

Autodesk® Moldflow® Insight 2012

AMI Molding Window Analysis

Autodesk®

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Molding Window analysis

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The Molding Window analysis is used to calculate the best preliminary process settings for your study.

This analysis quickly provides you with recommendations for the injection time, mold temperature, and melt temperature to use as preliminary inputs for a Fill+Pack analysis.

How it works

The Molding Window analysis uses the part geometry and the selected material and injection location to run a series of calculations, varying the process settings each time.

Specified process ranges and limits may also be used, if selected.

For each of these calculations, the Molding Window analysis checks whether certain results are achieved and then recommends the injection time and the temperature zones to mold your part. The analysis shows the feasible and preferred molding zones, and also shows which process settings will result in the highest quality molding.

Injection time range

The Process Settings Wizard provides an option that allows you to specify how the Molding Window analysis chooses the range of fill times to scan to determine the optimum molding window. The following options are available:

Automatic The most appropriate injection time range with which to run the analysis is determined. If you choose this method, run the analysis, and display results, the results will focus on the preferred window (displayed in green), if one exists. If a preferred molding window does not exist, the results will span the wide range (displayed in green, yellow, and red).

Wide The analysis is run across the widest possible range of injection times. If you choose this method, run the analysis, and display results, the results will span the full range (displayed in green, yellow, and red). within which to run optimization analyses.

Refined A suitable injection time range is determined, based on the mold and melt temperature ranges, and then the analysis is run within that range. If you choose this method, run the analysis, and display results, the results will focus on the preferred window (displayed in green), if one exists. If a preferred molding window does not exist, the results will focus on the feasible window (displayed in yellow), if one exists.

Specified Allows you to enter a specific injection time range.








Molding Window analysis

You can use the Molding Window analysis to calculate the best preliminary process settings for your study.

Setting up a Molding Window analysis


The following table summarizes the setup tasks required to prepare a Molding Window analysis.

The setup tasks below are for non fiber-filled, or fiber-filled thermoplastic materials.

Setup task	Analysis technology
<i>Molding processes</i>	
<i>Meshing the model</i>	
<i>Checking the mesh before analysis</i>	
<i>Analysis sequence</i>	
<i>Selecting a material</i>	
<i>Injection locations</i>	
<i>Process settings</i>	

Specify process settings for a Molding Window analysis


When performing a Molding Window analysis, you do not have to specify any process settings other than the defaults. You may change the default settings if there are particular characteristics of your study that you want the Molding Window analysis to consider.

- 1 Ensure that your model is meshed
- 2 Make sure that you have selected the Molding Window analysis, selected a material and an injection location.
- 3 Click  **Home tab > Molding Process Setup panel > Process Settings**, or double-click the Process Settings icon in the **Study Tasks** pane.
The **Molding Window Settings** dialog appears.
- 4 Change settings, as required.
- 5 Click **OK**.
- 6 Click **Finish**, or **Analyze** to perform the analysis.

Molding Window analysis

Use this dialog to specify settings for a Molding Window analysis.

Process Settings Wizard dialog—Molding Window Settings

This page of the **Process Settings Wizard**, which can be accessed by clicking  (Home tab > Molding Process Setup panel > Process Settings), is used to specify the molding window related process settings for the analysis sequence.


NOTE: Some of the items listed below may not be available on the current dialog. This is dependent on the molding process and analysis sequence selected.

Injection molding machine	Select and edit an injection molding machine to simulate your molding machine during the analysis. You can configure the injection unit, hydraulic unit, and clamping unit.
Mold temperature range to analyze	Select the range of mold temperatures to be used in the Molding Window analysis. You can specify a temperature range, or have the program calculate it automatically.
Melt temperature range to analyze	Select the range of melt temperatures to be used in the Molding Window analysis. You can specify a temperature range, or have the program calculate it automatically.
Injection time range to analyze	Specifies how you want the molding window solver to choose the range of injection times to scan.
Advanced options...	Displays the advanced options for the analysis.

Molding Window Advanced Options dialog

This dialog is used to specify the molding window analysis related advanced options for the analysis sequence.

To access this dialog, ensure that you have selected the analysis sequence


Molding Window, click  (Home tab > Molding Process Setup panel > Process Settings), then click **Advanced options**.

Limits for calculation of feasible molding window	Lists the parameters taken into consideration in the calculation of the feasible molding window, and specifies any upper limits to be applied to those parameters.
Limits for calculation of preferred molding window	Lists the parameters taken into consideration in the calculation of the preferred molding window, and specifies the upper limits to be applied to those parameters.

Molding Window Input Range dialog

This dialog is used to specify the range of values to be analyzed in the molding window analysis for the analysis input (mold temperature, melt temperature or injection time that was set to Specified on the Molding Window Settings page of the Process Settings Wizard).

To access this dialog, ensure that you have selected the analysis sequence

Molding Window, click  (Home tab > Molding Process Setup panel > Process Settings), set one of the three **range to analyze** options to **Specified**, then click **Edit range**.

Mold temperature range	Allows you to set the range of mold temperatures to be used in the calculation of the molding window.
Melt temperature range	Allows you to set the range of melt temperatures to be used in the calculation of the molding window.
Injection time range	Allows you to select the range of injection times to scan in order to determine the optimum molding window.

Molding window process settings defaults dialog—Input Factors tab

The **Input Factors** tab of the **Molding window process settings defaults** dialog is used to specify default values to control which input factors will be considered in a Molding Window analysis, and the range of values to be analyzed for each.

NOTE: The values used for the current analysis sequence may be changed by entering the desired values on the Process Settings Wizard—Molding Window Settings dialog.

Mold temperature range to analyze	Allows you to set the range of mold temperatures to be used in the calculation of the molding window.
Melt temperature range to analyze	Allows you to set the range of melt temperatures to be used in the calculation of the molding window.
Injection time range to analyze	Allows you to select the range of injection times to scan in order to determine the optimum molding window.

Molding window process settings defaults dialog—Preferred/Feasible Window tab

The **Preferred/Feasible Window** tab of the **Molding window process settings defaults** dialog is used to specify default values for the limits used to calculate the preferred window and feasible window in a Molding Window analysis.

NOTE: The values used for the current analysis sequence may be changed by entering the desired values on the Process Settings Wizard—Molding Window Settings dialog.

Limits for calculation of feasible molding window	<p>This section of the dialog lists the parameters taken into consideration in the calculation of the feasible molding window, and specifies any upper limits to be applied to those parameters.</p> <p>The feasible molding window calculates the largest possible range of injection times, mold temperatures and melt temperatures within which the part can be molded.</p>
Limits for calculation of preferred molding window	<p>This section of the dialog lists the parameters taken into consideration in the calculation of the preferred molding window, and specifies the upper limits to be applied to those parameters.</p> <p>The preferred molding window calculates the range of injection times, mold temperatures and melt temperatures within which the part can be molded based on a comprehensive set of limiting criteria intended to ensure the production of quality parts.</p>
Shear rate limit	Specifies whether a limit (maximum value) is to be applied to the shear rate

	in the part and runner system when calculating the preferred/feasible molding window.
Shear stress limit	Specifies whether a limit (maximum value) is to be applied to the shear stress in the part and runner system when calculating the preferred/feasible molding window.
Flow front temp. drop limit	Specifies whether a limit (maximum value) is to be applied to the drop in temperature of the melt front when calculating the preferred/feasible molding window.
Flow front temp. rise limit	Specifies whether a limit (maximum value) is to be applied to the rise in temperature of the melt front when calculating the preferred/feasible molding window.
Injection pressure limit	Specifies whether a limit (maximum value) is to be applied to the injection pressure to fill the part when calculating the preferred/feasible molding window.
Clamp force limit	Specifies whether a limit (maximum value) is to be applied to the clamp force required to fill the part when calculating the preferred/feasible molding window.

Molding Window Derivation—Calculation

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The Molding Window analysis runs a series of quick calculations on the part, varying the processing conditions each time.

The processing conditions are only varied within their ranges of acceptability, as specified in the material information in the material database. The analysis uses these variables across their ranges:

- Injection time
- Melt temperature
- Mold temperature

The Molding Window analysis checks whether five conditions are acceptable for each of these calculations, using the following inputs:

- Material
- Part geometry
- Injection location
- Maximum injection pressure

Each calculation is represented by a single point on the Molding Window results, which is colored red, yellow, or green according to whether the following five conditions are acceptable or not:

- Injection pressure.
- Temperature at flow front.
- Shear stress.
- Shear rate.
- Short shot.

Molding Window Derivation—Inputs

3

The Molding Window calculation uses information about the injection location and the size, shape, and thickness of the model to determine the lengths of the flow paths from the injection location to the points on the model's extremities.

The Molding Window analysis uses the following inputs:

- Material
- Part geometry
- Injection location
- Maximum injection pressure

Material

A Molding Window analysis can only be run with materials that have a specified maximum recommended shear rate and a specified maximum recommended shear stress.

Maximum injection pressure

You can change the default value if your injection molding machine is capable of injecting at higher pressures. If a Molding Window calculation predicts that the injection pressure required to fill the part is greater than the maximum injection pressure, then that point on the display corresponding to the conditions used in the calculation will be red.

Molding Window Derivation—Color

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The Molding Window Analysis checks whether the five conditions are acceptable and these calculations are checked against their ranges of acceptability.

Green

An area of the Molding Window is green if all of these cases are true.

The part is not a short shot.	
The injection pressure required to fill the part is less than 80% of maximum machine injection pressure capacity.	$P < 0.8 P_{max}$
Temperature at the flow front is less than 10°C above the injection (melt) temperature.	$T < T_{melt} + 10^{\circ}C$
Temperature at the flow front is greater than 10°C below the injection (melt) temperature.	$T > T_{melt} - 10^{\circ}C$
The shear stress is less than the maximum specified for the material in the material database.	$\tau < \tau_{max}$
The shear rate is less than the maximum specified for the material in the material database.	$\dot{\gamma} < \dot{\gamma}_{max}$

Yellow

An area of the Molding Window is yellow if it does not satisfy all the conditions for being displayed as green, and all of these cases are true.

The part is not a short shot.	
The injection pressure required to fill the part is less than the maximum machine injection pressure capacity.	$P < P_{max}$

Red

An area of the Molding Window is red if either of these cases is true.

The part is a short shot.	
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The injection pressure required to fill the part $P > P_{max}$ is greater than the machine injection pressure specified.