

Welcome to Paulson Training Programs, Inc.

SimTech™ Virtual Lab Lessons



SimTech™ is the world's most advanced injection molding simulator you can use to practice machine setup, molded-part problem solving, and cycle reduction all on your computer. Increase the number of molding experts in your facility in a fraction of the time it takes with "on-the-job training" with this powerful, proprietary, physics and math based (not rule-based) simulator. SimTech comes with pre-defined lab lessons depicting different molding scenarios with four levels of difficulty with new labs released monthly. Or you can set up your own "molding scenarios" with FreeMold for your employees to solve, focusing on just the specific problem you want. SimTech will revolutionize the way you train your employees.

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Important Notice

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What is SimTech™?

SimTech™ is an Injection molding machine simulator (think Flight simulator for Injection Molding). It is based on physics and mathematics – **not** ruled-based and can perform over 26 million calculations. SimTech is designed to be used after an interactive training module has been taken to allow a student to apply what they have learned furthering their understanding of the subject matter.

What are some of the Key Features & Benefits of SimTech?

- Runs a cycle in a 1-2 seconds
- 22 fully functioning molding machine controls, including Velocity-to-Pressure transfer (VPT)
- Reports 8 of the most common part problems from molding conditions
- Provides students with “at-the-machine” skills training without:
 - Wasting machine time
 - Wasting plastic
 - Risking damaging the machine or mold
- Interactive
- Units can be either US (English) or SI (Metric)
- Turns learning into a challenging “game”

How is SimTech different than Skillbuilder?

Skillbuilder is a simplified version of SimTech. Pre-programmed lessons lead the student on a specific path to address a pre-defined problem. Skillbuilder serves as the introduction to the use of SimTech.

SimTech allows a student to use their molding knowledge to improve machine set-ups and solve problems by making machine control changes, cycling the machine, and then analyzing the Cycle Results. Paulson provides lab lessons with predefined setups that require molded part problems to be solved along with cycle optimization. With SimTech, managers can also set up their own problem scenarios for the employees to solve.

What is the difference between SimTech “FreeMold” and SimTech Lab lessons?

Both run through SimTech. Lab Lessons are pre-defined lessons that Paulson has created which are assigned to personnel to target specific areas of learning.

“Freemold” operation lets **you** decide your own set-up by choosing your machine size, plastic, mold and dimensional tolerance from the Simtech database. You can set up scenarios for your employees or peers to solve specific molding problems, or just optimize a cycle.

How are my lab lessons scored?

Each lab lesson description states what must be accomplished in order to complete a lesson.



SimTech™

How to Use this Manual

The SimTech™ Lab Lessons are designed to be used in conjunction with the interactive training courses. After you have taken The Technology of Injection Molding Levels 1 & 2, and the Injection Molding Problems and Solutions course (along with the Skillbuilder lessons that accompany them), you will be ready to take the SimTech Lab Lessons. Now you can really apply what you have learned!

The manual is split up into sections.

- 1. How to Use this Manual** – Instructions on how to use the SimTech manual.
- 2. Training Administrator Instructions** – How to sign students up for SimTech lab lessons.
- 3. Tutorial Answer Key** – All the answers to the Student Workbook Tutorial for the training administrator.
- 4. Student Tutorial Workbook – Getting Started** – How to begin the Student Tutorial.
- 5. Student Tutorial Workbook** - Familiarizes the student with how to use SimTech. If a student is already familiar with SimTech, they can skip right to the Lab Lessons.
- 6. Student Tutorial Workbook - Answer Sheet** – Can be used to make copies for each student in order to write their answers for the Student Workbook Tutorial exercise.
- 7. Lab lessons – Getting Started** – How to log into the SimTech Lab lessons.
- 8. Lab lessons** – Scenarios/problems developed by Paulson Training that the students must solve while meeting certain criteria. A student will need a copy of each Lab Lesson they are to take.
 - 4 Levels of difficulty
 - Levels 1 (easiest) – 4 (hardest)

***All sections of this manual can be downloaded from our website at:**

www.paulsontraining.com/support-center

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SimTech™

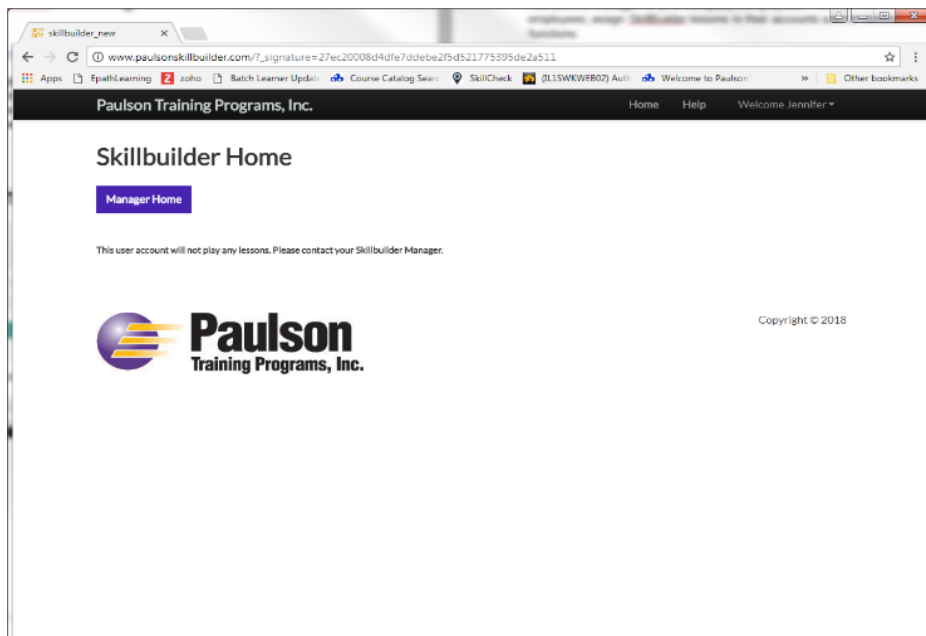
Training Administrator Instructions

Assigning users to SimTech is very similar to assigning users to Skillbuilder.

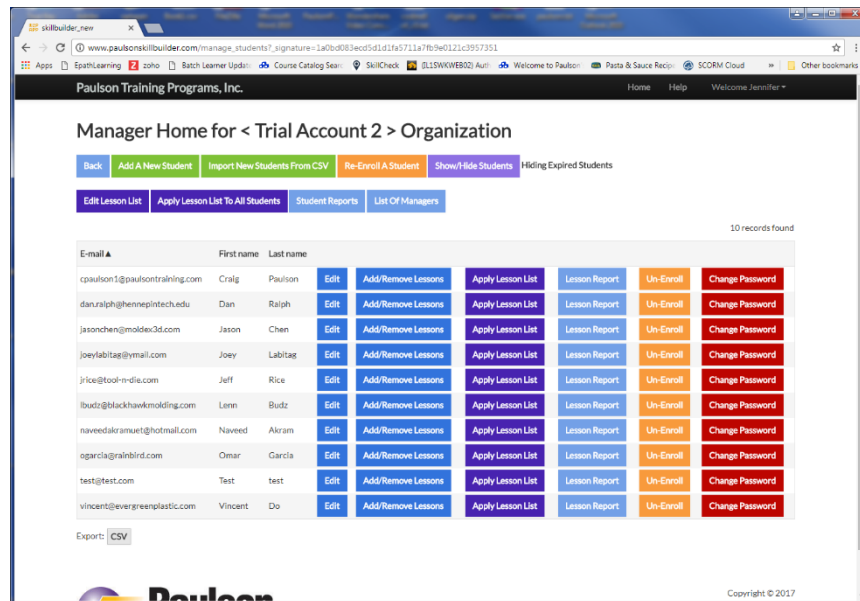
1. Go to www.paulsonskillbuilder.com and login using your provided credentials.

The screenshot shows a login form titled "Login". It contains two input fields: "E-mail:" and "Password:". Below the password field is a checkbox labeled "Remember me (for 30 days)". At the bottom of the form is a teal button labeled "Login".

2. Next you'll be at the home page of the Manager. Click on 'Manager Home'.



- As the Manager for your company's employees, you can add new students, assign SimTech lab lessons and FreeMold to their accounts, and do various other Manager functions.



- To Add a New Student

Click the 'Add a New Student' button. Fill in the required fields. Please note the email address does not have to be a valid email address, recognizing that not all employees have a company email, but it must follow email conventions. Example: tjones@abcco.com

The screenshot shows the 'New Student' form in the Paulson Training Programs, Inc. system. The form has the following fields and elements:

- Email:** A text input field.
- Password:** A text input field.
- Re-Enter Password:** A text input field.
- First Name:** A text input field.
- Last Name:** A text input field.
- Apply All Available Lessons to Student:** A checkbox that is currently checked.
- Buttons:** 'Exit Without Saving' (blue) and 'Save And Exit' (green).
- Footer:** Paulson Training Programs, Inc. logo and 'Copyright © 2018'.

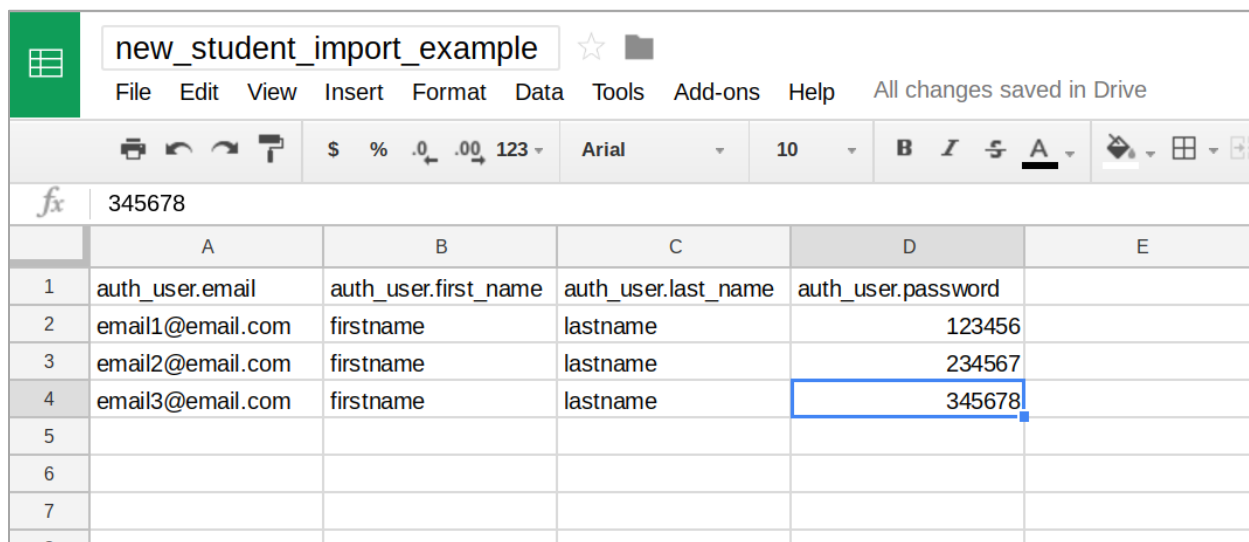
5. Adding Employees to SimTech or SkillBuilder as a Group

To enroll multiple employees into SimTech or SkillBuilder, create a *.csv file with their information and import using the Import 'New Students From CSV' button.

Import New Students From CSV

Below is a sample .csv file. At your request we can email you a blank *.csv file as a template. For each employee, you will need to provide an email address, first name, last name, and a password. Each employee can change their password anytime they login.

NOTE: The email address does not have to be a valid email, recognizing that not all employees have a company email. It just needs to follow email conventions, namely an "@". No email will be sent to that address, it is only used for login purposes. Passwords must be a minimum of six characters.



The screenshot shows a Google Sheets interface with a spreadsheet titled 'new_student_import_example'. The spreadsheet has columns A through E. Column A is labeled 'auth_user.email', Column B is 'auth_user.first_name', Column C is 'auth_user.last_name', and Column D is 'auth_user.password'. The data rows are as follows:

	A	B	C	D	E
1	auth_user.email	auth_user.first_name	auth_user.last_name	auth_user.password	
2	email1@email.com	firstname	lastname	123456	
3	email2@email.com	firstname	lastname	234567	
4	email3@email.com	firstname	lastname	345678	
5					
6					
7					

Apply Lesson List To All Students

This button assigns all the SimTech lab lessons you have purchased, to your employees. So after you have imported all your employees via a *.csv file, click this button to assign them SimTech lab lessons. From this point, all your employees will have access to all their SimTech lab lessons.

6. Student Reports

From the Manager Home page, click on 'Student Reports'. There are four different reports available. Each report indicates if a lesson is assigned, finished, percent complete, and date last accessed.

Comprehensive Student Report – Lists all students

Assigned Lesson Report - Lessons currently assigned to the student

Former Lessons Report - Lessons previously assigned to the student that are no longer assigned

All Lessons Report - Lessons currently assigned and previously assigned

Paulson Training Programs, Inc. Home Help Welcome Jennifer

Student Reports for <Trial Account 2> Organization

Back Comprehensive Student Report

12 records found

E-mail	First name	Last name	Assigned Lessons Report	Former Lessons Report	All Lessons Report
cpaulson1@paulsontraining.com	Craig	Paulson	Assigned Lessons Report	Former Lessons Report	All Lessons Report
dan.ralph@hennepin.edu	Dan	Ralph	Assigned Lessons Report	Former Lessons Report	All Lessons Report
jasonchen@moldex3d.com	Jason	Chen	Assigned Lessons Report	Former Lessons Report	All Lessons Report
joeylabitag@gmail.com	Joey	Labitag	Assigned Lessons Report	Former Lessons Report	All Lessons Report
jrice@tool-n-die.com	Jeff	Rice	Assigned Lessons Report	Former Lessons Report	All Lessons Report
lbudz@blackhawkmolding.com	Lenn	Budz	Assigned Lessons Report	Former Lessons Report	All Lessons Report
loren@ron-vik.com	Loren	Pribyl	Assigned Lessons Report	Former Lessons Report	All Lessons Report
naveedakramuet@hotmail.com	Naveed	Akram	Assigned Lessons Report	Former Lessons Report	All Lessons Report
ogarcia@rainbird.com	Omar	Garcia	Assigned Lessons Report	Former Lessons Report	All Lessons Report
test@test.com	Test	test	Assigned Lessons Report	Former Lessons Report	All Lessons Report
trialaccount2@gmail.com	Jennifer	Lentz	Assigned Lessons Report	Former Lessons Report	All Lessons Report
vincent@evergreenplastic.com	Vincent	Do	Assigned Lessons Report	Former Lessons Report	All Lessons Report



SimTech™

Tutorial Answer Key

(for Training Administrator)

This answer key provides all the answers to the Student Workbook Tutorial. The Student Workbook Tutorial should be taken by all users who are not familiar with how SimTech™ works. If a user is already familiar with SimTech™ and how it operates, they can move directly to the SimTech™ lab lessons located at the end of this manual.

The Student Workbook Tutorial is designed to show a user how to navigate through the SimTech™ control panel and the effects of each molding machine control on the plastic behavior and on the molded part properties. Users will be directed to make specific control changes and then asked to record and explain the results. Provided in the Student section of this manual, is a Student Answer Sheet which you can make copies of for students to write their answers in.

By the end of this tutorial, the user should be familiar with how to:

- Make machine control changes
- Cycle the machine
- Read the cycle results
- Identify part problem
- Identify machine alarms
- Will have observed the effects of each control and each alarm

The Student Tutorial Lesson is taken through FreeMold which allows a user to pick their machine size, plastic and part. This tutorial lesson uses a 300 ton machine, molding the “cover” using Polystyrene. After completing this tutorial, a user can change the type of machine, plastic, or part using the **New Session** button and do a similar evaluation for this new setup.

Note: All pressures shown on the SimTech™ control panel are plastic pressures, not hydraulic oil pressures.

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SimTech™ Tutorial – Answer Key

I. Effects of Barrel Temperature on Melt Temperature

A. You will now determine the effect on the melt temperature of each of the barrel zone temperatures.

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 0.00

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	450
Middle Zone Temp	F	450
Front Zone Temp	F	450
Nozzle Temp	F	450
Injection Unit		
Screw Rotation	rpm	35
Screw Back Pressure	psi	500
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	70
Mold Stationary Temp	F	70
Clamp Force	tons	300

Cycle Results

Name	Units	Value
Melt Temp	F	445.7
Fill Time	s	1.08
Cycle Time	s	37.08
Mold Full at VPT	%	94.90
Cushion Size	in	0.231
Part Length	in	6.510
Part Weight	oz	3.149
Screw Run Time	s	8.36

Part Problems (most recent cycle to the left)

Flash	
Burn Mark	
Size (+/- 0.01 in)	
Weld Lines	
Short Shot	
Warp	
Sink Marks	
Voids	

Machine Alarms

Screw Recovery	●
Max Pressure	●
No Cushion	●
Low Melt	●
High Melt	●

Cycle Graphs

Pressure (psi)

Screw Travel (in)

Cycle History: Cycle History Edit Setup Change Units User Sessions Page

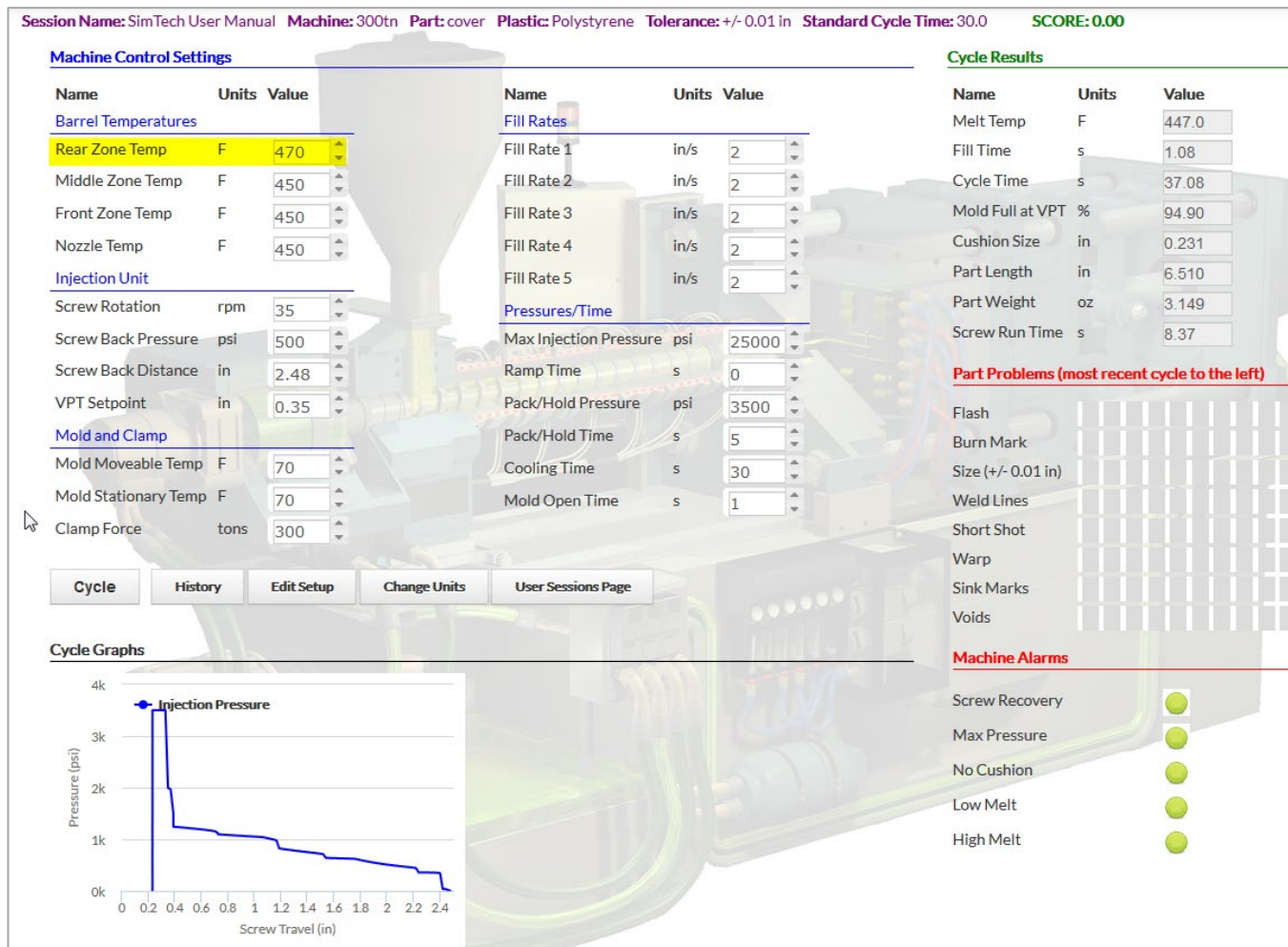
What is the melt temperature? ? 445.7 °F

II. Determine the Effect of Each Barrel Zone Temperatures on the Melt Temperature

A. You will raise each barrel zone by 20°F to determine which zone has the greatest effect.

1. Raise rear zone barrel temperature to 470°F. [Cycle the machine]

What is the melt temperature? 447.0 °F



2. Raise the middle zone temperature to 470°F and set the rear zone temperature back to 450°F.
[Cycle the machine]

What is the melt temperature? 448.7 °F

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 80.91

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	450
Middle Zone Temp	F	470
Front Zone Temp	F	450
Nozzle Temp	F	450
Injection Unit		
Screw Rotation	rpm	35
Screw Back Pressure	psi	500
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	70
Mold Stationary Temp	F	70
Clamp Force	tons	300

Cycle **History** **Edit Setup** **Change Units** **User Sessions Page**

Cycle Results

Name	Units	Value
Melt Temp	F	448.7
Fill Time	s	1.08
Cycle Time	s	37.08
Mold Full at VPT	%	94.89
Cushion Size	in	0.231
Part Length	in	6.510
Part Weight	oz	3.148
Screw Run Time	s	8.38

Part Problems (most recent cycle to the left)

Flash	
Burn Mark	
Size (+/- 0.01 in)	
Weld Lines	
Short Shot	
Warp	
Sink Marks	
Voids	

Machine Alarms

Screw Recovery	●
Max Pressure	●
No Cushion	●
Low Melt	●
High Melt	●

Cycle Graphs

Pressure (psi)

Screw Travel (in)

Injection Pressure

3. Raise the front zone barrel temperature and nozzle temperature to 470°F and set the middle zone back to 450°F. [Cycle the machine]

What is the melt temperature? 458.5 °F

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 0.00

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	450
Middle Zone Temp	F	450
Front Zone Temp	F	470
Nozzle Temp	F	470
Injection Unit		
Screw Rotation	rpm	35
Screw Back Pressure	psi	500
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	70
Mold Stationary Temp	F	70
Clamp Force	tons	300

Name	Units	Value
Fill Rates		
Fill Rate 1	in/s	2
Fill Rate 2	in/s	2
Fill Rate 3	in/s	2
Fill Rate 4	in/s	2
Fill Rate 5	in/s	2
Pressures/Time		
Max Injection Pressure	psi	25000
Ramp Time	s	0
Pack/Hold Pressure	psi	3500
Pack/Hold Time	s	5
Cooling Time	s	30
Mold Open Time	s	1

Cycle Results

Name	Units	Value
Melt Temp	F	458.5
Fill Time	s	1.08
Cycle Time	s	37.08
Mold Full at VPT	%	94.87
Cushion Size	in	0.231
Part Length	in	6.510
Part Weight	oz	3.149
Screw Run Time	s	8.47

Part Problems (most recent cycle to the left)

Flash	
Burn Mark	
Size (+/- 0.01 in)	
Weld Lines	
Short Shot	
Warp	
Sink Marks	
Voids	

Machine Alarms

Screw Recovery	●
Max Pressure	●
No Cushion	●
Low Melt	●
High Melt	●

Cycle

History

Edit Setup

Change Units

User Sessions Page

Cycle Graphs

Which zone affected the melt temperature the most? Front

Why? Plastic in the metering section is a thin layer. Therefore, it is heated faster by the barre heaters than the other zones. If the front zone temperature was lower than the melt temperature, the plastic would be cooled by the front zone.

4. Typical barrel zone settings for this plastic are: 450°F nozzle, 450°F front, 450°F middle, 400°F rear. Set the zones to these settings. [Cycle the machine]

What is the melt temperature? 441.7 °F

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 0.00

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	400
Middle Zone Temp	F	450
Front Zone Temp	F	450
Nozzle Temp	F	450
Injection Unit		
Screw Rotation	rpm	35
Screw Back Pressure	psi	500
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	70
Mold Stationary Temp	F	70
Clamp Force	tons	300

Cycle Results

Name	Units	Value
Melt Temp	F	441.7
Fill Time	s	1.08
Cycle Time	s	37.08
Mold Full at VPT	%	94.91
Cushion Size	in	0.231
Part Length	in	6.510
Part Weight	oz	3.149
Screw Run Time	s	8.32

Part Problems (most recent cycle to the left)

Flash	
Burn Mark	
Size (+/- 0.01 in)	
Weld Lines	
Short Shot	
Warp	
Sink Marks	
Voids	

Machine Alarms

Screw Recovery	●
Max Pressure	●
No Cushion	●
Low Melt	●
High Melt	●

Cycle Graphs

Pressure (psi)

Screw Travel (in)

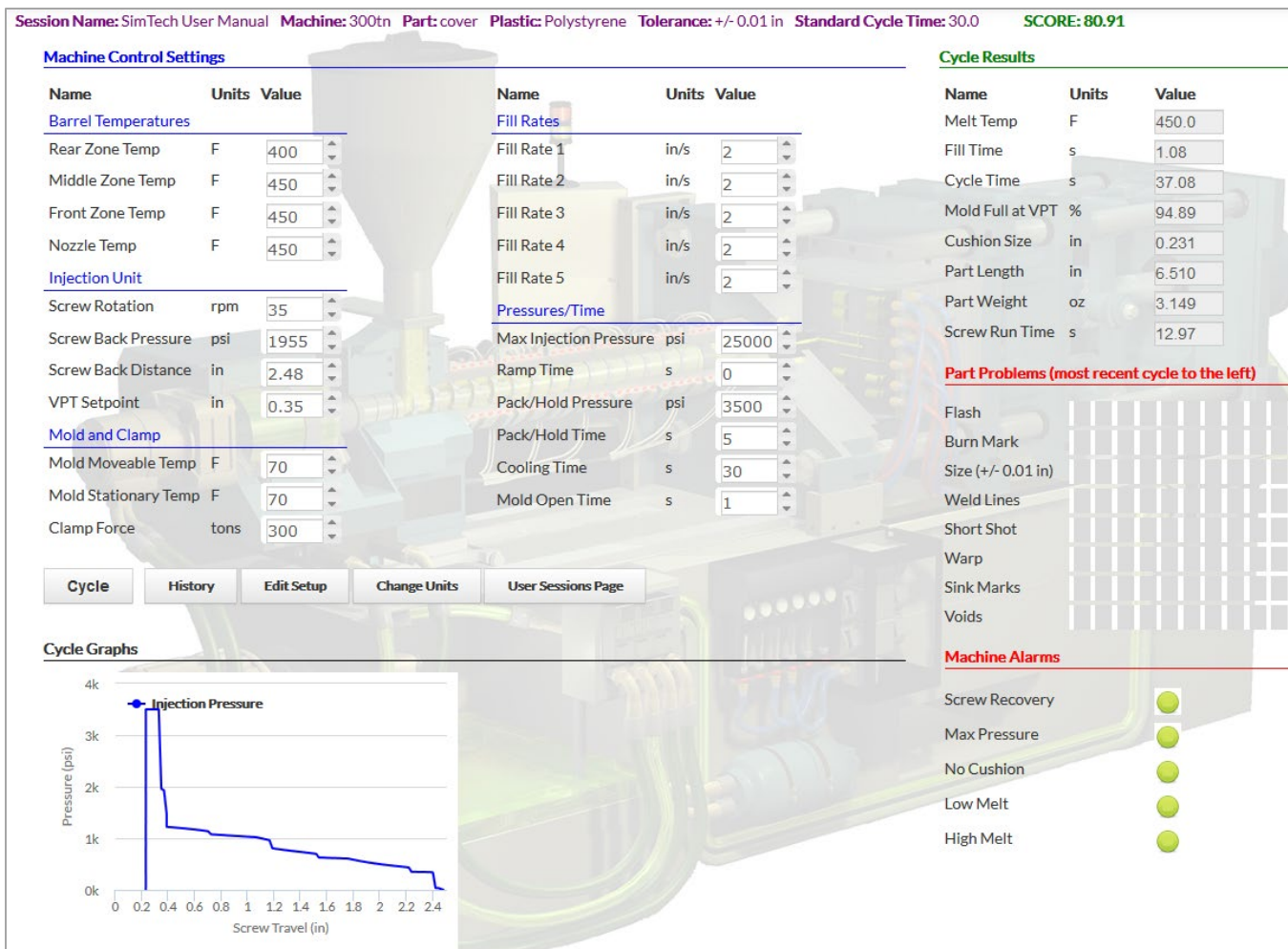
Injection Pressure

III. Determine the Effect of the Back Pressure on the Melt Temperature

A. Increased back pressure causes more heating of the plastic in the barrel.

1. Raise the back pressure and repeat the cycle until melt temperature is the same as the front zone temperature. (i.e. 450°F)

What is the back pressure when the melt temperature is 450°F? 1,955 psi



Explain why the melt temperature increased when the back pressure was increased.

Increased back pressure requires more energy to move plastic heat is generated through the shearing action.

Why is it best to have the front zone temperature and the melt temperature the same?

So the plastic is neither heated nor cooled while it waits for injection.

IV. Effects of Screw Back Setting

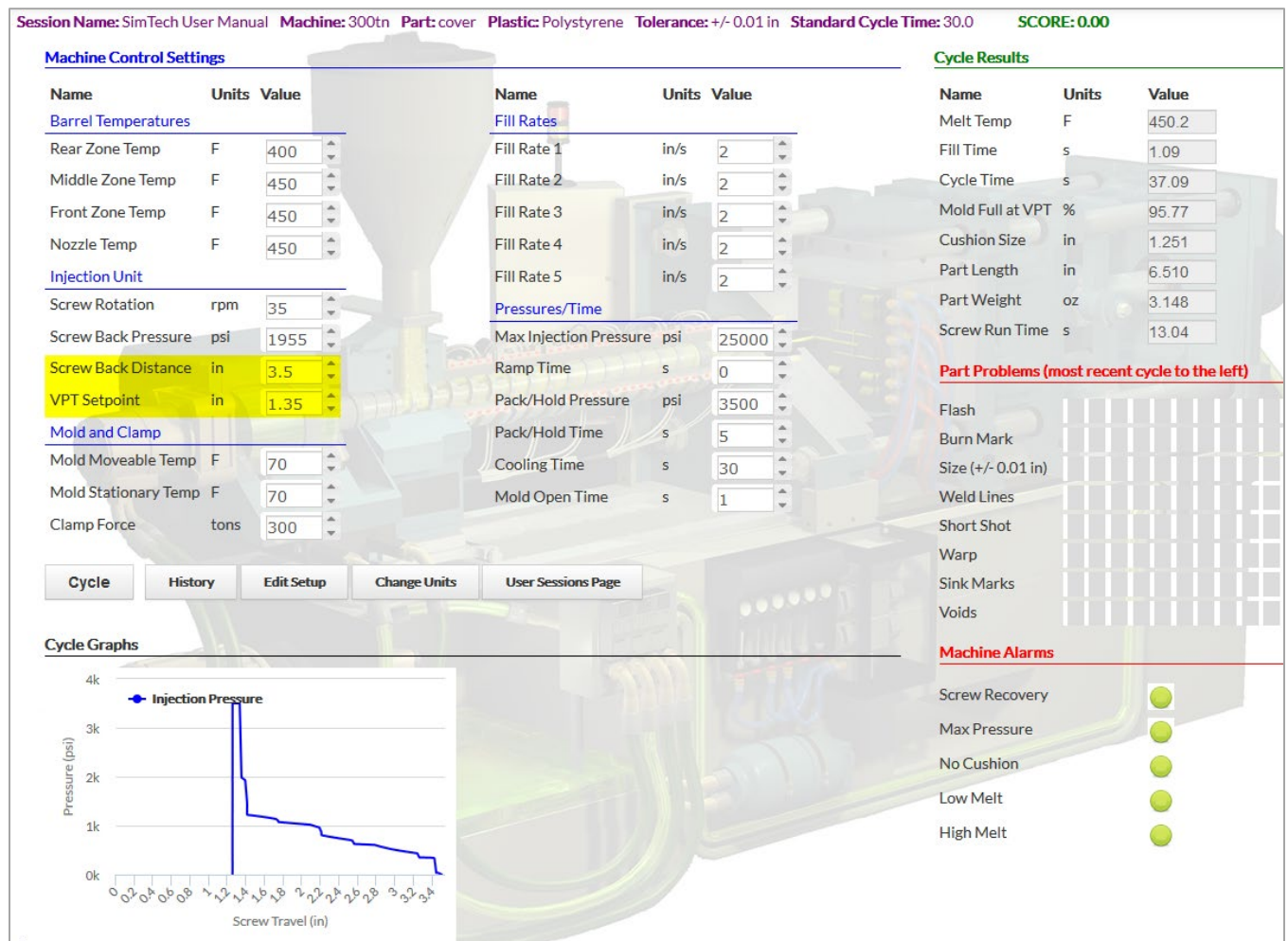
A. The screw back setting determines how far back the screw returns when it rotates. Screw back setting also controls the cushion size.

1. Set the screw back distance to 3.5" and the VPT setpoint to 1.35". [Cycle]

What is the present cushion size? 1.251 in

Is the cushion size all Right? No

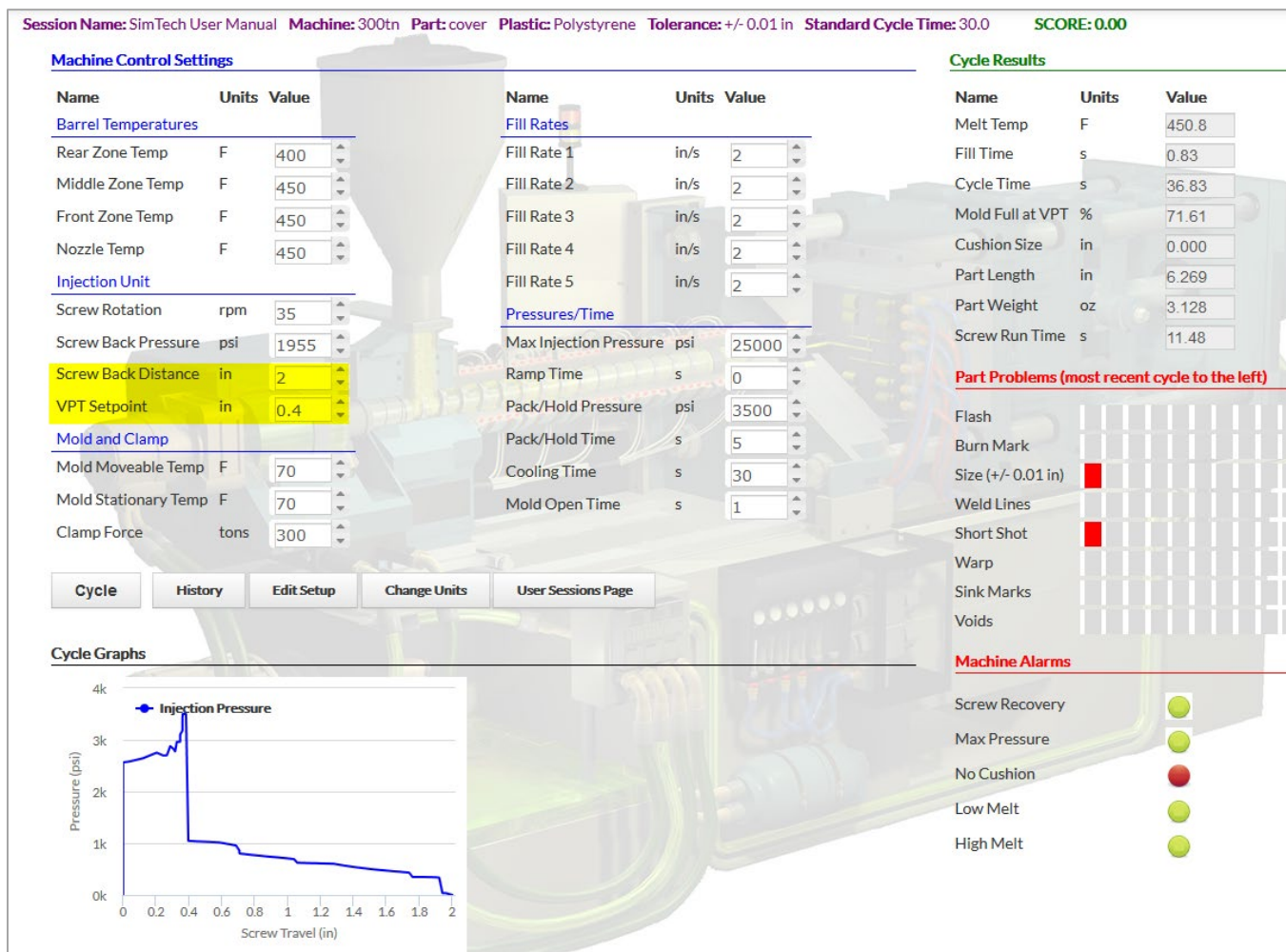
Explain: The plastic ahead of the screw is being heated too long by having a large cushion.



2. Reduce the screw back setting to 2.0" and the VPT setpoint to 0.4". [Cycle]

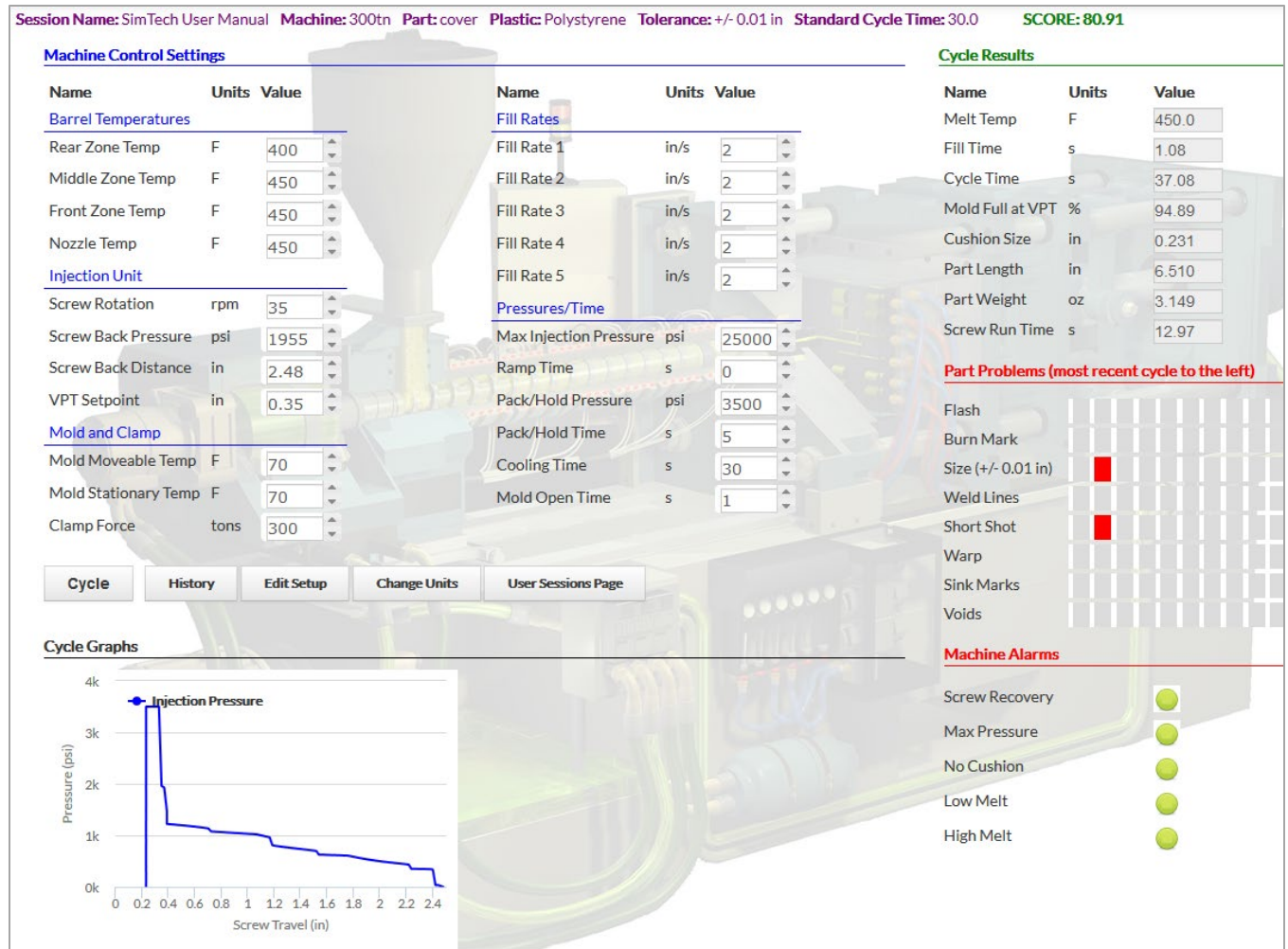
What happened? No cushion alarm came on.

Why? There was not enough plastic ahead of the screw when injection occurred



3. Set the screw back position so that the cushion size is between 0.125” and 0.250” [Cycle].

Note: In the ProMolder Series we consider an optimized cushion to be in a range of 5-10% of the total shot size.



What is the screw back position you have set? The screw back distance should be set around 2.48 in.

What is the VPT setpoint you have set? The VPT setpoint should be 0.35 in. This gives us a 94 – 96% range.

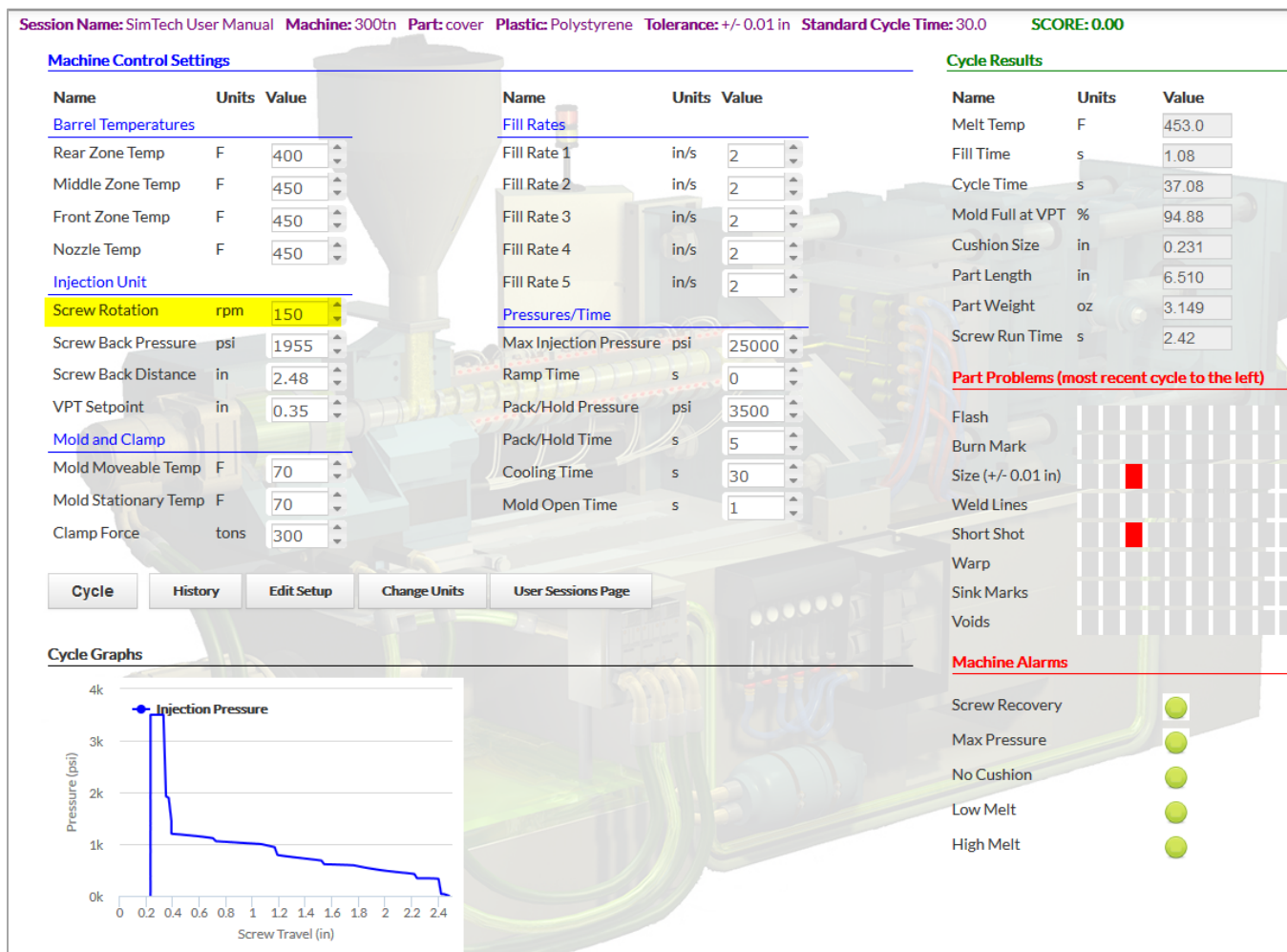
What is the melt temperature? 450.0 °F

Note: Do not re-adjust back pressure yet.

V. Determine the Effect of Screw RPM on the Melt Temperature

A. Screw rpm can also affect the plastic temperature, but the magnitude of the affect depends on the screw design and the amount of non-Newtonian viscosity change that occurs.

1. Increase screw rpm to 150. [Cycle]



What is the melt temperature? 453.0 °F

Why did the melt temperature increase? Higher screw rpm requires more energy. Most of the energy is converted to heat in the plastic.

2. Adjust the back pressure so that the melt temperature is 450°F. [Cycle]

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 80.91

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	400
Middle Zone Temp	F	450
Front Zone Temp	F	450
Nozzle Temp	F	450
Injection Unit		
Screw Rotation	rpm	150
Screw Back Pressure	psi	1335
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	70
Mold Stationary Temp	F	70
Clamp Force	tons	300

Cycle Results

Name	Units	Value
Melt Temp	F	450.0
Fill Time	s	1.08
Cycle Time	s	37.08
Mold Full at VPT	%	94.89
Cushion Size	in	0.231
Part Length	in	6.510
Part Weight	oz	3.149
Screw Run Time	s	2.14

Part Problems (most recent cycle to the left)

Flash	
Burn Mark	
Size (+/- 0.01 in)	
Weld Lines	
Short Shot	
Warp	
Sink Marks	
Voids	

Machine Alarms

Screw Recovery	
Max Pressure	
No Cushion	
Low Melt	
High Melt	

Cycle History Edit Setup Change Units User Sessions Page

Cycle Graphs

Pressure (psi)

Screw Travel (in)

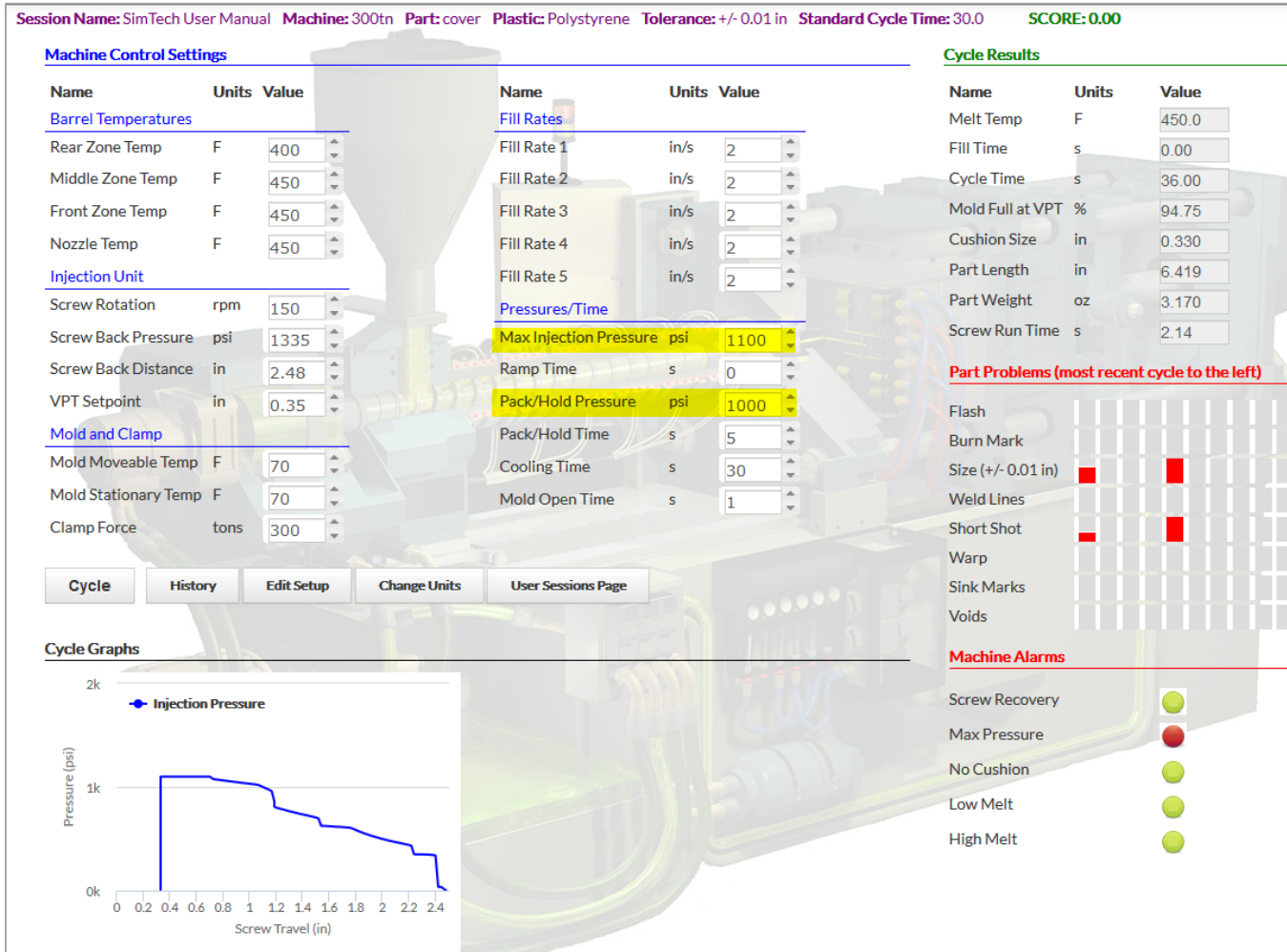
Injection Pressure

What is the back pressure to achieve 450°F melt temperature? 1,335 psi

VI. Maximum Injection Pressure Alarm

A. The Maximum Injection Pressure Alarm will activate if the machine has tried to exceed its maximum injection pressure.

1. Reduce max injection pressure to 1,100 psi. and reduce the Pack/Hold pressure to 1,000 psi [Cycle]



Why did the Low Max Injection Pressure alarm occur? Injection pressure during mold filling is not enough to maintain the set fill rate.

2. Raise the max injection pressure to 10,000 psi and the Pack/Hold pressure to 1,700 psi. **[Cycle]**

- You should get a good part.

Session Name: SimTech User Manual

Machine: 300tn

Part: cover

Plastic: Polystyrene

Tolerance: +/- 0.01 in

Standard Cycle Time: 30.0

SCORE: 80.66

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	400
Middle Zone Temp	F	450
Front Zone Temp	F	450
Nozzle Temp	F	450
Injection Unit		
Screw Rotation	rpm	150
Screw Back Pressure	psi	1335
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	70
Mold Stationary Temp	F	70
Clamp Force	tons	300

Cycle	History	Edit Setup	Change Units	User Sessions Page
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Cycle Graphs

Cycle Results

Name	Units	Value
Melt Temp	F	450.0
Fill Time	s	1.19
Cycle Time	s	37.19
Mold Full at VPT	%	94.89
Cushion Size	in	0.231
Part Length	in	6.506
Part Weight	oz	3.132
Screw Run Time	s	2.14

Part Problems (most recent cycle to the left)

Flash		
Burn Mark		
Size (+/- 0.01 in)		
Weld Lines		
Short Shot		
Warp		
Sink Marks		
VOIDS		

Machine Alarms

Screw Recovery	
Max Pressure	
No Cushion	
Low Melt	
High Melt	

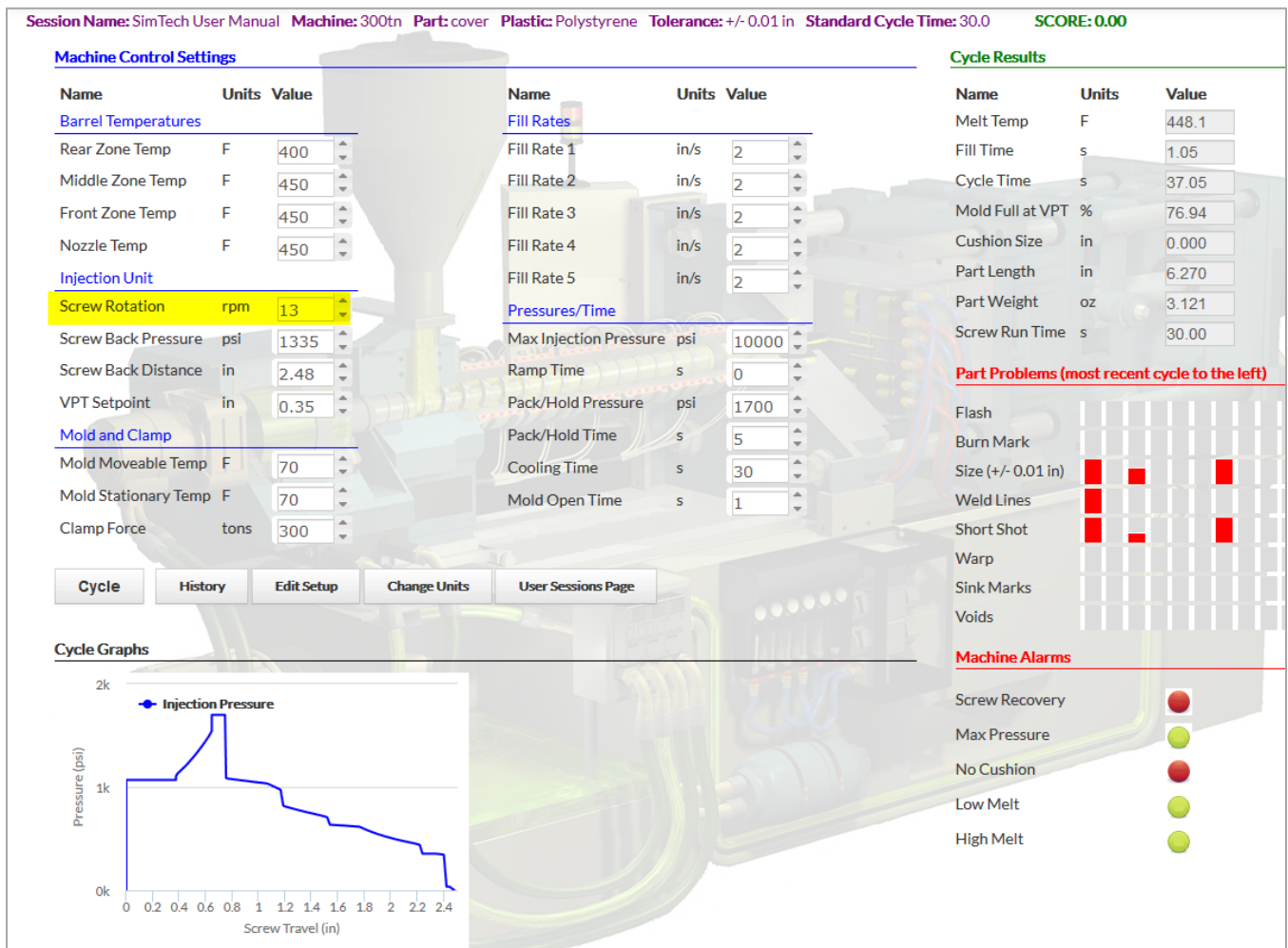
VII. The Screw Recovery Alarm

A. The Screw Recovery alarm will activate if the screw does not rotate fast enough thus, enabling the screw to return to the Screw Back Distance setting before the next shot.

1. Lower the screw speed to 13 rpm. [Cycle]

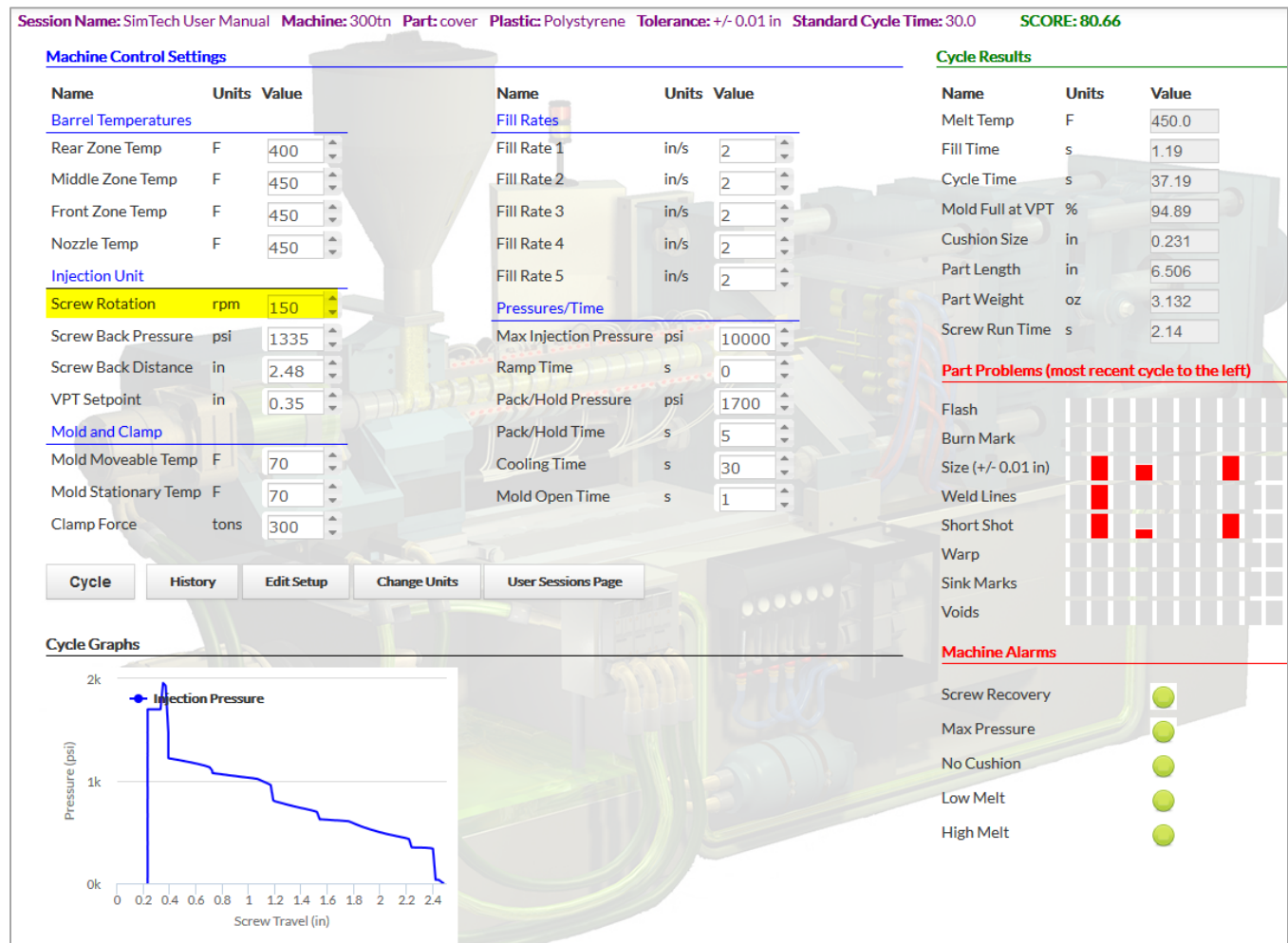
What alarm occurred? Screw Recovery Alarm.

Why? The screw did not have time to return before the mold opened



2. Raise rpm to 150. [Cycle]

- You should get a good part.



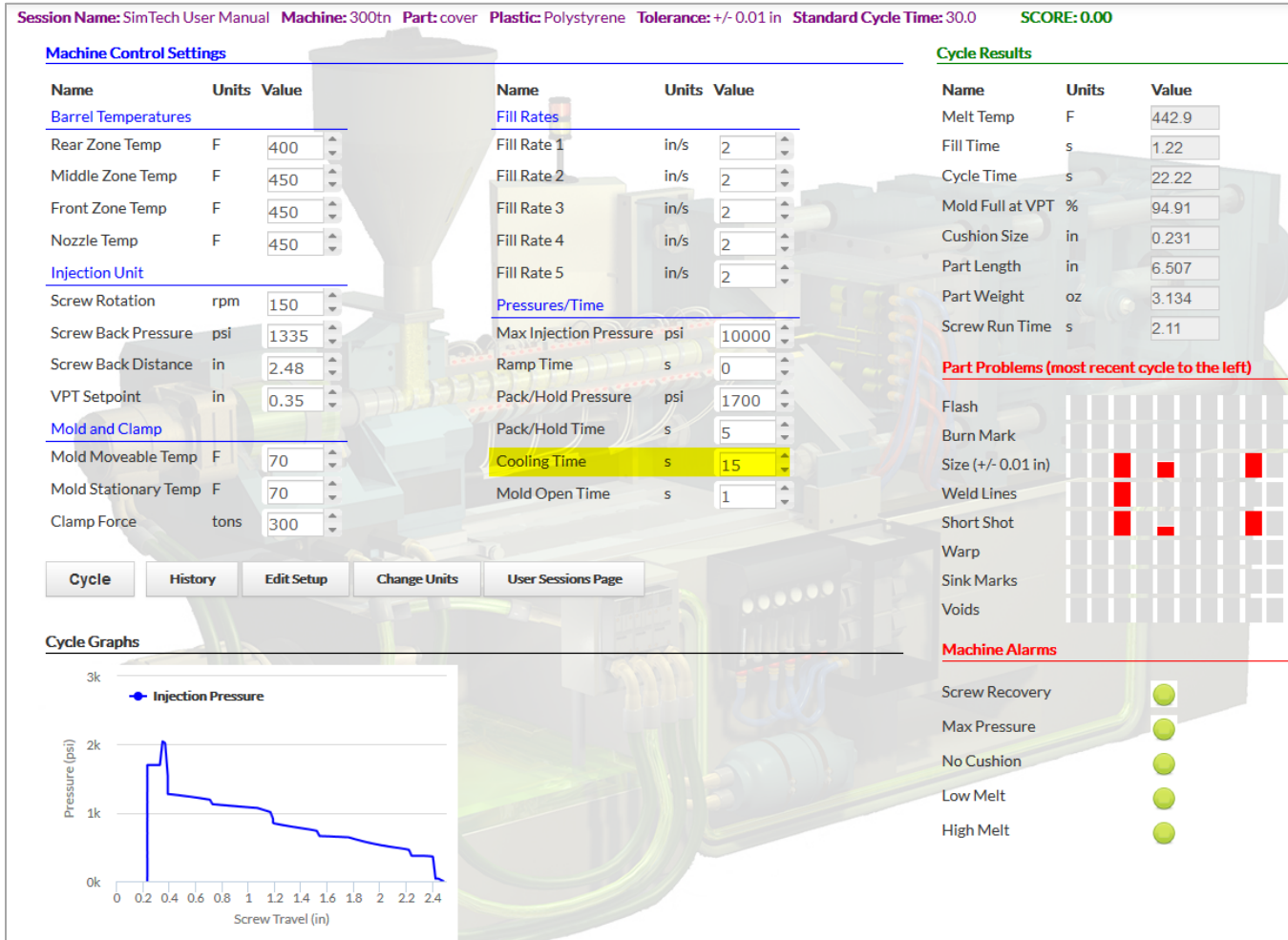
What is the melt temperature? 450.0 °F

VIII. Determine the Effect of the Mold Closed Time on the Melt Temperature

A. You will explore how the mold closed timer can affect the melt temperature.

1. Reduce mold closed time to 15 seconds. [Cycle]

(the cooling time is the same thing as the mold closed time)



What is melt temperature? 442.9 °F

Why did the melt temperature decrease? There is now less time for the plastic to be heated by the barrel

2. Use the back pressure to raise the melt temperature to $450^{\circ}\text{F} \pm 2^{\circ}$. [Cycle]

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 135.17

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	400
Middle Zone Temp	F	450
Front Zone Temp	F	450
Nozzle Temp	F	450
Injection Unit		
Screw Rotation	rpm	150
Screw Back Pressure	psi	2325
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	70
Mold Stationary Temp	F	70
Clamp Force	tons	300

Cycle Results

Name	Units	Value
Melt Temp	F	449.6
Fill Time	s	1.19
Cycle Time	s	22.19
Mold Full at VPT	%	94.89
Cushion Size	in	0.231
Part Length	in	6.506
Part Weight	oz	3.133
Screw Run Time	s	2.57

Part Problems (most recent cycle to the left)

Problem	1	2	3	4	5	6	7	8	9	10
Flash										
Burn Mark										
Size (+/- 0.01 in)										
Weld Lines										
Short Shot										
Warp										
Sink Marks										
Voids										

Machine Alarms

Screw Recovery	●
Max Pressure	●
No Cushion	●
Low Melt	●
High Melt	●

Cycle Graphs

Pressure (psi)

Screw Travel (in)

Injection Pressure

What is the new back pressure setting? 2,325 psi

IX. The Back Pressure and No Cushion Alarms

A. Why the back pressure and no cushion alarms come on

1. Raise back pressure to 6000 psi. [Cycle]

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 0.00

Machine Control Settings			Cycle Results		
Name	Units	Value	Name	Units	Value
Barrel Temperatures			Fill Rates		
Rear Zone Temp	F	400	Fill Rate 1	in/s	2
Middle Zone Temp	F	450	Fill Rate 2	in/s	2
Front Zone Temp	F	450	Fill Rate 3	in/s	2
Nozzle Temp	F	450	Fill Rate 4	in/s	2
Injection Unit			Fill Rate 5	in/s	2
Screw Rotation	rpm	150	Pressures/Time		
Screw Back Pressure	psi	6000	Max Injection Pressure	psi	10000
Screw Back Distance	in	2.48	Ramp Time	s	0
VPT Setpoint	in	0.35	Pack/Hold Pressure	psi	1700
Mold and Clamp			Pack/Hold Time	s	5
Mold Moveable Temp	F	70	Cooling Time	s	15
Mold Stationary Temp	F	70	Mold Open Time	s	1
Clamp Force	tons	300			

[Cycle](#)
[History](#)
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Cycle Graphs

Part Problems (most recent cycle to the left)

Problem	Flash	Burn Mark	Size (+/- 0.01 in)	Weld Lines	Short Shot	Warp	Sink Marks	Voids
Flash								
Burn Mark								
Size (+/- 0.01 in)								
Weld Lines								
Short Shot								
Warp								
Sink Marks								
Voids								

Machine Alarms

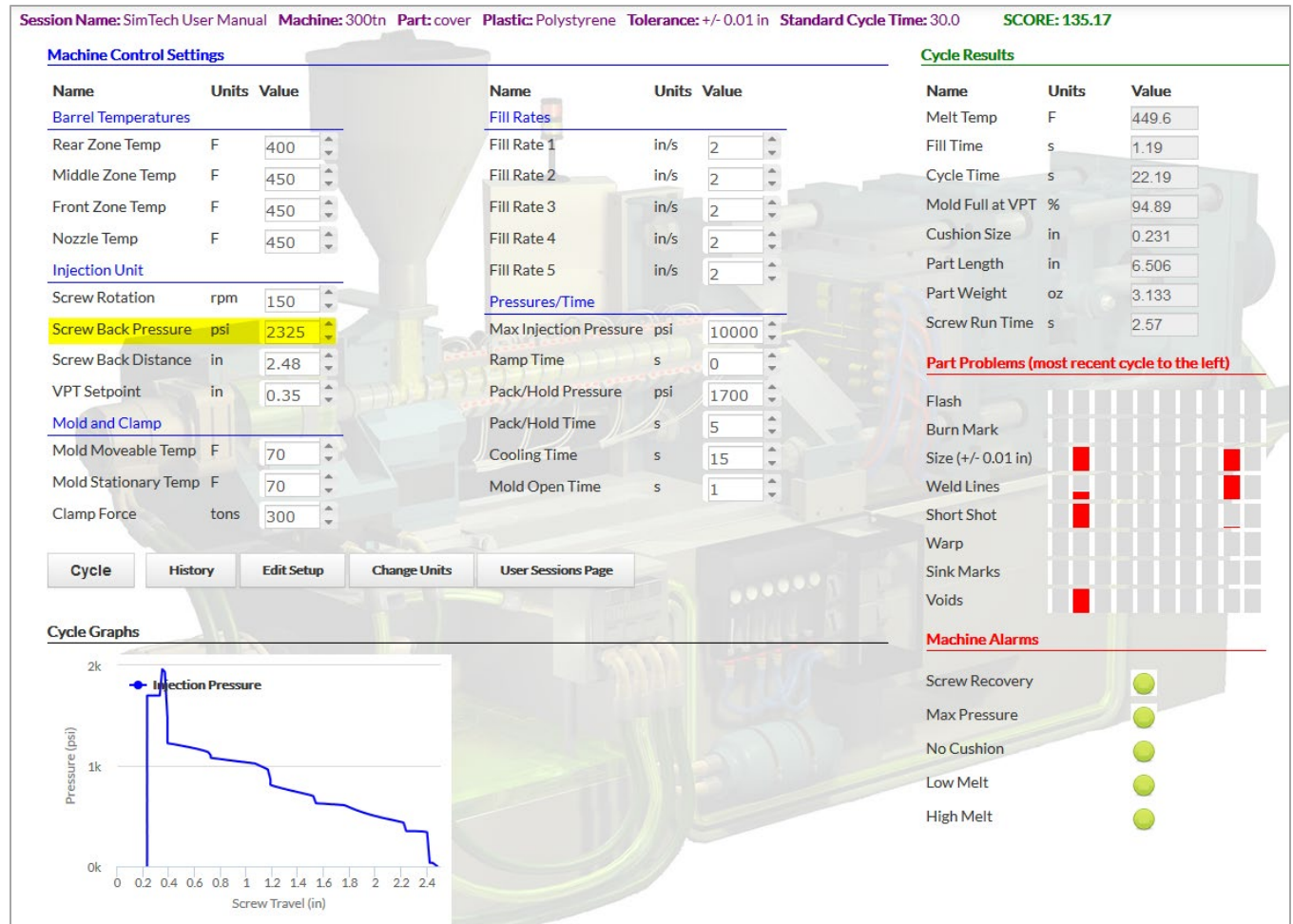
Alarm	Status
Screw Recovery	Green
Max Pressure	Green
No Cushion	Red
Low Melt	Green
High Melt	Red

What alarms occurred? No cushion alarm and high melt alarm

Why? The screw could not return against the high back pressure. When the mold opened the screw is required to stop rotating. There was not enough plastic ahead of the screw for the next shot.

2. Reset the back pressure to 2,325 psi. [Cycle]

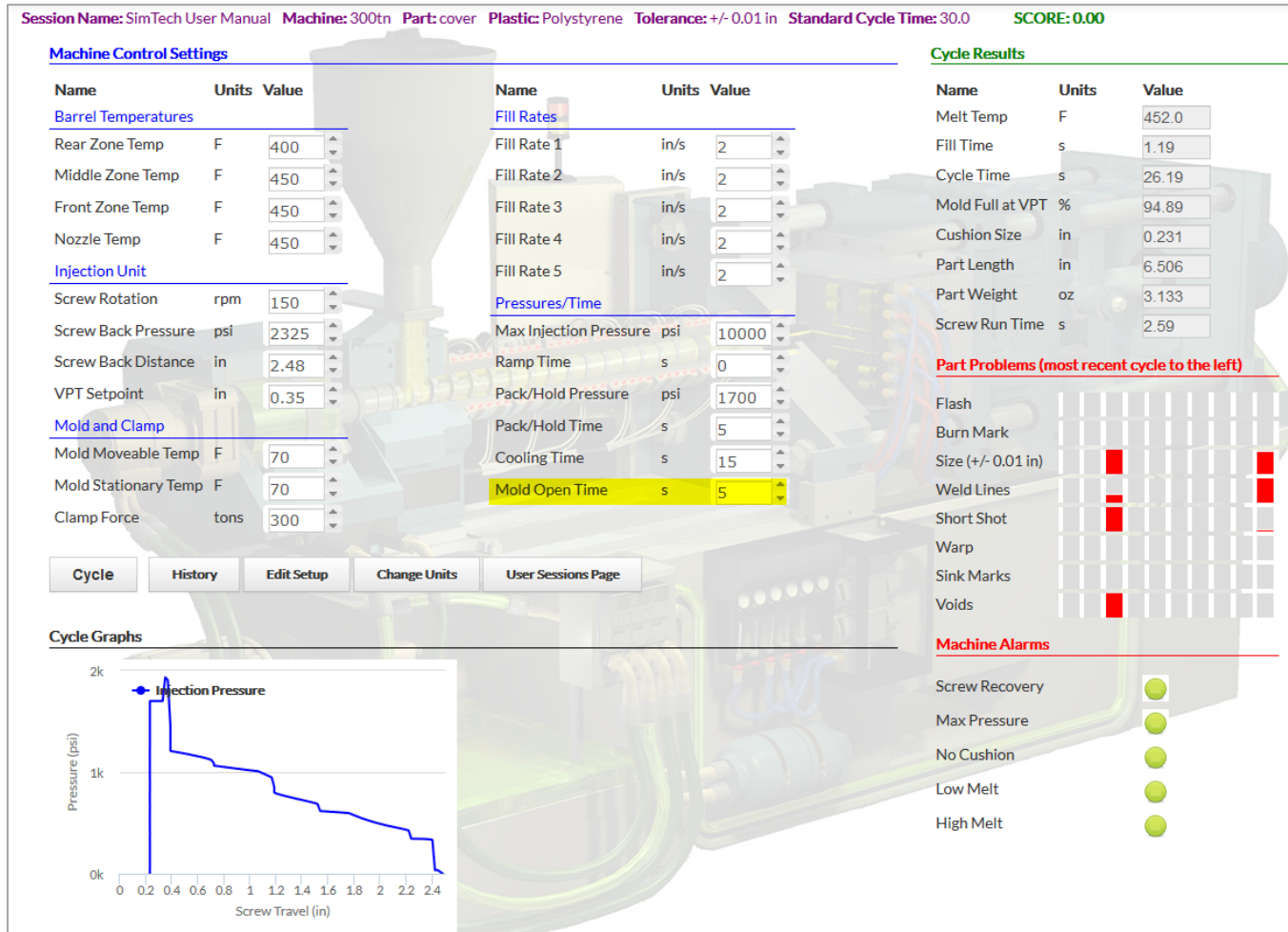
- You should get a good part.



X. Determine the Effect of Mold Open Time on the Melt Temperature

A. You will explore how the mold open timer can affect the melt temperature.

1. Increase the mold open time to 5 seconds. [Cycle]



What is the melt temperature? 452.0 °F

Why did the temperature increase? With an increased mold open time the plastic has more time to be heated in the barrel.

2. Set the mold open time to 1 seconds. [Cycle]

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 135.17

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	400
Middle Zone Temp	F	450
Front Zone Temp	F	450
Nozzle Temp	F	450
Injection Unit		
Screw Rotation	rpm	150
Screw Back Pressure	psi	2325
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	70
Mold Stationary Temp	F	70
Clamp Force	tons	300

Fill Rates

Name	Units	Value
Fill Rate 1	in/s	2
Fill Rate 2	in/s	2
Fill Rate 3	in/s	2
Fill Rate 4	in/s	2
Fill Rate 5	in/s	2

Pressures/Time

Name	Units	Value
Max Injection Pressure	psi	10000
Ramp Time	s	0
Pack/Hold Pressure	psi	1700
Pack/Hold Time	s	5
Cooling Time	s	15
Mold Open Time	s	1

Cycle Results

Name	Units	Value
Melt Temp	F	449.6
Fill Time	s	1.19
Cycle Time	s	22.19
Mold Full at VPT	%	94.89
Cushion Size	in	0.231
Part Length	in	6.506
Part Weight	oz	3.133
Screw Run Time	s	2.57

Part Problems (most recent cycle to the left)

Problem	Count
Flash	0
Burn Mark	0
Size (+/- 0.01 in)	0
Weld Lines	0
Short Shot	0
Warp	0
Sink Marks	0
Voids	0

Machine Alarms

Screw Recovery	●
Max Pressure	●
No Cushion	●
Low Melt	●
High Melt	●

Cycle History Edit Setup Change Units User Sessions Page

Cycle Graphs

Pressure (psi)

Screw Travel (in)

Injection Pressure

XI. Determine the Effect of the Mold Temperature on the Melt Temperature

A. You will explore how the mold temperature can affect the melt temperature.

1. Set mold temperature to 110°F (both halves). [Cycle]

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 0.00

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	400
Middle Zone Temp	F	450
Front Zone Temp	F	450
Nozzle Temp	F	450
Injection Unit		
Screw Rotation	rpm	150
Screw Back Pressure	psi	2325
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	110
Mold Stationary Temp	F	110
Clamp Force	tons	300

Cycle History Edit Setup Change Units User Sessions Page

Cycle Results

Name	Units	Value
Melt Temp	F	449.6
Fill Time	s	1.15
Cycle Time	s	22.15
Mold Full at VPT	%	94.86
Cushion Size	in	0.231
Part Length	in	6.505
Part Weight	oz	3.127
Screw Run Time	s	2.57

Part Problems (most recent cycle to the left)

Flash	
Burn Mark	
Size (+/- 0.01 in)	
Weld Lines	
Short Shot	
Warp	
Sink Marks	
Voids	

Machine Alarms

Screw Recovery	
Max Pressure	
No Cushion	
Low Melt	
High Melt	

Cycle Graphs

Pressure (psi)

Injection Pressure

Screw Travel (in)

What is the melt temperature? 449.6 °F

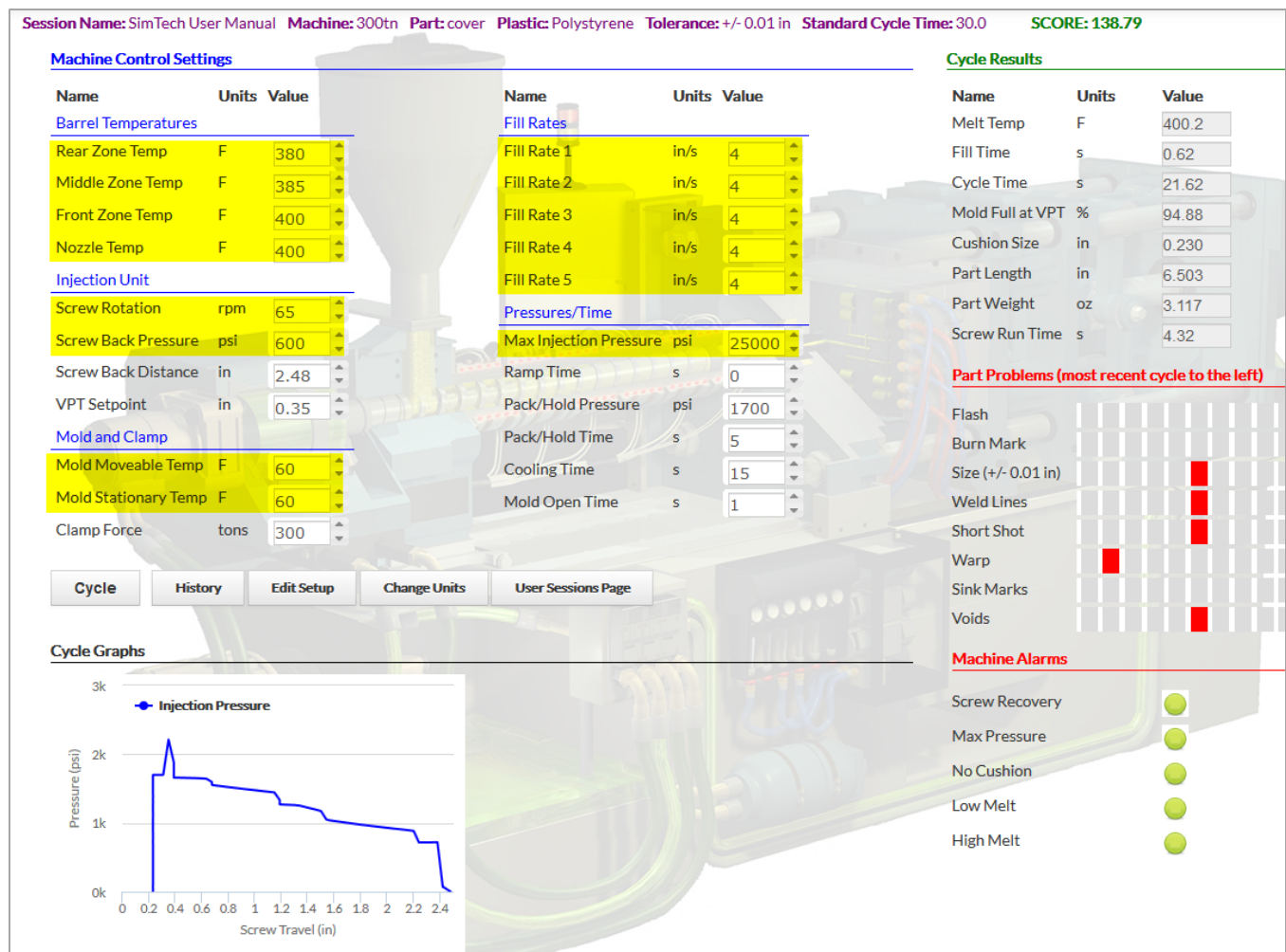
Does the mold temperature affect the melt temperature in the barrel? No

XII. Determine the Effects of Fill Rates on the Molded Parts

A. You will explore how fill rates can affect the molded parts.

1. Set barrel rear zone to 380°F, middle zone to 385°F, front and nozzle to 400°F. [Cycle]
2. Set screw rotation to 65 rpm and screw back pressure to 600 psi. [Cycle]
3. Set mold temperature to 60°F (both halves). [Cycle]
4. Set all fill rates 4.0 in/sec. [Cycle]
5. Set the max injection pressure to 25,000 psi. [Cycle]

Note: This molding machine has a maximum fill rate of 25 inches per second.



What is the fill time? 0.62 sec

What is the cycle time? 21.62 sec

What is the part weight? 3.117 oz.

What is the part length? 6.503 in

7. Set Fill Rate 5 to 4.0 in/sec. **[Cycle]**

Session Name: SimTech User Manual
Machine: 300tn
Part: cover
Plastic: Polystyrene
Tolerance: +/- 0.01 in
Standard Cycle Time: 30.0
SCORE: 140.75

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	380
Middle Zone Temp	F	385
Front Zone Temp	F	400
Nozzle Temp	F	400
Injection Unit		
Screw Rotation	rpm	65
Screw Back Pressure	psi	600
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	60
Mold Stationary Temp	F	60
Clamp Force	tons	300

Name	Units	Value
Fill Rates		
Fill Rate 1	in/s	10
Fill Rate 2	in/s	10
Fill Rate 3	in/s	10
Fill Rate 4	in/s	10
Fill Rate 5	in/s	4
Pressures/Time		
Max Injection Pressure	psi	25000
Ramp Time	s	0
Pack/Hold Pressure	psi	1700
Pack/Hold Time	s	5
Cooling Time	s	15
Mold Open Time	s	1

Cycle Results

Name	Units	Value
Melt Temp	F	400.2
Fill Time	s	0.32
Cycle Time	s	21.32
Mold Full at VPT	%	95.19
Cushion Size	in	0.230
Part Length	in	6.501
Part Weight	oz	3.109
Screw Run Time	s	4.32

Part Problems (most recent cycle to the left)

Problem	Occurrence
Flash	None
Burn Mark	None
Size (+/- 0.01 in)	None
Weld Lines	None
Short Shot	None
Warp	None
Sink Marks	None
Voids	None

Cycle
History
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Cycle Graphs

Pressure (psi)

Screw Travel (in)

Machine Alarms

Screw Recovery	●
Max Pressure	●
No Cushion	●
Low Melt	●
High Melt	●

What is the cycle time? 21.32 sec

What is the part length? 6.501 in

What changes occurred to the molded parts? Part weight decreased very slightly, dimensionally there is a very slight change but no significant change is observed.

8. Set Fill Rates 1, 2, 3, and 4 to 3.0 in/sec.

9. Set Fill Rate 5 to 6.0 in/sec. [Cycle]

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 0.00

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	380
Middle Zone Temp	F	385
Front Zone Temp	F	400
Nozzle Temp	F	400
Injection Unit		
Screw Rotation	rpm	65
Screw Back Pressure	psi	600
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	60
Mold Stationary Temp	F	60
Clamp Force	tons	300

Cycle Results

Name	Units	Value
Melt Temp	F	400.2
Fill Time	s	0.72
Cycle Time	s	21.72
Mold Full at VPT	%	95.99
Cushion Size	in	0.230
Part Length	in	6.503
Part Weight	oz	3.118
Screw Run Time	s	4.32

Part Problems (most recent cycle to the left)

Problem	Status
Flash	
Burn Mark	Yes
Size (+/- 0.01 in)	Yes
Weld Lines	Yes
Short Shot	Yes
Warp	Yes
Sink Marks	
Voids	Yes

Machine Alarms

Alarm	Status
Screw Recovery	OK
Max Pressure	OK
No Cushion	OK
Low Melt	OK
High Melt	OK

Cycle Graphs

Injection Pressure

Pressure (psi)

Screw Travel (in)

What is the fill time? 0.72 sec

What is the cycle time? 21.72 sec

What is the part weight? 3.118 oz.

What is the part length? 6.503 in

What happened to part weight and dimensions when the final Fill Rate 5 is very fast?

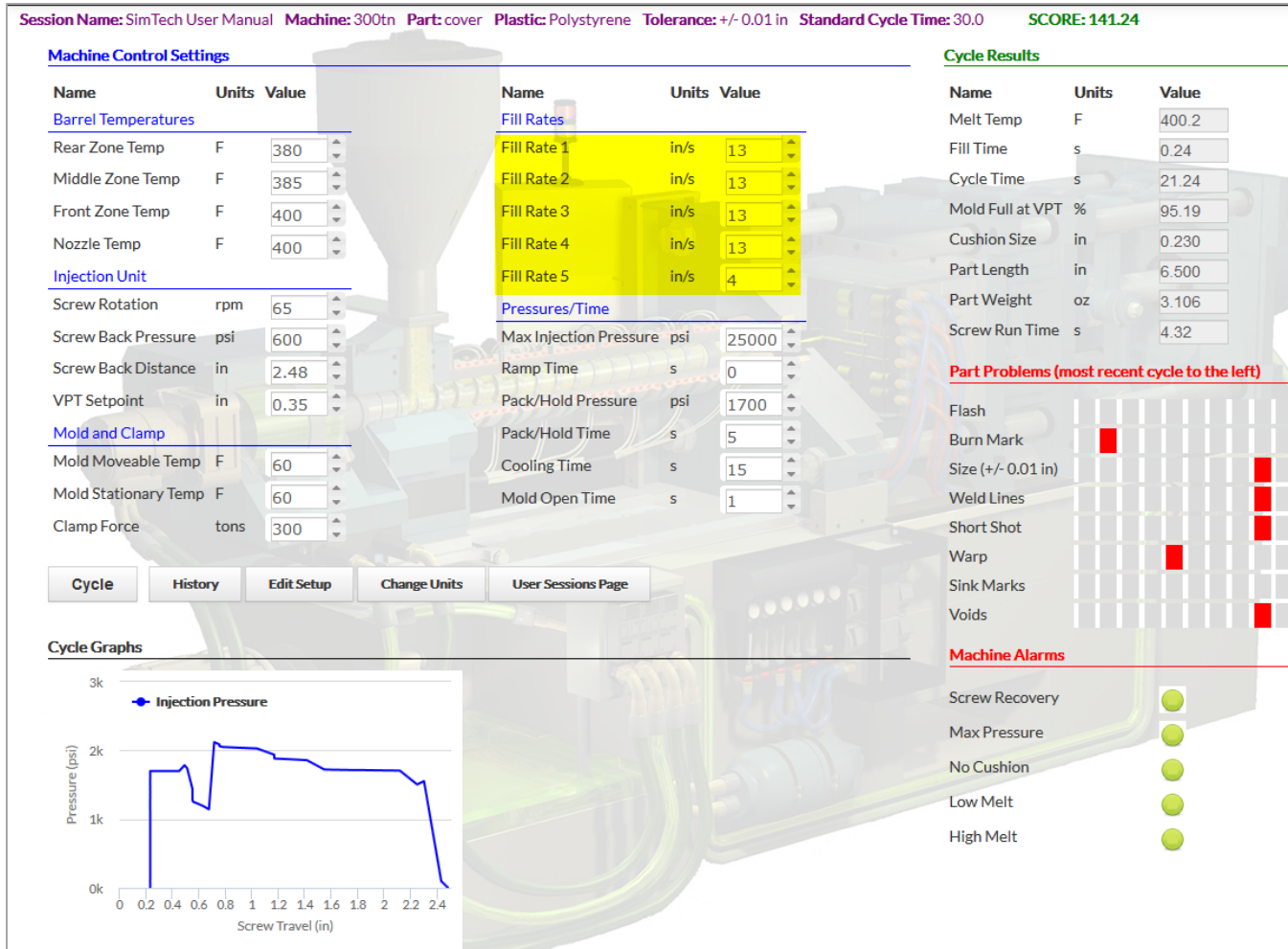
The part weight and dimensions increased. Burn marks are also present

Why? The machine uses higher pressures to fill at higher flow rates so more plastic is packed into cavities.

10. Set Fill Rates 1, 2, 3, and 4 to 13.0 in/sec.

11. Set Fill Rate 5 to 4.0 in/sec. [Cycle]

- You should get a good part.



What is the fill time? 0.24 sec

What is the cycle time? 21.24 sec

What is the part weight? 3.106 oz.

What is the part length? 6.500 in

What happened to part weight and dimensions when final Fill Rate 5 is reduced? The part weight and dimensions decrease.

Why? The plastic cools while it is flowing. The gate begins to freeze and a thicker skin of frozen material forms causing a decrease in volumetric flow. The result is decreased dimensions and part weight.

Fill Rates Conclusions:

- Very high fill rates require high injection pressures.
- Of all the fill rates, the final Fill Rate 5 has the greatest effect on part dimensions and weight.

2. Reduce clamp force to 65 tons. [Cycle]

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 0.00

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	380
Middle Zone Temp	F	385
Front Zone Temp	F	400
Nozzle Temp	F	400
Injection Unit		
Screw Rotation	rpm	65
Screw Back Pressure	psi	600
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	60
Mold Stationary Temp	F	60
Clamp Force	tons	65

Fill Rates

Name	Units	Value
Fill Rate 1	in/s	4
Fill Rate 2	in/s	4
Fill Rate 3	in/s	4
Fill Rate 4	in/s	4
Fill Rate 5	in/s	8

Pressures/Time

Name	Units	Value
Max Injection Pressure	psi	25000
Ramp Time	s	0
Pack/Hold Pressure	psi	1700
Pack/Hold Time	s	5
Cooling Time	s	15
Mold Open Time	s	1

Cycle Results

Name	Units	Value
Melt Temp	F	400.2
Fill Time	s	0.53
Cycle Time	s	21.53
Mold Full at VPT	%	96.27
Cushion Size	in	0.230
Part Length	in	6.502
Part Weight	oz	3.113
Screw Run Time	s	4.32

Part Problems (most recent cycle to the left)

Problem	1	2	3	4	5	6	7	8	9	10
Flash										
Burn Mark										
Size (+/- 0.01 in)										
Weld Lines										
Short Shot										
Warp										
Sink Marks										
Voids										

Machine Alarms

Alarm	Status
Screw Recovery	On
Max Pressure	On
No Cushion	On
Low Melt	On
High Melt	On

Cycle Graphs

Pressure (psi)

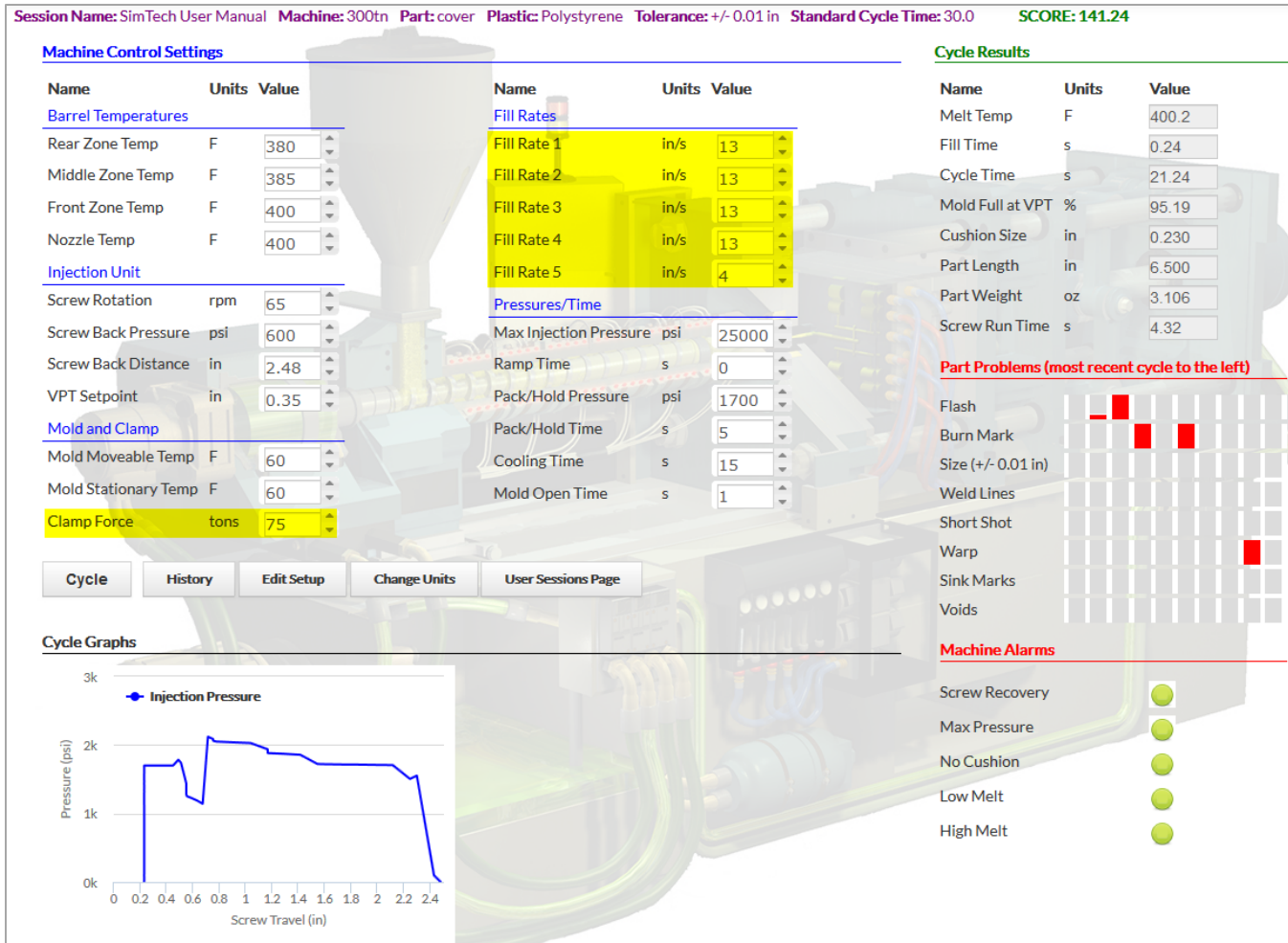
Screw Travel (in)

What change occurred in the defects present? The burn marks were eliminated, but the part now has flash.

Why? More air could escape at the lower clamp force, but the lower clamp force allowed flash.

3. Set Fill Rates 1, 2, 3, and 4 to 13.0 in/sec. Set Fill Rate 5 to 4.0 in/sec. [Cycle]

4. Set the Clamp Force to 75 tons. [Cycle]



What happened to the flash? Flash was eliminated.

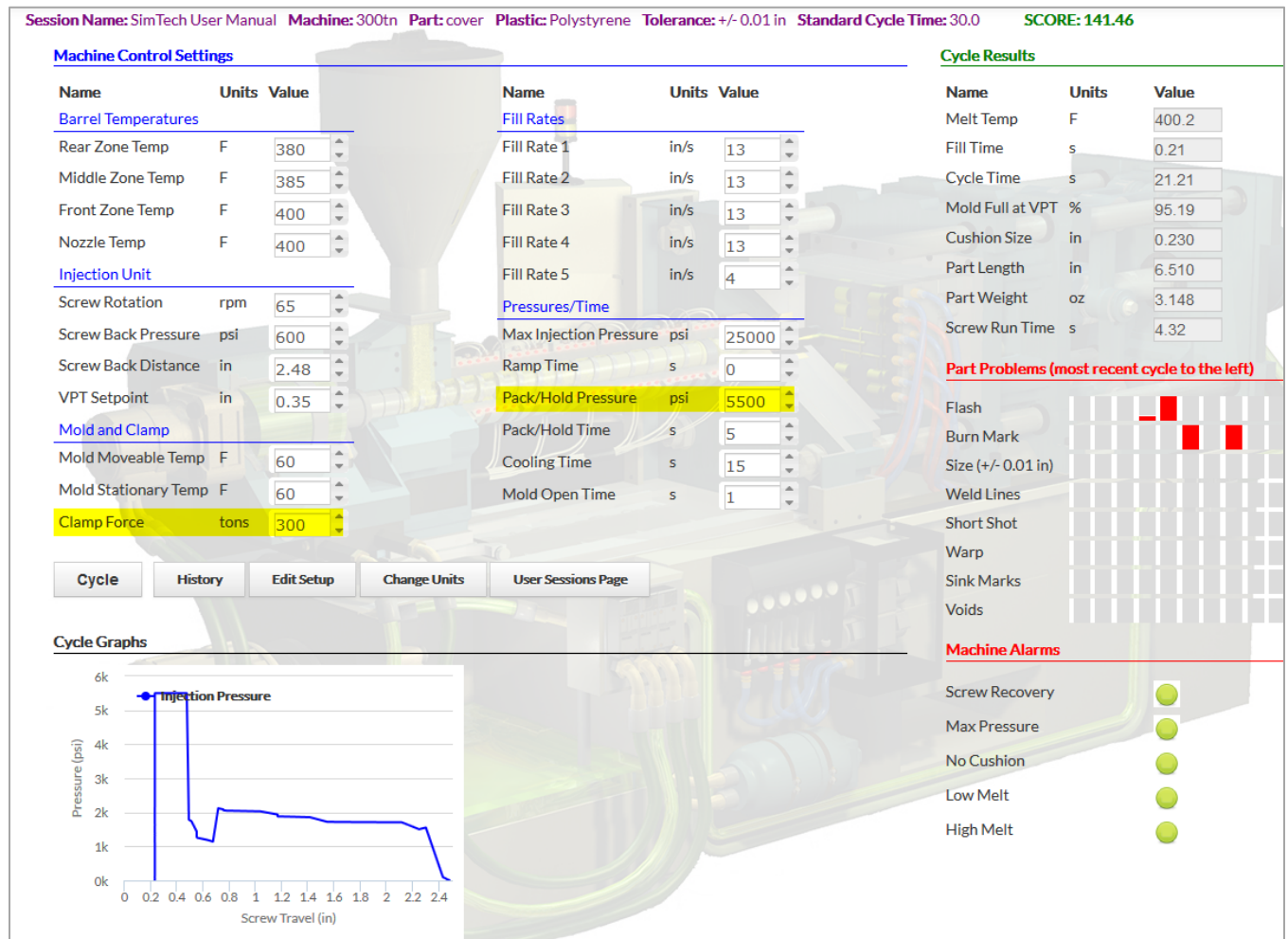
Why? The slower fill rate at the end of fill reduced the cavity pressure enough so that the mold no longer flashed.

What conclusions would you make concerning the effects of clamp force and fill rate on burn marks and flash? The final fill rate affects both burns and flash. The amount of clamp force affects burns and flash.

XIV. Determine the Effects of Pack/Hold pressure on the Molded Part Properties

A. Now we'll examine the effect of pack/hold pressure on part weight and dimensions.

1. Increase the clamp force to 300 tons. (This will avoid flash when we increase the pack/hold pressure.) [Cycle]
2. Increase the pack/hold pressure to 5,500 psi. [Cycle]



What is the fill time? 0.21 sec

What is the cycle time? 21.21 sec

What is the part weight? 3.148 oz.

What is the part length? 6.510 in

Why did the part size increase? The higher holding pressure packed more plastic in the cavity.

3. Reduce the pack/hold pressure to 4,500 psi. [Cycle]

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 141.45

Machine Control Settings			Cycle Results		
Name	Units	Value	Name	Units	Value
Barrel Temperatures			Fill Rates		
Rear Zone Temp	F	380	Fill Rate 1	in/s	13
Middle Zone Temp	F	385	Fill Rate 2	in/s	13
Front Zone Temp	F	400	Fill Rate 3	in/s	13
Nozzle Temp	F	400	Fill Rate 4	in/s	13
Injection Unit			Fill Rate 5	in/s	4
Screw Rotation	rpm	65	Pressures/Time		
Screw Back Pressure	psi	600	Max Injection Pressure	psi	25000
Screw Back Distance	in	2.48	Ramp Time	s	0
VPT Setpoint	in	0.35	Pack/Hold Pressure	psi	4500
Mold and Clamp			Pack/Hold Time	s	5
Mold Moveable Temp	F	60	Cooling Time	s	15
Mold Stationary Temp	F	60	Mold Open Time	s	1
Clamp Force	tons	300			

[Cycle](#)
[History](#)
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Cycle Graphs

Part Problems (most recent cycle to the left)

Problem	Occurrence
Flash	Yes
Burn Mark	Yes
Size (+/- 0.01 in)	Yes
Weld Lines	No
Short Shot	No
Warp	No
Sink Marks	No
Voids	No

Machine Alarms

Alarm	Status
Screw Recovery	OK
Max Pressure	OK
No Cushion	OK
Low Melt	OK
High Melt	OK

What is the fill time? 0.21 sec

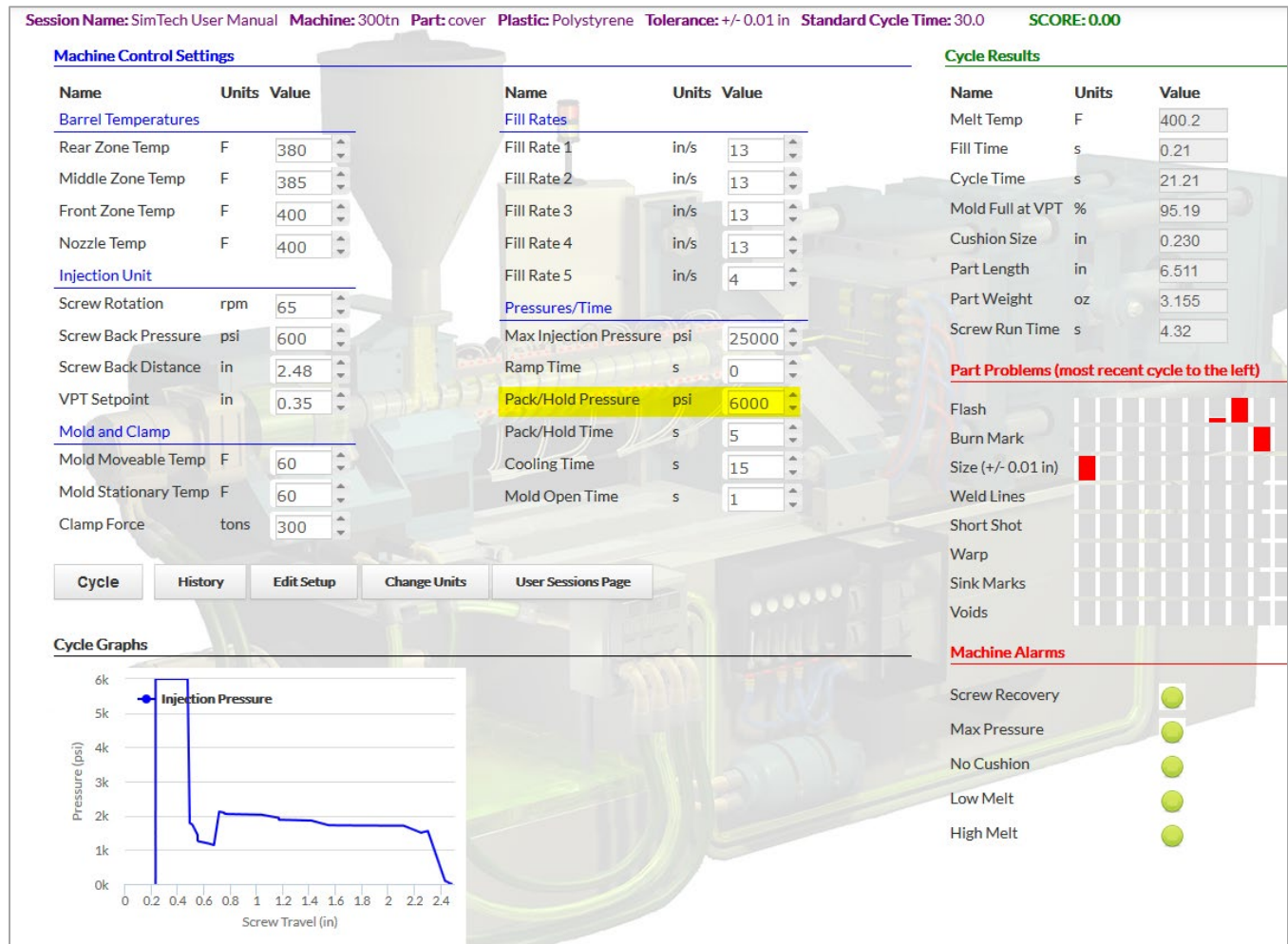
What is the cycle time? 21.21 sec

What is the part weight? 3.135 oz.

What is the part length? 6.507 in

Why did the part dimensions and weight decrease when the pack/hold pressure was reduced?
The lower Pack/Hold pressure puts plastic molecules into the cavity.

4. Raise the pack/hold pressure to 6,000 psi. [Cycle]



What is the fill time? 0.21 sec

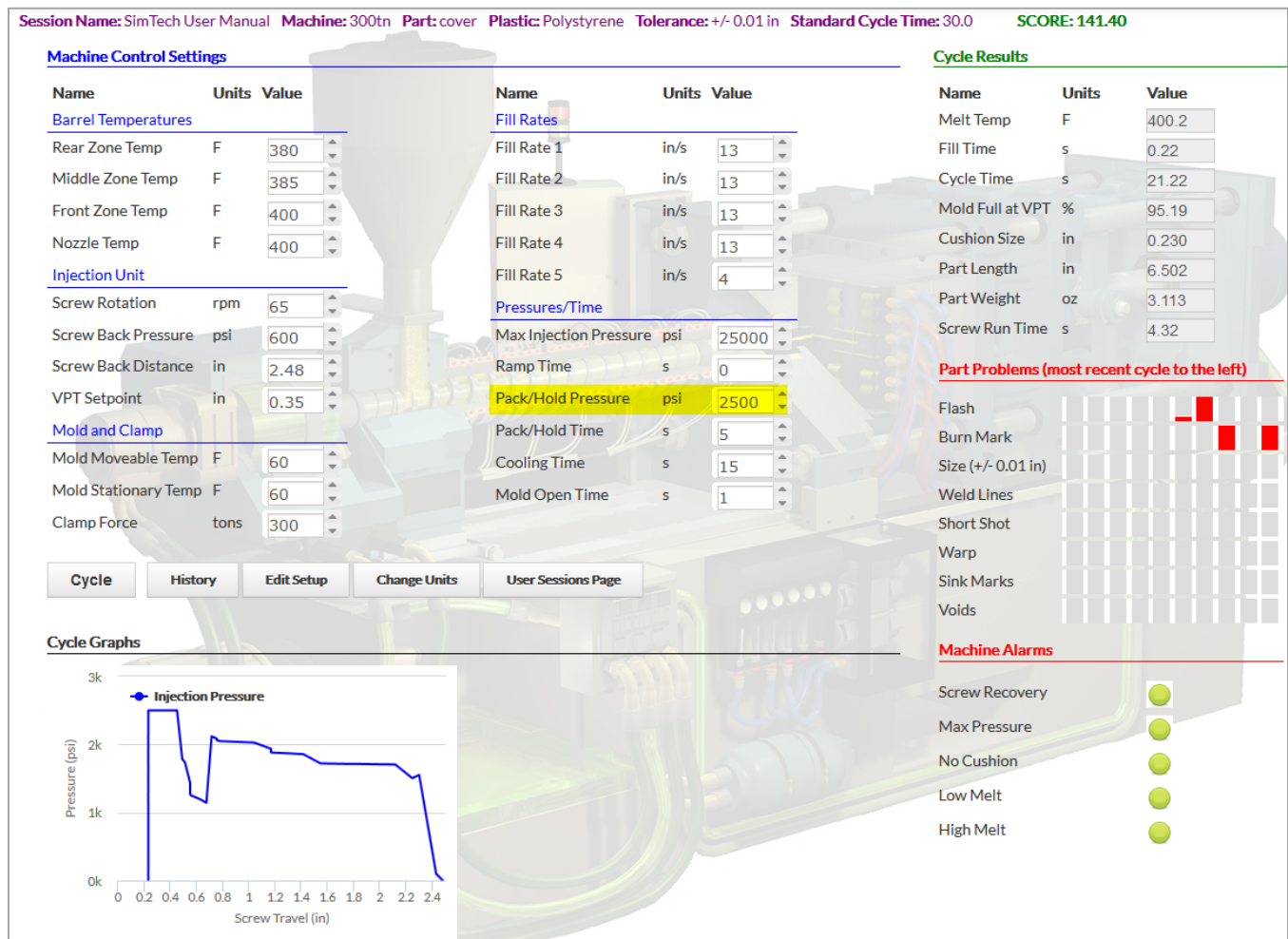
What is the cycle time? 21.21 sec

What is the part weight? 3.155 oz.

What is the part length? 6.511 in

Notice the part dimensions are now out of spec. Why did this happen? The higher Pack/Hold Pressure pushes more plastic molecules into the mold. This increases the part weight and reduces the overall shrinkage. In this case so much so that the part is too large.

5. Decrease the pack/hold pressure to 2,500 psi. [Cycle]



What is the fill time? 0.22 sec

What is the cycle time? 21.22 sec

What is the part weight? 3.113 oz.

What is the part length? 6.502 in

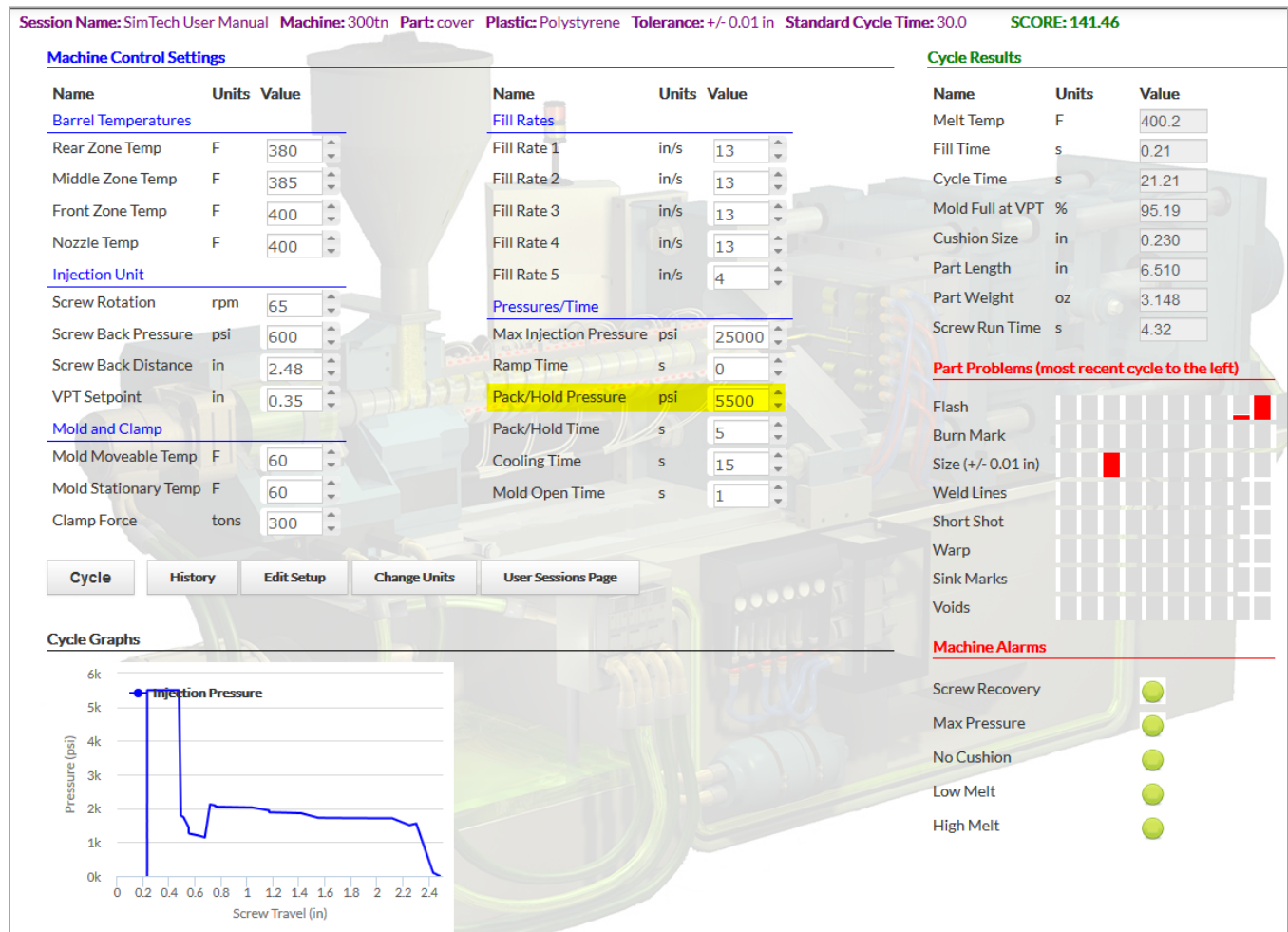
XV. Determine the Effects of Pack/Hold Time on the Molded Part Properties

A. Now we'll examine the effect of pack/hold time on part weight and dimensions.

Note: Too short a holding time can cause “discharge”.

1. Set the Pack/Hold Pressure back to 5,500 psi. [Cycle]

- You should have a good part.



What is the fill time? 0.21 sec

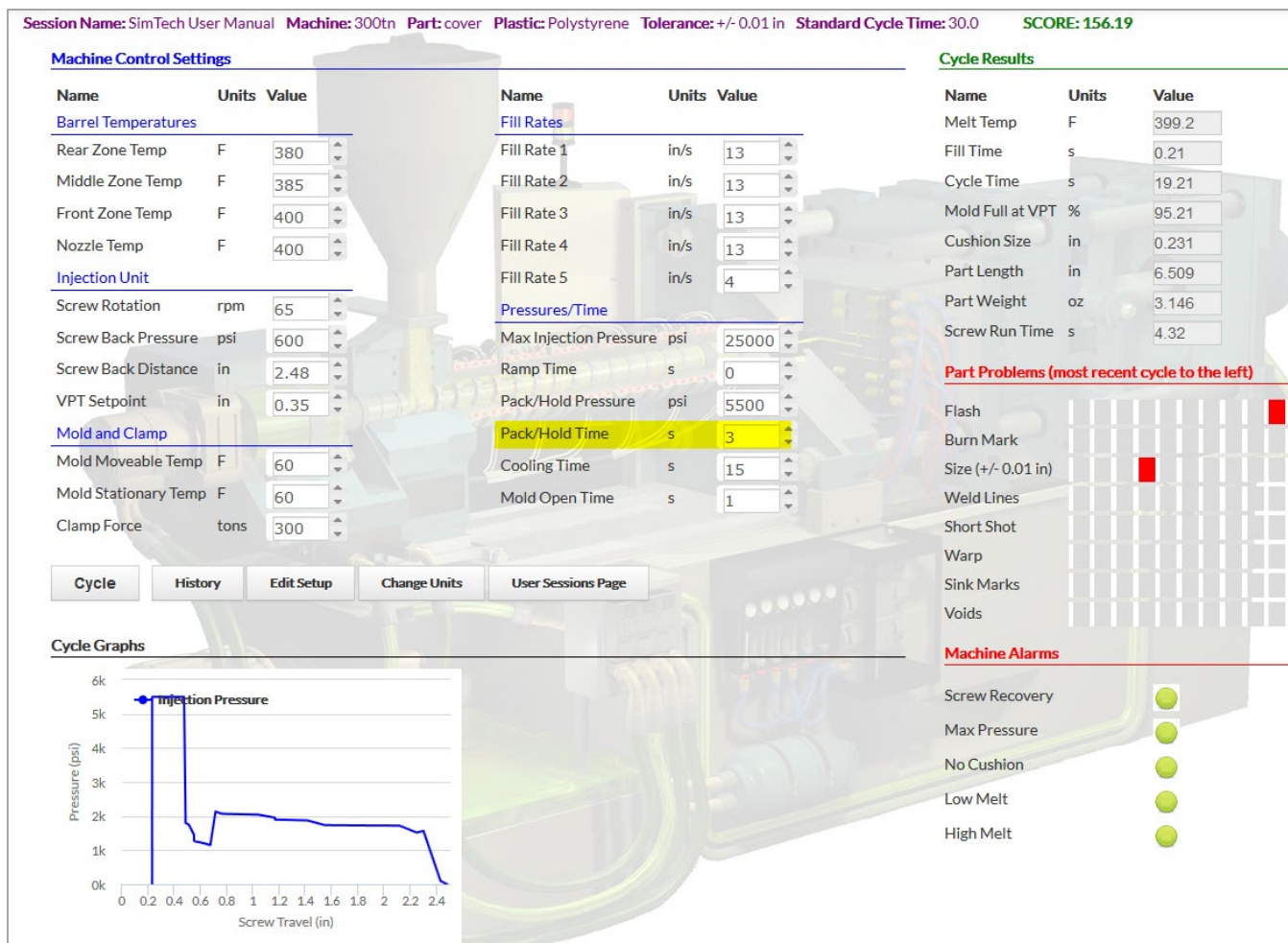
What is the cycle time? 21.21 sec

What is the part weight? 3.148 oz.

What is the part length? 6.510 in

Is there any change in the molded parts? The part is now within specification although it is to the upper specification limit.

2. Set pack/hold time to 3 seconds. [Cycle]



What is the fill time? 0.21 sec

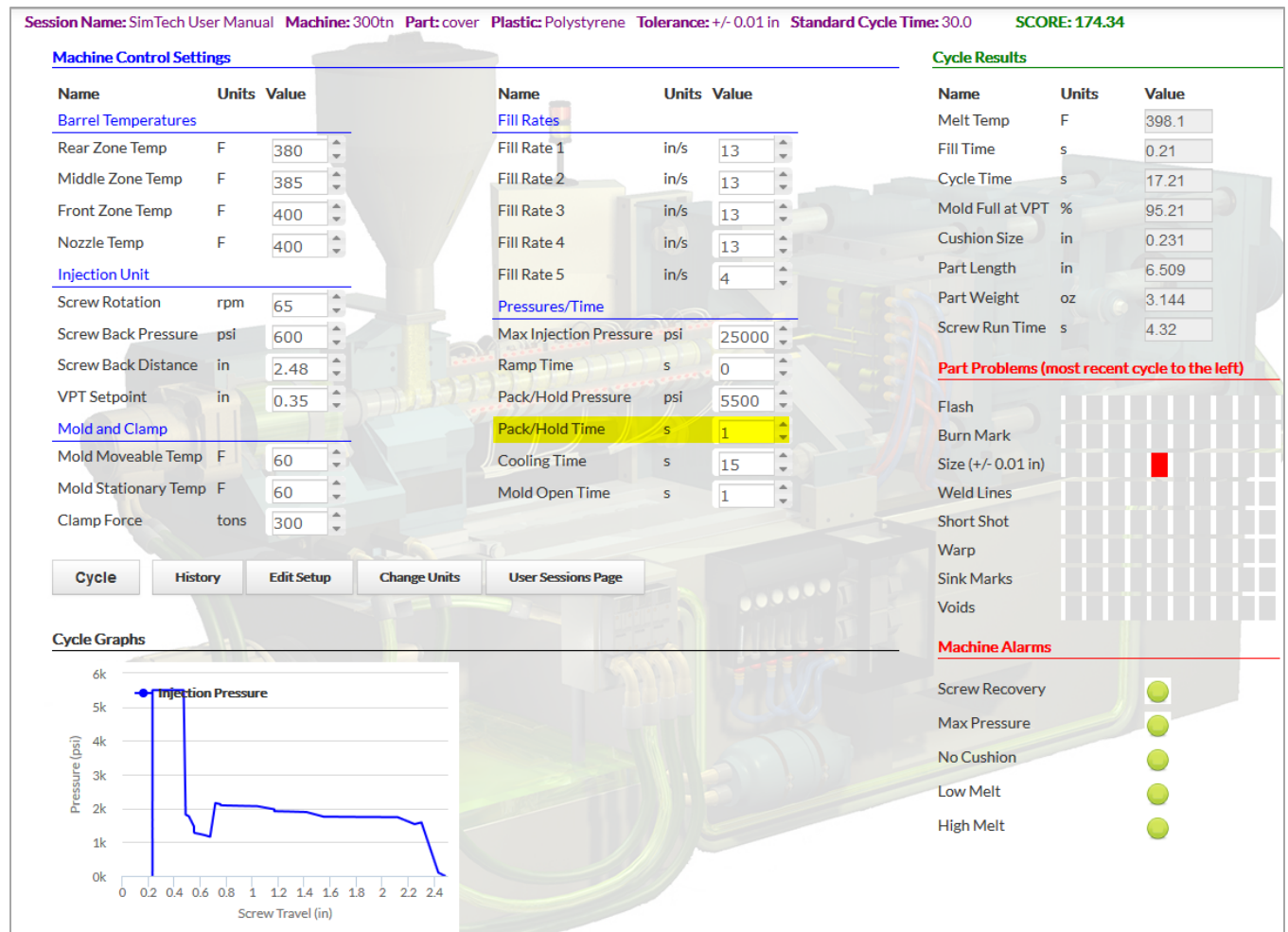
What is the cycle time? 19.21 sec

What is the part weight? 3.146 oz.

What is the part length? 6.509 in

Is there any change in the molded parts? There is a very slight decrease in part weight and part length.

3. Set holding time to 1 seconds. [Cycle]



What is the fill time? 0.21 sec

What is the cycle time? 17.21 sec

What is the part weight? 3.144 oz.

What is the part length? 6.509 in

Is there any change in the molded parts? There is a very slight decrease in part weight and part length.

XVI. Find the Gate Freeze Time

1. Set the Pack/Hold Time to 0.1 second. **[Cycle]**
2. Continue to increase the Pack/Hold Time by 0.1 seconds until you find that the part weight and length does not change.
 - Once the part weight and part length do not change that means the gate has frozen.

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 172.33

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	380
Middle Zone Temp	F	385
Front Zone Temp	F	400
Nozzle Temp	F	400
Injection Unit		
Screw Rotation	rpm	65
Screw Back Pressure	psi	600
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	60
Mold Stationary Temp	F	60
Clamp Force	tons	300

Cycle Results

Name	Units	Value
Melt Temp	F	398.2
Fill Time	s	0.21
Cycle Time	s	17.41
Mold Full at VPT	%	95.21
Cushion Size	in	0.231
Part Length	in	6.509
Part Weight	oz	3.147
Screw Run Time	s	4.32

Part Problems (most recent cycle to the left)

Flash	
Burn Mark	
Size (+/- 0.01 in)	
Weld Lines	
Short Shot	
Warp	
Sink Marks	
Voids	

Machine Alarms

Screw Recovery	●
Max Pressure	●
No Cushion	●
Low Melt	●
High Melt	●

Cycle Graphs

Pressure (psi)

Screw Travel (in)

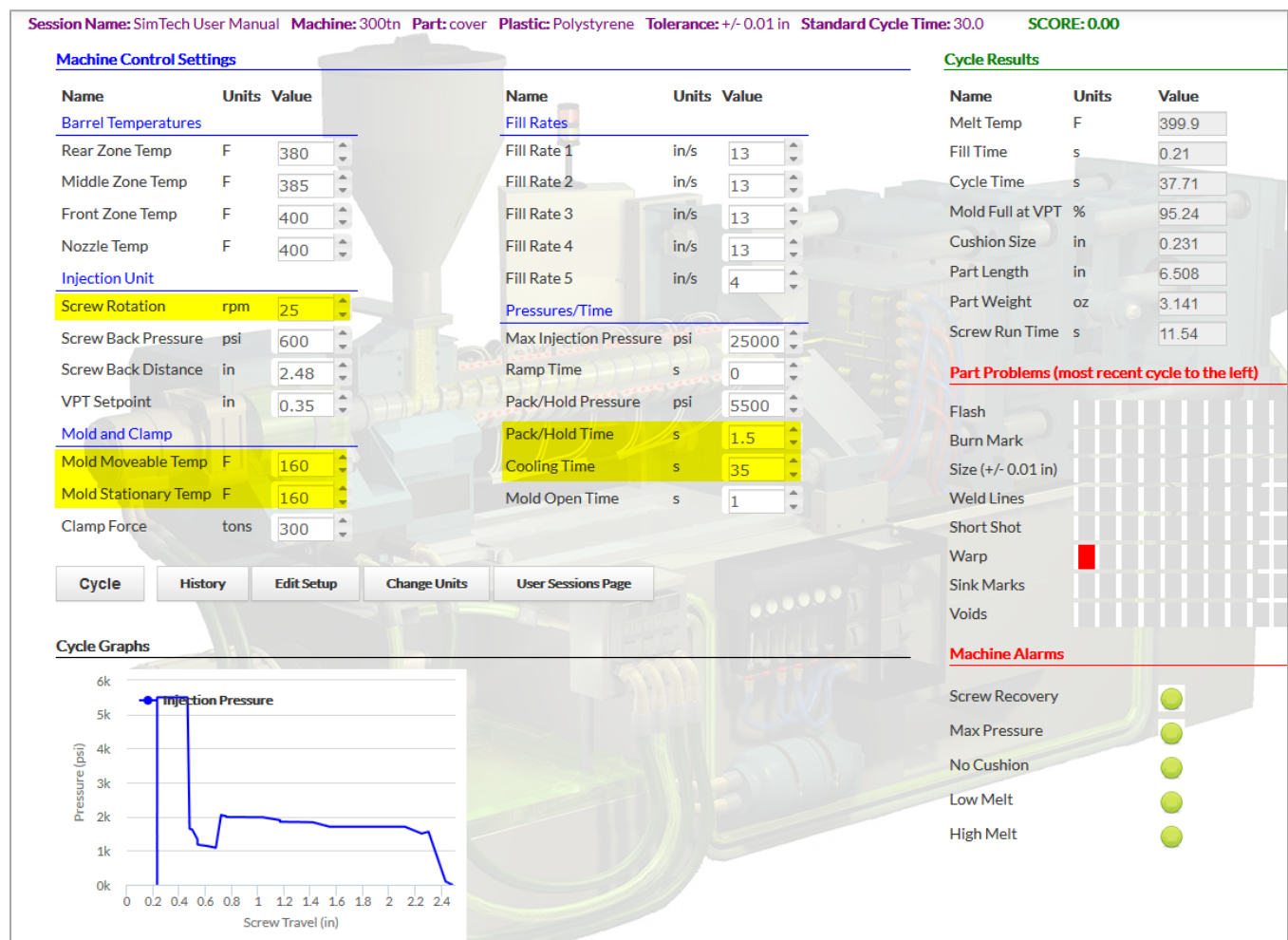
Injection Pressure

At what holding time does the gate freeze? 1.2 sec

XVII. Effects of Mold Temperature on Part Properties and Gate Freeze Time

A. Observe the effect of mold temperature on part dimensions and weight.

1. Set the Screw Rotation to 25 rpm. [Cycle]
2. Set Mold Temperature for both mold halves to 160°F. [Cycle]
3. Set the Pack/Hold Time to 1.5 seconds. [Cycle]
4. Set Cooling Time to 35 seconds. [Cycle]



What is the cycle time? 37.71 sec

What is the part weight? 3.141 oz.

What is the part length? 6.508 in

Determine the gate freeze time at 160° F.

1. Set the Pack/Hold Time to 0.2 second. **[Cycle]**
2. Continue to increase the Pack/Hold Time by 0.2 seconds until you find that the part weight and length does not change.
 - Once the part weight and part length do not change that means the gate has frozen.
 - At this mold temperature (160°F) the part will have warp or “distortion” Disregard this part problem for this exercise.

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 0.00

Machine Control Settings			Cycle Results		
Name	Units	Value	Name	Units	Value
Barrel Temperatures			Fill Rates		
Rear Zone Temp	F	380	Fill Rate 1	in/s	13
Middle Zone Temp	F	385	Fill Rate 2	in/s	13
Front Zone Temp	F	400	Fill Rate 3	in/s	13
Nozzle Temp	F	400	Fill Rate 4	in/s	13
Injection Unit			Fill Rate 5	in/s	4
Screw Rotation	rpm	25	Pressures/Time		
Screw Back Pressure	psi	600	Max Injection Pressure	psi	25000
Screw Back Distance	in	2.48	Ramp Time	s	0
VPT Setpoint	in	0.35	Pack/Hold Pressure	psi	5500
Mold and Clamp			Pack/Hold Time	s	2
Mold Moveable Temp	F	160	Cooling Time	s	35
Mold Stationary Temp	F	160	Mold Open Time	s	1
Clamp Force	tons	300			

[Cycle](#)
[History](#)
[Edit Setup](#)
[Change Units](#)
[User Sessions Page](#)

Cycle Graphs

Part Problems (most recent cycle to the left)

Problem	Count
Flash	0
Burn Mark	0
Size (+/- 0.01 in)	0
Weld Lines	0
Short Shot	0
Warp	8
Sink Marks	2
Voids	0

Machine Alarms

Alarm	Status
Screw Recovery	OK
Max Pressure	OK
No Cushion	OK
Low Melt	OK
High Melt	OK

What is the cycle time? 38.21 sec

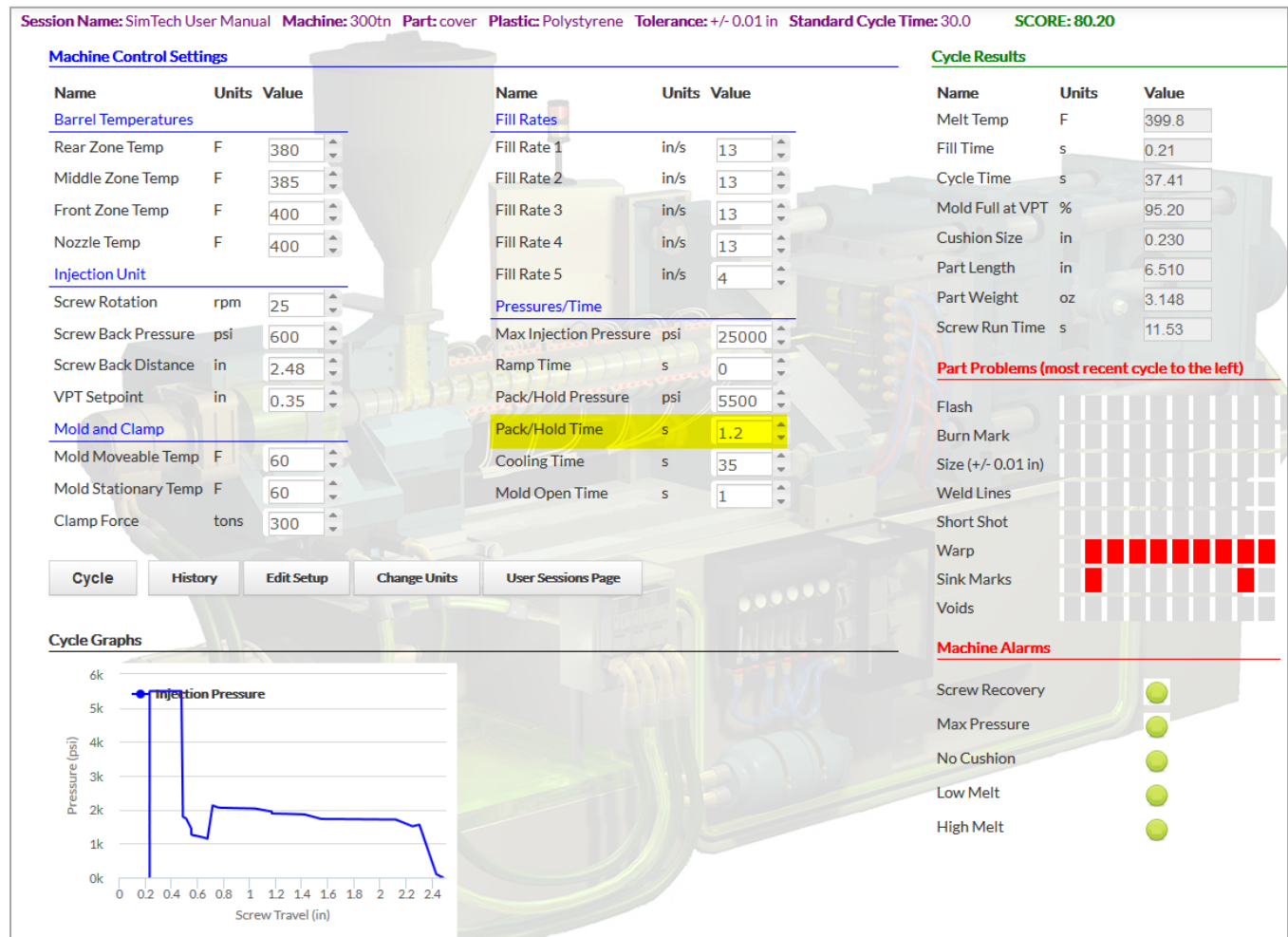
What is the part weight? 3.149 oz.

What is the part length? 6.510 in

What is the gate freeze time? 2.0 sec.

Determine the gate freeze time at 60° F.

1. Set the Mold Temperature for both mold halves to 60°F. [Cycle]
2. Set the Pack/Hold Time to 0.2 seconds. [Cycle]
3. Increase the Pack/Hold Time by 0.2 seconds until you find that the part weight and length does not change. [Cycle]



What is the cycle time? 37.41sec

What is the part weight? 3.148 oz.

What is the part length? 6.510 in

What is the gate seal time? 1.2 sec

You have now completed one evaluation of the effects of molding conditions on melt temperature, part weight, part dimensions, machine alarms, and you have observed several molded part defects for this plastic and part.

You can now try to improve your production efficiency for this part. Change the machine controls to reduce the cycle time. You should be able to mold to 100% efficiency or better.

When you begin new mold set-ups, you will solve problems and reduce cycle times using the knowledge you have gained in this lesson. To increase your knowledge of the molding process, you can do a similar evaluation using other plastics.



SimTech™

Student Tutorial Workbook

Getting Started

I. Introduction

This workbook is designed to be used with the Paulson fill rate controlled SimTech™ injection molding simulator. The Student Workbook Tutorial should be taken by all users who are not familiar with how SimTech™ works. If you are already familiar with SimTech™ and how it operates, you can move directly to the SimTech™ lab lessons located at the end of this manual.

The Student Workbook Tutorial is designed to show you how to navigate through the SimTech™ control panel and the effects of each molding machine control on the plastic behavior and on the molded part properties. You will be directed to make specific control changes and then asked to record and explain the results. Provided in the Student section of this manual, is a Student Answer Sheet which you can make copies of for students to write their answers in.

By the end of this tutorial, you should be familiar with how to:

- Make machine control changes
- Cycle the machine
- Read the cycle results
- Identify part problem
- Identify machine alarms
- Will have observed the effects of each control and each alarm

The Student Tutorial Lesson is taken through FreeMold which allows you to pick your machine size, plastic and part. This tutorial lesson uses a 300 ton machine, molding the “cover” using Polystyrene. After completing this tutorial, you can change the type of machine, plastic, or part using the **New Session** button and do a similar evaluation for this new setup.

Note: All pressures shown on the SimTech™ control panel are plastic pressures, not hydraulic oil pressures.

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II. Starting Instructions

1. To access SimTech “FreeMold” go to www.paulsonskillbuilder.com
2. Login with your email and password.

3. This will take you to your Skillbuilder Home page.
 - On this page, you will see all the Skillbuilder and SimTech Lab lessons assigned to you. In addition, you will see FreeMold. (You may have to go to page 2 or 3 in the bottom right-hand corner to see FreeMold)

Skillbuilder Home

My Student Report

Change My Password

43 records found

Lesson	Assigned	Finished	% Done		
Simtech Lab 12 (Level 2)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0%	Continue	Start Over
Simtech Lab 13 (Level 3)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0%	Continue	Start Over
FreeMold	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0%	Continue	Start Over

123

4. Find FreeMold in your list and click on either Continue or Start Over.
 - For FreeMold, clicking on Continue or Start Over are exactly the same.

FreeMold	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0%	Continue	Start Over
----------	-------------------------------------	--------------------------	----	--------------------------	----------------------------

5. You will now be on your User Sessions page.

- Any sessions you created will be listed here
- You can run or edit an existing session, or create a new session

User Sessions

Back New Session

Search Clear 3 records found

Session Name	Updated On	Units	Tolerance	Machine	Part	Plastic					
Test Lesson	2019-10-16 20:22:07	english	precision	300tn	bracket	ABS	Edit Setup	Run	Copy	View History	Delete
Flash lesson	2019-10-15 20:21:40	english	standard	100tn	cover	ABS	Edit Setup	Run	Copy	View History	Delete
Warp & Short Shots Lesson	2019-10-15 20:21:29	english	precision	150tn	bracket	Polypropylene	Edit Setup	Run	Copy	View History	Delete

6. To create a new session, click on New Session.

User Sessions

Back **New Session**

Search Clear 3 records found

Session Name	Updated On	Units	Tolerance	Machine	Part	Plastic					
Test Lesson	2019-10-16 20:22:07	english	precision	300tn	bracket	ABS	Edit Setup	Run	Copy	View History	Delete
Flash lesson	2019-10-15 20:21:40	english	standard	100tn	cover	ABS	Edit Setup	Run	Copy	View History	Delete
Warp & Short Shots Lesson	2019-10-15 20:21:29	english	precision	150tn	bracket	Polypropylene	Edit Setup	Run	Copy	View History	Delete

7. Type in a “Session Name” (we’re using SimTech User Manual) and click “Save And Exit”.


New Session

Exit Without Saving

Session Name:

Setup: NOTE: Machine, Part, and Plastic will be selected on next screen.

Save And Exit



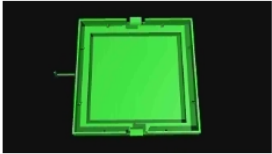
8. You will now be on the Setup page. Configure your setup page to match the setup below. When you have finished, click Save and Exit.

Setup

Name

 Enter a name for this session

Part



Part Length	in	6.500
Part Width	in	6.500
Part Thickness	in	0.080
Part Volume	in^3	5.330
Number of Cavities		2


Standard Cycle Time

 Standard Cycle Time used for Score

Units

 Choose the units to work in

Plastic

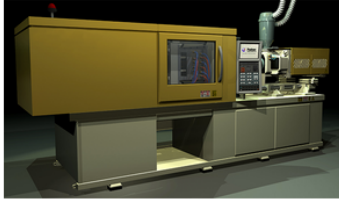


Plastic Type		PS
Low Melt Temp	F	379
High Melt Temp	F	471

Tolerance

 +/-

Machine



Max Injection Press	psi	25000
Max Clamp Force	tons	300
Max Shot Size	in^3	39.300
Max Flow Rate	in^3	25.000

9. Now Click the Run button and you will see the machine controls page.

User Sessions

Back

New Session

Search

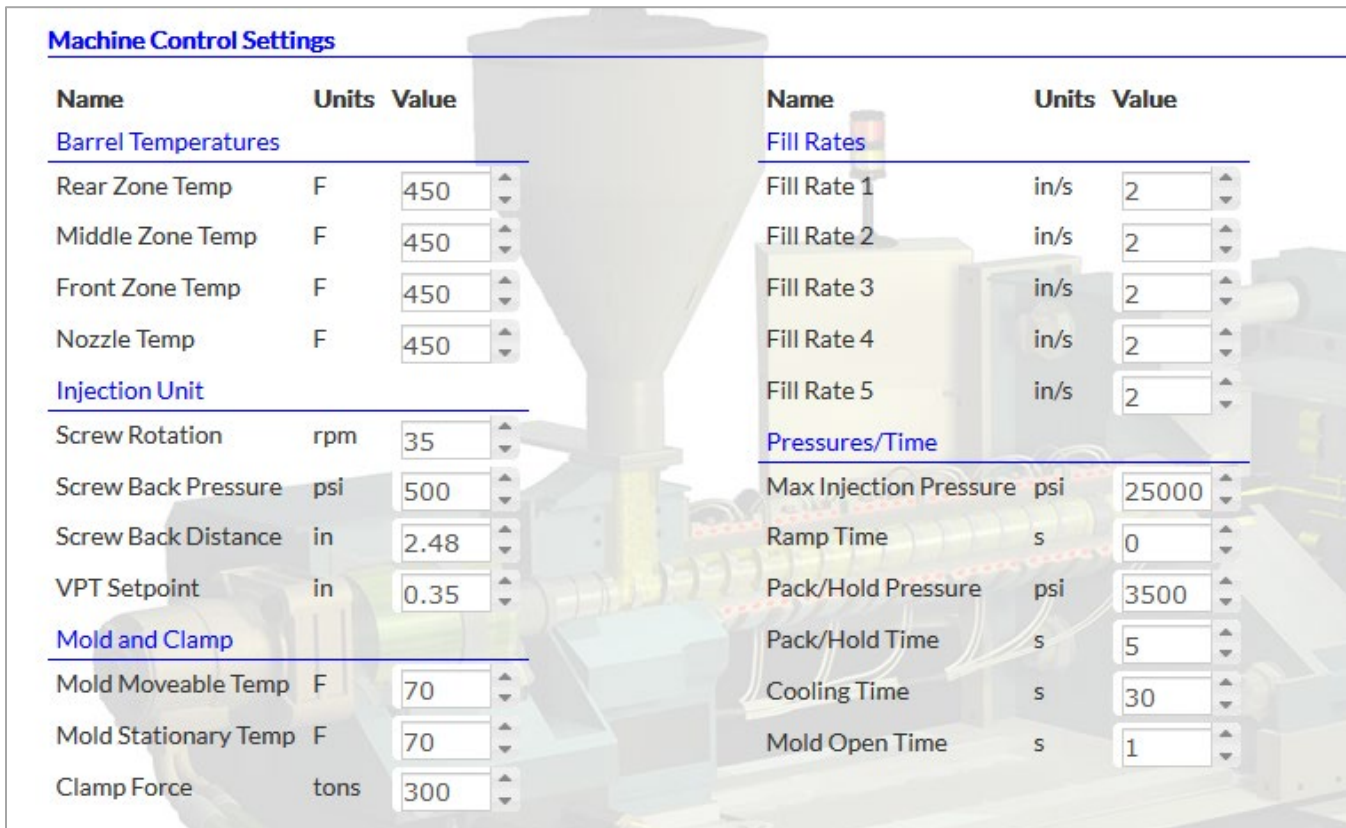
Clear

5 records found

Session Name	Updated On	Units	Tolerance	Machine	Part	Plastic					
SimTech User Manual	2019-10-23 21:00:34	english	loose	300tn	cover	Polystyrene	Edit Setup	Run	Copy	View History	Delete

10. Enter the process data just as you see below.

- You can type in number values or use the up and down arrows to change the values.



Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	450
Middle Zone Temp	F	450
Front Zone Temp	F	450
Nozzle Temp	F	450
Injection Unit		
Screw Rotation	rpm	35
Screw Back Pressure	psi	500
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	70
Mold Stationary Temp	F	70
Clamp Force	tons	300

Name	Units	Value
Fill Rates		
Fill Rate 1	in/s	2
Fill Rate 2	in/s	2
Fill Rate 3	in/s	2
Fill Rate 4	in/s	2
Fill Rate 5	in/s	2
Pressures/Time		
Max Injection Pressure	psi	25000
Ramp Time	s	0
Pack/Hold Pressure	psi	3500
Pack/Hold Time	s	5
Cooling Time	s	30
Mold Open Time	s	1

11. Click on the **Cycle** button. Wait for the molding cycle to end.

- You are molding a part with no defects.

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 0.00

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	450
Middle Zone Temp	F	450
Front Zone Temp	F	450
Nozzle Temp	F	450
Injection Unit		
Screw Rotation	rpm	35
Screw Back Pressure	psi	500
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	70
Mold Stationary Temp	F	70
Clamp Force	tons	300

Name	Units	Value
Fill Rates		
Fill Rate 1	in/s	2
Fill Rate 2	in/s	2
Fill Rate 3	in/s	2
Fill Rate 4	in/s	2
Fill Rate 5	in/s	2
Pressures/Time		
Max Injection Pressure	psi	25000
Ramp Time	s	0
Pack/Hold Pressure	psi	3500
Pack/Hold Time	s	5
Cooling Time	s	30
Mold Open Time	s	1

Cycle Results

Name	Units	Value
Melt Temp	F	445.7
Fill Time	s	1.08
Cycle Time	s	37.08
Mold Full at VPT	%	94.90
Cushion Size	in	0.231
Part Length	in	6.510
Part Weight	oz	3.149
Screw Run Time	s	8.36

Part Problems (most recent cycle to the left)

Flash	
Burn Mark	
Size (+/- 0.01 in)	
Weld Lines	
Short Shot	
Warp	
Sink Marks	
Voids	

Machine Alarms

Screw Recovery	
Max Pressure	
No Cushion	
Low Melt	
High Melt	

Cycle History Edit Setup Change Units User Sessions Page

Cycle Graphs

Injection Pressure

Pressure (psi)

Screw Travel (in)

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SimTech™

Student Tutorial Workbook

A complete step-by-step tutorial that teaches all about successfully operating **SimTech™** - the injection molding machine simulator.

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SimTech™ Tutorial – Student Workbook

I. Effects of Barrel Temperature on Melt Temperature

A. You will now determine the effect on the melt temperature of each of the barrel zone temperatures.

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 0.00

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	450
Middle Zone Temp	F	450
Front Zone Temp	F	450
Nozzle Temp	F	450
Injection Unit		
Screw Rotation	rpm	35
Screw Back Pressure	psi	500
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	70
Mold Stationary Temp	F	70
Clamp Force	tons	300

Fill Rates

Name	Units	Value
Fill Rate 1	in/s	2
Fill Rate 2	in/s	2
Fill Rate 3	in/s	2
Fill Rate 4	in/s	2
Fill Rate 5	in/s	2

Pressures/Time

Name	Units	Value
Max Injection Pressure	psi	25000
Ramp Time	s	0
Pack/Hold Pressure	psi	3500
Pack/Hold Time	s	5
Cooling Time	s	30
Mold Open Time	s	1

Cycle Results

Name	Units	Value
Melt Temp	F	445.7
Fill Time	s	1.08
Cycle Time	s	37.08
Mold Full at VPT	%	94.90
Cushion Size	in	0.231
Part Length	in	6.510
Part Weight	oz	3.149
Screw Run Time	s	8.36

Part Problems (most recent cycle to the left)

Flash	
Burn Mark	
Size (+/- 0.01 in)	
Weld Lines	
Short Shot	
Warp	
Sink Marks	
Voids	

Machine Alarms

Screw Recovery	
Max Pressure	
No Cushion	
Low Melt	
High Melt	

Cycle History: Cycle History Edit Setup Change Units User Sessions Page

Cycle Graphs

Pressure (psi)

Screw Travel (in)

What is the melt temperature? _____ °F

II. Determine the Effect of Each Barrel Zone Temperatures on the Melt Temperature

A. You will raise each barrel zone by 20°F to determine which zone has the greatest effect.

1. Raise rear zone barrel temperature to 470°F. [Cycle the machine]

What is the melt temperature? _____ °F

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 0.00

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	470
Middle Zone Temp	F	450
Front Zone Temp	F	450
Nozzle Temp	F	450
Injection Unit		
Screw Rotation	rpm	35
Screw Back Pressure	psi	500
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	70
Mold Stationary Temp	F	70
Clamp Force	tons	300

Cycle Results

Name	Units	Value
Melt Temp	F	447.0
Fill Time	s	1.08
Cycle Time	s	37.08
Mold Full at VPT	%	94.90
Cushion Size	in	0.231
Part Length	in	6.510
Part Weight	oz	3.149
Screw Run Time	s	8.37

Part Problems (most recent cycle to the left)

Flash	
Burn Mark	
Size (+/- 0.01 in)	
Weld Lines	
Short Shot	
Warp	
Sink Marks	
Voids	

Machine Alarms

Screw Recovery	●
Max Pressure	●
No Cushion	●
Low Melt	●
High Melt	●

Cycle Graphs

Pressure (psi)

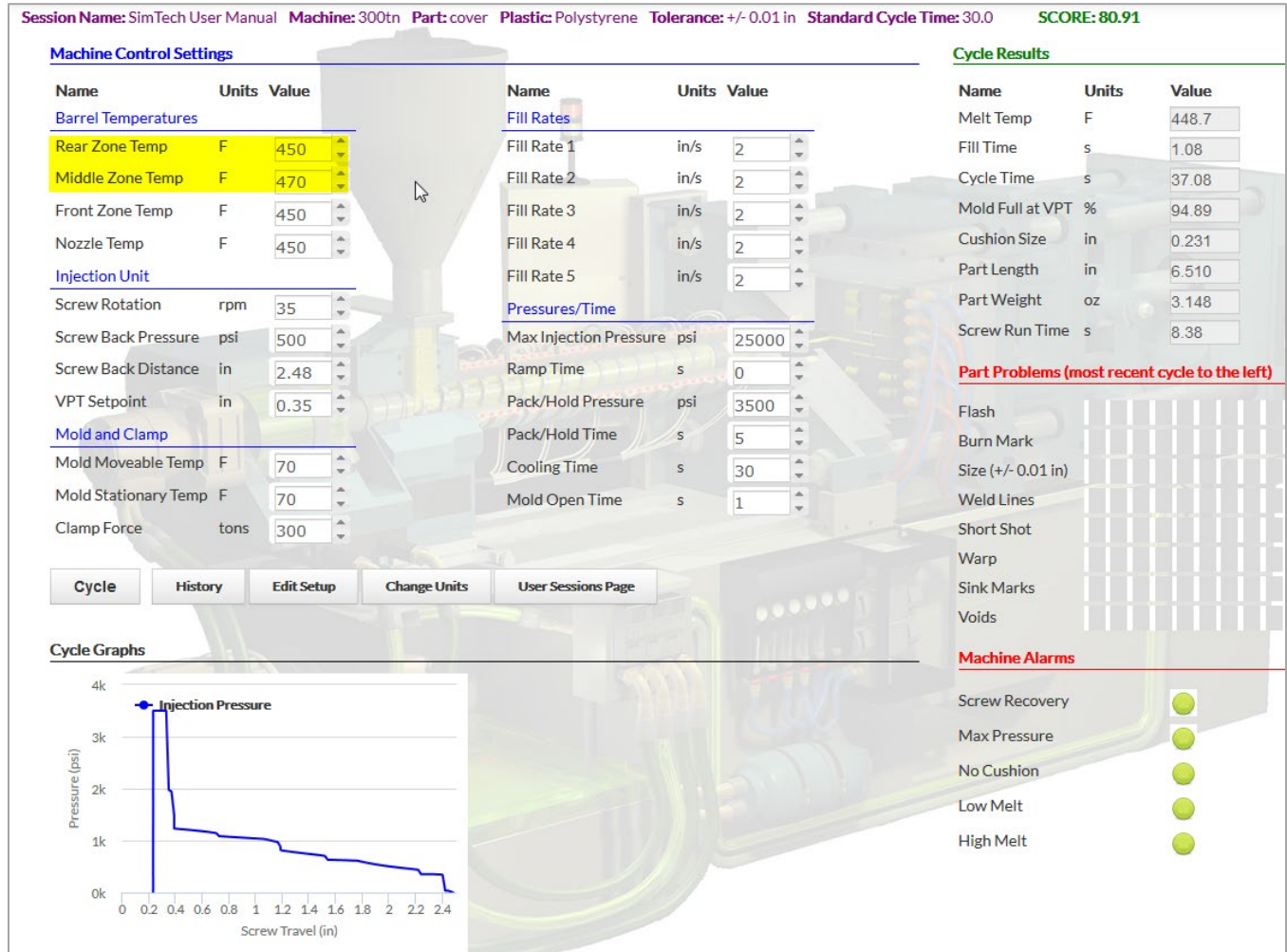
Screw Travel (in)

Injection Pressure

Cycle History Edit Setup Change Units User Sessions Page

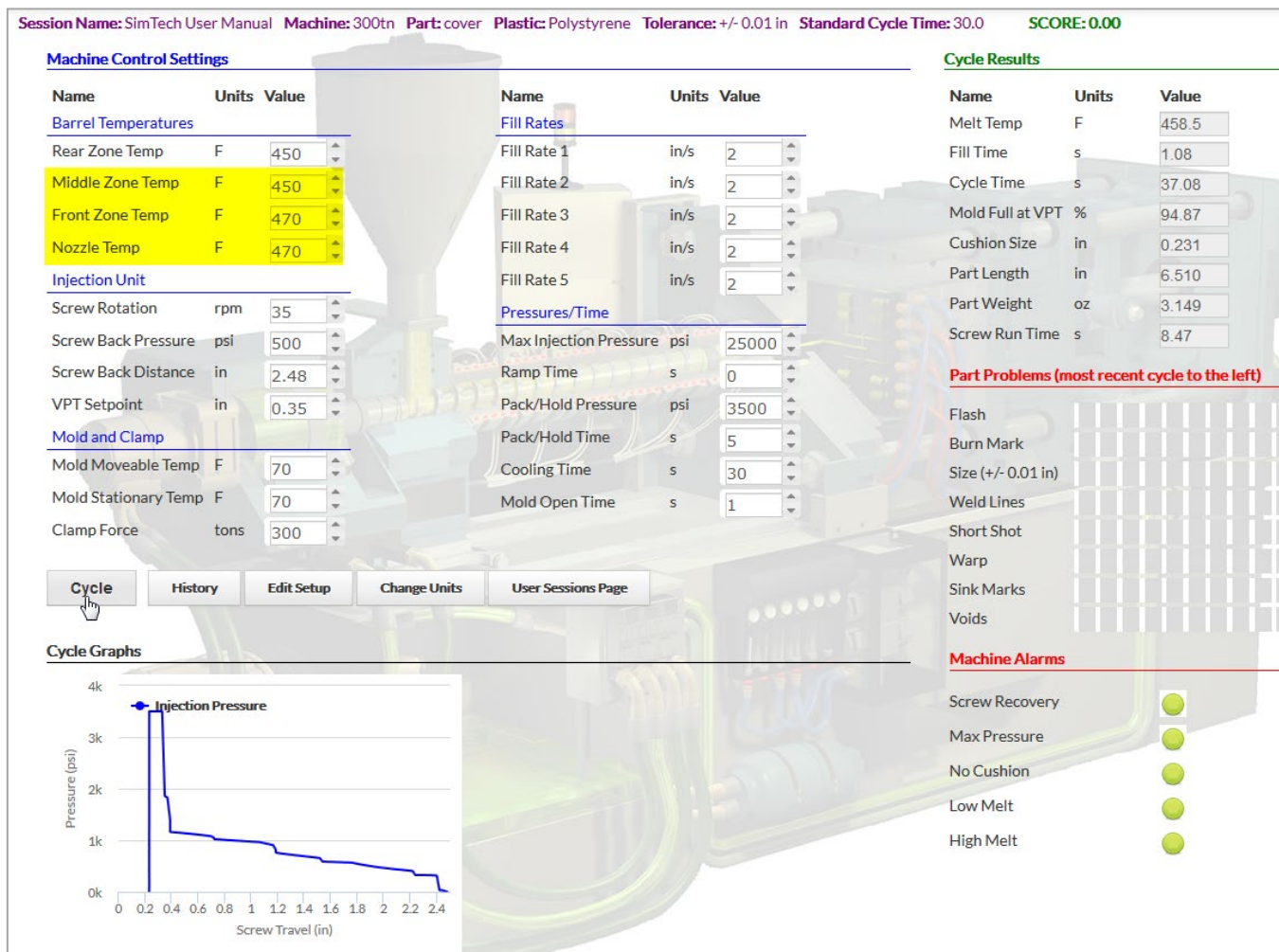
2. Raise the middle zone temperature to 470°F and set the rear zone temperature back to 450°F.
[Cycle the machine]

What is the melt temperature? _____ °F



3. Raise the front zone barrel temperature and nozzle temperature to 470°F and set the middle zone back to 450°F. [Cycle the machine]

What is the melt temperature? _____ °F



Which zone affected the melt temperature the most? _____

Why? _____

4. Typical barrel zone settings for this plastic are: 450°F nozzle, 450°F front, 450°F middle, 400°F rear. Set the zones to these settings. [Cycle the machine]

What is the melt temperature? _____ °F

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 0.00

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	400
Middle Zone Temp	F	450
Front Zone Temp	F	450
Nozzle Temp	F	450
Injection Unit		
Screw Rotation	rpm	35
Screw Back Pressure	psi	500
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	70
Mold Stationary Temp	F	70
Clamp Force	tons	300

Cycle Results

Name	Units	Value
Melt Temp	F	441.7
Fill Time	s	1.08
Cycle Time	s	37.08
Mold Full at VPT	%	94.91
Cushion Size	in	0.231
Part Length	in	6.510
Part Weight	oz	3.149
Screw Run Time	s	8.32

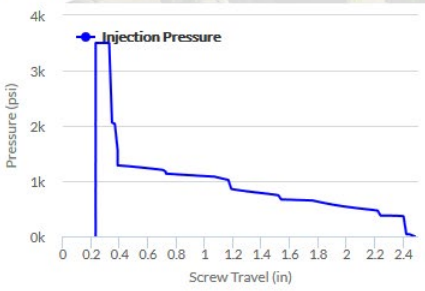
Part Problems (most recent cycle to the left)

Flash	
Burn Mark	
Size (+/- 0.01 in)	
Weld Lines	
Short Shot	
Warp	
Sink Marks	
Voids	

Machine Alarms

Screw Recovery	
Max Pressure	
No Cushion	
Low Melt	
High Melt	

Cycle Graphs

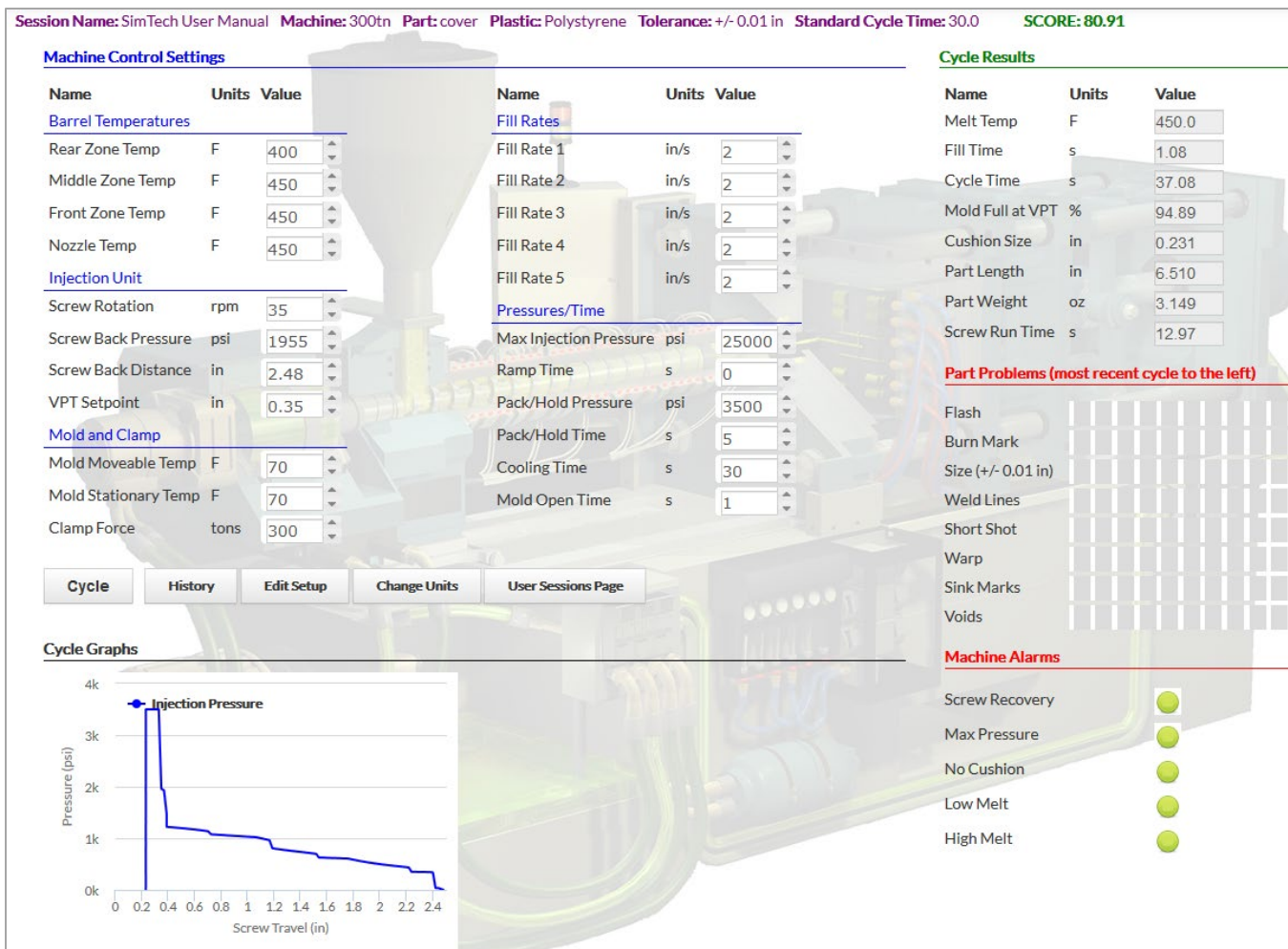


III. Determine the Effect of the Back Pressure on the Melt Temperature

A. Increased back pressure causes more heating of the plastic in the barrel.

1. Raise the back pressure and repeat the cycle until melt temperature is the same as the front zone temperature. (i.e. 450°F)

What is the back pressure when the melt temperature is 450°F? _____ psi



Explain why the melt temperature increased when the back pressure was increased.

Why is it best to have the front zone temperature and the melt temperature the same?

IV. Effects of Screw Back Setting

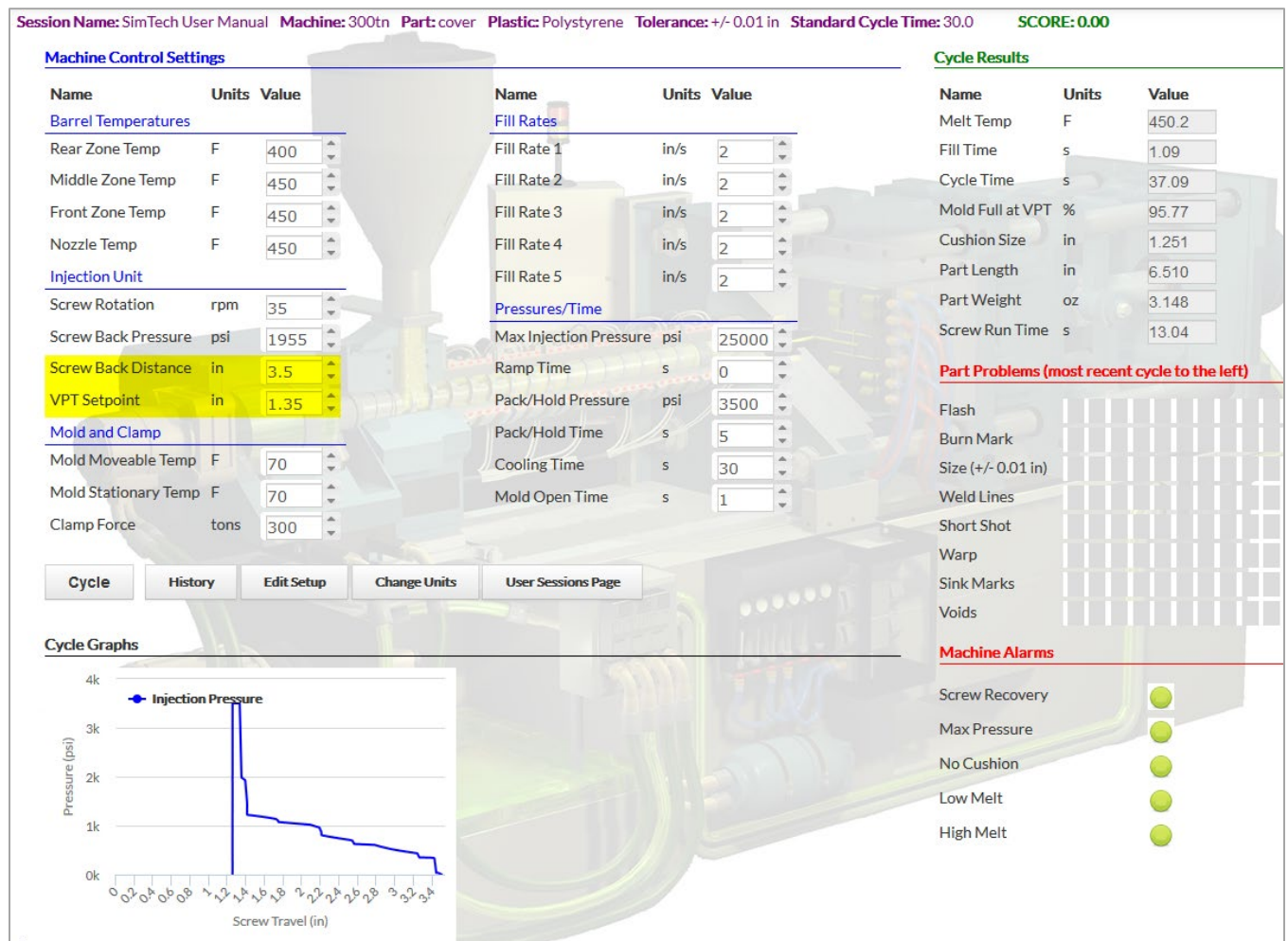
A. The screw back setting determines how far back the screw returns when it rotates. Screw back setting also controls the cushion size.

1. Set the screw back distance to 3.5" and the VPT setpoint to 1.35". [Cycle]

What is the present cushion size? _____ in

Is the cushion size all Right? _____

Explain: _____



2. Reduce the screw back setting to 2.0" and the VPT setpoint to 0.4". [Cycle]

What happened? _____

Why? _____

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 0.00

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	400
Middle Zone Temp	F	450
Front Zone Temp	F	450
Nozzle Temp	F	450
Injection Unit		
Screw Rotation	rpm	35
Screw Back Pressure	psi	1955
Screw Back Distance	in	2
VPT Setpoint	in	0.4
Mold and Clamp		
Mold Moveable Temp	F	70
Mold Stationary Temp	F	70
Clamp Force	tons	300

Cycle Results

Name	Units	Value
Melt Temp	F	450.8
Fill Time	s	0.83
Cycle Time	s	36.83
Mold Full at VPT	%	71.61
Cushion Size	in	0.000
Part Length	in	6.269
Part Weight	oz	3.128
Screw Run Time	s	11.48

Part Problems (most recent cycle to the left)

Flash	
Burn Mark	
Size (+/- 0.01 in)	
Weld Lines	
Short Shot	
Warp	
Sink Marks	
Voids	

Machine Alarms

Screw Recovery	
Max Pressure	
No Cushion	
Low Melt	
High Melt	

Cycle Graphs

Pressure (psi)

Injection Pressure

Screw Travel (in)

3. Set the screw back position so that the cushion size is between 0.125" and 0.250" [Cycle].

Note: In the ProMolder Series we consider an optimized cushion to be in a range of 5-10% of the total shot size.

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 80.91

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	400
Middle Zone Temp	F	450
Front Zone Temp	F	450
Nozzle Temp	F	450
Injection Unit		
Screw Rotation	rpm	35
Screw Back Pressure	psi	1955
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	70
Mold Stationary Temp	F	70
Clamp Force	tons	300

Cycle Results

Name	Units	Value
Melt Temp	F	450.0
Fill Time	s	1.08
Cycle Time	s	37.08
Mold Full at VPT	%	94.89
Cushion Size	in	0.231
Part Length	in	6.510
Part Weight	oz	3.149
Screw Run Time	s	12.97

Part Problems (most recent cycle to the left)

Flash	
Burn Mark	
Size (+/- 0.01 in)	<div></div>
Weld Lines	
Short Shot	<div></div>
Warp	
Sink Marks	
Voids	

Machine Alarms

Screw Recovery	<div></div>
Max Pressure	<div></div>
No Cushion	<div></div>
Low Melt	<div></div>
High Melt	<div></div>

Cycle Graphs



Cycle

History

Edit Setup

Change Units

User Sessions Page

What is the screw back position you have set? _____

What is the VPT setpoint you have set? _____

What is the melt temperature? _____ °F

Note: Do not re-adjust back pressure yet.

V. Determine the Effect of Screw RPM on the Melt Temperature

A. Screw rpm can also affect the plastic temperature, but the magnitude of the affect depends on the screw design and the amount of non-Newtonian viscosity change that occurs.

1. Increase screw rpm to 150. [Cycle]

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 0.00

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	400
Middle Zone Temp	F	450
Front Zone Temp	F	450
Nozzle Temp	F	450
Injection Unit		
Screw Rotation	rpm	150
Screw Back Pressure	psi	1955
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	70
Mold Stationary Temp	F	70
Clamp Force	tons	300

Cycle Results

Name	Units	Value
Melt Temp	F	453.0
Fill Time	s	1.08
Cycle Time	s	37.08
Mold Full at VPT	%	94.88
Cushion Size	in	0.231
Part Length	in	6.510
Part Weight	oz	3.149
Screw Run Time	s	2.42

Part Problems (most recent cycle to the left)

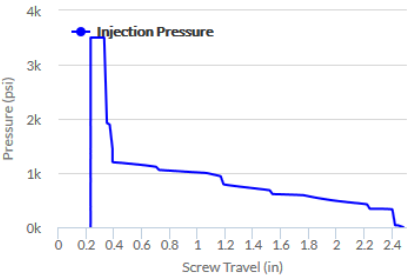
Flash	
Burn Mark	
Size (+/- 0.01 in)	
Weld Lines	
Short Shot	
Warp	
Sink Marks	
Voids	

Machine Alarms

Screw Recovery	
Max Pressure	
No Cushion	
Low Melt	
High Melt	

Cycle Graphs

Injection Pressure



What is the melt temperature? _____ °F

Why did the melt temperature increase? _____

2. Adjust the back pressure so that the melt temperature is 450°F. [Cycle]

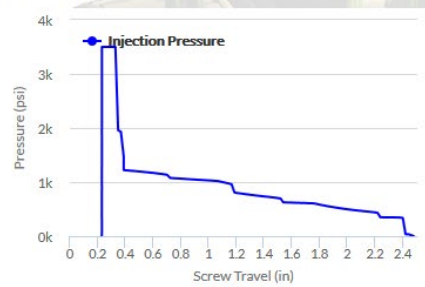
Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 80.91

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	400
Middle Zone Temp	F	450
Front Zone Temp	F	450
Nozzle Temp	F	450
Injection Unit		
Screw Rotation	rpm	150
Screw Back Pressure	psi	1335
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	70
Mold Stationary Temp	F	70
Clamp Force	tons	300

Cycle History Edit Setup Change Units User Sessions Page

Cycle Graphs



Cycle Results

Name	Units	Value
Melt Temp	F	450.0
Fill Time	s	1.08
Cycle Time	s	37.08
Mold Full at VPT	%	94.89
Cushion Size	in	0.231
Part Length	in	6.510
Part Weight	oz	3.149
Screw Run Time	s	2.14

Part Problems (most recent cycle to the left)

Flash	
Burn Mark	
Size (+/- 0.01 in)	
Weld Lines	
Short Shot	
Warp	
Sink Marks	
Voids	

Machine Alarms

Screw Recovery	
Max Pressure	
No Cushion	
Low Melt	
High Melt	

What is the back pressure to achieve 450°F melt temperature? _____ psi

VI. Maximum Injection Pressure Alarm

A. The Maximum Injection Pressure Alarm will activate if the machine has tried to exceed its maximum injection pressure.

1. Reduce max injection pressure to 1,100 psi. and reduce the Pack/Hold pressure to 1,000 psi [Cycle]

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 0.00

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	400
Middle Zone Temp	F	450
Front Zone Temp	F	450
Nozzle Temp	F	450
Injection Unit		
Screw Rotation	rpm	150
Screw Back Pressure	psi	1335
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	70
Mold Stationary Temp	F	70
Clamp Force	tons	300

Fill Rates

Name	Units	Value
Fill Rate 1	in/s	2
Fill Rate 2	in/s	2
Fill Rate 3	in/s	2
Fill Rate 4	in/s	2
Fill Rate 5	in/s	2

Pressures/Time

Max Injection Pressure	psi	1100
Ramp Time	s	0
Pack/Hold Pressure	psi	1000
Pack/Hold Time	s	5
Cooling Time	s	30
Mold Open Time	s	1

Cycle Results

Name	Units	Value
Melt Temp	F	450.0
Fill Time	s	0.00
Cycle Time	s	36.00
Mold Full at VPT	%	94.75
Cushion Size	in	0.330
Part Length	in	6.419
Part Weight	oz	3.170
Screw Run Time	s	2.14

Part Problems (most recent cycle to the left)

Flash		
Burn Mark		
Size (+/- 0.01 in)		
Weld Lines		
Short Shot		
Warp		
Sink Marks		
Voids		

Machine Alarms

Screw Recovery	●
Max Pressure	●
No Cushion	●
Low Melt	●
High Melt	●

Cycle Graphs

2k
1k
0k

Pressure (psi)

Injection Pressure

0 0.2 0.4 0.6 0.8 1 1.2 1.4 1.6 1.8 2 2.2 2.4

Screw Travel (in)

Why did the Low Max Injection Pressure alarm occur? _____

2. Raise the max injection pressure to 10,000 psi and the Pack/Hold pressure to 1,700 psi. [Cycle]

- You should get a good part.

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 80.66

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	400
Middle Zone Temp	F	450
Front Zone Temp	F	450
Nozzle Temp	F	450
Injection Unit		
Screw Rotation	rpm	150
Screw Back Pressure	psi	1335
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	70
Mold Stationary Temp	F	70
Clamp Force	tons	300

Cycle History Edit Setup Change Units User Sessions Page

Cycle Results

Name	Units	Value
Melt Temp	F	450.0
Fill Time	s	1.19
Cycle Time	s	37.19
Mold Full at VPT	%	94.89
Cushion Size	in	0.231
Part Length	in	6.506
Part Weight	oz	3.132
Screw Run Time	s	2.14

Part Problems (most recent cycle to the left)

Flash	
Burn Mark	
Size (+/- 0.01 in)	
Weld Lines	
Short Shot	
Warp	
Sink Marks	
Voids	

Machine Alarms

Screw Recovery	●
Max Pressure	●
No Cushion	●
Low Melt	●
High Melt	●

Cycle Graphs

Injection Pressure

Pressure (psi)

Screw Travel (in)

VII. The Screw RPM Alarm

A. The Screw Recovery Alarm will activate if the screw does not rotate fast enough thus, enabling the screw to return to the Screw Back Distance setting before the next shot.

1. Lower the screw speed to 13 rpm. **[Cycle]**

What alarm occurred? _____

Why? _____

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 0.00

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	400
Middle Zone Temp	F	450
Front Zone Temp	F	450
Nozzle Temp	F	450
Injection Unit		
Screw Rotation	rpm	13
Screw Back Pressure	psi	1335
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	70
Mold Stationary Temp	F	70
Clamp Force	tons	300

Cycle Results

Name	Units	Value
Melt Temp	F	448.1
Fill Time	s	1.05
Cycle Time	s	37.05
Mold Full at VPT	%	76.94
Cushion Size	in	0.000
Part Length	in	6.270
Part Weight	oz	3.121
Screw Run Time	s	30.00

Part Problems (most recent cycle to the left)

Flash	
Burn Mark	
Size (+/- 0.01 in)	
Weld Lines	
Short Shot	
Warp	
Sink Marks	
Voids	

Machine Alarms

Screw Recovery	●
Max Pressure	●
No Cushion	●
Low Melt	●
High Melt	●

Cycle Graphs

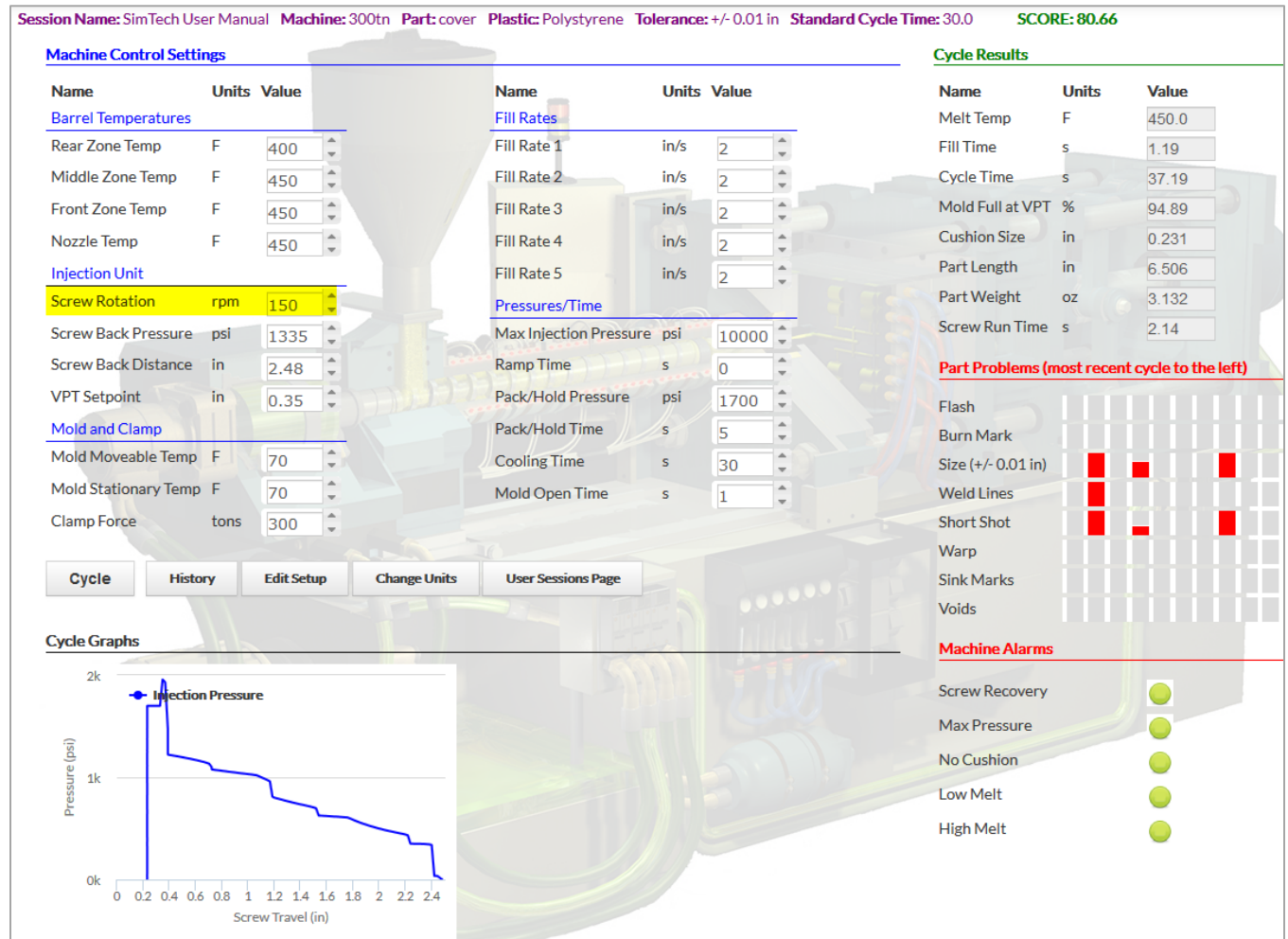
Pressure (psi)

Screw Travel (in)

Cycle History: **Cycle** | History | Edit Setup | Change Units | User Sessions Page

2. Raise rpm to 150. [Cycle]

- You should get a good part.



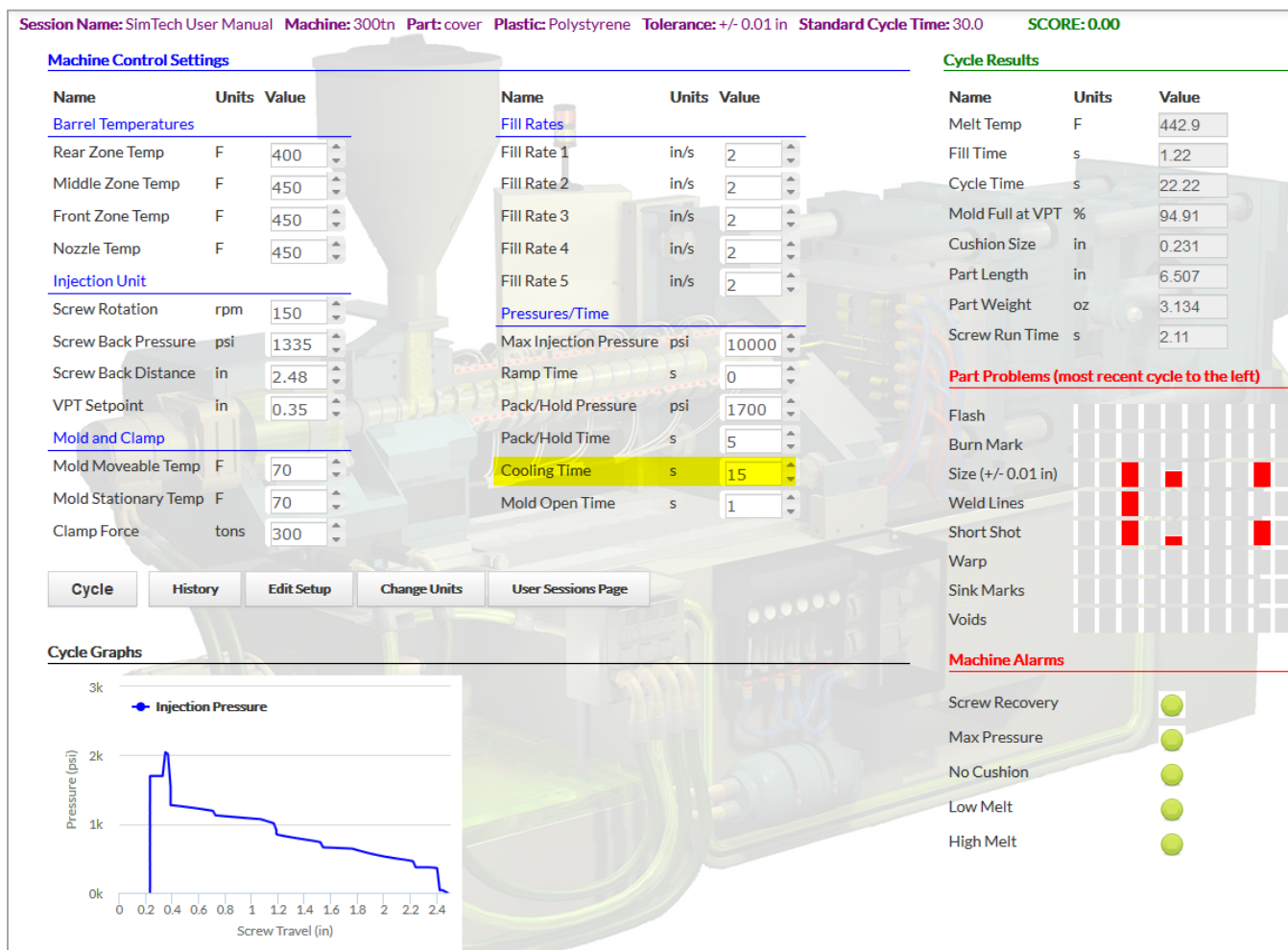
What is the melt temperature? _____ °F

VIII. Determine the Effect of the Mold Closed Time on the Melt Temperature

A. You will explore how the mold closed timer can affect the melt temperature.

1. Reduce mold closed time to 15 seconds. [Cycle]

(the cooling time is the same thing as the mold closed time)



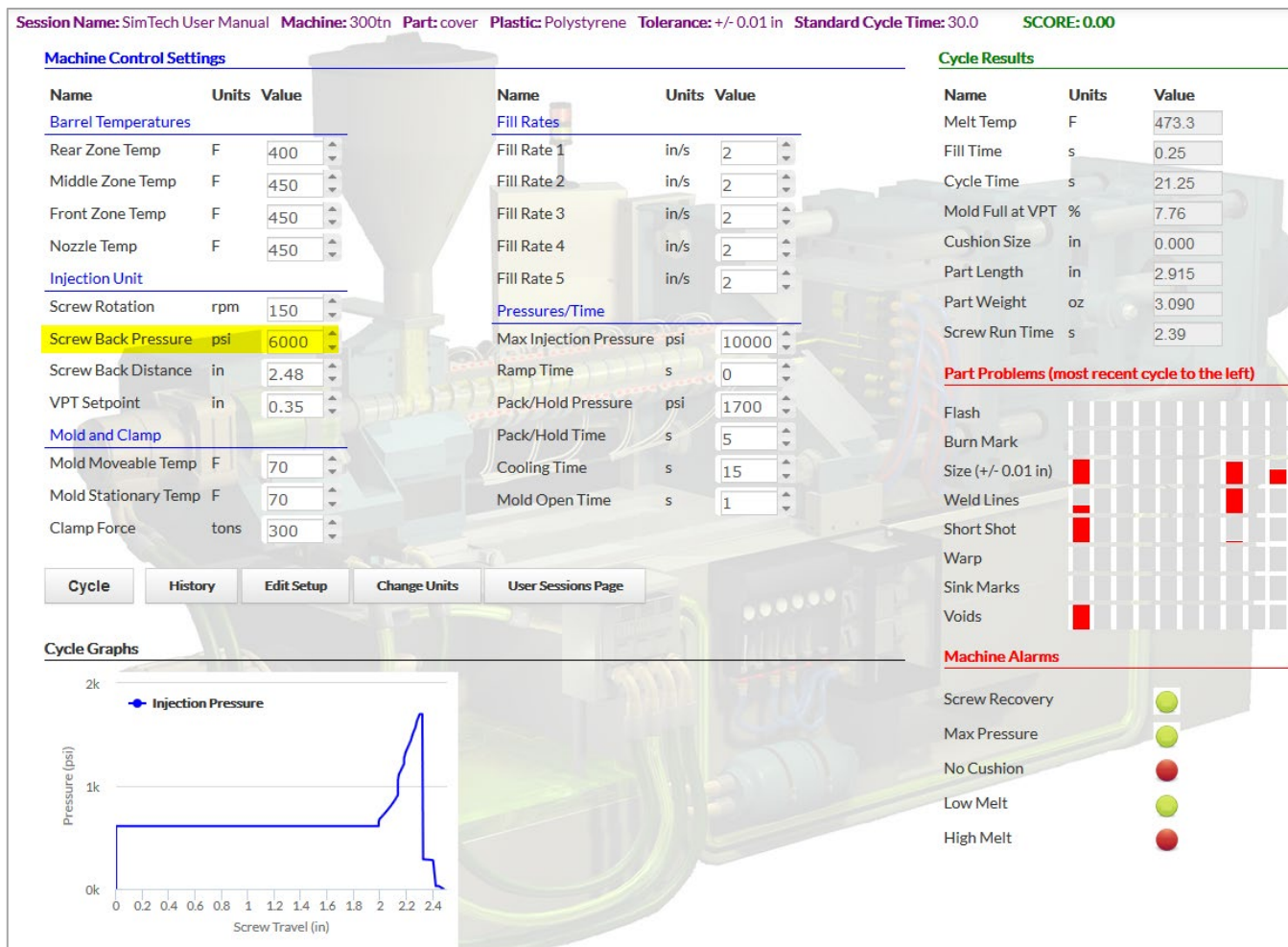
What is melt temperature? _____ °F

Why did the melt temperature decrease? _____

IX. The Back Pressure and No Cushion Alarms

A. Why the back pressure and no cushion alarms come on

1. Raise back pressure to 6000 psi. [Cycle]



What alarms occurred? _____

Why? _____

2. Reset the back pressure to 2,325 psi. [Cycle]

- You should get a good part.

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 135.17

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	400
Middle Zone Temp	F	450
Front Zone Temp	F	450
Nozzle Temp	F	450
Injection Unit		
Screw Rotation	rpm	150
Screw Back Pressure	psi	2325
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	70
Mold Stationary Temp	F	70
Clamp Force	tons	300

Cycle Results

Name	Units	Value
Melt Temp	F	449.6
Fill Time	s	1.19
Cycle Time	s	22.19
Mold Full at VPT	%	94.89
Cushion Size	in	0.231
Part Length	in	6.506
Part Weight	oz	3.133
Screw Run Time	s	2.57

Pressures/Time

Name	Units	Value
Fill Rates		
Fill Rate 1	in/s	2
Fill Rate 2	in/s	2
Fill Rate 3	in/s	2
Fill Rate 4	in/s	2
Fill Rate 5	in/s	2
Pressures/Time		
Max Injection Pressure	psi	10000
Ramp Time	s	0
Pack/Hold Pressure	psi	1700
Pack/Hold Time	s	5
Cooling Time	s	15
Mold Open Time	s	1

Part Problems (most recent cycle to the left)

Problem	Flash	Burn Mark	Size (+/- 0.01 in)	Weld Lines	Short Shot	Warp	Sink Marks	Voids
Flash								
Burn Mark								
Size (+/- 0.01 in)								
Weld Lines								
Short Shot								
Warp								
Sink Marks								
Voids								

Machine Alarms

Screw Recovery	●
Max Pressure	●
No Cushion	●
Low Melt	●
High Melt	●

Cycle Graphs

Pressure (psi)

Screw Travel (in)

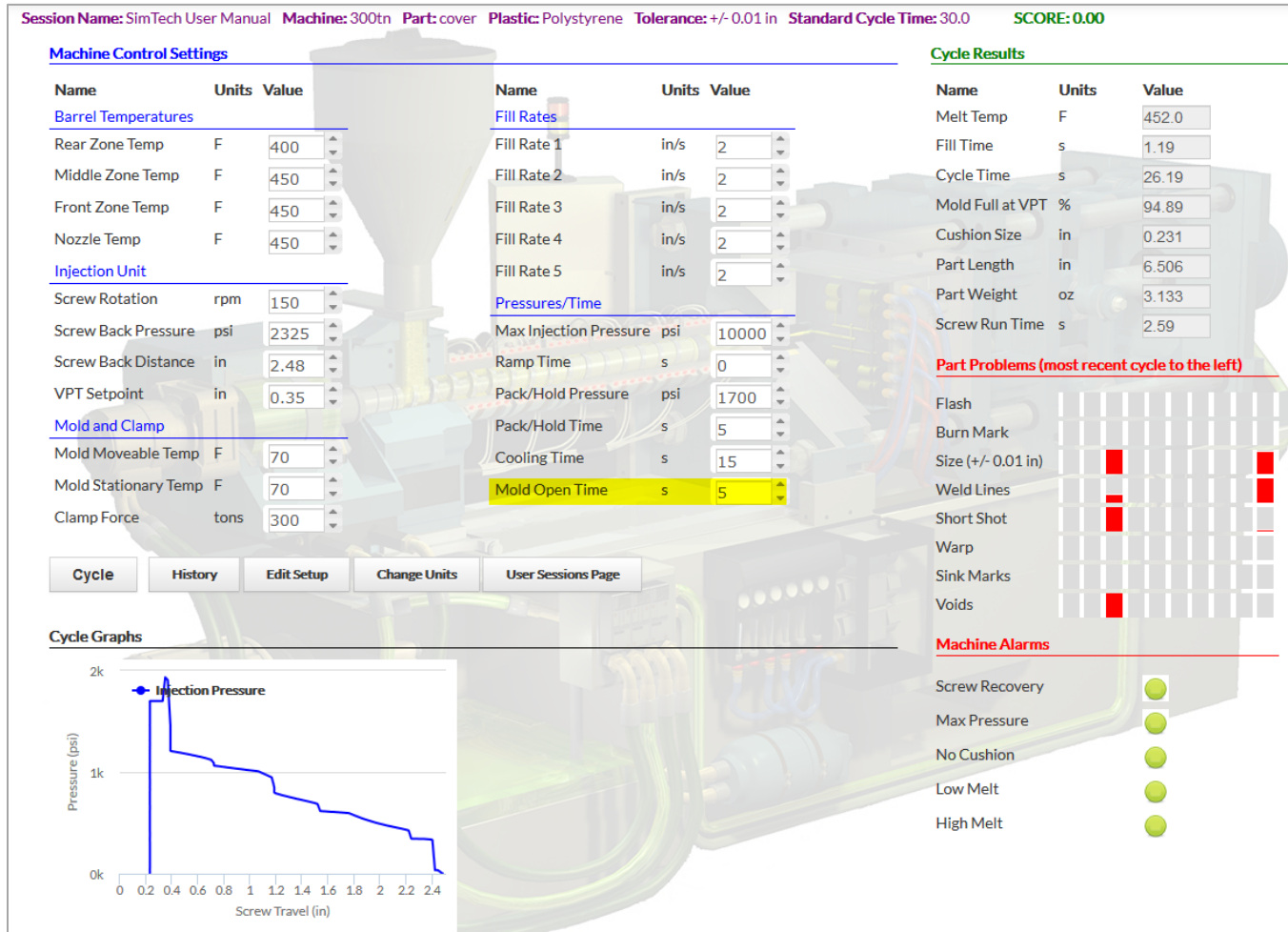
Injection Pressure

Cycle **History** **Edit Setup** **Change Units** **User Sessions Page**

X. Determine the Effect of Mold Open Time on the Melt Temperature

A. You will explore how the mold open timer can affect the melt temperature.

1. Increase the mold open time to 5 seconds. [Cycle]



What is the melt temperature? _____ °F

Why did the temperature increase? _____

2. Set the mold open time to 1 seconds. [Cycle]

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 135.17

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	400
Middle Zone Temp	F	450
Front Zone Temp	F	450
Nozzle Temp	F	450
Injection Unit		
Screw Rotation	rpm	150
Screw Back Pressure	psi	2325
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	70
Mold Stationary Temp	F	70
Clamp Force	tons	300

Fill Rates

Name	Units	Value
Fill Rate 1	in/s	2
Fill Rate 2	in/s	2
Fill Rate 3	in/s	2
Fill Rate 4	in/s	2
Fill Rate 5	in/s	2

Pressures/Time

Name	Units	Value
Max Injection Pressure	psi	10000
Ramp Time	s	0
Pack/Hold Pressure	psi	1700
Pack/Hold Time	s	5
Cooling Time	s	15
Mold Open Time	s	1

Cycle Results

Name	Units	Value
Melt Temp	F	449.6
Fill Time	s	1.19
Cycle Time	s	22.19
Mold Full at VPT	%	94.89
Cushion Size	in	0.231
Part Length	in	6.506
Part Weight	oz	3.133
Screw Run Time	s	2.57

Part Problems (most recent cycle to the left)

Problem	Count
Flash	0
Burn Mark	0
Size (+/- 0.01 in)	0
Weld Lines	0
Short Shot	0
Warp	0
Sink Marks	0
Voids	0

Machine Alarms

Screw Recovery	●
Max Pressure	●
No Cushion	●
Low Melt	●
High Melt	●

Cycle History Edit Setup Change Units User Sessions Page

Cycle Graphs

Pressure (psi)

Screw Travel (in)

Injection Pressure

XI. Determine the Effect of the Mold Temperature on the Melt Temperature

A. You will explore how the mold temperature can affect the melt temperature.

1. Set mold temperature to 110°F (both halves). [Cycle]

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 0.00

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	400
Middle Zone Temp	F	450
Front Zone Temp	F	450
Nozzle Temp	F	450
Injection Unit		
Screw Rotation	rpm	150
Screw Back Pressure	psi	2325
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	110
Mold Stationary Temp	F	110
Clamp Force	tons	300

Cycle Results

Name	Units	Value
Melt Temp	F	449.6
Fill Time	s	1.15
Cycle Time	s	22.15
Mold Full at VPT	%	94.86
Cushion Size	in	0.231
Part Length	in	6.505
Part Weight	oz	3.127
Screw Run Time	s	2.57

Part Problems (most recent cycle to the left)

Flash	
Burn Mark	
Size (+/- 0.01 in)	
Weld Lines	
Short Shot	
Warp	
Sink Marks	
Voids	

Machine Alarms

Screw Recovery	
Max Pressure	
No Cushion	
Low Melt	
High Melt	

Pressures/Time

Max Injection Pressure	psi	10000
Ramp Time	s	0
Pack/Hold Pressure	psi	1700
Pack/Hold Time	s	5
Cooling Time	s	15
Mold Open Time	s	1

Fill Rates

Fill Rate 1	in/s	2
Fill Rate 2	in/s	2
Fill Rate 3	in/s	2
Fill Rate 4	in/s	2
Fill Rate 5	in/s	2

Cycle Graphs

Pressure (psi)

Screw Travel (in)

Cycle History: Cycle, History, Edit Setup, Change Units, User Sessions Page

What is the melt temperature? _____ °F

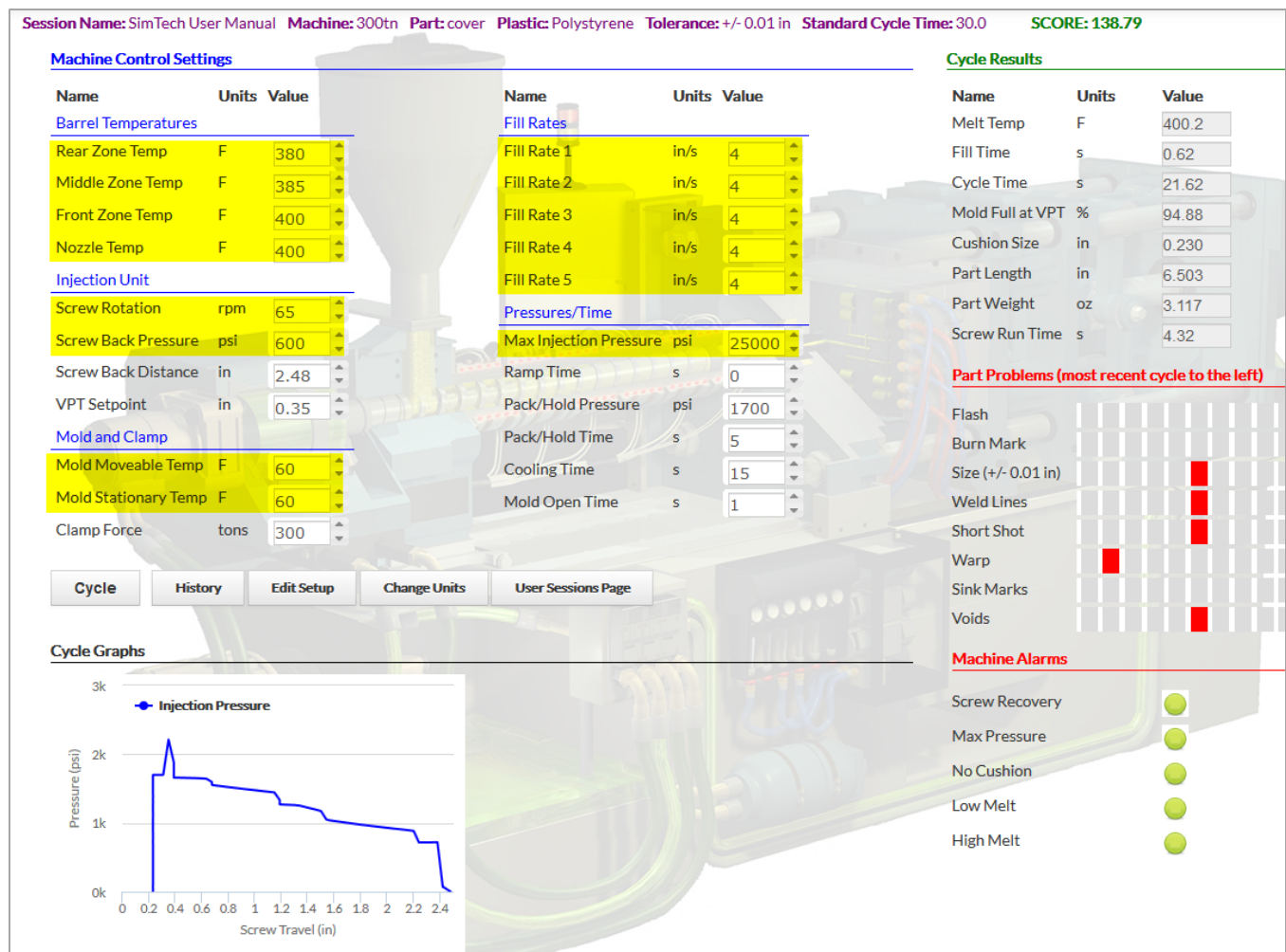
Does the mold temperature affect the melt temperature in the barrel? _____

XII. Determine the Effects of Fill Rates on the Molded Parts

A. You will explore how fill rates can affect the molded parts.

1. Set barrel rear zone to 380°F, middle zone to 385°F, front and nozzle to 400°F [Cycle]
2. Set screw rotation to 65 rpm and screw back pressure to 600 psi. [Cycle]
3. Set mold temperature to 60°F (both halves). [Cycle]
4. Set all fill rates 4.0 in/sec. [Cycle]
5. Set the max injection pressure to 25,000 psi. [Cycle]

Note: This molding machine has a maximum fill rate of 25 inches per second.



What is the fill time? _____ sec

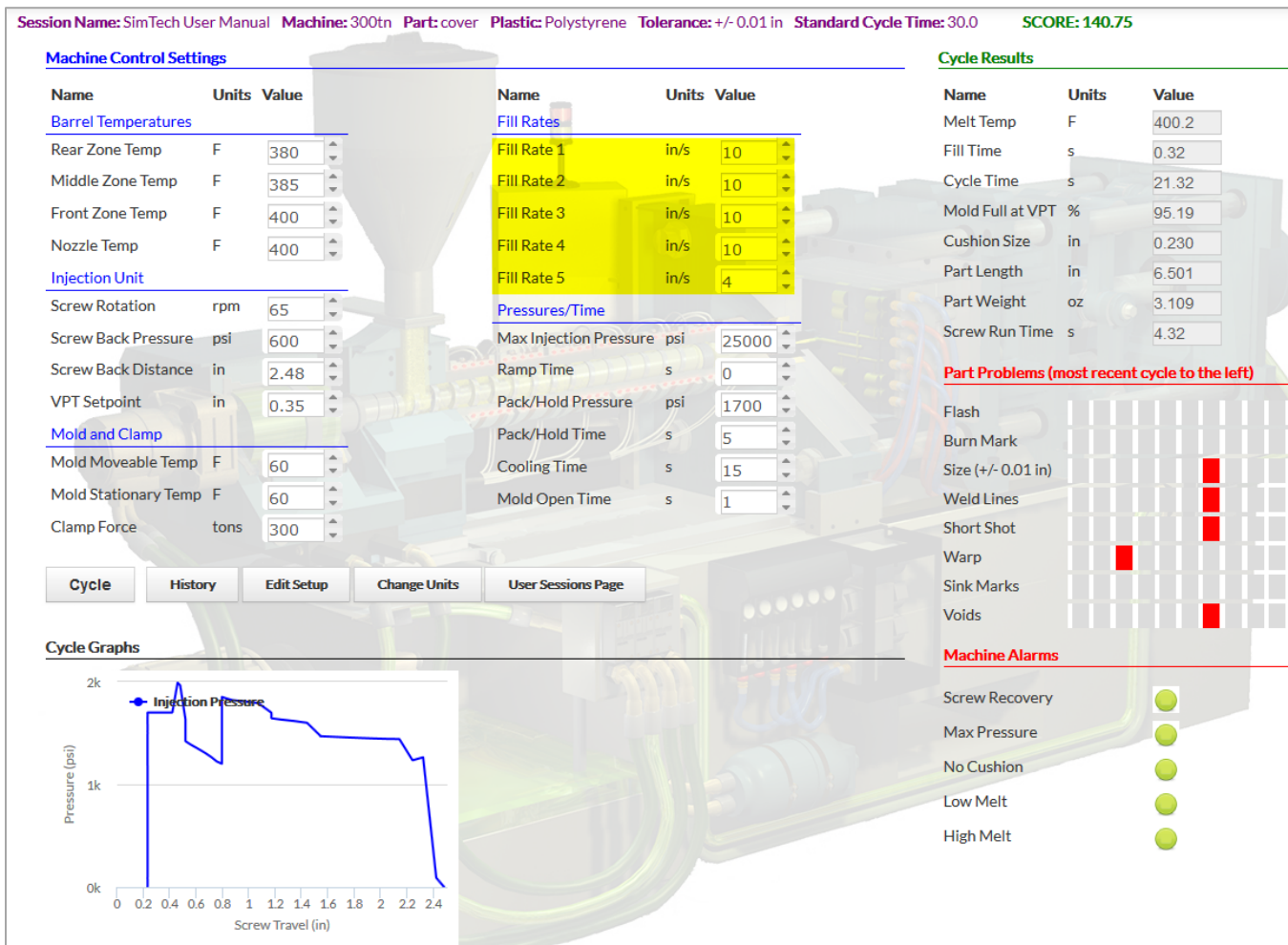
What is the cycle time? _____ sec

What is the part weight? _____ oz.

What is the part length? _____ in

6. Set Fill Rates 1, 2, 3, and 4 to 10.0 in/sec.

7. Set Fill Rate 5 to 4.0 in/sec. [Cycle]



What is the fill time? _____ sec

What is the cycle time? _____ sec

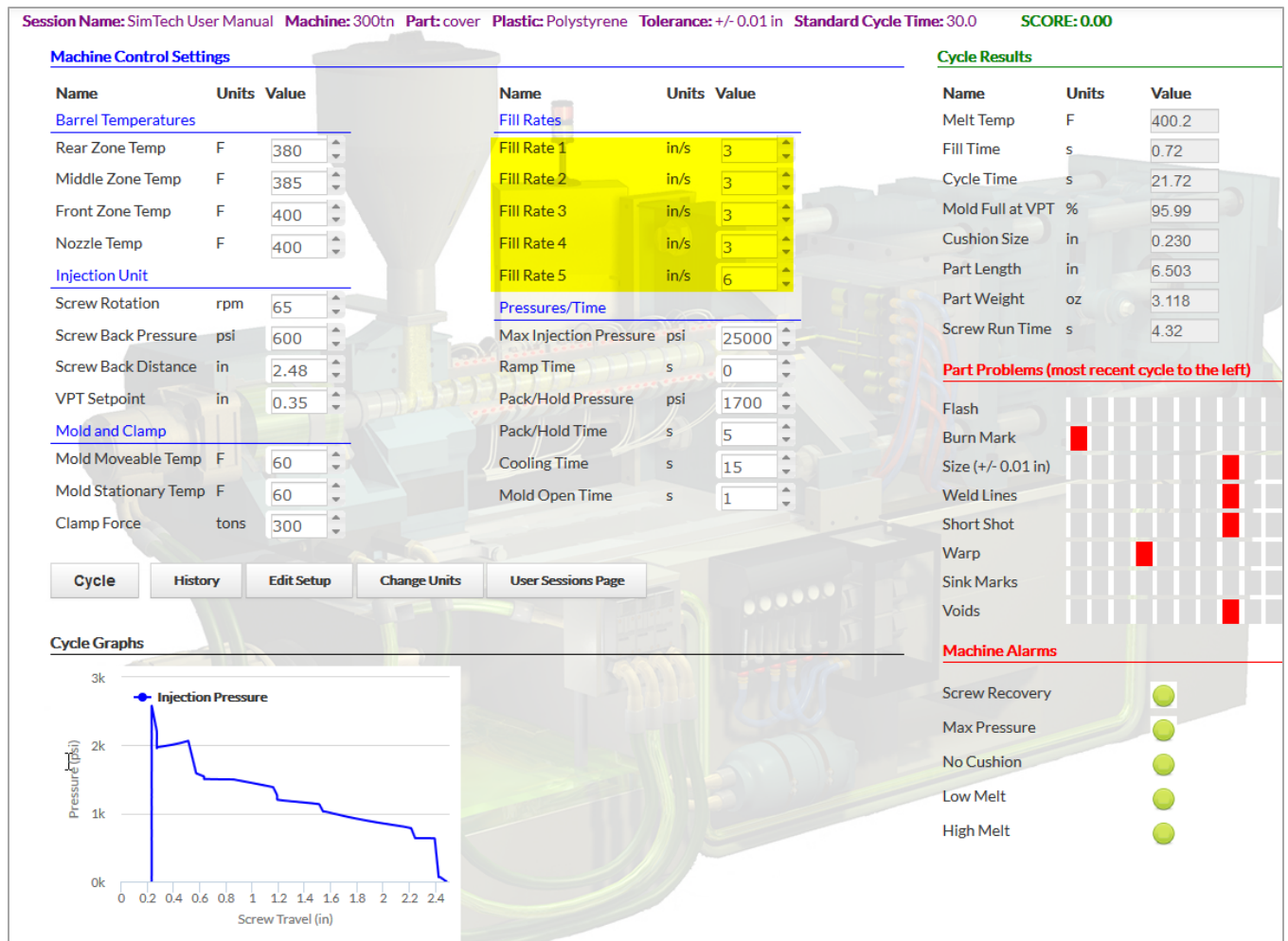
What is the part weight? _____ oz.

What is the part length? _____ in

What changes occurred to the molded parts? _____

8. Set Fill Rates 1, 2, 3, and 4 to 3.0 in/sec.

9. Set Fill Rate 5 to 6.0 in/sec. **[Cycle]**



What is the fill time? _____ sec

What is the cycle time? _____ sec

What is the part weight? _____ oz.

What is the part length? _____ in

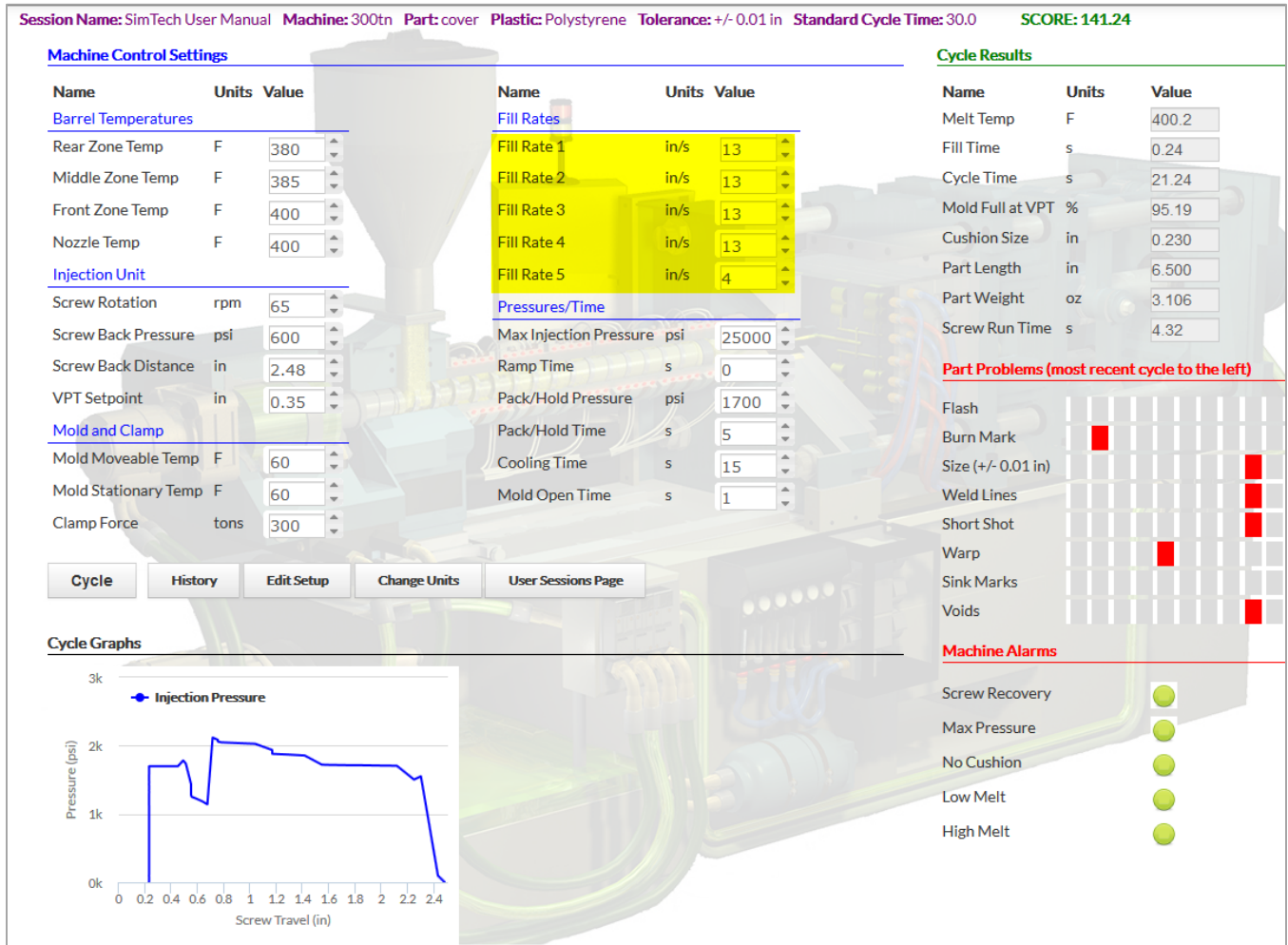
What happened to part weight and dimensions when the final Fill Rate 5 is very fast?

Why? _____

10. Set Fill Rates 1, 2, 3, and 4 to 13.0 in/sec.

11. Set Fill Rate 5 to 4.0 in/sec. **[Cycle]**

- You should get a good part.



What is the fill time? _____ sec

What is the cycle time? _____ sec

What is the part weight? _____ oz.

What is the part length? _____ in

What happened to part weight and dimensions when final Fill Rate 5 is reduced? _____

Why? _____

Fill Rates Conclusions:

- Very high fill rates require high injection pressures.
- Of all the fill rates, the final Fill Rate 5 has the greatest effect on part dimensions and weight.

2. Reduce clamp force to 65 tons. [Cycle]

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 0.00

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	380
Middle Zone Temp	F	385
Front Zone Temp	F	400
Nozzle Temp	F	400
Injection Unit		
Screw Rotation	rpm	65
Screw Back Pressure	psi	600
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	60
Mold Stationary Temp	F	60
Clamp Force	tons	65

Fill Rates

Name	Units	Value
Fill Rate 1	in/s	4
Fill Rate 2	in/s	4
Fill Rate 3	in/s	4
Fill Rate 4	in/s	4
Fill Rate 5	in/s	8

Pressures/Time

Name	Units	Value
Max Injection Pressure	psi	25000
Ramp Time	s	0
Pack/Hold Pressure	psi	1700
Pack/Hold Time	s	5
Cooling Time	s	15
Mold Open Time	s	1

Cycle Results

Name	Units	Value
Melt Temp	F	400.2
Fill Time	s	0.53
Cycle Time	s	21.53
Mold Full at VPT	%	96.27
Cushion Size	in	0.230
Part Length	in	6.502
Part Weight	oz	3.113
Screw Run Time	s	4.32

Part Problems (most recent cycle to the left)

Problem	Defect
Flash	Yes
Burn Mark	Yes
Size (+/- 0.01 in)	Yes
Weld Lines	No
Short Shot	No
Warp	No
Sink Marks	No
Voids	No

Machine Alarms

Screw Recovery	Yes
Max Pressure	Yes
No Cushion	Yes
Low Melt	Yes
High Melt	Yes

Cycle Graphs

Pressure (psi)

Screw Travel (in)

What change occurred in the defects present? _____

Why? _____

3. Set Fill Rates 1, 2, 3, and 4 to 13.0 in/sec. Set Fill Rate 5 to 4.0 in/sec. **[Cycle]**

4. Set the Clamp Force to 75 tons. **[Cycle]**

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 141.24

Machine Control Settings			Cycle Results		
Name	Units	Value	Name	Units	Value
Barrel Temperatures			Fill Rates		
Rear Zone Temp	F	380	Fill Rate 1	in/s	13
Middle Zone Temp	F	385	Fill Rate 2	in/s	13
Front Zone Temp	F	400	Fill Rate 3	in/s	13
Nozzle Temp	F	400	Fill Rate 4	in/s	13
Injection Unit			Fill Rate 5	in/s	4
Screw Rotation	rpm	65	Pressures/Time		
Screw Back Pressure	psi	600	Max Injection Pressure	psi	25000
Screw Back Distance	in	2.48	Ramp Time	s	0
VPT Setpoint	in	0.35	Pack/Hold Pressure	psi	1700
Mold and Clamp			Pack/Hold Time	s	5
Mold Moveable Temp	F	60	Cooling Time	s	15
Mold Stationary Temp	F	60	Mold Open Time	s	1
Clamp Force	tons	75			

Cycle Problems (most recent cycle to the left)

Problem	Flash	Burn Mark	Size (+/- 0.01 in)	Weld Lines	Short Shot	Warp	Sink Marks	Voids
Flash	Yes	No	No	No	No	No	No	No
Burn Mark	No	Yes	No	No	No	No	No	No
Size (+/- 0.01 in)	No	No	Yes	No	No	No	No	No
Weld Lines	No	No	No	Yes	No	No	No	No
Short Shot	No	No	No	No	Yes	No	No	No
Warp	No	No	No	No	No	Yes	No	No
Sink Marks	No	No	No	No	No	No	Yes	No
Voids	No	No	No	No	No	No	No	Yes

Machine Alarms

Alarm	Status
Screw Recovery	OK
Max Pressure	OK
No Cushion	OK
Low Melt	OK
High Melt	OK

Cycle Graphs

What happened to the flash? _____

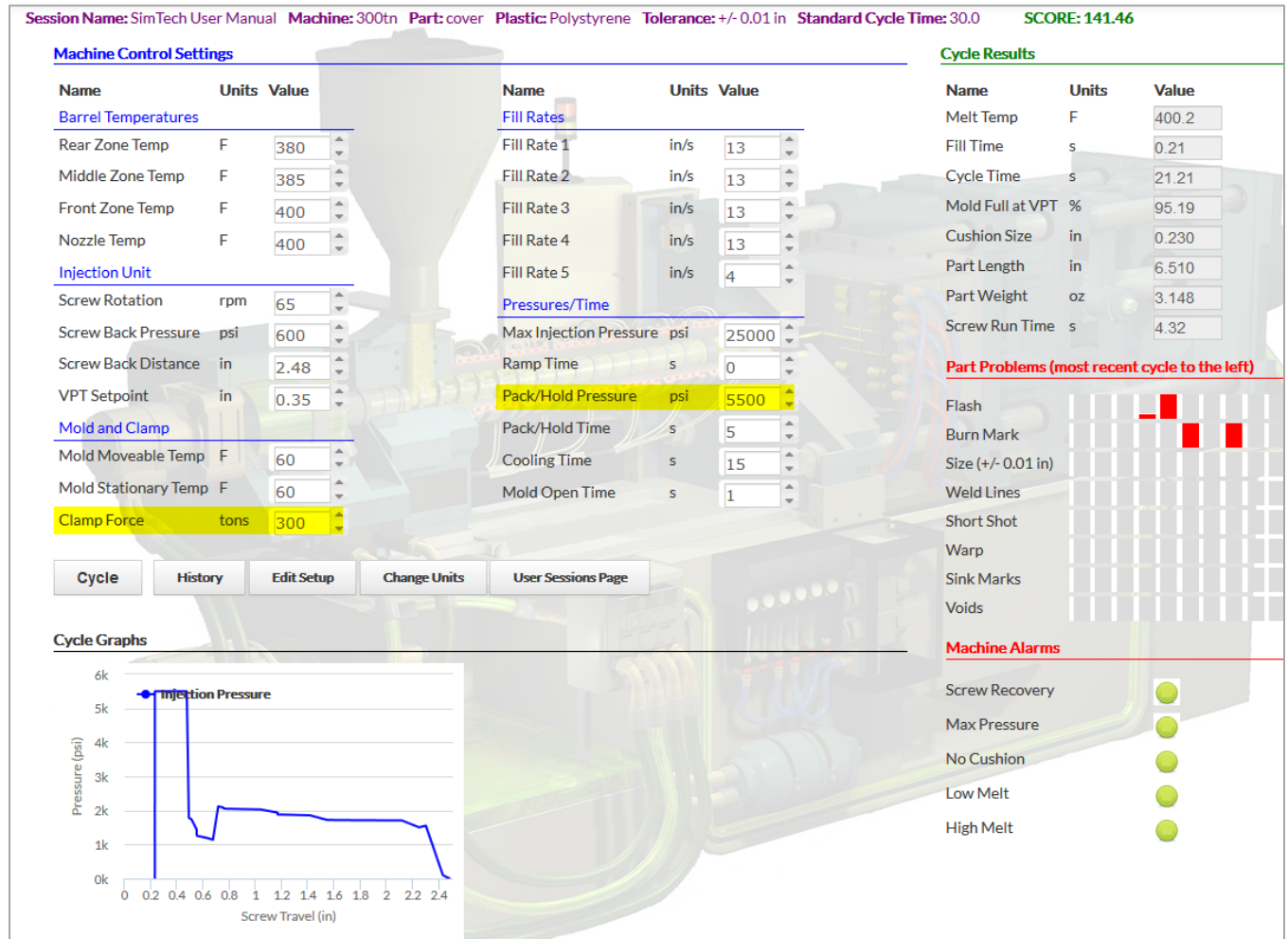
Why? _____

What conclusions would you make concerning the effects of clamp force and fill rate on burn marks and flash? _____

XIV. Determine the Effects of Pack/Hold pressure on the Molded Part Properties

A. Now we'll examine the effect of pack/hold pressure on part weight and dimensions.

1. Increase the clamp force to 300 tons. (This will avoid flash when we increase the pack/hold pressure.) **[Cycle]**
2. Increase the pack/hold pressure to 5,500 psi. **[Cycle]**



What is the fill time? _____ sec

What is the cycle time? _____ sec

What is the part weight? _____ oz.

What is the part length? _____ in

Why did the part size increase? _____

3. Reduce the pack/hold pressure to 4,500 psi. [Cycle]

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 141.45

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	380
Middle Zone Temp	F	385
Front Zone Temp	F	400
Nozzle Temp	F	400
Injection Unit		
Screw Rotation	rpm	65
Screw Back Pressure	psi	600
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	60
Mold Stationary Temp	F	60
Clamp Force	tons	300

Cycle Results

Name	Units	Value
Fill Rates		
Fill Rate 1	in/s	13
Fill Rate 2	in/s	13
Fill Rate 3	in/s	13
Fill Rate 4	in/s	13
Fill Rate 5	in/s	4
Pressures/Time		
Max Injection Pressure	psi	25000
Ramp Time	s	0
Pack/Hold Pressure	psi	4500
Pack/Hold Time	s	5
Cooling Time	s	15
Mold Open Time	s	1

Part Problems (most recent cycle to the left)

Name	Units	Value
Melt Temp	F	400.2
Fill Time	s	0.21
Cycle Time	s	21.21
Mold Full at VPT	%	95.19
Cushion Size	in	0.230
Part Length	in	6.507
Part Weight	oz	3.135
Screw Run Time	s	4.32

Machine Alarms

Flash	<input type="checkbox"/>
Burn Mark	<input type="checkbox"/>
Size (+/- 0.01 in)	<input type="checkbox"/>
Weld Lines	<input type="checkbox"/>
Short Shot	<input type="checkbox"/>
Warp	<input type="checkbox"/>
Sink Marks	<input type="checkbox"/>
Voids	<input type="checkbox"/>
Screw Recovery	<input type="checkbox"/>
Max Pressure	<input type="checkbox"/>
No Cushion	<input type="checkbox"/>
Low Melt	<input type="checkbox"/>
High Melt	<input type="checkbox"/>

Cycle Graphs

Pressure (psi) vs Screw Travel (in)

Injection Pressure

4500 psi

1500 psi

2000 psi

0.2 in

0.8 in

2.4 in

What is the fill time? _____ sec

What is the cycle time? _____ sec

What is the part weight? _____ oz.

What is the part length? _____ in

Why did the part dimensions and weight decrease when the pack/hold pressure was reduced?

4. Reduce the pack/hold pressure to 6,000 psi. [Cycle]

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 0.00

Machine Control Settings			Cycle Results		
Name	Units	Value	Name	Units	Value
Barrel Temperatures			Fill Rates		
Rear Zone Temp	F	380	Fill Rate 1	in/s	13
Middle Zone Temp	F	385	Fill Rate 2	in/s	13
Front Zone Temp	F	400	Fill Rate 3	in/s	13
Nozzle Temp	F	400	Fill Rate 4	in/s	13
Injection Unit			Fill Rate 5	in/s	4
Screw Rotation	rpm	65	Pressures/Time		
Screw Back Pressure	psi	600	Max Injection Pressure	psi	25000
Screw Back Distance	in	2.48	Ramp Time	s	0
VPT Setpoint	in	0.35	Pack/Hold Pressure	psi	6000
Mold and Clamp			Pack/Hold Time	s	5
Mold Moveable Temp	F	60	Cooling Time	s	15
Mold Stationary Temp	F	60	Mold Open Time	s	1
Clamp Force	tons	300			

[Cycle](#)
[History](#)
[Edit Setup](#)
[Change Units](#)
[User Sessions Page](#)

Cycle Graphs

Part Problems (most recent cycle to the left)

Problem	Status
Flash	Yes
Burn Mark	Yes
Size (+/- 0.01 in)	Yes
Weld Lines	No
Short Shot	No
Warp	No
Sink Marks	No
Voids	No

Machine Alarms

Alarm	Status
Screw Recovery	OK
Max Pressure	OK
No Cushion	OK
Low Melt	OK
High Melt	OK

What is the fill time? _____ sec

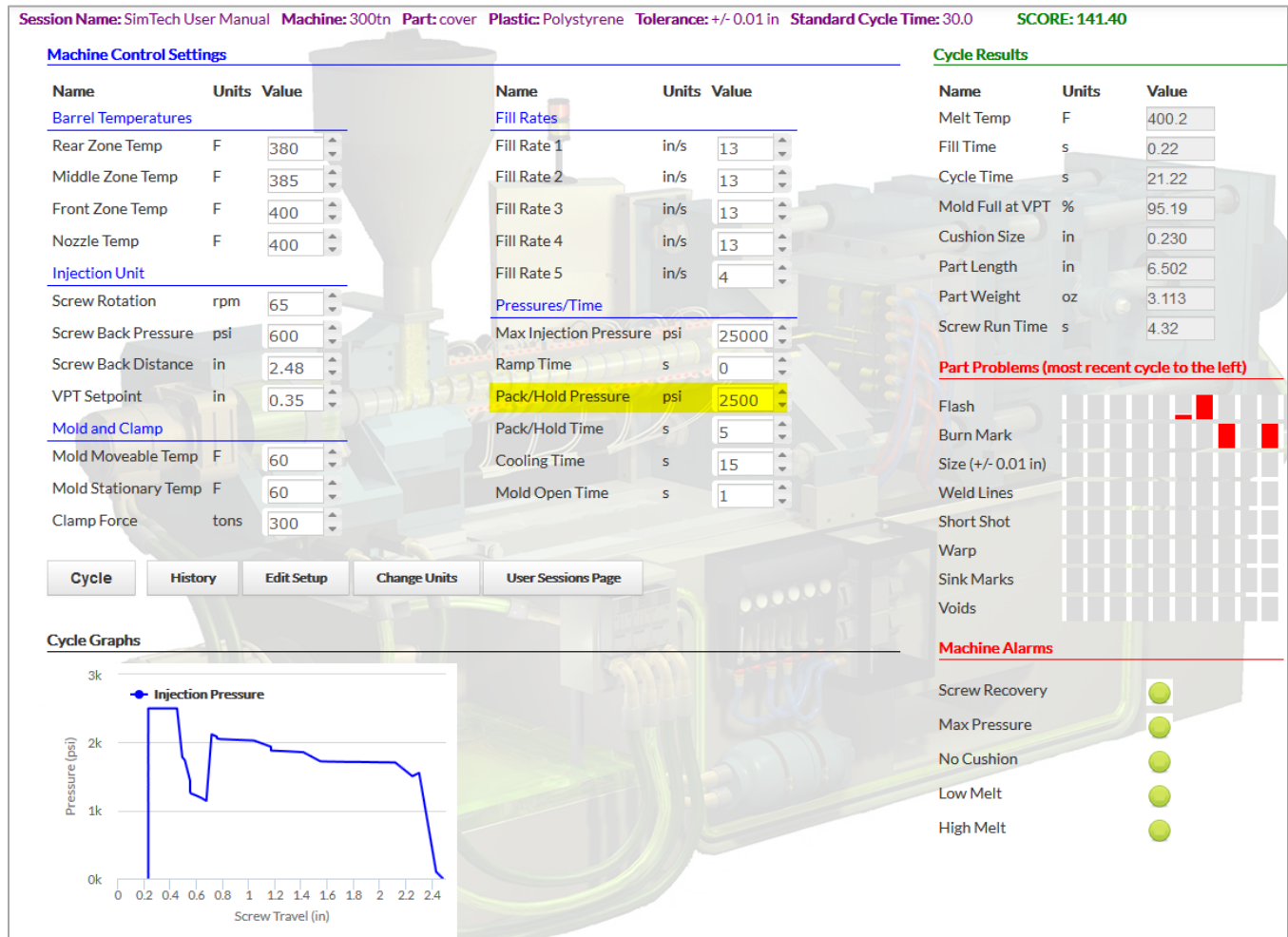
What is the cycle time? _____ sec

What is the part weight? _____ oz.

What is the part length? _____ in

Notice the part dimensions are now out of spec. Why did this happen?

5. Increase the pack/hold pressure to 2,500 psi. [Cycle]



What is the fill time? _____ sec

What is the cycle time? _____ sec

What is the part weight? _____ oz.

What is the part length? _____ in

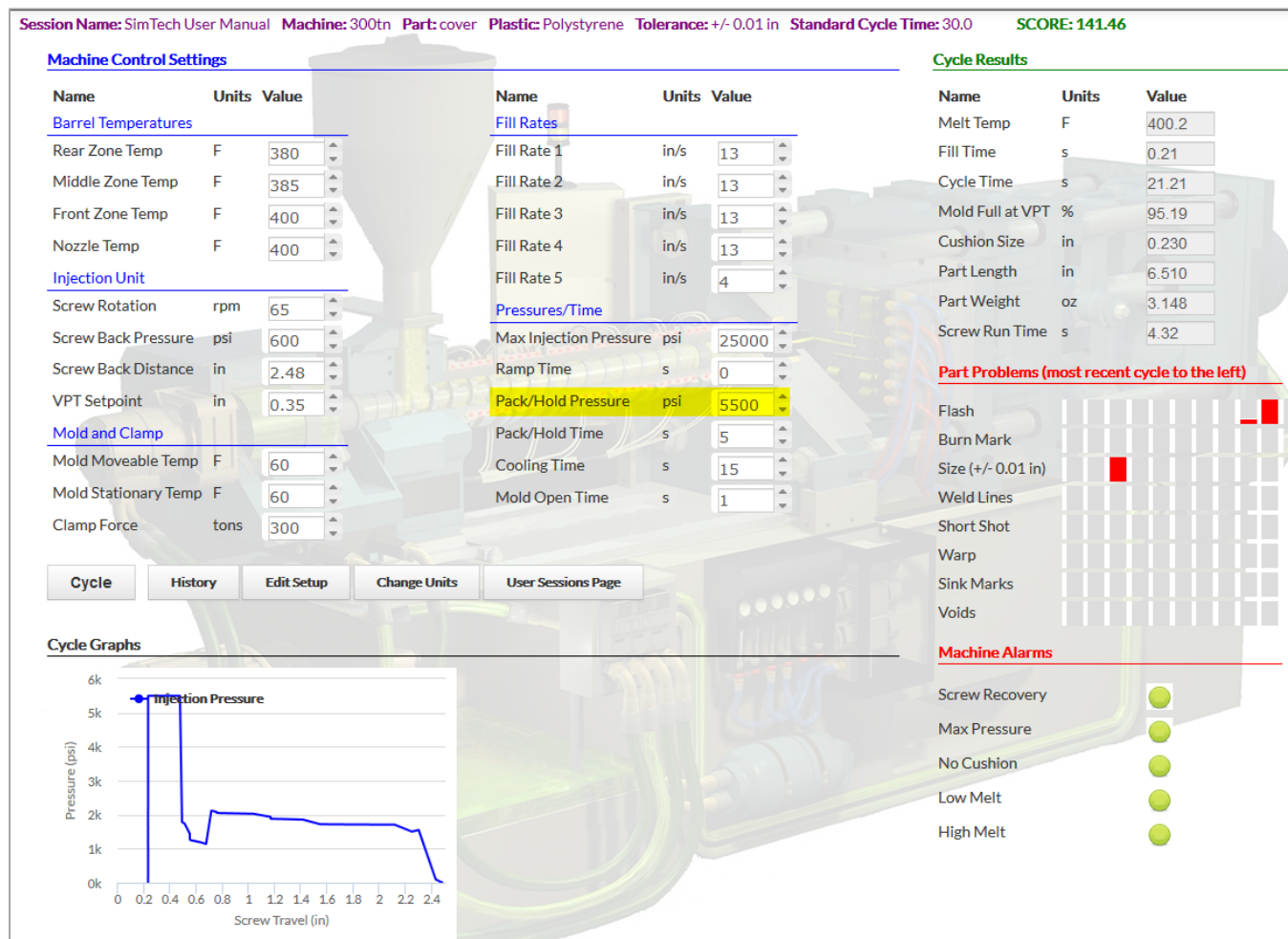
XV. Determine the Effects of Pack/Hold Time on the Molded Part Properties

A. Now we'll examine the effect of pack/hold time on part weight and dimensions.

Note: Too short a holding time can cause “discharge”.

1. Set the Pack/Hold Pressure back to 5,500 psi.. [Cycle]

- You should have a good part.



What is the fill time? _____ sec

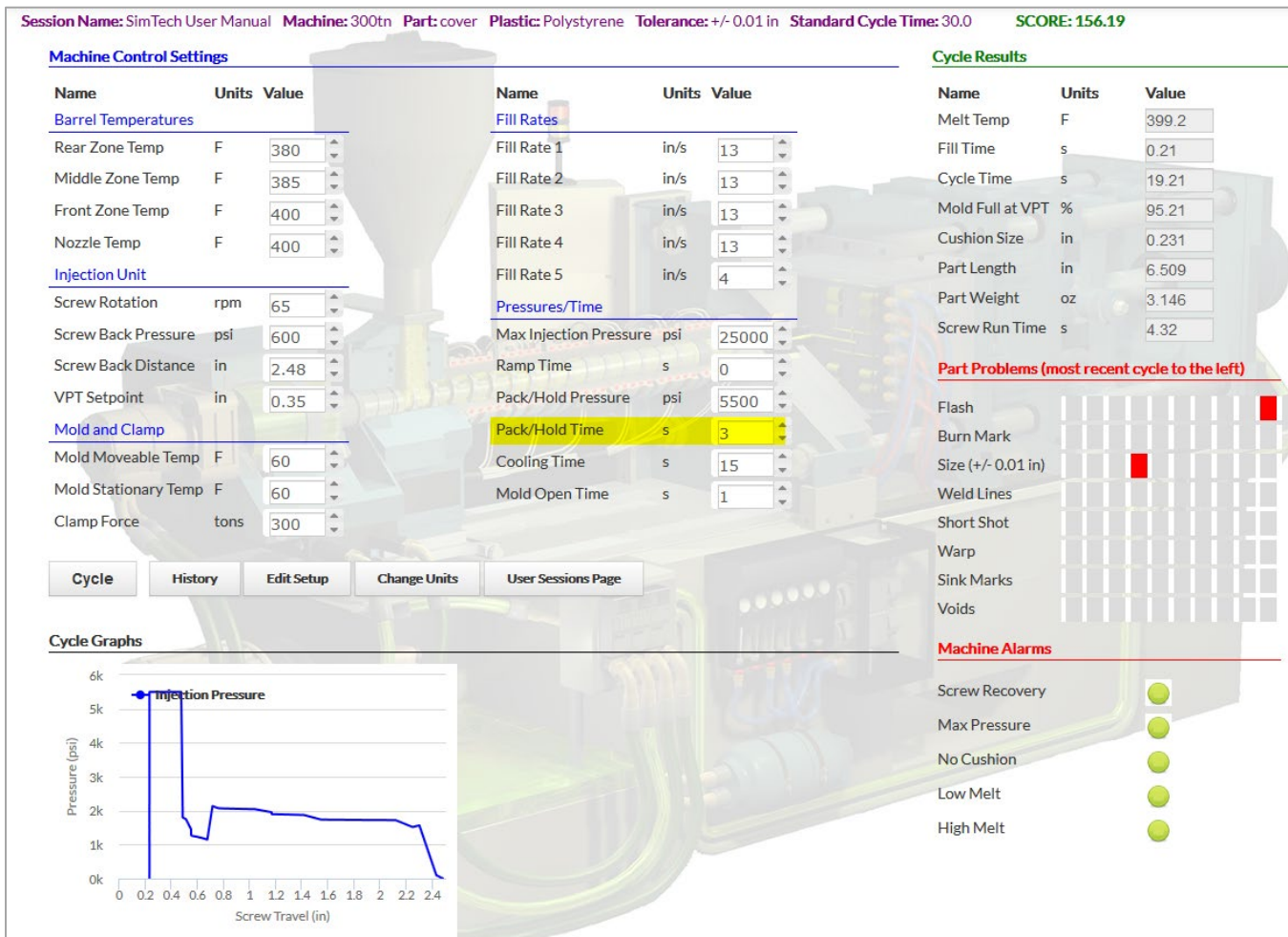
What is the cycle time? _____ sec

What is the part weight? _____ oz.

What is the part length? _____ in

Is there any change in the molded parts? _____

2. Set pack/hold time to 3 seconds. [Cycle]



What is the fill time? _____ sec

What is the cycle time? _____ sec

What is the part weight? _____ oz.

What is the part length? _____ in

Is there any change in the molded parts? _____

3. Set holding time to 1 seconds. [Cycle]

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 174.34

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	380
Middle Zone Temp	F	385
Front Zone Temp	F	400
Nozzle Temp	F	400
Injection Unit		
Screw Rotation	rpm	65
Screw Back Pressure	psi	600
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	60
Mold Stationary Temp	F	60
Clamp Force	tons	300

Cycle History Edit Setup Change Units User Sessions Page

Cycle Results

Name	Units	Value
Melt Temp	F	398.1
Fill Time	s	0.21
Cycle Time	s	17.21
Mold Full at VPT	%	95.21
Cushion Size	in	0.231
Part Length	in	6.509
Part Weight	oz	3.144
Screw Run Time	s	4.32

Part Problems (most recent cycle to the left)

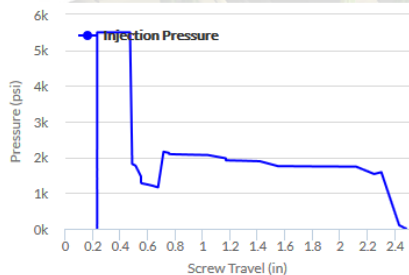
Flash	
Burn Mark	
Size (+/- 0.01 in)	
Weld Lines	
Short Shot	
Warp	
Sink Marks	
Voids	

Machine Alarms

Screw Recovery	
Max Pressure	
No Cushion	
Low Melt	
High Melt	

Cycle Graphs

Injection Pressure



What is the fill time? _____ sec

What is the cycle time? _____ sec

What is the part weight? _____ oz.

What is the part length? _____ in

Is there any change in the molded parts? _____

XVI. Find the Gate Freeze Time

1. Set the Pack/Hold Time to 0.1 second. **[Cycle]**
2. Continue to increase the Pack/Hold Time by 0.1 seconds until you find that the part weight and length does not change.
 - Once the part weight and part length do not change that means the gate has frozen.

Session Name: SimTech User Manual Machine: 300tn Part: cover Plastic: Polystyrene Tolerance: +/- 0.01 in Standard Cycle Time: 30.0 SCORE: 172.33

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	380
Middle Zone Temp	F	385
Front Zone Temp	F	400
Nozzle Temp	F	400
Injection Unit		
Screw Rotation	rpm	65
Screw Back Pressure	psi	600
Screw Back Distance	in	2.48
VPT Setpoint	in	0.35
Mold and Clamp		
Mold Moveable Temp	F	60
Mold Stationary Temp	F	60
Clamp Force	tons	300

Cycle Results

Name	Units	Value
Melt Temp	F	398.2
Fill Time	s	0.21
Cycle Time	s	17.41
Mold Full at VPT	%	95.21
Cushion Size	in	0.231
Part Length	in	6.509
Part Weight	oz	3.147
Screw Run Time	s	4.32

Part Problems (most recent cycle to the left)

Flash	
Burn Mark	
Size (+/- 0.01 in)	
Weld Lines	
Short Shot	
Warp	
Sink Marks	
Voids	

Machine Alarms

Screw Recovery	●
Max Pressure	●
No Cushion	●
Low Melt	●
High Melt	●

Cycle Graphs

Pressure (psi)

Screw Travel (in)

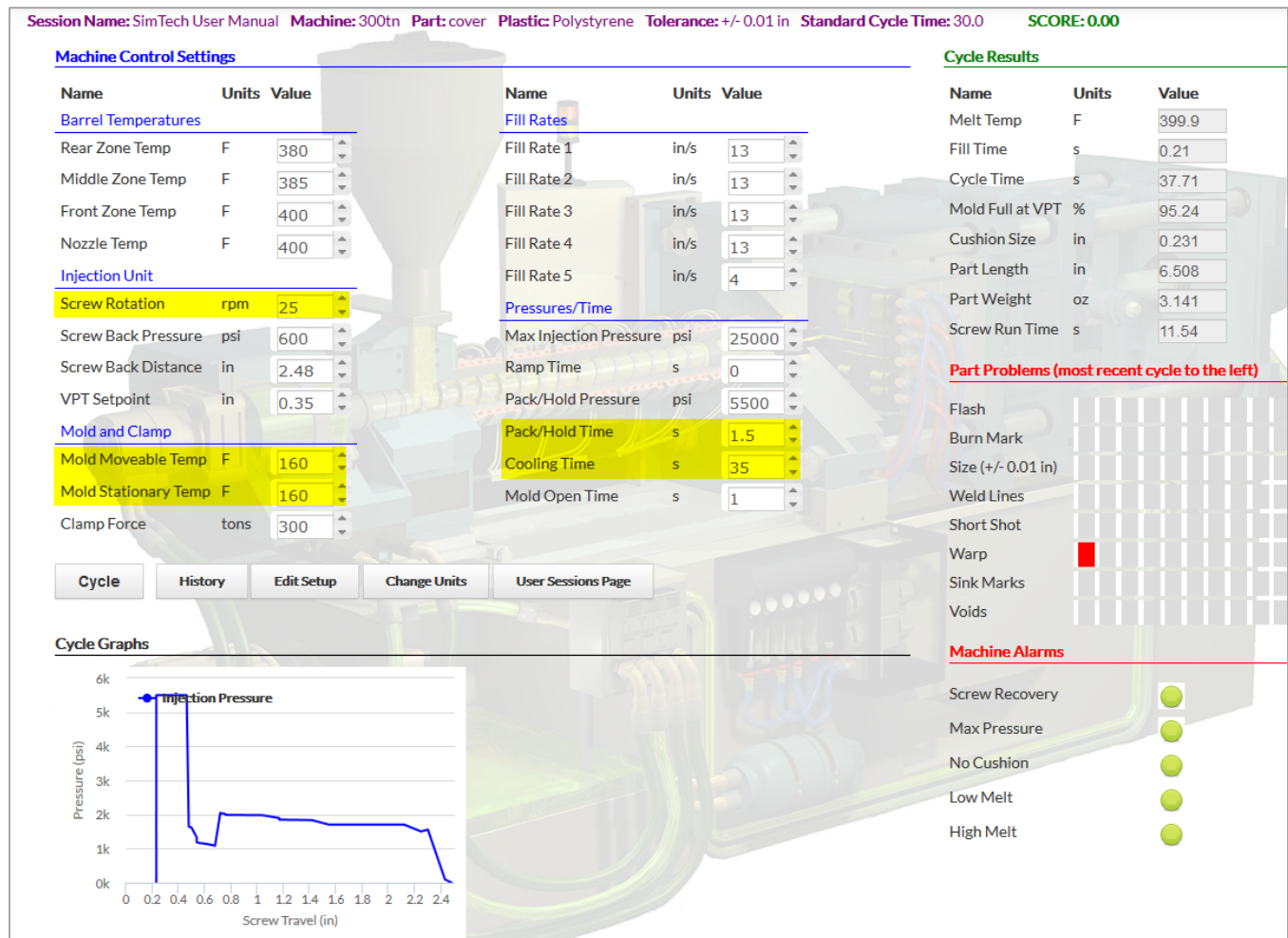
Injection Pressure

At what holding time does the gate freeze? _____ sec

XVII. Effects of Mold Temperature on Part Properties and Gate Freeze Time

A. Observe the effect of mold temperature on part dimensions and weight.

1. Set the Screw Rotation to 25 rpm. [Cycle]
2. Set Mold Temperature for both mold halves to 160°F. [Cycle]
3. Set the Pack/Hold Time to 1.5 seconds. [Cycle]
4. Set Cooling Time to 35 seconds. [Cycle]



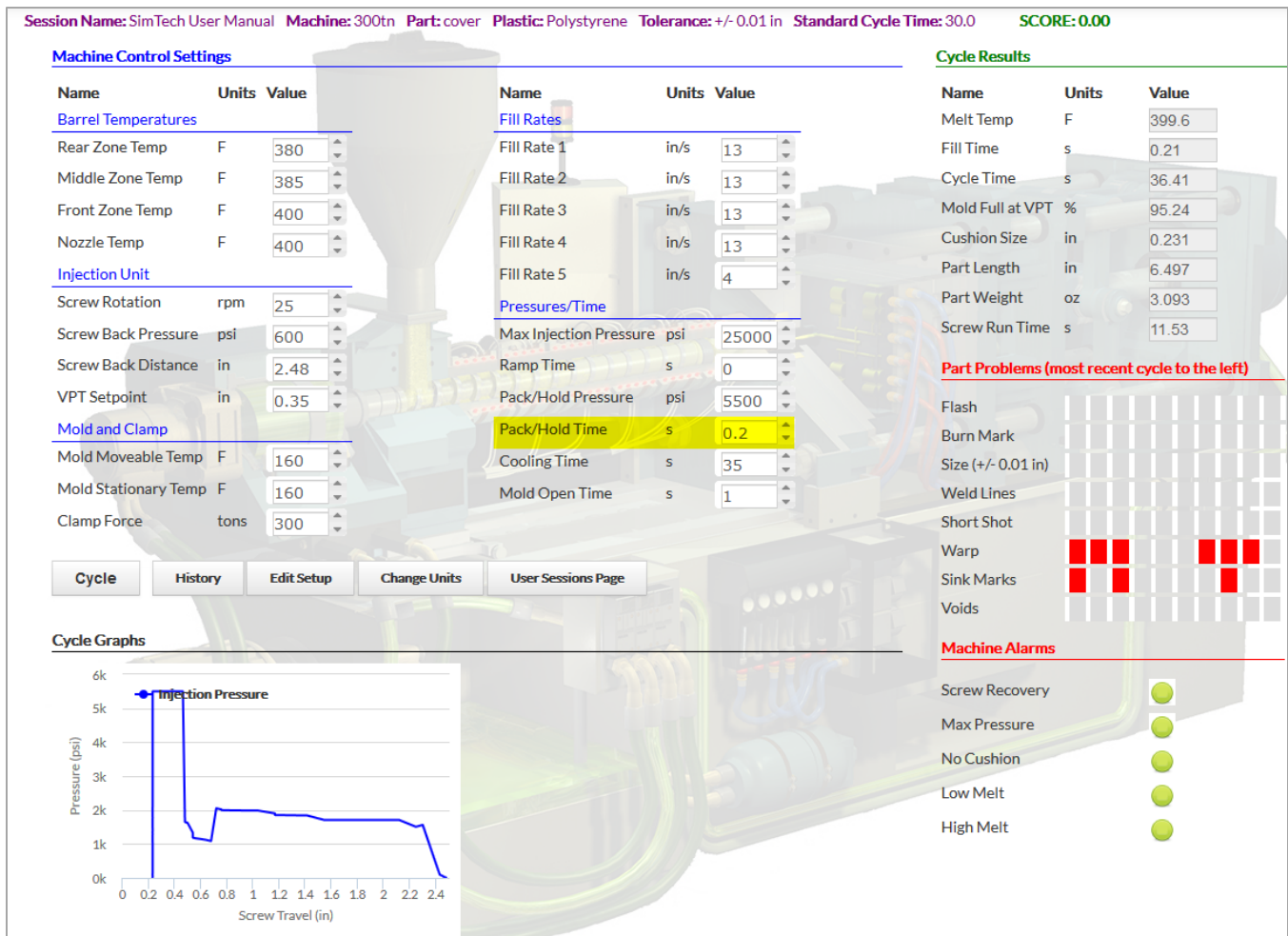
What is the cycle time? _____ sec

What is the part weight? _____ oz.

What is the part length? _____ in

Determine the gate freeze time at 160° F.

1. Set the Pack/Hold Time to 0.2 second. [Cycle]
2. Continue to increase the Pack/Hold Time by 0.2 seconds until you find that the part weight and length does not change.
 - Once the part weight and part length do not change that means the gate has frozen.
 - At this mold temperature (160°F) the part will have warp or “distortion”. Disregard this part problem for this exercise.



What is the cycle time? _____ sec

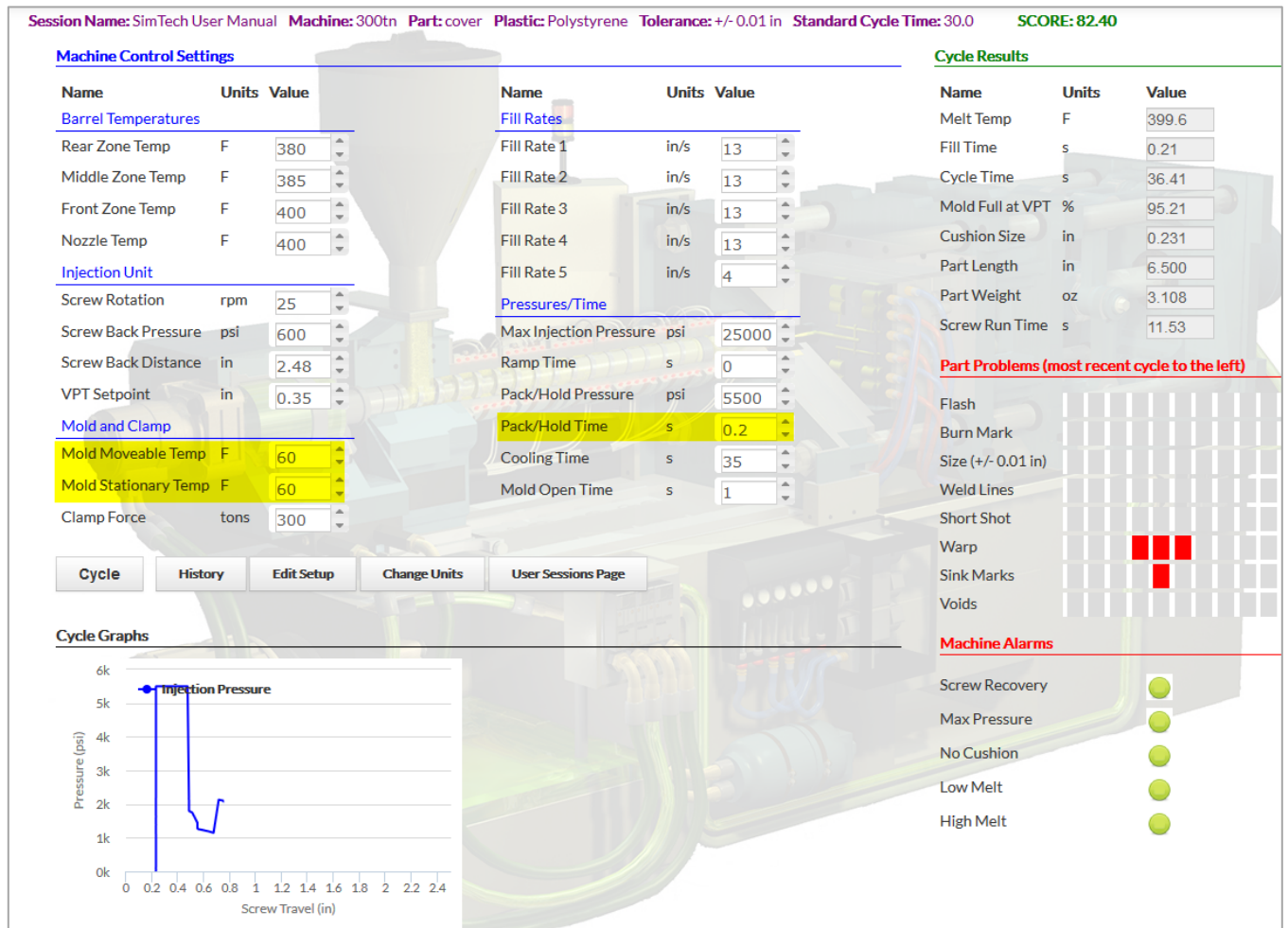
What is the part weight? _____ oz.

What is the part length? _____ in

What is the gate freeze time? _____ sec.

Determine the gate freeze time at 60° F.

1. Set the Mold Temperature for both mold halves to 60°F. [Cycle]
2. Set the Pack/Hold Time to 0.2 seconds. [Cycle]
3. Increase the Pack/Hold Time by 0.2 seconds until you find that the part weight and length does not change. [Cycle]



What is the cycle time? _____ sec

What is the part weight? _____ oz.

What is the part length? _____ in

What is the gate seal time? _____ sec

You have now completed one evaluation of the effects of molding conditions on melt temperature, part weight, part dimensions, machine alarms, and you have observed several molded part defects for this plastic and part.

You can now try to improve your production efficiency for this part. Change the machine controls to reduce the cycle time. You should be able to mold to 100% efficiency or better.

When you begin new mold set-ups, you will solve problems and reduce cycle times using the knowledge you have gained in this lesson. To increase your knowledge of the molding process, you can do a similar evaluation using other plastics.



SimTech™

Student Answer Sheet

This answer sheet can be used to make copies for each student to write down their answers from the Student Tutorial Workbook.

This answer sheet can also be download from our website at:

www.paulsontraining.com/support-center

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Name: _____

Student Answer Sheet

I. Effects of Barrel Temperature on Melt Temperature

What is the melt temperature? _____ °F

II. Determine the Effect of Each Barrel Zone Temperatures on the Melt Temperature

A. You will raise each barrel zone by 20°F to determine which zone has the greatest effect.

1. Raise rear zone barrel temperature to 470°F.

What is the melt temperature? _____ °F

2. Raise the middle zone temperature to 470°F and set the rear zone temperature back to 450°F.

What is the melt temperature? _____ °F

3. Raise the front zone barrel temperature and nozzle temperature to 470°F and set the middle zone back to 450°F.

What is the melt temperature? _____ °F

Which zone affected the melt temperature the most? _____

Why? _____

4. Typical barrel zone settings for this plastic are: 450°F nozzle, 450°F front, 450°F middle, 400°F rear. Set the zones to these settings.

What is the melt temperature? _____ °F

III. Determine the Effect of the Back Pressure on the Melt Temperature

A. Increased back pressure causes more heating of the plastic in the barrel.

1. Raise the back pressure and repeat the cycle until melt temperature is the same as the front zone temperature. (i.e. 450°F)

What is the back pressure when the melt temperature is 450°F? _____ psi

Explain why the melt temperature increased when the back pressure was increased.

Why is it best to have the front zone temperature and the melt temperature the same?

IV. Effects of Screw Back Setting

A. The screw back setting determines how far back the screw returns when it rotates. Screw back setting also controls the cushion size.

1. Set the screw back distance to 3.5" and the VPT setpoint to 1.35".

What is the present cushion size? _____ in

Is the cushion size all Right? _____

Explain: _____

2. Reduce the screw back setting to 2.0" and the VPT setpoint to 0.4".

What happened? _____

Why? _____

3. Set the screw back position so that the cushion size is between 0.125" and 0.250".

What is the screw back position you have set? _____

What is the VPT setpoint you have set? _____

What is the melt temperature? _____ °F

V. Determine the Effect of Screw RPM on the Melt Temperature

- A. Screw rpm can also affect the plastic temperature, but the magnitude of the affect depends on the screw design and the amount of non-Newtonian viscosity change that occurs.

1. Increase screw rpm to 150.

What is the melt temperature? _____ °F

Why did the melt temperature increase? _____

2. Adjust the back pressure so that the melt temperature is 450°F.

What is the back pressure to achieve 450°F melt temperature? _____ psi

VI. Maximum Injection Pressure Alarm

- A. The Maximum Injection Pressure Alarm will activate if the machine has tried to exceed its maximum injection pressure.

1. Reduce max injection pressure to 1,100 psi. and reduce the Pack/Hold pressure to 1,000 psi

Why did the Low Max Injection Pressure alarm occur? _____

VII. The Screw RPM Alarm

- A. The Screw Recovery Alarm will activate if the screw does not rotate fast enough thus, enabling the screw to return to the Screw Back Distance setting before the next shot.

1. Lower the screw speed to 13 rpm.

What alarm occurred? _____

Why? _____

2. Raise rpm to 150.

What is the melt temperature? _____ °F

VIII. Determine the Effect of the Mold Closed Time on the Melt Temperature

A. You will explore how the mold closed timer can affect the melt temperature.

1. Reduce mold closed time to 15 seconds.

What is melt temperature? _____ °F

Why did the melt temperature decrease? _____

2. Use the back pressure to raise the melt temperature to 450°F ±2°.

What is the new back pressure setting? _____ psi

IX. The Back Pressure and No Cushion Alarms

A. Why the back pressure and no cushion alarms come on

1. Raise back pressure to 6000 psi.

What alarms occurred? _____

Why? _____

X. Determine the Effect of Mold Open Time on the Melt Temperature

A. You will explore how the mold open timer can affect the melt temperature.

1. Increase the mold open time to 5 seconds.

What is the melt temperature? _____ °F

Why did the temperature increase? _____

XI. Determine the Effect of the Mold Temperature on the Melt Temperature

A. You will explore how the mold temperature can affect the melt temperature.

1. Set mold temperature to 110°F (both halves).

What is the melt temperature? _____ °F

Does the mold temperature affect the melt temperature in the barrel? _____

XII. Determine the Effects of Fill Rates on the Molded Parts

A. You will explore how fill rates can affect the molded parts.

1. Set barrel rear zone to 380°F, middle zone to 385°F, front and nozzle to 400°F
2. Set screw rotation to 65 rpm and screw back pressure to 600 psi.
3. Set mold temperature to 60°F (both halves).
4. Set all fill rates 4.0 in/sec.
5. Set the max injection pressure to 25,000 psi.

What is the fill time? _____ sec

What is the cycle time? _____ sec

What is the part weight? _____ oz.

What is the part length? _____ in

6. Set Fill Rates 1, 2, 3, and 4 to 10.0 in/sec.

7. Set Fill Rate 5 to 4.0 in/sec.

What is the fill time? _____ sec

What is the cycle time? _____ sec

What is the part weight? _____ oz.

What is the part length? _____ in

What changes occurred to the molded parts? _____

8. Set Fill Rates 1, 2, 3, and 4 to 3.0 in/sec.

9. Set Fill Rate 5 to 6.0 in/sec.

What is the fill time? _____ sec

What is the cycle time? _____ sec

What is the part weight? _____ oz.

What is the part length? _____ in

What happened to part weight and dimensions when the final Fill Rate 5 is very fast?

Why? _____

10. Set Fill Rates 1, 2, 3, and 4 to 13.0 in/sec.

11. Set Fill Rate 5 to 4.0 in/sec.

What is the fill time? _____ sec

What is the cycle time? _____ sec

What is the part weight? _____ oz.

What is the part length? _____ in

What happened to part weight and dimensions when final Fill Rate 5 is reduced?

Why? _____

XIII. Determine the Effects of Clamp Force Setting and Fill Rates on Burn Marks and Flash

A. How does clamp force and the fill rate settings affect burn marks and flash?

1. Set Fill Rates 1, 2, 3, and 4 to 4.0 in/sec. Set Fill Rate 5 to 8.0 in/sec

What molded part defect occurred? _____

Why? _____

2. Reduce clamp force to 65 tons.

What change occurred in the defects present? _____

Why? _____

3. Set Fill Rates 1, 2, 3, and 4 to 13.0 in/sec. Set Fill Rate 5 to 4.0 in/sec.

4. Set the Clamp Force to 75 tons.

What happened to the flash? _____

Why? _____

What conclusions would you make concerning the effects of clamp force and fill rate on burn marks and flash? _____

XIV. Determine the Effects of Pack/Hold pressure on the Molded Part Properties

A. Now we'll examine the effect of pack/hold pressure on part weight and dimensions.

1. Increase the clamp force to 300 tons. (This will avoid flash when we increase the pack/hold pressure.)
2. Increase the pack/hold pressure to 5,500 psi.

What is the fill time? _____sec

What is the cycle time? _____sec

What is the part weight? _____oz.

What is the part length? _____in

Why did the part size increase? _____

3. Reduce the pack/hold pressure to 4,500 psi.

What is the fill time? _____sec

What is the cycle time? _____sec

What is the part weight? _____oz.

What is the part length? _____in

Why did the part dimensions and weight decrease when the pack/hold pressure was reduced?

4. Reduce the pack/hold pressure to 6,000 psi.

What is the fill time? _____ *sec*

What is the cycle time? _____ *sec*

What is the part weight? _____ *oz.*

What is the part length? _____ *in*

Notice the part dimensions are now out of spec. Why did this happen?

5. Increase the pack/hold pressure to 2,500 psi.

What is the fill time? _____ *sec*

What is the cycle time? _____ *sec*

What is the part weight? _____ *oz.*

What is the part length? _____ *in*

XV. Determine the Effects of Pack/Hold Time on the Molded Part Properties

A. Now we'll examine the effect of pack/hold time on part weight and dimensions.

1. Set the Pack/Hold Pressure back to 5,500 psi..

What is the fill time? _____ *sec*

What is the cycle time? _____ *sec*

What is the part weight? _____ *oz.*

What is the part length? _____ *in*

Is there any change in the molded parts? _____

2. Set pack/hold time to 3 seconds.

What is the fill time? _____ sec

What is the cycle time? _____ sec

What is the part weight? _____ oz.

What is the part length? _____ in

Is there any change in the molded parts? _____

3. Set holding time to 1 seconds.

What is the fill time? _____ sec

What is the cycle time? _____ sec

What is the part weight? _____ oz.

What is the part length? _____ in

Is there any change in the molded parts? _____

XVI. Find the Gate Freeze Time

1. Set the Pack/Hold Time to 0.1 second.
2. Continue to increase the Pack/Hold Time by 0.1 seconds until you find that the part weight and length does not change.

At what holding time does the gate freeze? _____ sec

XVII. Effects of Mold Temperature on Part Properties and Gate Freeze Time

- A. Observe the effect of mold temperature on part dimensions and weight.

1. Set the Screw Rotation to 25 rpm.
2. Set Mold Temperature for both mold halves to 160°F.
3. Set the Pack/Hold Time to 1.5 seconds.
4. Set Cooling Time to 35 seconds.

What is the cycle time? _____ sec

What is the part weight? _____ oz.

What is the part length? _____ in

Determine the gate freeze time at 160° F.

1. Set the Pack/Hold Time to 0.2 second.
2. Continue to increase the Pack/Hold Time by 0.2 seconds until you find that the part weight and length does not change.

What is the cycle time? _____ sec

What is the part weight? _____ oz.

What is the part length? _____ in

What is the gate freeze time? _____ sec.

Determine the gate freeze time at 60° F.

1. Set the Mold Temperature for both mold halves to 60°F.
2. Set the Pack/Hold Time to 0.2 seconds.
3. Increase the Pack/Hold Time by 0.2 seconds until you find that the part weight and length does not change.

What is the cycle time? _____ sec

What is the part weight? _____ oz.

What is the part length? _____ in

What is the gate seal time? _____ sec



SimTech™

How to Take the SimTech™ Virtual Lab Lessons

Getting Started

It is now time to apply what you have learned from taking the course lessons. SimTech lab lessons can be taken in any order. We suggest you start with the lessons marked as “Level 1” and work your way up to the “Level 4” labs.

Note: If you are not familiar with how to use SimTech, take the Student Workbook Tutorial first before attempting the Lab Lessons.

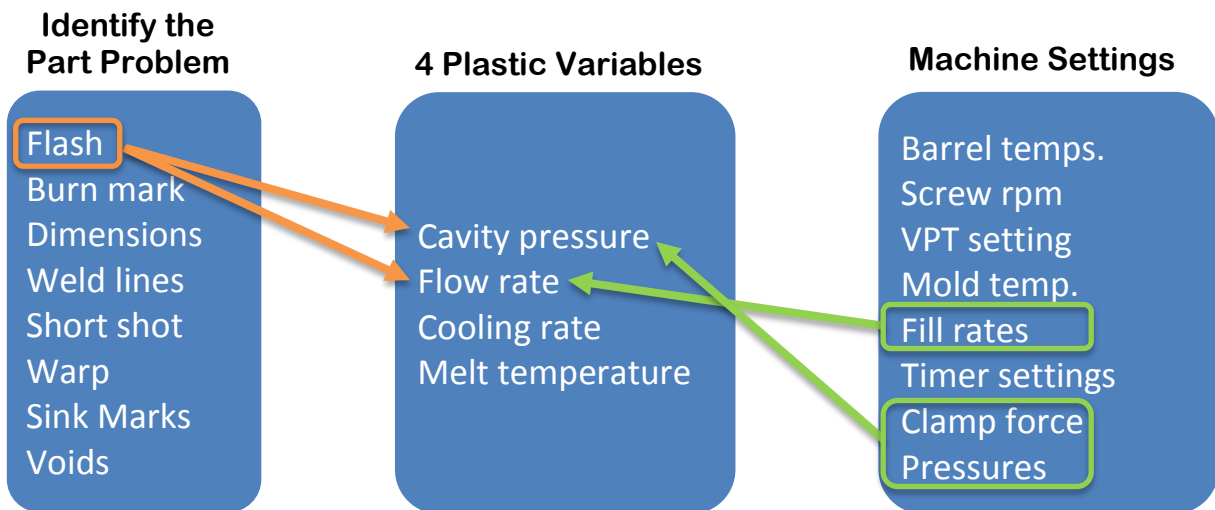
Unlike the Skillbuilder lessons you have already taken, the SimTech lab lessons do not have any restrictions on the machine controls. You can change any control you want.

You will benefit the most from these lessons by following the directions carefully. Each lab has a certain set of criteria that needs to be met in order to “complete” a lesson. You will practice machine setup, molded-part problem solving, and cycle time reduction. As you have learned in our training lessons, it is the four basic plastic variables that determine the molded part properties. By understanding how the machine controls affect the four basic plastic variables, you will begin to understand how to fix part problems, and how to set up the most efficient process.

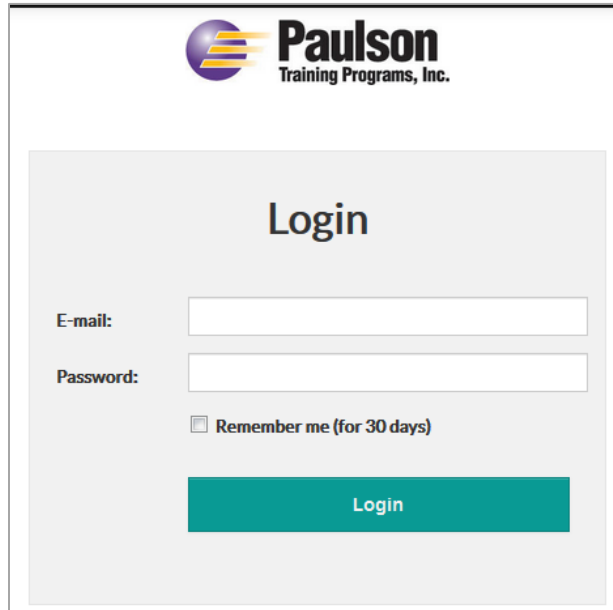
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As you have learned in the training lessons, you should approach these problems in a scientific and systematic way.

1. Identify the problem(s).
2. Determine which of the four processing variables is causing the problem.
3. Determine which machine controls affect the processing variable(s) in step 2.
4. Make one control change and then Cycle the machine to see the effects of the control change.
5. Continue to make control changes (cycling after each machine control adjustment) until the problem is solved.
6. Then move onto the next problem and follow the same procedure.



1. Login at www.paulsonskillbuilder.com
 - Your administrator will provide you with your password.



The image shows a login page for Paulson Training Programs, Inc. At the top is the company logo, which consists of a stylized 'P' with three horizontal bars to its right, followed by the text 'Paulson Training Programs, Inc.'. Below the logo is a large, light gray rectangular box with the word 'Login' centered at the top in a bold, black font. Inside this box, there are two input fields: one for 'E-mail:' and one for 'Password:'. Below these fields is a checkbox labeled 'Remember me (for 30 days)'. At the bottom of the box is a teal-colored button with the word 'Login' in white text.

2. Scroll down until you see the SimTech Lab Lesson you want to take and click on “Continue” or “Start Over”
 - “Start Over” will reset the machine controls to their starting values
 - “Continue” loads up your last machine control setting for this lesson

Simtech Lab 1 (Level 1)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0%	Continue	Start Over
Simtech Lab 2 (Level 1)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0%	Continue	Start Over
Simtech Lab 3 (Level 1)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0%	Continue	Start Over

3. You will see the control panel and your machine setup. You must click on **“Cycle”** to view the outputs of the current machine control settings.
4. Review the lab lesson from the binder to understand the problems you are trying to solve and the criteria for completing that lesson.

Session Name: simtechlab01 Machine: 300tn Part: cover Plastic: ABS Tolerance: +/- 0.005 in Standard Cycle Time: 20.0 SCORE: 0.00

Machine Control Settings

Name	Units	Value
Barrel Temperatures		
Rear Zone Temp	F	350
Middle Zone Temp	F	400
Front Zone Temp	F	450
Nozzle Temp	F	450
Injection Unit		
Screw Rotation	rpm	60
Screw Back Pressure	psi	300
Screw Back Distance	in	2.35
VPT Setpoint	in	0.21
Mold and Clamp		
Mold Moveable Temp	F	70
Mold Stationary Temp	F	70
Clamp Force	tons	220

Cycle Results

Name	Units	Value
Melt Temp	F	424.1
Fill Time	s	0.36
Cycle Time	s	19.36
Mold Full at VPT	%	95.18
Cushion Size	in	0.101
Part Length	in	6.504
Part Weight	oz	3.129
Screw Run Time	s	4.52

Part Problems (most recent cycle to the left)

Flash	
Burn Mark	
Size (+/- 0.005 in)	
Weld Lines	
Short Shot	
Warp	
Sink Marks	
Voids	

Machine Alarms

Screw Recovery	
Max Pressure	
No Cushion	
Low Melt	
High Melt	

Cycle History View Setup Change Units Reset Controls Home Page

Cycle Graphs

Injection Pressure

Pressure (psi)

Screw Travel (in)

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Lab 1 - Solving Burnmarks (Level 1)

Solving Burnmarks

For this challenge, you are molding a square cover. This customer's dimensional specifications for this rectangular cover part are 6.500" X 6.500" plus or minus 0.005". The plastic you are using is ABS on a 300 ton machine. Your part has a burnmark. The standard (quoted) cycle time for this job is 24 seconds. The part tolerance for this job is $\pm.005$.

Instructions:

1. Log into your Virtual Lab Lessons site (www.paulsonskillbuilder.com)
2. Open lesson "Lab 1"
3. "Cycle" the machine.
4. After you cycle the machine you will see under Part Problems you have a Burnmark problem.
5. Begin to make machine control changes and Cycle the machine after each control adjustment to see how your machine control changes have affected your cycle/part.

Note: If you hover over the red block next to the part problem, you will see a number telling you the severity of your problem.

To complete this lesson:

Solve the burnmark problem two different ways.

1. Solve the burnmark by adjusting the Fill rate controls.
 - a. Once you have solved the burnmark with Fill Rate, click the "Reset Control" button and **Cycle** the machine. This will reset your controls to the original settings and you should see a burnmark again.
2. Solve the burnmark by using the clamp force.

NOTE: Only make one control change at a time and then click the "Cycle" button to see the effects of that particular control change. This is the best practice to follow when making any control changes whether it be in SimTech or on an actual molding machine. The exceptions are the four barrel temperatures and five fill rates.

Lab 2 - Solving Flash - (Level 1)

Solving Flash

For this challenge, you are molding a square cover. This customer's dimensional specifications for this rectangular cover part are 6.500" X 6.500" plus or minus 0.005". The plastic you are using is ABS on a 300 ton machine. Your part has flash. The standard (quoted) cycle time for this job is 24 seconds. The part tolerance for this job is ± 0.005 .

Instructions:

1. Log into your Virtual Lab Lessons site (www.paulsonskillbuilder.com)
2. Open lesson "Lab 2"
3. "Cycle" the machine.
4. After you cycle the machine you will see under Part Problems you have a slight Flash problem.
5. Begin to make machine control changes and Cycle the machine after each control adjustment to see how your machine control changes have affected your cycle/part.

Note: If you hover over the red block next to the part problem, you will see a number telling you the severity of your problem.

To complete this lesson:

Solve the flash problem two different ways.

1. Solve flash by adjusting one of the Fill rate controls.
 - a. Once you have solved the flash with Fill Rate, click the "Reset Control" button and **Cycle** the machine. This will reset your controls to the original settings and you should see flash again.
2. Solve flash by using the least clamp force possible.

NOTE: Only make one control change at a time and then click the "Cycle" button to see the effects of that particular control change. This is the best practice to follow when making any control changes whether it be in SimTech or on an actual molding machine. The exceptions are the four barrel temperatures and five fill rates.

Lab 3 - Solving Sink Mark and Dimension Problems (Level 1)

Solving Sink Mark and Dimension Problems

For this challenge, you are molding a frame. This customer's dimensional specifications for the part are 12.00" X 4.00" with a tolerance of ± 0.005 ". The plastic you are using is ABS on a 300 ton machine. Your part has sink marks and is below the length specification. The standard (quoted) cycle time for this job is 65 seconds.

Instructions:

1. Log into your Virtual Lab Lessons site (www.paulsonskillbuilder.com)
2. Open lesson "Lab 3"
3. "Cycle" the machine.
4. After you cycle the machine you will see under Part Problems you have a sink mark problem and your part size is too small.
5. Begin to make machine control changes and Cycle the machine after each control adjustment to see how your machine control changes have affected your cycle/part.

To complete this lesson:

- Have no part problems or alarms
- Achieve a cycle time of 65 seconds or less

NOTE: Only make one control change at a time and then click the "Cycle" button to see the effects of that particular control change. This is the best practice to follow when making any control changes whether it be in SimTech or on an actual molding machine. The exceptions are the four barrel temperatures and five fill rates.

Lab 4 - Solve Burnmarks, Dimensional, Sink Mark Problems & Process Optimization (Level 3)

Solve Burnmarks, Dimensional, Sink Mark Problems & Process Optimization

You are molding the part called a bezel out of polystyrene using a 300 ton molding machine.

You will see under the **Cycle Results**, the “Mold Full at VPT” is 90.05%. This VPT setting is not optimized. You’ll have to correct this. The VPT should occur when the mold is between 94% - 96% full. The part has some problems. The part is burning and has a sink mark. The part is also out of specification. Notice for this part, the tolerance is only ± 0.002 ”.

Burning is a critical part problem and must be addressed first in the optimization process. This is because burning creates a high probability of tool damage. Once the burning problem has been corrected, then proceed to the sink mark, optimizing the VPT, cycle time and part dimensions.

Instructions:

1. Log into your Virtual Lab Lessons site (www.paulsonskillbuilder.com)
2. Open lesson “Lab 4”
3. “Cycle” the machine.
4. Begin changing machine controls one at a time to solve the part problems and get the cycle time to 23 seconds or below.

To complete this lesson:

- Have no part problems or alarms
- Achieve a cycle time of 23 seconds or less

In addition to solving all part problems and getting your cycle time to 23 seconds or below, you must also meet the below “good molding practices” criteria.

- Cushion size must be less than 10% of the Screw Back Distance.
- Mold Full at VPT must be between 94% - 96%.
- Melt temp must be $\pm 2^{\circ}\text{F}$ of front zone barrel temperature

NOTE: Only make one control change at a time and then click the “Cycle” button to see the effects of that particular control change. This is the best practice to follow when making any control changes whether it be in SimTech or on an actual molding machine. The exceptions are the four barrel temperatures and five fill rates.

Lab 5 - Solving Flash, Burnmarks, and Dimension Problems (Level 2)

Solving Flash, Burnmarks, and Dimension problems

We are molding a square cover. This customer's dimensional specifications for this rectangular cover part are 6.500" X 6.500". The plastic you are using is Polystyrene on a 300 ton machine. Your part has flash, burnmarks, and is out of dimension, it is too big. The standard (quoted) cycle time for this job is 14 seconds. The part tolerance for this job is 6.500" \pm .005.

Instructions:

1. Log into your Virtual Lab Lessons site (www.paulsonskillbuilder.com)
2. Open lesson "Lab 5"
3. "Cycle" the machine.
4. After you cycle the machine you will see under Part Problems you have a Flash problem, Burn mark problem, and dimensional problem.
5. Begin to make machine control changes and Cycle the machine after each control adjustment to see how your machine control changes have affected your cycle/part.

To complete this lesson:

- Have no part problems or alarms
- Achieve a cycle time of 14 seconds or less

In addition to the above requirements, you must also meet the below "good molding practices" criteria.

- Cushion size must be less than 10% of the Screw Back Distance.
- Mold Full at VPT must be between 94% - 96%.
- Melt temp must be $\pm 2^{\circ}\text{F}$ of front zone barrel temperature

NOTE: Only make one control change at a time and then click the "Cycle" button to see the effects of that particular control change. This is the best practice to follow when making any control changes whether it be in SimTech or on an actual molding machine. The exceptions are the four barrel temperatures and five fill rates.

Lab 6 Solving Voids and Warp (Level 2)

Solving Voids and Warp

We are molding a cover out of ABS plastic on a 300 ton machine. Your part has voids and warp. The standard (quoted) cycle time for this job is 23 seconds. The part tolerance for this job is 6.500" \pm .005.

Instructions:

1. Log into your Virtual Lab Lessons site (www.paulsonskillbuilder.com)
2. Open lesson "Lab 6"
3. "Cycle" the machine.
4. After you cycle the machine you will see under Part Problems you have a warp and voids problem.
5. Begin to make machine control changes and Cycle the machine after each control adjustment to see how your machine control changes have affected your cycle/part.

To complete this lesson:

- Have no part problems
- Achieve a cycle time of 23 seconds or less

In addition to the above conditions, you must also meet the below "good molding practices" criteria.

- Cushion size must be less than 10% of the Screw Back Distance.
- Mold Full at VPT must be between 94% - 96%.
- Melt temp must be $\pm 2^{\circ}\text{F}$ of front zone barrel temperature

NOTE: Only make one control change at a time and then click the "Cycle" button to see the effects of that particular control change. This is the best practice to follow when making any control changes whether it be in SimTech or on an actual molding machine. The exceptions are the four barrel temperatures and five fill rates.

Lab 7 - Solving Warp, Sinkmarks, and Dimensional Problems (Level 2)**Solving Warp, Sinkmarks, and Dimensional Problems**

We are molding a part called a bezel out of Polystyrene on a 300 ton machine. The customer's specifications for this part are 8.000" x 8.000". The part is too small, it has sink marks and it is warping. The standard (quoted) cycle time for this job is 30 seconds. The part tolerance for this job is $\pm .005$. You must solve the part problems and then optimize the cycle. Of the three 'good molding practices' two of the conditions are already met. The Mold Full at VPT is currently at 94.89% which is with our specification of 94-96%. The cushion size is less than 10% of the screw back distance, again within our 'good molding practices' specifications. However, the melt temperature is 427.7°, not within 2°F of the Front Zone and Nozzle temp. setting. This will need to be fixed.

Instructions:

1. Log into your Virtual Lab Lessons site (www.paulsonskillbuilder.com)
2. Open lesson "Lab 7"
3. "Cycle" the machine.
4. After you cycle the machine you will see under Part Problems you have warp, sinkmarks, and dimensions problems.
5. Begin to make machine control changes and Cycle the machine after each control adjustment to see how your machine control changes have affected your cycle/part.

To complete this lesson:

- Have no part problems or alarms
- Achieve a cycle time of 27 seconds or less

In addition to solving all part problems and getting your cycle time to 23 seconds or below, you must also meet the below "good molding practices" criteria.

- Cushion size must be less than 10% of the Screw Back Distance.
- Mold Full at VPT must be between 94% - 96%.
- Melt temp must be $\pm 2^\circ\text{F}$ of front zone barrel temperature

NOTE: Only make one control change at a time and then click the "Cycle" button to see the effects of that particular control change. This is the best practice to follow when making any control changes whether it be in Simtech or on an actual molding machine. The exceptions are the four barrel temperatures and five fill rates.

Lab 8 - Solving Sink Marks, Warp and Dimensions Problems (Level 4)

Solving Sink Marks and Dimensions Problems

We are molding a frame. This customer's dimensional specifications for part are 12.00" X 4.00" plus or minus 0.005". The plastic you are using is ABS on a 300 ton machine. Your part has sink marks and a dimensional problem, it is too small. The standard (quoted) cycle time for this job is 65 seconds. The part tolerance for this job is ± 0.005 .

Instructions:

1. Log into your Virtual Lab Lessons site (www.paulsonskillbuilder.com)
2. Open lesson "Lab 8"
3. "Cycle" the machine.
4. After you cycle the machine you will see under Part Problems you have a sink mark problem and a size problem.
5. Begin to make machine control changes and Cycle the machine after each control adjustment to see how your machine control changes have affected your cycle/part.

To complete this lesson:

- Have no part problems or alarms
- Achieve a cycle time of 65 seconds or less

In addition to solving all part problems and getting your cycle time to 35 seconds or below, you must also meet the below "good molding practices" criteria.

- Cushion size must be less than 10% of the Screw Back Distance.
- Mold Full at VPT must be between 94% - 96%.
- Melt temp must be $\pm 2^{\circ}\text{F}$ of front zone barrel temperature

NOTE: Only make one control change at a time and then click the "Cycle" button to see the effects of that particular control change. This is the best practice to follow when making any control changes whether it be in SimTech or on an actual molding machine. The exceptions are the four barrel temperatures and five fill rates.

Lab 9 - Optimize the Process and Reduce Cycle Time (Level 3)

Optimize the Process and Reduce Cycle Time

In this set-up, we are already making parts without any defects but the machine settings are not optimized. Your job is to eliminate all part problems, reduce cycle time, and set the controls to “good molding practices” conditions.

Instructions:

1. Log into your Virtual Lab Lessons site (www.paulsonskillbuilder.com)
2. Open lesson “Lab 9”
3. “Cycle” the machine.
4. You will not see any part problems or machine alarms but your cycle time is too high.
5. Begin to make machine control changes and Cycle the machine after each control adjustment to see how your machine control changes have affected your cycle/part.

To complete this lesson:

- Have no part problems or alarms
- Achieve a cycle time of 14 seconds or less

Meet “good molding practices” criteria.

- Cushion size must be less than 10% of the Screw Back Distance.
- Mold Full at VPT must be between 94% - 96%.
- Melt temp must be $\pm 2^{\circ}\text{F}$ of front zone barrel temperature

NOTE: Only make one control change at a time and then click the “Cycle” button to see the effects of that particular control change. This is the best practice to follow when making any control changes whether it be in SimTech or on an actual molding machine. The exceptions are the four barrel temperatures and five fill rates.

Lab 10 - Solving Flash, Dimensional, and Warp problems & VPT (Level 2)

Solving Flash, Dimensional, and Warp problems & VPT

We are molding a cell cover out of ABS plastic on a 150 ton machine. As you can see from the part problems, we have flash, warp, and the part is too big. The standard (quoted) cycle time for this job is 17 seconds. The part tolerance for this job is ± 0.005 .

You will see under the **Cycle Results**, the “Mold Full at VPT” is 9999 and the max pressure alarm came on which means the maximum pressure was used. This means the VPT setting was never reached. You’ll have to correct this. The VPT should occur when the mold is between 94% - 96% full. Because VPT did not occur before the mold was full, the mold flashed and that could cause serious damage to the mold.

Instructions:

1. Log into your Virtual Lab Lessons site (www.paulsonskillbuilder.com)
2. Open lesson “Lab 10”
3. “Cycle” the machine.
4. Begin to make machine control changes and Cycle the machine after each control adjustment to see how your machine control changes have affected your cycle/part.

To complete this lesson:

- Have no part problems or alarms
- Achieve a cycle time of 17 seconds or less

Meet “good molding practices” criteria.

- Cushion size must be less than 10% of the Screw Back Distance.
- Mold Full at VPT must be between 94% - 96%.
- Melt temp must be $\pm 2^{\circ}\text{F}$ of front zone barrel temperature

NOTE: Only make one control change at a time and then click the “Cycle” button to see the effects of that particular control change. This is the best practice to follow when making any control changes whether it be in SimTech or on an actual molding machine. The exceptions are the four barrel temperatures and five fill rates.