AMI Gas-assisted Injection Molding
Revision 1, 22 March 2012.

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Gas-assisted Injection Molding

Gas-Assisted Injection Molding is a process where an inert gas is introduced at pressure, into the polymer melt stream at the end of the polymer injection phase.

The gas injection displaces the molten polymer core ahead of the gas, into the as yet unfilled sections of the mold, and compensates for the effects of volumetric shrinkage, thus completing the filling and packing phases of the cycle and producing a hollow part.

Traditionally, injection molded components have been designed with a relatively constant wall thickness throughout the component. This design guideline helps to avoid major flaws or defects such as sink marks and warpage. However, apart from the simplest of parts, it is impossible to design a component where all sections are of identical thickness. These variations in wall thickness result in different sections of the part packing differently, which in turn means that there will be differentials in shrinkage throughout the molding and that subsequently distortion and sinkage can often occur in these situations.

By coring out the melt center, gas injection molding enables the packing force (which compensates for differential shrinkage) to be transmitted directly to those areas of the molding which require attention. This dramatically reduces differentials in shrinkage and thus the sinkage. In addition, the internal stresses are kept to a minimum, considerably reducing any distortion that may otherwise have taken place.

Maximum clamp pressures are normally required during the packing phase of a molding cycle. This is due to the force which has to be exerted at the polymer gate in order to pack melt into the extremities of the mold cavity in an effort to compensate for the volumetric shrinkage of the solidifying melt. In comparison to compact injection molding, gas injection molding typically has considerably shorter distance over which the solidifying melt is required to be packed because of the gas core. This means that proportionally lower packing pressures are required to achieve the same results and in turn, lower machine clamp forces are required.
Gas injection allows cost effective production of components with:

- Thick section geometry.
- No sink marks.
- Minimal internal stresses.
- Reduced warpage.
- Low clamp pressures.

**Gas-assisted Fill+Pack analysis benefits**

Gas-assisted Fill+Pack analysis provides you with the ability to study polymer and gas flow behavior within a part model and examine the influence that design modifications make on both the polymer and gas flow paths.

Using this information, the design engineer will be able to optimize product design and accurately position polymer and gas injection points. Also to ensure that the product specifications are met, utilizing the full capabilities of the gas injection molding process. Expensive tool modifications, long lead times and trial and error will also be kept to a minimum.

The process engineer will benefit from the program's capacity to examine the effects that varying processing conditions will have on the component and enable optimum processing conditions to be established prior to mold commissioning.
The following table shows the available analysis technologies for a Gas-assisted injection molding analysis type.

**Table 1: Gas-assisted Injection Molding process and analysis types**

<table>
<thead>
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<th>Analysis Type</th>
<th>Analysis Technology</th>
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<td>Fill</td>
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<td>Stress</td>
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</table>

**Gas-assisted injection molding analysis types and analysis technologies**

There are specific set-up tasks required for a Gas-assisted injection molding analysis.

**Setting up a Gas-assisted injection molding analysis**

The following table summarizes the setup tasks required to prepare a Gas-assisted Fill+Pack analysis of a non fiber-filled, or fiber-filled thermoplastic material.

**TIP:** The optimal number of mesh layers through the thickness is at least 10 for a Gas-assisted analysis using 3D analysis technology.

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### Optional setup tasks

<table>
<thead>
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<th>Setup task</th>
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<td><strong>Cavity/core side mold temperatures</strong> (^3)</td>
<td><img src="image14.png" alt="Image" /></td>
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</tbody>
</table>

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1. The gas channel mesh must pass diagnostic tests.
2. Gas injection control parameters can be set at the same time as the gas entrance.
3. Manual core/cavity mold temperature assignment is only relevant when not performing a Cool analysis.
Preparing the model for Gas-assisted injection analysis

There are modeling tasks required for a Gas-assisted Fill+Pack analysis.

Compulsory modeling tasks
- A meshed part model.
- Polymer and Gas Injection nodes specified.

Optional modeling tasks
- Assign ideal cavity / core side mold temperatures.
Modeling gas channels

Compared to modeling for traditional injection molding, modeling for Gas-assisted Fill+Pack analysis requires more attention to the mesh detail in regions where gas is expected to penetrate.

This requires specific modeling and meshing techniques.

The primary aim of the Gas-assisted process is to get maximum gas penetration without leakage into the cavity walls, and without a blow through to the atmosphere. This requires accurate predictions of the gas flow path and its penetration by the analysis. Such accuracy depends on the geometry of the flow path and the mesh quality.

A gas channel, usually a thick rib, represents the preferred gas path through the polymer. How this path should be modeled and meshed, using either shell or beam elements, depends on the width-to-thickness ratio of the channel.

Gas channels with width-to-thickness ratio > 4:1

Part designs for gas-assisted injection molding that include ribs, as illustrated in the following figure, typically have a width-thickness ratio greater than 4:1.

These rib features (a) should be modeled as regions (b) with stepped thickness values according to the rib profile. For optimum modeling of the stepped profile, thickness transition regions should be modeled, as illustrated in the following figure. To avoid solution instabilities, the Flow solver smooths thickness steps over a distance of one element either side of a node on the transition edge. By including transition regions, a better representation of the rib profile is obtained.
In this diagram, the two lower images are geometries as interpreted by the analysis. By modeling transition regions (R), you can define a more accurate shape of the geometry.

**Gas channels with width-to-thickness ratio < 4:1**

Where the width-to-thickness (W to T) ratio of the gas channel cross-section is lower than 4, as illustrated in the following figure, the gas channel should be modeled as curves of type **Part beam** with appropriate cross-sectional dimensions. Beams better account for the effect of heat transfer through the edges of thick ribs which have a width-thickness ratio of less than 4:1. This transfer has a major effect on cooling and frozen layer predictions which, in turn, is a significant factor in defining the route of gas penetration.

The following figure provides a further example of a gas channel that should be modeled as a beam. Beams with irregular cross-sections can be assigned a cross-sectional shape of **Other**, with an equivalent diameter and shape factor calculated as explained in *About cross-sectional shapes and shape factors*. 
Mesh density

The precision of gas penetration predictions is to within one element of the mesh at any point on the final gas flow front. Therefore, gas channels and adjacent areas where gas is likely to penetrate should have small elements with the lowest possible aspect ratio. The aim is to mesh shell type surfaces so that there is:

■ A minimum of 2 elements across each region.
■ A minimum of 3 elements across gas channels.
■ An aspect ratio of 4 for gas channels, and 6 for everything else.

Small elements can be generated by setting the global edge length value to a low value, or by adjusting the local mesh density in areas of interest.
Gas entrances

A gas entrance is the position where compressed gas is injected into the mold cavity.

The gas injection stage of the software is an integral component of the filling phase, and allows you to specify single or multiple gas entrances directly into the cavity, or through the polymer injection location(s), that is, machine nozzle or in-runner.

Gas entrance considerations

Gas, like the molten polymer, always flows toward the point of lowest pressure. Therefore, select the gas entrance to ensure that the gas stays in the gas channel, and that the area of lowest pressure is near the end of the gas channel.

Some of the more important questions to consider when setting gas entrances on your model are:

■ Polymer injection location(s).
■ Along which route will the gas flow?
■ How far will the gas penetrate?
■ Will gas penetrate into the thin wall section?
■ What will the channel and wall thickness be?
■ Is the optimum part weight being achieved?
■ Will sink marks be avoided?

As with all polymer melt flow analyses, geometry changes in one area can have an effect on the flow characteristics in another section. This is even more significant with gas-assisted injection molding due to the sensitivity with which the pressurized gas searches out and flows through the route of least resistance until such a time as the cumulative resistance of the melt exceeds the pressure of the gas.

For this reason, changes to component geometries must not be looked at in isolation to one another. Due to the complexity of the problem this is only feasible with the aid of a computer based simulation process.
Gas entrances

To simulate the injection of compressed gas into the mold, following the polymer, you must set a gas entrance on your model.

Setting gas entrances

Gas, like the molten polymer, will always flow towards the point of lowest pressure. Therefore the gas entrance should be chosen to ensure that the gas stays in the gas channel, and that the area of lowest pressure is near the end of the gas channel.

1 Click **Home tab > Molding Process Setup panel > Process Settings** and select **Gas-assisted Injection Molding**.

2 Click **Boundary Conditions tab > Gas panel > Set Entrances**. The **Set Gas Entrance** dialog allows you to create a new gas entrance or to edit an existing one.

3 Create or edit an existing gas entrance, as follows:

   ■ To create a new gas entrance, click **New**, click **Edit**, and make the necessary changes to the Gas-assisted injection controller, and click **OK**.

   ■ To edit an existing gas entrance, select it in the **Set Gas Entrance** dialog, and click **Edit**. Make the necessary changes to the Gas-assisted injection controller, and click **OK**.

4 Click on the required gas entrance in the **Set Gas Entrance** dialog to select it.

5 Click the cross-hairs on the model where you want to set the gas entrance.

   A large **G** symbol with an arrow pointing towards the model appears, indicating that the gas entrance has been set.

6 Right-click and select **Finish Gas Entrances**.

7 then click **Save > Save Study** to save your study.

**NOTE:** You can update the gas entrance later by right-clicking on the yellow **G** and selecting **Properties**.

---

Gas entrances

Use this dialog to specify settings for gas entrances.
**Gas Entrance dialog**

The **Gas Entrance** dialog is used to specify the properties of the selected gas entrance(s).

The set of property values defined by the dialog are saved to a property set with the description shown in the **Name** box.

**NOTE:** Give the Gas-assisted injection controller a unique name in the text box provided. This will enable you to quickly identify the controller at a later time.

| Gas-assisted injection controller | Allows you to select and/or edit a gas injection controller to be associated with the gas entrance. |

**Gas-Assisted Injection Controller dialog**

The **Gas-Assisted Injection Controller** dialog is used to specify gas injection settings for a Gas-assisted injection molding analysis.

The collection of property values defined on the dialog are saved to a property set with the description shown in the **Name** box.

<table>
<thead>
<tr>
<th>Gas delay time</th>
<th>The gas delay time is the time from velocity/pressure switch-over to when injection of gas into the mold begins. If you want the gas to be ejected immediately at the time of velocity/pressure switch-over, enter a delay time of zero.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas injection control</td>
<td>Select whether you want the solver to automatically determine a suitable gas injection profile for your part, or whether you want to enter a profile manually.</td>
</tr>
</tbody>
</table>

**Gas Volume Controller Settings dialog**

This dialog is used to specify the settings for a volume control Gas-assisted injection controller for the selected gas entrance.

**Gas Pressure Controller Settings dialog**

This dialog is used to specify the settings for a pressure control Gas-assisted injection controller for the selected gas entrance.
Gas injection methods

During Gas-assisted injection molding, the gas can be injected into the polymer melt either through the nozzle of the molding machine, or by direct injection into the mold or into a runner.

This help topic outlines the advantages and disadvantages of each using each method.

Gas injection through the nozzle

The molding machine is fitted with a special polymer/gas injection nozzle through which firstly polymer and then gas is injected into the tool.

**Advantages**

Requires no tool modifications or tool specific components, thus implementation of gas injection molding is relatively cheap.

**Disadvantages**

Gas and polymer are injected through a single location, resulting in less process control.

Cannot be used with hot runner systems.

Gas control unit is often tied to a particular molding machine.

Location and number of gas injection points are determined by the runner system, which is a constraint for mold design.

Runner system affects the gas flow.

Very difficult to use with multi-cavity (family) molds, due to difficulties in control of gas and polymer flow paths.
Gas injection directly into the mold or runner

The gas is introduced directly into the runner or cavity by a needle device built into the tool.

**Advantages**
- Gas is introduced directly into the cavity, so it can be injected where most appropriate.
- Independent gas injection times and pressure profiles may be set for each injection location.
- Hot runner systems may be used.
- Gas control unit is not molding machine specific.
- Can be used with multi-cavity (family) molds.

**Disadvantages**
- Higher tooling costs.
Gas injection control

The injection of pressurized gas (usually nitrogen) is achieved by the use of a gas control unit that compresses and then releases the gas into the polymer melt.

The two main control techniques for gas injection are volume control and pressure control.

Gas injection stage

The gas injection stage of the Gas-assisted Fill+Pack analysis is an integral component of the filling phase and provides you with the ability to specify single or multiple gas injection locations either directly into the cavity, or via the polymer injection position/s, that is, machine nozzle or runner.

The onset of gas injection is independent of the time at which polymer injection stops, providing the ability to incorporate a dwell period between the end of polymer injection and the start of gas injection. The gas injection pressure can be set up to a maximum of 70 MPa, and can be profiled to a maximum of 100 steps.

Gas volume control

A preset volume of gas is injected and the gas pressure decays during the packing phase. In the case of volume control, the initial charge of gas is fixed at a particular volume for a set pressure. The gas is injected into the polymer melt by means of a gas compression ram. The gas pressure then decays as the gas expands into the melt and is held during the packing phase.

During the holding (cooling) phase the gas maintains pressure on the polymer and in so doing packs (compresses) the solidifying polymer, compensating for volumetric shrinkage. The gas pressure also forces the outer polymer skin against the mold walls maintaining good thermal contact and ensuring that cooling periods are kept to a minimum.

Gas pressure control

Gas pressure is controlled during the injection cycle and can be stepped or profiled. In the case of pressure control, it is the pressure of the gas which is being controlled during the injection cycle, not the volume. This is based on the assumption that the gas pressure can affect the rate of movement of gas/polymer flow fronts. Gas pressure can be stepped or profiled during both the injection and packing phases.
Gas injection control

Controlling the gas injection phase of the filling phase is important for the final product.

Specifying gas injection control parameters

The gas injection stage of the Gas-assisted Fill+Pack analysis is an integral component of the filling phase, and allows you to specify gas entrance(s) directly into the cavity, or via the polymer injection location(s).

The onset of gas injection is independent of the time at which polymer injection stops, providing the ability to incorporate a dwell period between the end of polymer injection and the start of gas injection. The gas entrance can be set at the same time as the injection controller, as indicated below.

2. Click Boundary Conditions tab > Gas panel > Set Entrances.
3. Click New.
   The Gas entrance dialog appears, allowing you to create an injection controller, or to select one from the database.
   - To edit/create a controller, click Edit to display the Gas-assisted injection controller dialog.
   - Enter a Gas delay time in seconds, measured from the velocity/pressure switch-over time.
   - Select the gas injection control method:
     - Automatic The solver will automatically determine a suitable gas injection profile for your part.
     - Specified Select either gas pressure controller or gas volume controller, click Edit controller settings, enter the required controller parameters, then click OK.
   - Enter a name for the Gas-assisted injection controller, then click OK.
   - To select a controller, click Select, select the required controller in the list, and click OK twice.
4. Click the cross-hairs on the model where you want to set the gas entrance on the model.
   A large G symbol with an arrow pointing towards the model appears, indicating that the gas entrance has been set.
5. Right-click and select Finish Gas Entrances.
6. Click then click Save > Save Study to save your study.
NOTE: You can update the gas injection controller later by right-clicking on the yellow G (Gas entrance) and selecting Properties...

Specifying a gas injection profile

A gas injection profile is used to specify the rate of gas injection during the pressure phase.

NOTE: Make sure you have selected the Gas-assisted injection molding process Home tab > Molding Process Setup panel > Gas-Assisted Injection Molding.

1 Set a gas injection entrance by selecting the Set Gas Entrance icon in the Study Tasks pane, then selecting the node at which the gas will be injected.

   NOTE: Alternatively, click Boundary Conditions tab > Gas panel > Set Entrances

The Set Gas entrance dialog is displayed.

2 To edit the gas entrance properties, select Edit in the Set Gas entrance dialog. You can edit the properties of an existing gas entrance by right-clicking on the gas entrance and selecting Properties.

   The Gas entrance dialog is displayed.

3 Select Edit to display the Gas-assisted injection controller dialog.

   NOTE: If you have more than one gas entrance, and you do not want all existing gas entrances to use the same settings, uncheck the Apply to all entities that share this property checkbox.

4 You can choose to control the gas injection by using the gas pressure controller or the gas volume controller from the drop down list.

5 Click Edit controller settings to display the dialog for the controller you selected. Enter your profile.

   If you selected gas pressure controller you need to enter absolute values in the profile table.

   If you selected gas volume controller you need to enter percentage (relative) values in the profile table. You will also need to enter the following values:

   ■ Gas injection time
   ■ Maximum gas pressure
   ■ Plunger travel time
   ■ Initial pressure
   ■ Piston volume
Specifying polymer nozzle shutoff in Gas analysis

During a Gas-assisted Fill+Pack analysis, you may want to terminate polymer injection before gas injection begins.

For example, you may want to inject polymer to 80% of the total cavity volume, and wait 2 seconds before injecting the gas. To simulate the polymer nozzle shut-off at a specified percentage of fill, you need to set the velocity/pressure switch-over to a %volume filled, and then set a packing profile duration of zero, as indicated below.

1. Click Home tab > Molding Process Setup panel > Process Settings, or double-click the Process Settings icon in the Study Tasks pane.
2. In the Velocity/pressure switch-over drop-down list, select by %volume filled.
3. Enter the required percentage of fill to reach before gas injection begins.
4. In the Pack/holding control drop-down list, select % Filling pressure vs time, and click Edit profile....
5. Enter Duration = 0, % Filling pressure = 0 into the first row. If other values are entered in the table, select the row number and then press delete.
6. Click OK.
7. Click OK to close the Process Settings Wizard when you have finished specifying process settings.

Gas injection control

This dialog is used to set the gas injection settings for a Gas-assisted injection molding analysis.

To access this dialog, click Tools tab > Databases panel > New. Select Process Conditions from the Category drop-down menu, and Gas-assisted injection controller from the Property type list. Click New in the Properties dialog to bring up the Gas-assisted injection controller dialog.

Gas-Assisted Injection Controller dialog

The Gas-Assisted Injection Controller dialog is used to specify gas injection settings for a Gas-assisted injection molding analysis.

The collection of property values defined on the dialog are saved to a property set with the description shown in the Name box.
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</tbody>
</table>
Overflow wells—gas injection molding

Ideally, the placement and extent of gas channels should be controlled by suitable modifications to the part geometry.

In cases where this does not provide sufficient control, overflow wells can be used to increase gas penetration, or direct the gas into specific areas of the part.

An overflow well is a secondary cavity into which the gas can displace polymer and thereby penetrate further into the part. Overflow wells provide paths of least resistance along which the gas will preferentially travel. Further control over gas flow can be achieved by opening and closing the overflow wells at specific times by means of valve gates.

The following figure illustrates the typical application of overflow wells in gas-assisted injection. The passage to the overflow well is generally closed during the injection phase while the plastic is filling the rest of the cavity, as illustrated in a) below. At the end of polymer injection, there is an optional delay time which allows the polymer over the thin sections to solidify. Immediately before gas injection is triggered, the passage to the overflow well is opened, creating an additional volume to accommodate the resin that is displaced by the incoming gas, as illustrated in b) below. After the part is ejected from the mold, the overflow can be trimmed off if it is undesirable.

1) Control valve closed during polymer injection. 2) Gas penetration. 3) Gas entrance. 4) Control valve open during gas injection.
Overflow wells must be modeled with a defined volume. For Midplane models only, an overflow well with infinite volume can be simulated by setting a venting location at the end node of the overflow well.

**Overflow wells - gas injection molding**

Overflow wells can be used to increase gas penetration, or direct the gas into specific areas of the part.

**Modeling overflow wells in Midplane models**

An overflow well is a secondary cavity into which the gas can displace polymer and thereby penetrate further into the part.

1. Click **Home tab > Molding Process Setup panel > Process Settings** and select **Gas-assisted Injection Molding**.
2 Model the overflow well(s) by creating regions with the property *Overflow well (Midplane)* and/or curves with the property *Overflow well (beam).*

3 Click **Mesh tab > Mesh panel > Generate Mesh** to mesh the overflow wells.

4 To specify the overflow well properties, select an overflow well element, then right-click and select **Properties**. The overflow well properties dialog for the element type opens.
   a For Midplane and beam overflow wells, specify the thickness or diameter, respectively, of the overflow well on the **Overflow Well Properties** tab.
   b To assign a valve gate to the overflow well, select the **Valve Gate Control** tab, click **Edit...**, select the valve control method (usually *Time* in Gas-assisted injection molding), then click **Edit settings...** and enter the opening and closing times of the valve gate. Click **OK** twice to close the valve control related dialogs.
   c When you have finished editing the overflow well properties, click **OK** to close the properties dialog.

5 To simulate an overflow well of infinite volume, click **Boundary Conditions tab > Venting panel > Venting Locations** and click on a node belonging to an overflow well triangular element or beam. A venting location symbol is displayed on the selected node.

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**NOTE:** The Gas-assisted injection molding analysis is supported only for Midplane and 3D mesh types.

**NOTE:** Overflow wells of infinite volume are only supported for Midplane meshes.

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**Modeling overflow wells in 3D models**

An overflow well is a secondary cavity into which the gas can displace polymer and thereby penetrate further into the part.

1 Click **Home tab > Molding Process Setup panel > Process Settings** and select **Gas-assisted Injection Molding**.

2 Model the overflow well(s) together with the part in your CAD system, then import the model and create the tetrahedral mesh. Select the overflow well elements, then click **Mesh tab > Properties panel > Assign**, then in the **Assign Property** dialog select **New > Overflow well (3D)**.

   You can also model overflow wells by creating beams on your 3D model with the property **Overflow well (beam)**.

3 To specify the overflow well properties, select an overflow well element then right-click and select **Properties**.
The overflow well properties dialog for the element type opens.

a For 3D and beam overflow wells, you need to specify the volume or diameter, respectively, of the overflow well on the **Overflow Well Properties** tab.

b To assign a valve gate to the overflow well, select the **Valve Control** tab, click **Edit...**, select the valve control method (usually **Time** in Gas-assisted injection molding), then click **Edit settings...** and enter the opening and closing times of the valve gate. Click **OK** twice to close the valve control related dialogs.

c When you have finished editing the overflow well properties, click **OK** to close the properties dialog.

**NOTE:** The Gas-assisted injection molding analysis is supported only for Midplane and 3D mesh types.

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**Overflow wells—gas injection molding**

Use this dialog to specify settings for gas entrances.

**Overflow Well (Midplane) dialog—Valve control tab**

The **Valve Control** tab of this dialog is used to assign a valve gate controller to the selected overflow well element.

The valve gate controller specifies the criterion and timings for the opening and closing of the associated valve gate.

The collection of property values defined on the dialog are saved to a property set with the description shown in the **Name** box. In addition, you may be given the option to also apply the property values to related entities in the model.

**Overflow Well (Midplane) dialog—Mold Properties tab**

The **Mold Properties** tab of this dialog is used to specify the properties of the mold blocks in contact with the selected elements or regions of type **Overflow well (Midplane)**.

The collection of property values defined on the dialog are saved to a property set with the description shown in the **Name** box. In addition, you may be given the option to also apply the property values to related entities in the model.

**Overflow Well (Midplane) dialog—Overmolding Component tab**

The **Overmolding Component** tab of this dialog is used to specify which stage/component in the overmolding process the selected elements or regions of type **Overflow well (shell)** relate to.
The collection of property values defined on the dialog are saved to a property set with the description shown in the Name box. In addition, you may be given the option to also apply the property values to related entities in the model.

Overflow Well (Midplane) dialog—Overflow Well Properties tab

The Overflow Well Properties tab of this dialog is used to specify the overflow well related properties of the selected elements or regions of type Overflow well (Midplane).

The collection of property values defined on the dialog are saved to a property set with the description shown in the Name box. In addition, you may be given the option to also apply the property values to related entities in the model.

Overflow Well (Beam) dialog—Valve Control tab

The Valve Control tab of this dialog is used to assign a valve gate controller to the selected overflow well element.

The valve gate controller specifies the criterion and timings for the opening and closing of the associated valve gate.

The collection of property values defined on the dialog are saved to a property set with the description shown in the Name box. In addition, you may be given the option to also apply the property values to related entities in the model.

Overflow Well (Beam) dialog—Mold Properties tab

The Mold Properties tab of this dialog is used to specify the properties of the mold block in contact with the selected beam elements or curves of type Overflow well (beam).

The collection of property values defined on the dialog are saved to a property set with the description shown in the Name box. In addition, you may be given the option to also apply the property values to related entities in the model.

Overflow Well (Beam) dialog—Overmolding Component tab

The Overmolding Component tab of this dialog is used to specify which stage/component in the overmolding process the selected beam(s) or curve(s) of type Overflow well (beam) relate to.

The collection of property values defined on the dialog are saved to a property set with the description shown in the Name box. In addition, you may be given the option to also apply the property values to related entities in the model.
Overflow Well (Beam) dialog—Overflow Well Properties tab

The **Overflow Well Properties** tab of this dialog is used to specify the overflow well related properties of the selected beam(s) or curve(s) of type **Overflow well (beam)**.

The collection of property values defined on the dialog are saved to a property set with the description shown in the **Name** box. In addition, you may be given the option to also apply the property values to related entities in the model.

Overflow Well (3D) dialog—Valve Control tab

The **Valve Control** tab of this dialog is used to assign a valve gate controller to the selected overflow well element.

The valve gate controller specifies the criterion and timings for the opening and closing of the associated valve gate.

The collection of property values defined on the dialog are saved to a property set with the description shown in the **Name** box. In addition, you may be given the option to also apply the property values to related entities in the model.

Overflow Well (3D) dialog—Mold Properties tab

The **Mold Properties** tab of this dialog is used to specify the properties of the mold block in contact with the selected tetrahedral elements of type **Overflow well (3D)**.

The collection of property values defined on the dialog are saved to a property set with the description shown in the **Name** box. In addition, you may be given the option to also apply the property values to related entities in the model.

Overflow Well (3D) dialog—Overflow Well Properties tab

The **Overflow Well Properties** tab of this dialog is used to specify the overflow well related properties of the selected tetrahedral elements of type **Overflow well (3D)**.

The collection of property values defined on the dialog are saved to a property set with the description shown in the **Name** box. In addition, you may be given the option to also apply the property values to related entities in the model.
Venting locations

Vents are tiny channels at the end of the flow path that allow air and/or polymer to escape the cavity during a Gas-assisted Fill+Pack analysis.

**Defining a vent location**

The Gas-assisted Fill+Pack analysis program allows you to specify venting locations at the end of the gas channel. Venting locations can only be assigned to overflow wells, and are saved as boundary conditions to define the overflow well as having an infinite volume.

To define an overflow well as having an infinite volume, a venting location must be assigned to the end node on the overflow well.

**Venting locations**

Venting locations are tiny channels at the end of the flow path that allow air and/or polymer to escape the cavity during a Gas-assisted Fill+Pack analysis.

**Setting gas-injection venting locations**

**NOTE:** A venting location can only be set on an overflow well.

1. Ensure that you have already set an overflow well on the model.

2. Click `Boundary Conditions tab > Venting panel > Venting Locations`. Cross-hairs will appear, allowing you to specify the vent.

3. Click the cross-hairs on the overflow well section of the model where you want to set the vent.
   The overflow well entities should be indicated on the model by a green color. After you set the vent, a light blue icon will appear.

4. Right-click and select **Finish Venting Locations**.

5. Then click `Save > Save Study` to save your study.

**NOTE:** You can update the name of the vent later by right-clicking on the light blue icon and selecting **Properties**.
Venting locations

Use this dialog to specify settings for a venting location.

Venting Location dialog

The Venting Location dialog is used to assign a name to the selected Venting locations.

Venting locations do not have any properties associated with them; perfect and adequate venting is always assumed.