0.000919	m^3/Kg
b2s	3.534e-007	m^3/Kg-K
b3s	2.10996e+008	Pa
b4s	0.005629	1/K
b7	0.000094	m^3/Kg
b8	0.069271	1/K
b9	1.078e-008	1/Pa



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Shrinkage

Method:

MPL Shrinkage Test Method (QOP-17-M)
(Method falls outside the scope of A2LA Accreditation)

Instrument:

Krauss Maffei KM160-750CX Injection molding machine
Test mold inscribed with a fine grid pattern
Temperature and Humidity Controlled Room
OGP Smartscope Flash 400 metrology system

Test Specifications:

Sample Form**:**	Pellets
Pre-Processing**:**	Dried at 70°C for 1 hour in a hopper dryer
Moisture Level**:**	Not Measured
Date Molded**:**	26-MAY-15
Post-Processing**:**	Conditioned at 23°C / 50% relative humidity for 7 days
Date Measured**:**	02-JUN-15
Shrinkage Data Correlated With**:**	Autodesk Simulation Moldflow Insight 2015
Default Model**:**	Residual Stress (CRIMS)
Date Received:	6-APR-15

Operator's Notes:

Testing was performed per standard testing procedures.
No anomalies were noted during the course of testing.
Shrinkage measurements have been corrected to account for mold thermal expansion.
Data for some process conditions may have been removed in the determination of the favored model.

Shrinkage Experimental Data

Process Condition	Melt Temperature (°C)	Mold Temperature (°C)	Flow Rate (cc/sec)	Part Thickness (mm)	Packing Pressure (MPa)	Packing Time (sec)	Cooling Time (sec)
1	239.7	50.7	40.0	3	18.2	18	10
2	240.0	44.9	38.4	3	46.7	18	10
3	240.2	51.2	40.9	3	75.4	18	10
4	239.8	51.1	20.0	3	46.5	18	10
5	240.0	45.5	62.0	3	46.7	18	10
6	239.7	49.6	32.8	1.5	18.2	6	10
7	239.9	46.7	31.7	1.5	46.6	6	10
8	240.0	43.5	31.7	1.5	75.4	6	10
9	239.8	45.7	16.4	1.5	46.5	6	10
10	239.7	49.3	47.6	1.5	46.9	6	10
11	239.7	49.8	35.3	2	18.3	10	10
12	239.7	50.7	36.3	2	46.7	10	10
13	240.0	46.1	35.3	2	75.3	10	10
14	239.9	45.0	18.4	2	46.6	10	10
15	239.9	50.0	55.2	2	46.8	10	10
16	217.3	44.8	37.4	2	18.2	10	10
17	217.4	42.5	36.3	2	46.8	10	10
18	217.4	48.8	35.3	2	75.6	10	10
19	217.1	49.8	18.4	2	46.5	10	10
20	217.2	46.1	55.2	2	46.9	10	10
21	251.6	50.2	37.4	2	18.3	10	10
22	253.1	51.4	35.3	2	46.8	10	10
23	253.9	45.5	35.3	2	75.5	10	10
24	253.8	47.6	17.9	2	46.7	10	10
25	253.9	51.3	57.7	2	46.9	10	10

Part Shrinkage

Process Condition	Average Measured Parallel	Average Measured Perpendicular	Average Predicted Volumetric
1	0.239%	1.321%	4.067%
2	0.196%	1.033%	2.719%
3	0.113%	0.792%	1.683%
4	0.181%	1.019%	2.813%
5	0.148%	1.038%	2.720%
6	0.182%	1.336%	7.224%
7	0.177%	1.049%	3.838%
8	0.134%	0.807%	2.469%
9	0.203%	1.110%	3.756%
10	0.204%	0.946%	3.837%
11	0.202%	1.444%	5.218%
12	0.194%	1.117%	3.243%
13	0.122%	0.781%	1.991%
14	0.191%	1.040%	3.177%
15	0.163%	1.068%	3.230%
16	0.185%	1.466%	5.563%
17	0.151%	1.050%	3.216%
18	0.152%	0.797%	2.033%
19	0.156%	1.099%	3.277%
20	0.160%	1.006%	3.235%
21	0.206%	1.435%	5.174%
22	0.156%	0.991%	3.218%
23	0.121%	0.749%	1.961%
24	0.176%	1.117%	3.169%
25	0.164%	1.104%	3.210%

Residual Stress Coefficients

Corrected residual in-mold stress (CRIMS) model coefficients	
A1	0.92753
A2	-0.015828
A3	0.000795
A4	1.806468
A5	-0.5000
A6	0.003257

Residual Strain Coefficients

Parallel				
	Coefficient	Lower Limit	Upper Limit	Centroid
1	0.014265	0.015716	0.091673	0.034404
2	-0.000375	0.0185	0.57026	0.2541
3	-6.4629e-006	0.94342	10.938	4.8363
4	1.6763e-009	3488.90	31485.00	14670.00
5	0.001309	0	0	0

Perpendicular				
	Coefficient	Lower Limit	Upper Limit	Centroid
1	0.16446	0.015716	0.069753	0.03302
2	-0.000689	0.0185	0.57026	0.25357
3	-0.00015	0.94342	10.938	4.8041
4	2.8294e-007	1578.40	4949.90	3389.10
5	0.005147	0	0	0

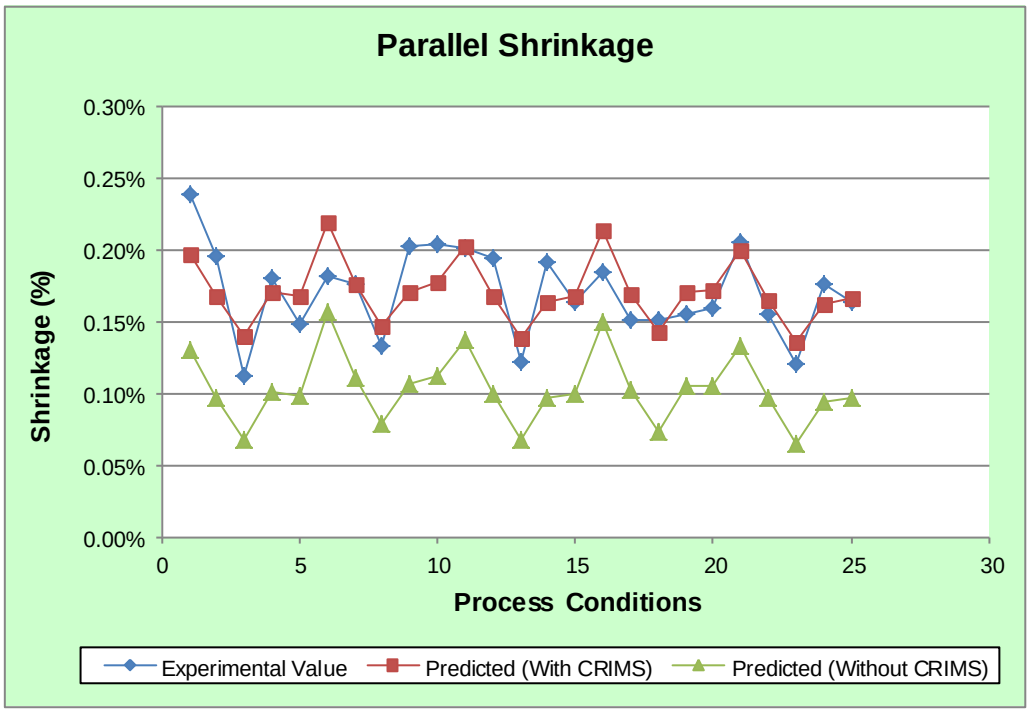
The shrinkage models shown above are valid for Autodesk Simulation Moldflow Insight 2015. Shrinkage models for previous software versions are included in the 21000.udb file.

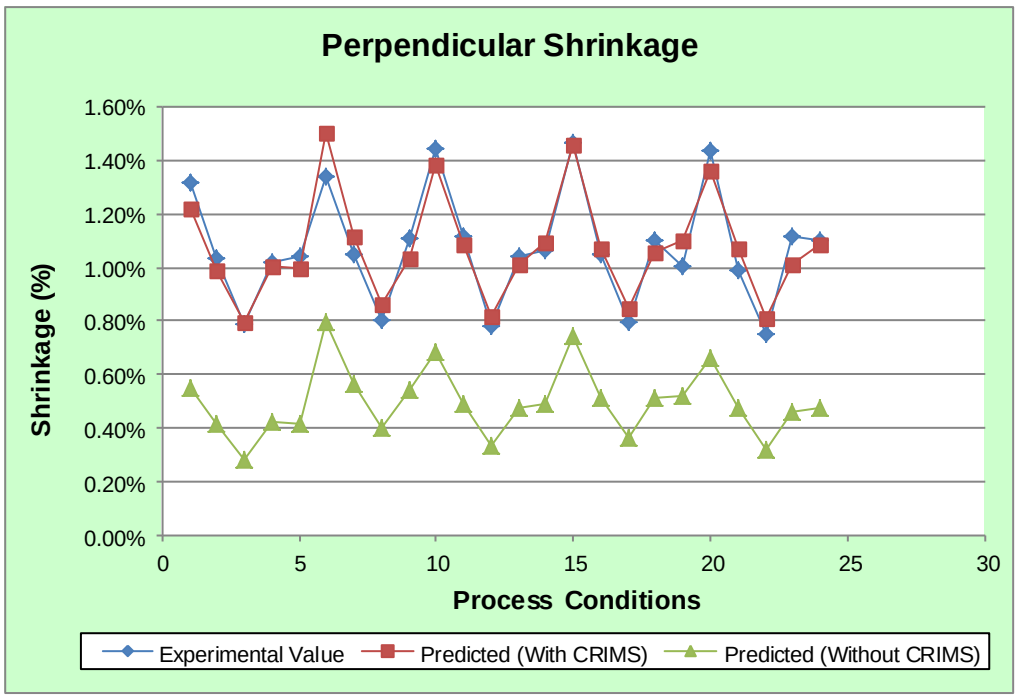
Observed Shrinkage

Observed nominal shrinkage	
Parallel	0.171%
Perpendicular	1.069%

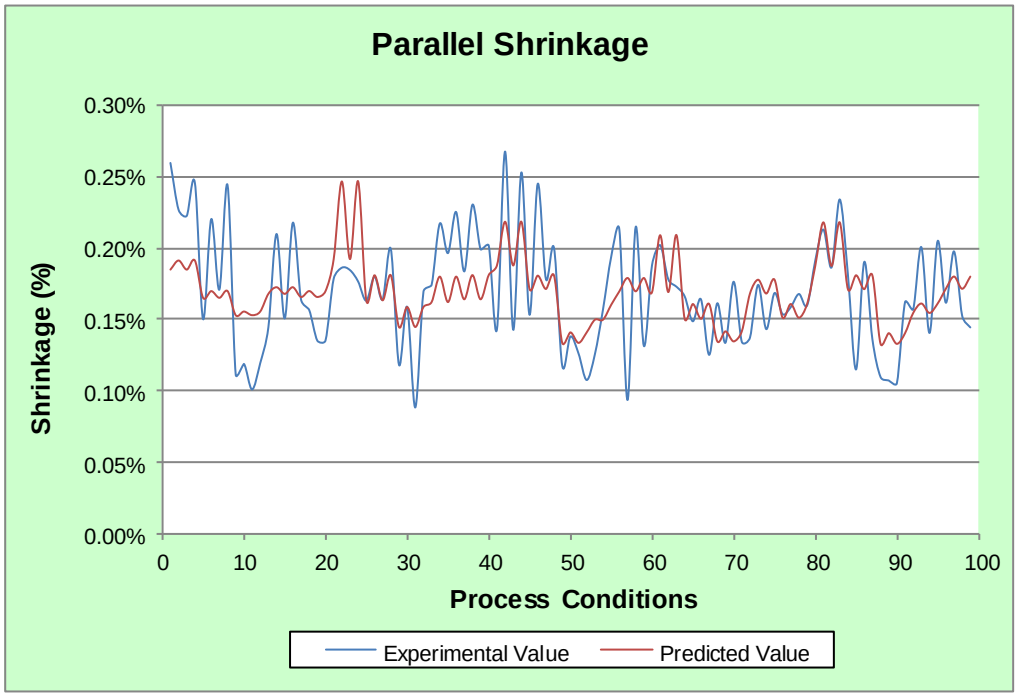
Observed shrinkage	
Minimum Parallel	0.113%
Maximum Parallel	0.239%
Minimum Perpendicular	0.749%
Maximum Perpendicular	1.466%

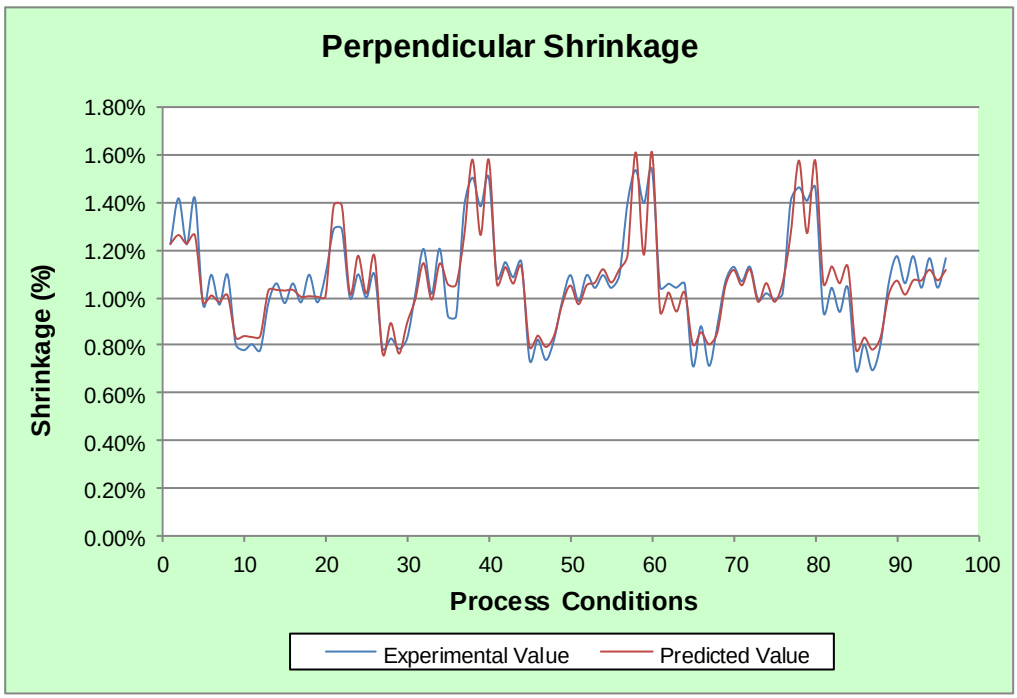
Residual Stress Plots





Residual Strain Plots





Mechanical

Elastic modulus and Poisson's ratio

Method:
ASTM D 638, Standard Test Method for Tensile Properties of Plastics
ASTM E 132, Standard Test Method for Poisson's Ratio at Room Temperature

Instrument:
MTS Sintech 5/G Universal Testing Machine

Test Specifications:

Specimens Tested:	8
Pre-Processing:	23°C +/-2°C at 50% +/-5% relative humidity for a minimum of 40 hours
Sample Form:	Machined from molded plaques
Test Speed:	5 mm/min
Date Received:	6-APR-15
Date Tested:	29-MAY-15

Operator's Notes:
Testing was performed per standard testing procedures.
**NOTE: measured values for v23 were higher than expected; based on other data v23 was set equal to v12.

Elastic modulus		
Elastic modulus, 1st principal direction [E1]	5552	MPa
Elastic modulus, 2nd principal direction [E2]	3421	MPa

Poisson's ratio		
Poisson's ratio [v12]	0.4420	
Poisson's ratio [v23]	0.4420*	

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Shear modulus

Method:
ASTM D 638, Standard Test Method for Tensile Properties of Plastics

Instrument:
MTS Sintech 5/G Universal Testing Machine

Test Specifications:

Specimens Tested:	8
Pre-Processing:	23°C +/-2°C at 50% +/-5% relative humidity for a minimum of 40 hours
Sample Form:	Machined from molded plaques
Test Speed:	5 mm/min
Date Received:	6-APR-15
Date Tested:	29-MAY-15

Operator's Notes:
Shear modulus is calculated using orthotropic elasticity from the tensile modulus measured on a sample cut at an angle of 45° with the flow direction.
Testing was performed per standard testing procedures.
No anomalies were noted during testing.

Shear modulus		
Shear modulus [G12]	1211	MPa

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Coefficient of linear thermal expansion

Method:
QOP-11, Coefficient of Linear Thermal Expansion of Plastics

Instrument:
Quartz tube dilatometer per ASTM

Test Specifications:

Specimens Tested:	2 (per direction): test repeated 2 times per specimen
Pre-Processing:	23°C +/-2°C at 50% +/-5% relative humidity for a minimum of 40 hours
Sample Form:	Machined from molded plaques
Specimen Geometry:	Rectangular, 8mm x 50mm, full thickness
Temperature Range:	0°C to 60°C
Date Received:	6-APR-15
Date Tested:	29-MAY-15

Operator's Notes:
Testing was performed per standard testing procedures.
No anomalies were noted during testing.

Transversely isotropic coefficient of thermal expansion [CTE] data		
Alpha 1	2.870e-005	1/°C
Alpha 2	7.350e-005	1/°C

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Mold verification

Method:
MPL Mold Verification Test Method (QOP-16-M)
(Method falls outside the scope of A2LA Accreditation)

Instrument:
Krauss Maffei KM160-750CX Injection Molding Machine

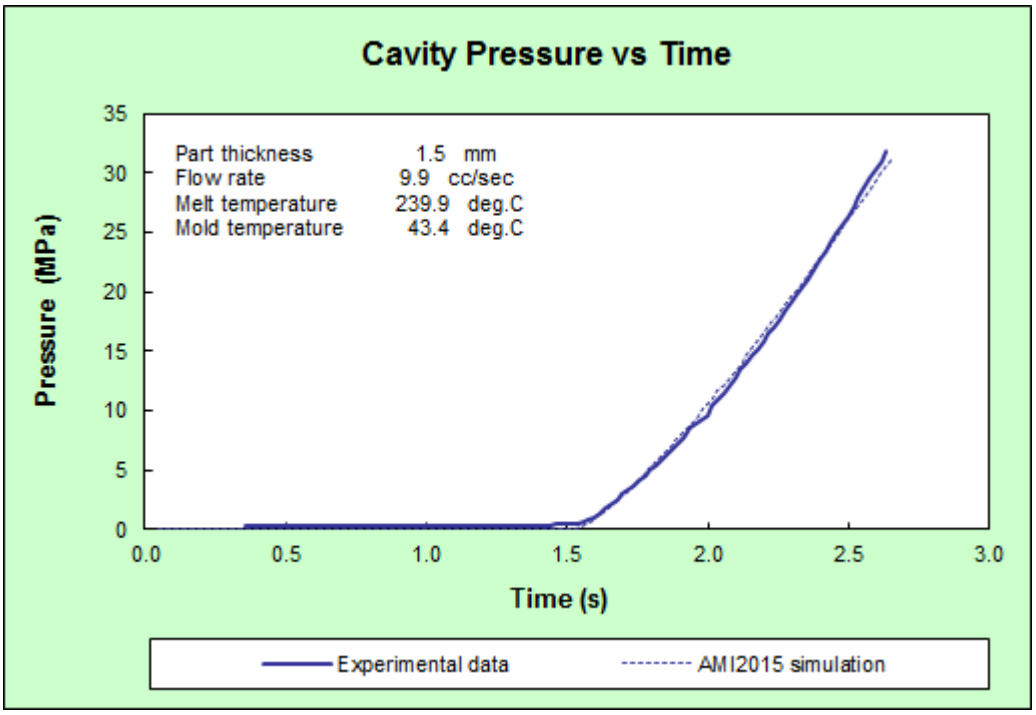
Test Specifications:

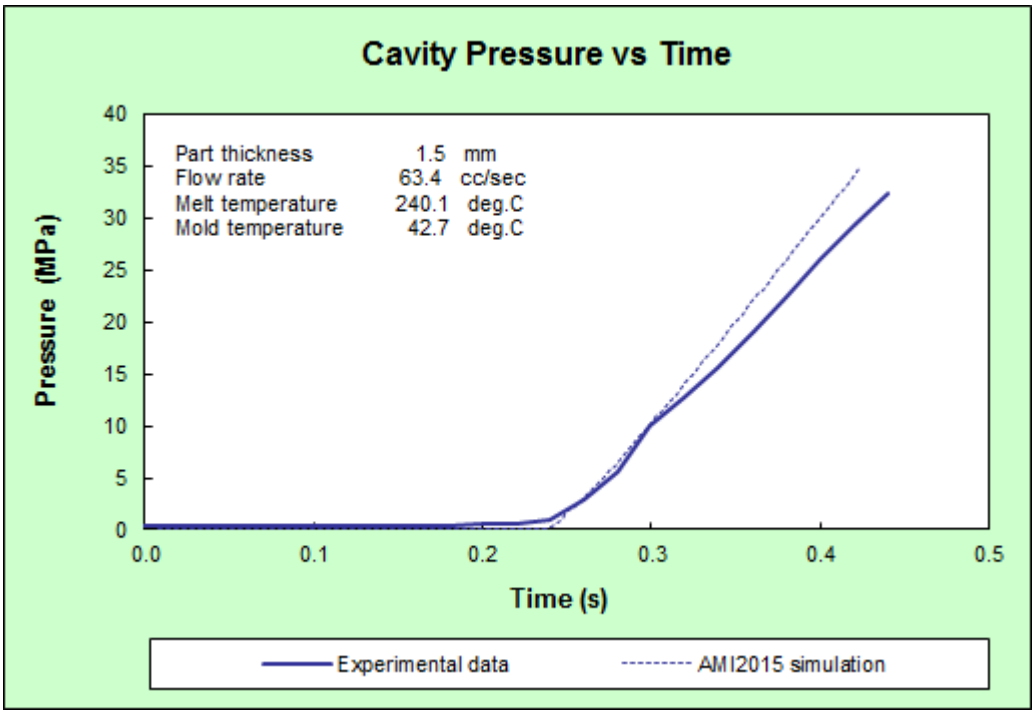
Sample Form:	Pellets
Pre-Processing:	Dried at 70°C for 1 hour in a hopper dryer
Moisture Level:	Not Measured
Date Received:	6-APR-15
Date Tested:	26-MAY-15

Operator's Notes:
Testing was performed per standard testing procedures.
No anomalies were noted during the course of testing.

1.5mm tag die

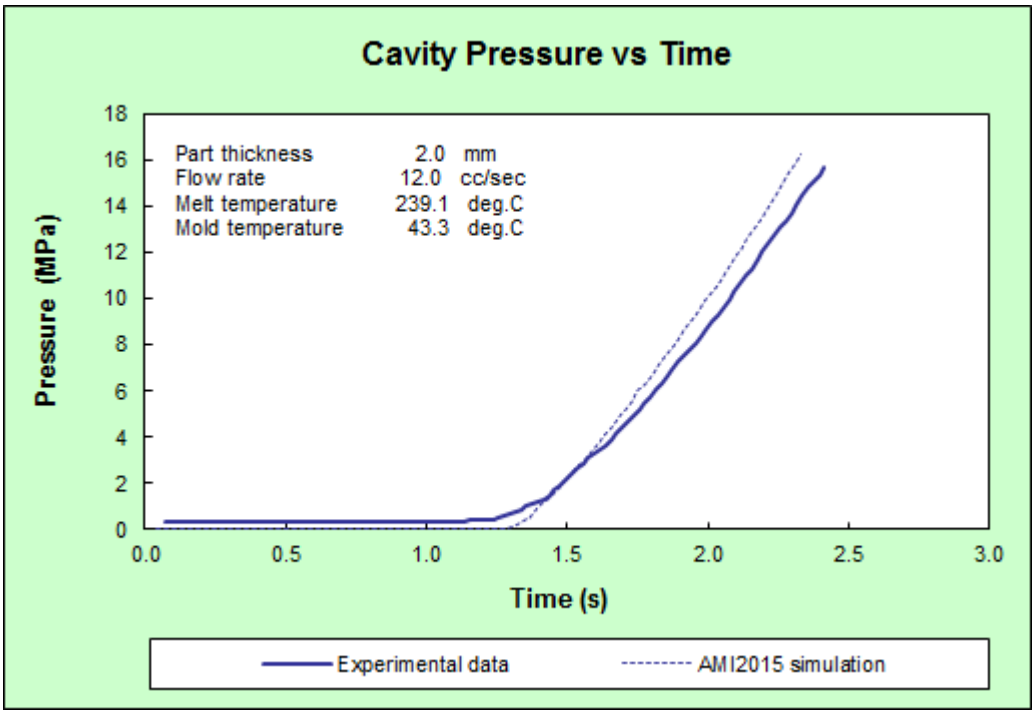
Experiment Number	Flow Rate (cc/sec)	Melt Temperature	Mold Temperature
Cyc0081	9.9	239.9	43.4
Cyc0093	63.4	240.1	42.7

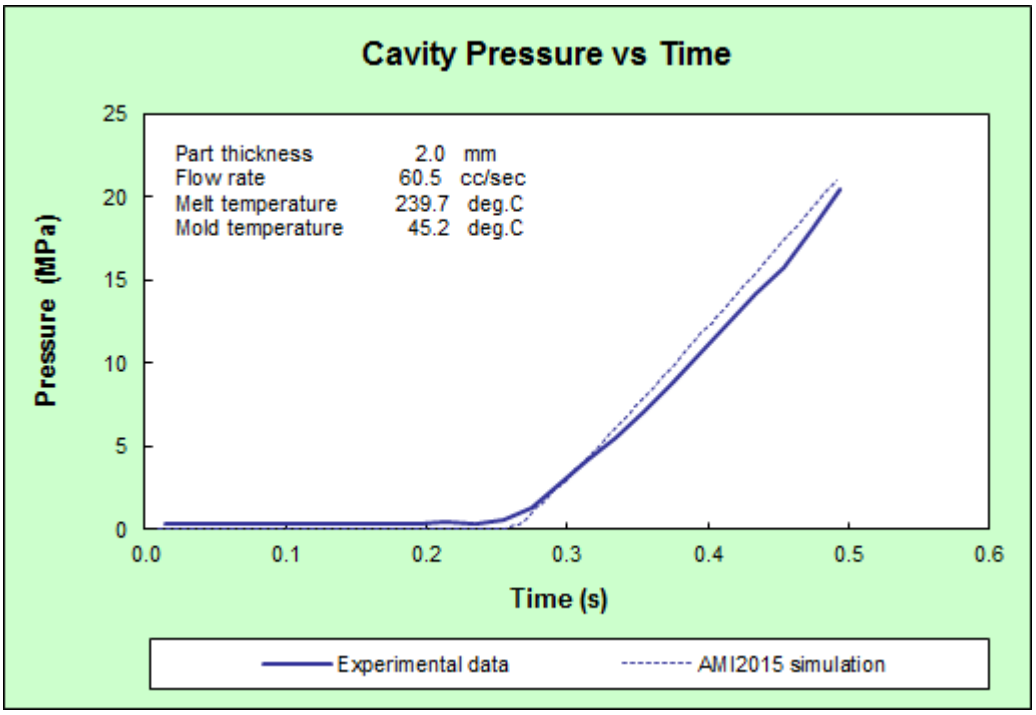




2mm tag die

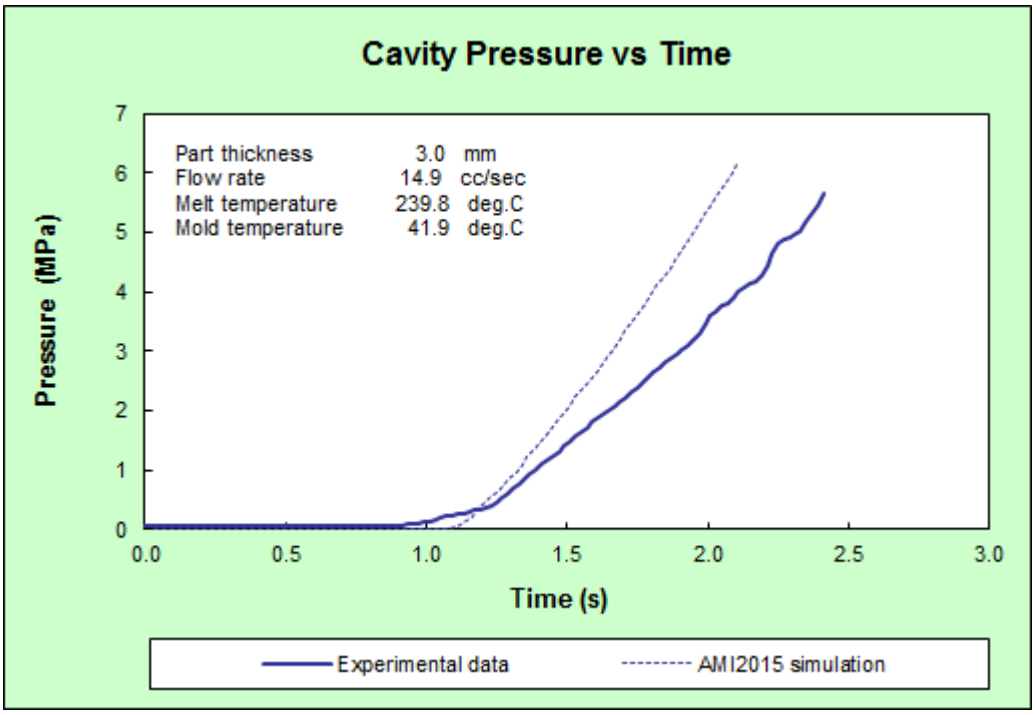
Experiment Number	Flow Rate (cc/sec)	Melt Temperature	Mold Temperature
Cyc0123	12	239.1	43.3
Cyc0135	60.5	239.7	45.2

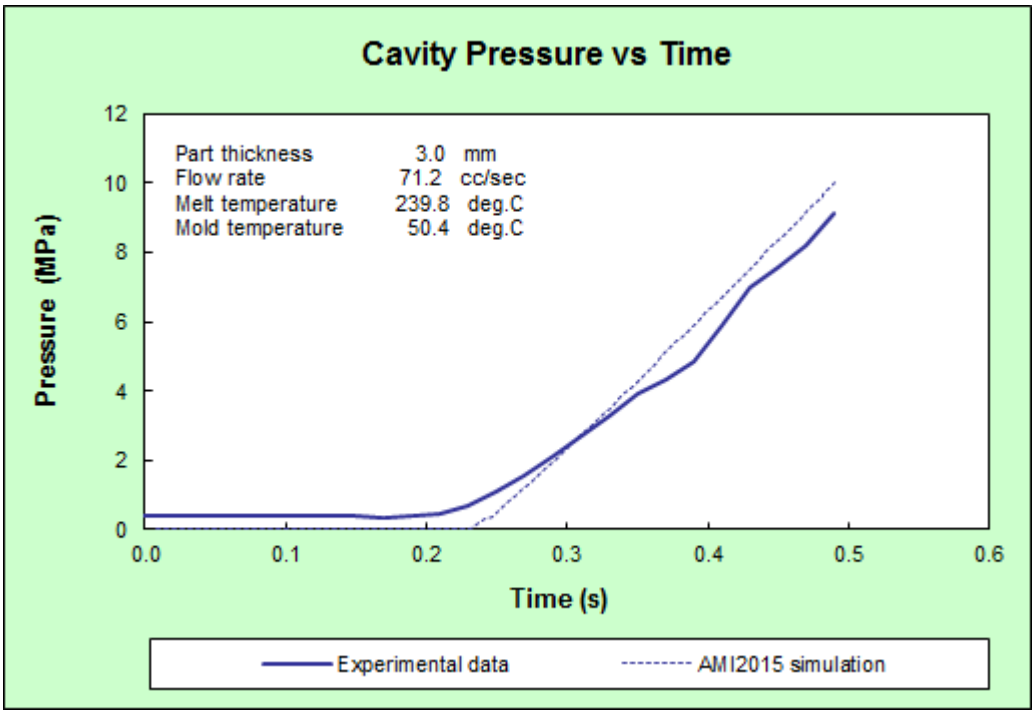




3mm tag die

Experiment Number	Flow Rate (cc/sec)	Melt Temperature	Mold Temperature
Cyc0034	14.9	239.8	41.9
Cyc0046	71.2	239.8	50.4





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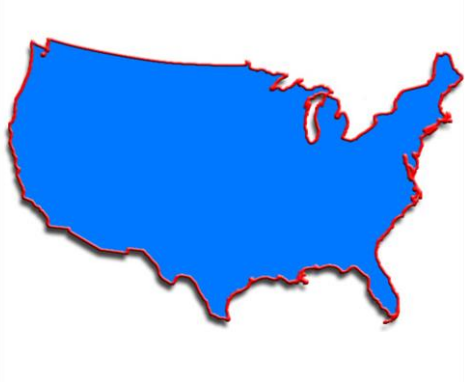

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