Curl Management

SOFTWARE/PRODUCT/FINISHING

OVERVIEW

Curl is defined as the distortion of horizontal surfaces caused by the shrinkage of a new layer as it's applied over the existing layers, causing those layers to deform. This can be a challenge with parts that have thick cross sections or large flat areas. Insight™ software features several tools that can mitigate part curl even on the most challenging geometries.

1. OPTIONS

1.1. Base Layer Modifications

Two non-invasive ways to reduce part curl are to increase the support ***Base oversize*** and ***Base layers*** values in the Insight software ***Support Parameters*** dialog box. Change one or both values as needed to achieve the best results. These two options are ideal when used with standard and engineering-grade thermoplastics because they won't leave any residual marks on the part.

1.2. Removing Perforations

For materials with breakaway supports the default support parameters add perforations (single model layers incorporated in the support at predetermined intervals) for ease of support removal. For geometries where a large amount of stress may induce curling, failure may occur at the perforation layer. Typically, these geometries have large areas of support and curling can be avoided by eliminating perforations.

NOTE

Consider the part geometry and support removal process when removing perforations. For intricate or detailed parts, removal of perforations is not recommended.

1.3. Anchor Columns

On large flat parts (> 305 mm [12 in.] long and >12.7 mm [0.5 in.] thick) that have the potential to curl due to differential cooling, anchor columns may be used to secure the model to the base. The anchor column is made of model material and will need to be mechanically removed after the build. Placement and quantity will depend on the part's geometry and any observed curl in previous builds.

NOTE

If the surface quality of the downward-facing surfaces is important, consider using ***Stabilize Wall*** to secure the parts by its vertical surfaces. This method isn't as robust but can be less invasive while reducing part curl.

1.4. Anchor Profiles

Anchor profiles offer the advantage of anchoring the part in a uniform manner around its perimeter. This manual process is typically used when anchor columns aren't sufficient to secure the part.

NOTE

Descriptions of all the options in the parameters sheet are available through the Insight software help menu. Many of these settings can have detrimental effects on your parts if not used properly. Therefore, it is recommended that only experienced or advanced users make changes to these values. To insure the best possible part quality, Stratasys® recommends that you always review the toolpaths on your parts, and make modifications if necessary, before downloading them to your system.

Figure 1: Support Parameters dialog box in Insight software.

2. PROCESS

2.1. Base Layer Modifications

STEP 1: From the ***Support*** menu, select ***Setup***.

STEP 2: Click  to access the ***Support Parameters***.

STEP 3: In the ***Base*** section, make sure the checkbox next to ***Contour Base*** is checked (Figure 1).

STEP 4: In the ***Base*** section, increase the value in the ***Base oversize*** field.

STEP 5: In the ***Base*** section, increase the value in the ***Base Layers*** field to add additional layers.

STEP 6: Click  to confirm the change.

STEP 7: This completes the base layer modification procedure.

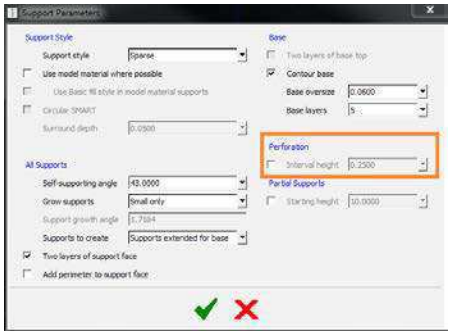

Figure 2: Clearing the checkbox in the Support Parameters dialog box to remove perforations.

2.2. Remove Perforations (Large Areas of Support)

STEP 1: From the ***Support*** menu, select ***Setup***.

STEP 2: Click  to access the ***Support Parameters***.

STEP 3: In the ***Perforation*** section, clear the checkbox next to ***Interval height*** to remove all perforations (Figure 2).

STEP 4: Click  to confirm the change.

STEP 5: This completes the procedure to remove perforations.

2.3. Anchor Columns

NOTE

Create anchor columns prior to creating supports and toolpaths. The generated supports will recognize the anchor columns and trim against the column.

STEP 1: From the ***Support*** menu, select ***Anchor column***.

STEP 2: Specify the desired ***Top diameter*** and ***Bottom diameter*** (Figure 3).

NOTE

It is recommended to use uniform small-diameter anchors. The columns should be wider at the interface with the build sheet and smaller at the part interface. This will minimize any witness marks when the anchors are removed while increasing the adhesive force, which prevents curling.

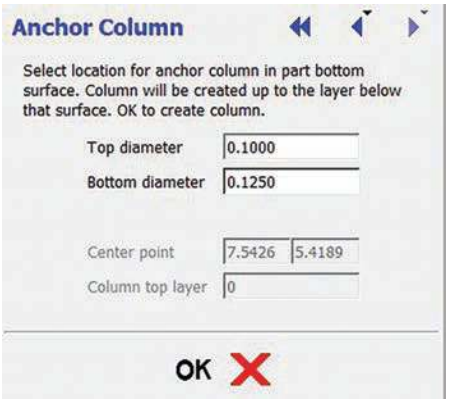

Figure 3: Specifying the anchor column dimensions.

STEP 3: Find the bottom layer of the part feature that will be secured using the anchor column. The next step is best done from a top-down view.

STEP 4: Position the cursor on the location where you want to put the anchor column and left click. The center point of the selected location will populate (Figure 4).

STEP 5: Click **OK** to confirm the anchor column location.

TIP

Because the anchor column will be generated from the base to the layer below the displayed layer, nothing will change in the current view. You may scroll down one layer to confirm placement.

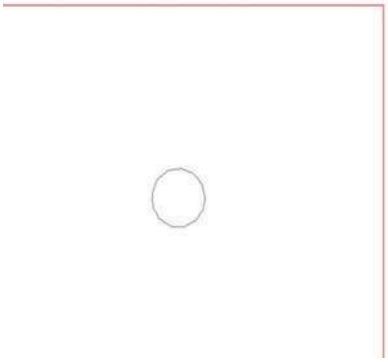

Figure 4: Positioning an anchor column.

STEP 6: Repeat the procedure to place any additional anchor columns.

NOTE

All anchor columns must be placed and confirmed before support is generated.

STEP 7: This completes the procedure for creating anchor columns.

2.4. Anchor Profiles

STEP 1: Configure the modeler.

NOTE

Import using the appropriate scale.

STEP 2: Open and orient the STL.

STEP 3: Click  to create part curves using the current parameters.

STEP 4: From the ***Support*** menu, select ***Setup***.

STEP 5: Click  to access the ***Support Parameters***.

STEP 6: In the ***Supports to create*** section, select ***Supports extended for base***. In the ***Base*** section, make sure the

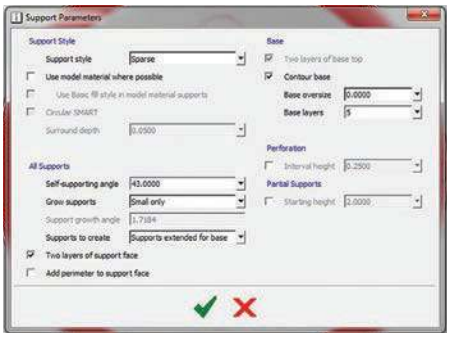

Figure 5: Ensuring the proper parameters are selected when generating supports in Insight software.

checkbox next to ***Contour base*** is checked and change the ***Base oversize*** to 0.0000 (Figure 5).

TIP

Ensure ***Perforation: Interval height*** is unchecked.

STEP 7: Click  to create supports for the current job.

STEP 8: From the ***Edit*** menu, select ***Copy Curves Through Z*** to extend the outer perimeter model contour down to the build sheet. Change the ***Copy mode*** to ***Specify through Z coordinate***. Enter the desired value into the ***Through Z height*** field (in this case: -0.0400). Change the ***Destination group*** to ***Same as selected*** (Figure 6).

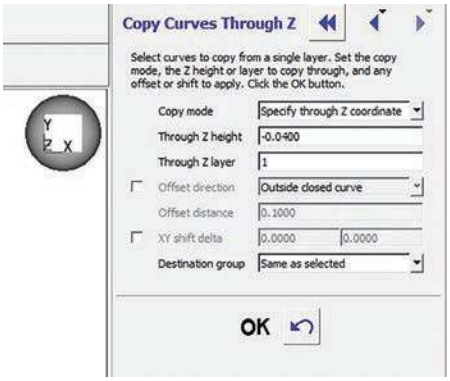

Figure 6: Extending the outer perimeter model contour to the build sheet using the Copy Curves Through Z options.

STEP 9: From the ***Edit*** menu, select ***Offset Curves*** to offset the outer perimeter model contour inward. Change the ***Offset direction*** to ***Inside closed curve***. Enter the desired value into the ***Offset distance*** field (in this case: 0.0200). Change the ***Destination group*** to ***Same as selected***. Change ***Keep original*** to ***Yes*** (Figure 7).

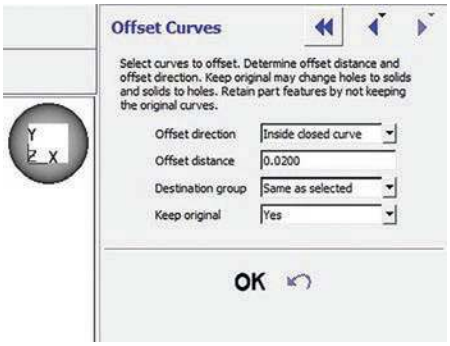

Figure 7: Offset the outer perimeter contour using the Offset Curves menu options.

STEP 10: From the ***Edit*** menu, select ***Copy Curves Through Z*** to extend the new inner perimeter model contour down to the build sheet. Change the ***Copy mode*** to ***Specify through Z coordinate***. Specify the desired value into the ***Through Z height*** field (in this case: -0.0400). Change the ***Destination group*** to ***Same as selected*** (Figure 8).

STEP 11: From the ***Edit*** menu, select ***Offset Curves*** to offset all of the support contours that are outside of the outer perimeter model contour so that they are inside the new inner perimeter model contour. Change the ***Offset direction*** to ***Inside closed curve***. Specify the desired value into the ***Offset distance*** field (in this case: 0.0700). Change the ***Destination group*** to ***Same as selected***. Change ***Keep original*** to ***No*** (Figure 9).

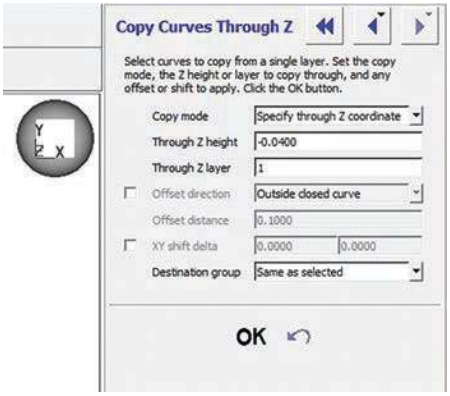

Figure 8: Extending the inner perimeter model contour using the Copy Curves Through Z menu options.

STEP 12: Generate toolpaths (Figure 10).

STEP 13: This completes the procedure for creating anchor profiles.

TIP

Once the parts have been printed, the anchor profiles can be removed by slitting the profile and peeling the profile contour off of the part.

TIP

A hot air welding tool can be used to remove white “haze” that might be present after removing the anchor profile.

3. SAFETY

Observe manufacturer’s recommendations for safety, material handling and storage. This information can be found in the safety data sheets (SDS).

4. SOFTWARE

- Insight software (documented with Insight 10.4)
- Control Center™ software (documented with Control Center 10.4)

5. MATERIALS

5.1. All Fortus® Materials

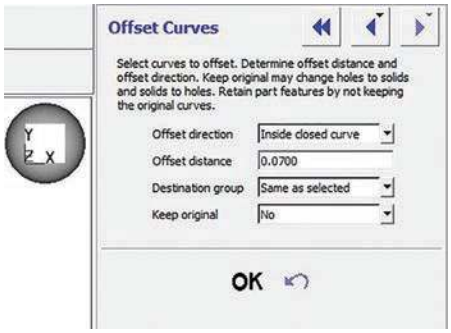

Figure 9: Offset all the support contours using the Offset Curves menu options.

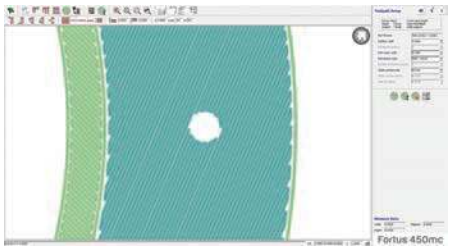

Figure 10: Generating the toolpaths.

CONTACT

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