

UNIT 22: Output Criteria: Material Density Function

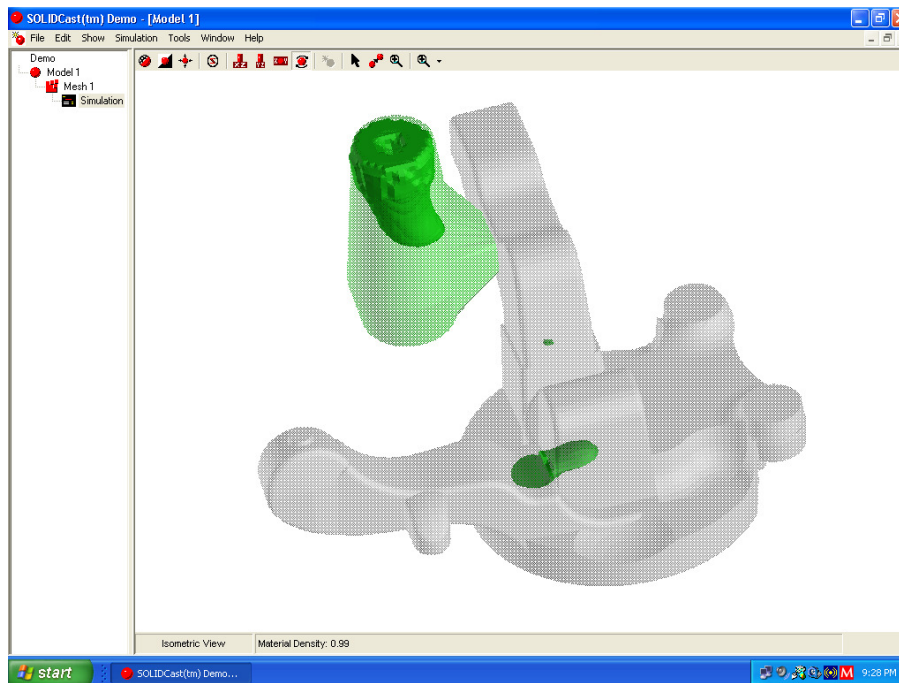
The Material Density Function is the result of a calculation in which the contraction of the casting, and resulting flow of liquid feed metal, is taken into account during solidification. Areas that have metal removed due to feeding liquid metal to other areas of the casting will show up as having lower Material Density numbers. In this way, potential shrinkage can be predicted.

The Material Density Function is a number that can vary from 0 to 1. It is a measure of how much of the metal remains at each point in the model. A value of 0 means that the metal has been completely drained from that part of the casting; a value of 1 indicates completely sound metal. The Material Density Function therefore should be interpreted as follows:

Value = 0	0% Metal	100% Porosity
Value = 0.90	90% Metal	10% Porosity
Value = 0.99	99% Metal	1% Porosity
Value = 1.0	100% Metal	0% Porosity

In general, we have found that values in the range of .995-.990 and below are areas of detectable shrinkage porosity in castings.

The Material Density Function is a measure of macroporosity and is MOST useful in ferrous castings. In non-ferrous alloys, especially aluminum, it can be used to predict gross macroporosity, but structural microporosity due to poor or stagnant solidification can best be predicted by other criteria such as Niyama or the FCC Custom Criterion.



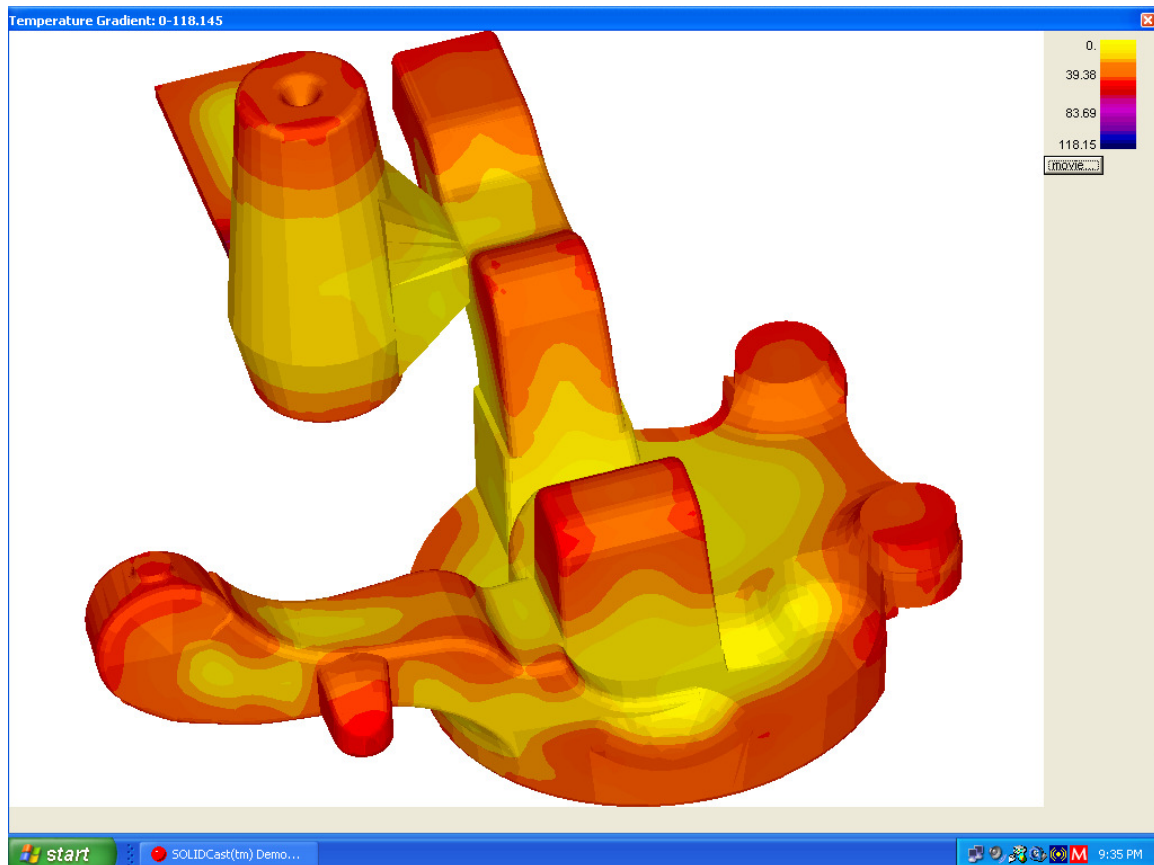
Indications show areas of likely shrinkage porosity in the casting.

UNIT 23: Output Criteria: Temperature Gradient

Temperature Gradient is a measure of how much change in temperature there is as you go from point to point within a casting. A high temperature gradient means that there is a large temperature change within a short distance within the casting. A low temperature gradient means a small change in temperature from one point to the next.

Temperature Gradient is calculated at each node within the casting as that point hits the Niyama Point on the cooling curve. Temperature Gradient is always calculated in °C per centimeter.

Temperature Gradient can be used to get an idea of whether there was good or poor directional solidification at various points within the casting. In general, higher temperature gradients are good, as steeper temperature gradients mean a greater driving force for solidification.



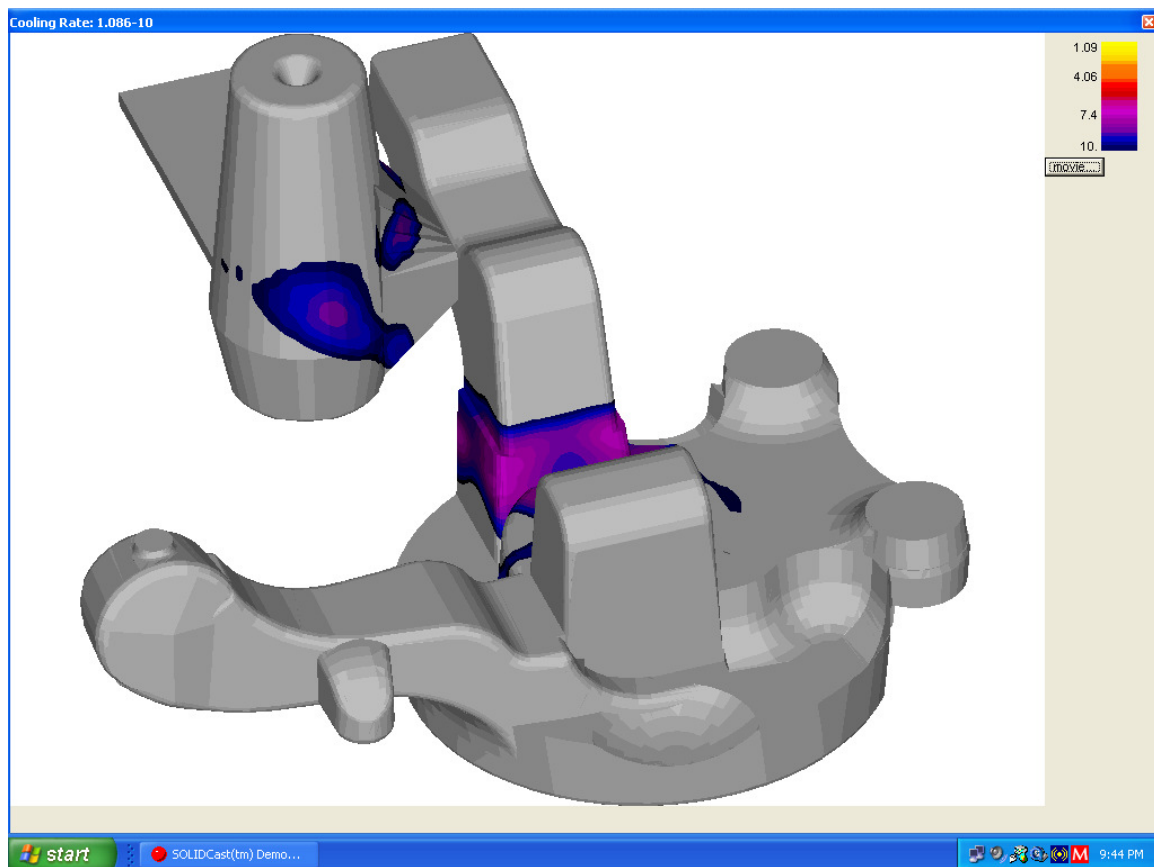
The disadvantage of Temperature Gradient is that each casting ends up with a different range of values, depending on geometry, and it is hard to compare one casting with the next.

In the figure above, the brightest areas indicate those areas with the lowest temperature gradients, and the poorest directional solidification.

UNIT 24: Output Criteria: Cooling Rate

Cooling Rate is a measure of how quickly a casting is cooling down, in °C per minute, measured at each point in the casting as that point hits the Niyama Point on the cooling curve.

Cooling Rate can be an indication of material quality. Areas of the casting that cool rapidly generally have a more favorable grain structure, with less deposition of partially-soluble compounds at the grain boundaries. Therefore, these areas tend to have better material properties such as strength, elongation and hardness. Those areas of the casting that cool more slowly generally tend to have poorer material properties.



The plot above shows the areas of the casting with the lowest cooling rates.

It is possible to correlate cooling rates with material properties. One useful method for this plot is to find out what minimum cooling rate is required to achieve, for example, a given hardness. Then, plot cooling rate, using this minimum value as a boundary. Your plot, then, will only highlight those areas with cooling rates below your established minimum.

UNIT 25: Output Criteria: The Niyama Criterion

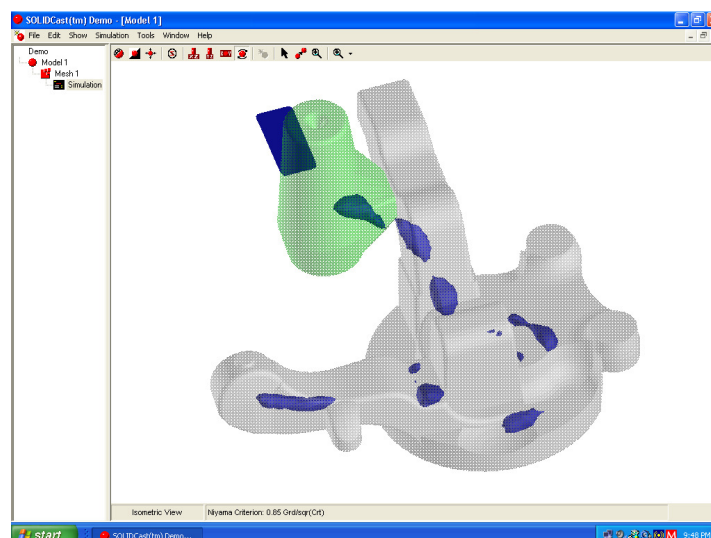
The Niyama Criterion is a function based on Temperature Gradient and Cooling Rate. The criterion was developed by Dr. Niyama, a Japanese researcher studying shrinkage prediction in steel. Niyama found that the Temperature Gradient divided by the square root of the Cooling Rate corresponded to the presence of shrinkage porosity in steel castings. The lower the value, the higher the probability of shrinkage. If this number were 1 or above there was little or no shrinkage porosity in the castings. Niyama has been used extensively for shrinkage prediction in castings, until the use of more advanced calculations such as the Material Density Function.

The Niyama Criterion has been extended to alloys other than steel. Niyama is basically a prediction of **directional solidification**. Poor directional solidification is represented by a value of 0, good directional solidification by higher values. Ranges of critical values are:

Steels:	0	1
Cast Irons:	0	0.75
Aluminum:	0	0.30
Copper Base	0	1.30

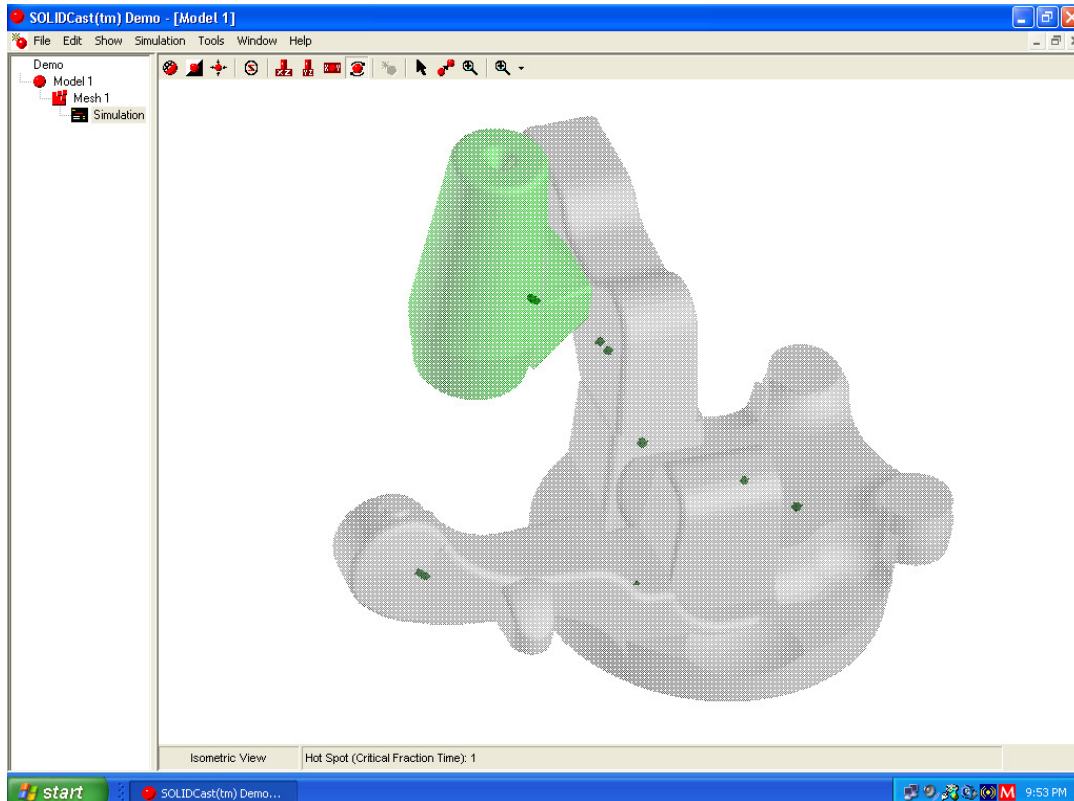
The general idea is that the lower the value of Niyama, the worse the potential for shrinkage. A value of 0 is the highest probability of shrinkage, and as the value increases, the severity of the probable porosity decreases. Above the critical number, probability of porosity is low.

Niyama plots need interpretation, because they give low values in many areas where temperature gradients are low but shrinkage might not be likely, such as at the centerline of thin-wall areas and at the dividing line between the feeding areas of two risers. Also, Niyama is based only on heat transfer and does not take the effect of gravity into account. For most ferrous materials, Material Density (which DOES take gravity into account) is generally a better indicator. Niyama, however, is still used heavily in many non-ferrous applications (typically in aluminum alloys).



UNIT 26: Output Criteria: Hot Spots

Hot Spot plotting is a function in SOLIDCast that locates thermal centers or hot spots within the casting by comparing solidification times or critical fraction solid times of points within local areas. The range of values is always 0 to 10, and generally the value plotted is around 1.1 or 1.2 (a value of 1.0 indicates an area of “stagnant” solidification). You can plot Hot Spots based either on Solidification Time or based on Critical Fraction Solid Time.



To figure hot spot values, the system compares either the solidification time, or the critical fraction solid(CFS) time of each metal node to its' neighbors. If it froze later than its' neighbors, it is an isolated area, or a hot spot. The system keeps track of the differences in time, then orders them from the greatest isolation on down. All isolated areas are normalized to the range of 0-1, where 0 is most isolated, and 1 is stagnant, that is, froze at the same time as neighbors. Non-isolated areas are ordered, then normalized to the range of 1-10, where 1 is stagnant and 10 is most directional.

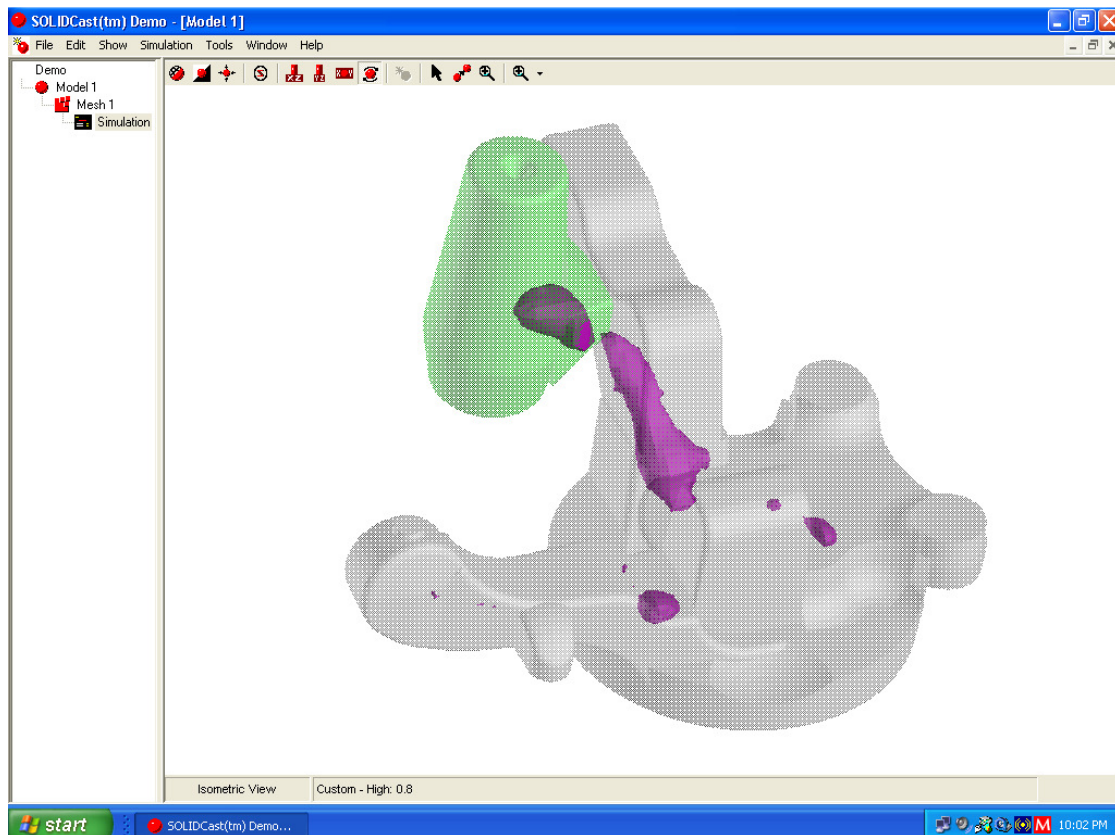
By plotting at a level of 1, you can see actual isolation locations. If you plot at 1.1 or 1.2, you may be able to see these locations more clearly, since they will cover a greater volume.

The hot spot plot does not give an indication of the severity of the defect, as it does not take contraction/expansion into account. But it does give a good indication of what areas may have problems.

UNIT 27: Output Criteria: Custom Criterion

Custom Criterion is a function that allows you to plot data from standalone programs in SOLIDCast. These programs are available from Finite Solutions, Inc. Or, you can develop custom criteria functions using one of the stand-alone utilities described in Unit 46.

One custom function calculates the FCC Criterion, which was developed by F. Chiesa of the Universite de Trois-Rivieres in Quebec. This function was developed as an indicator of total evolved microporosity in aluminum castings. It has since been applied to other alloys with some success. This criterion is based on the solidus velocity (the speed with which the solidification wavefront moves through the casting) and the local solidification time (the time to cool from liquidus to solidus). Higher numbers indicate more probability of porosity. An example of an FCC plot is shown here:



Another Custom Criterion that is being developed is a gradient calculation for Solidification Time. This has been shown in several cases to be a predictor of hot tearing in some castings. Dendrite Arm Spacing(DAS) in aluminum castings is still another custom criterion.

As these new functions are created, they will be made available to all SOLIDCast users.

Note: A full description of the FCC Criterion and how to use it is given in Unit 41.

UNIT 28: Importing Model Files

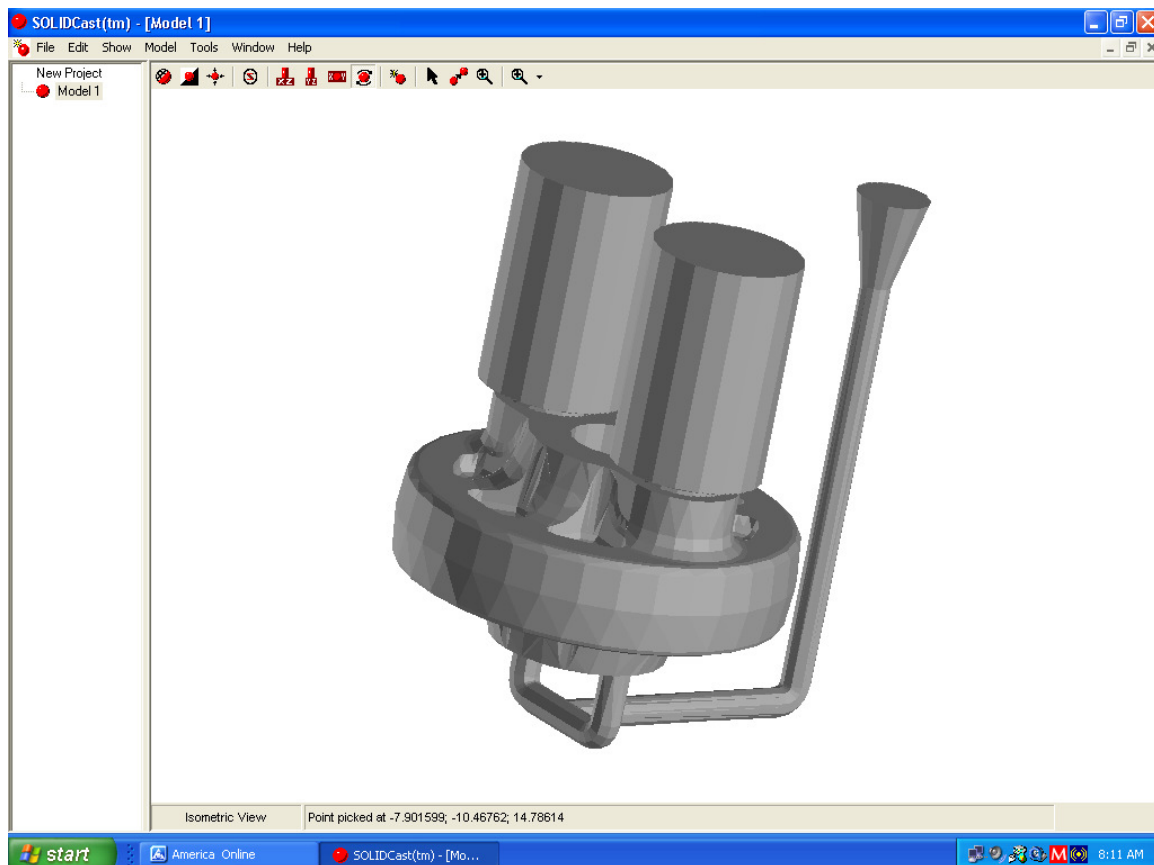
This function was developed to allow you to import Model Files created with the Version 4 Model Builder(DOS) into SOLIDCast. This function is no longer active.

UNIT 29: Planes of Symmetry

Planes of Symmetry can be used to section a symmetrical casting model, so that only a portion of the model needs to be meshed and simulated. Why do this? The reason is so that a simulation can be run with fewer nodes and thus in a shorter time, but still get the same resolution in terms of node size.

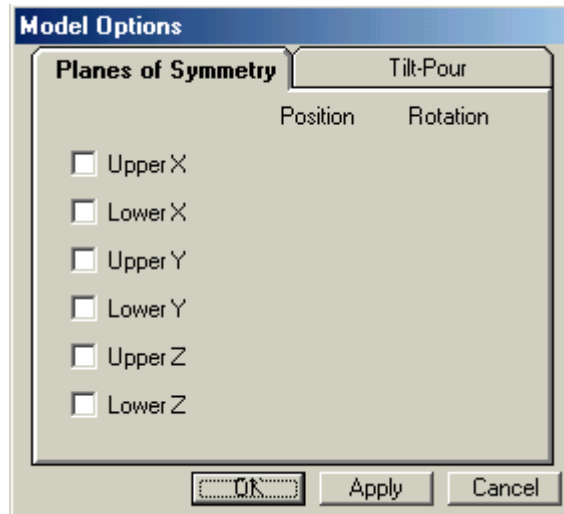
For example, if a casting is symmetrical in halves, it is possible to cut the model in half with a plane of symmetry. Running a simulation with 500,000 nodes on one half of the model would produce the same results as running a simulation of the full model with 1,000,000 nodes. The amount of time to run the smaller simulation would be significantly shorter.

As an example, consider the following model of an idler casting. This model is exactly symmetrical down the middle:

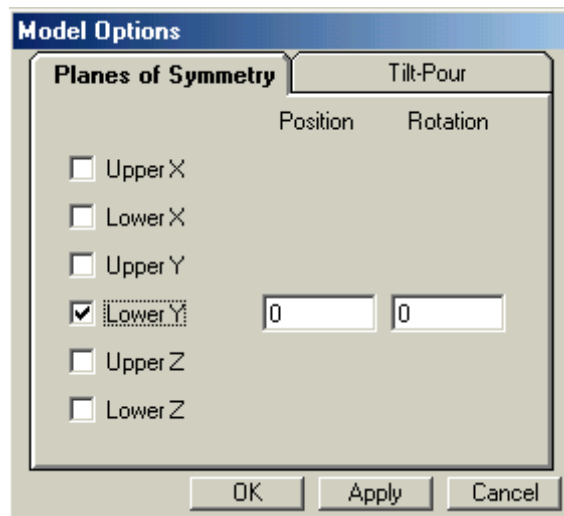


In this case, we could place a plane of symmetry along the X-axis of the part. This model was conveniently created with the center of the casting at the origin point of space (where X and Y are 0) so it is easy to set up a plane of symmetry here.

To create the plane of symmetry, select Model...Options... and click on the Planes of Symmetry tab. You will see the following window appear:

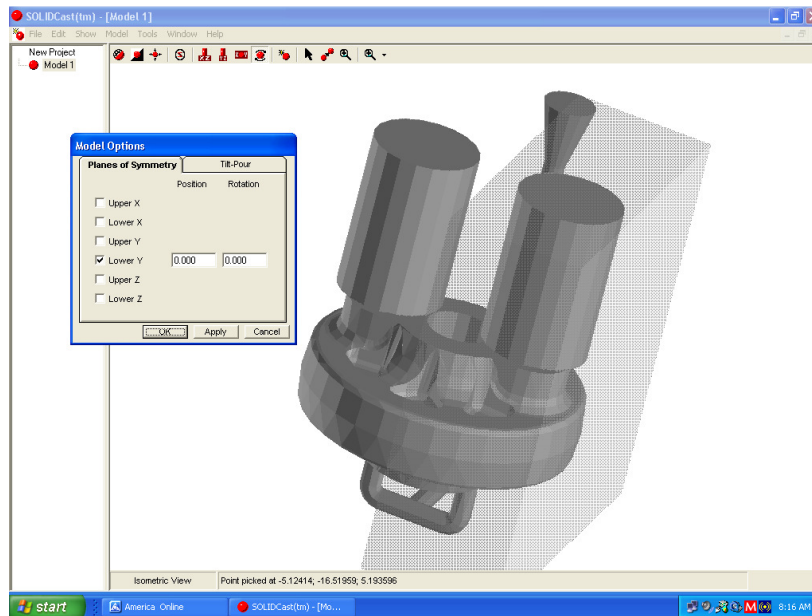


In this case, we want a lower-Y Plane of Symmetry at the position $Y=0.000$. Therefore, click on the small square to the left of Lower Y to place a check mark there. The window will then appear as follows:

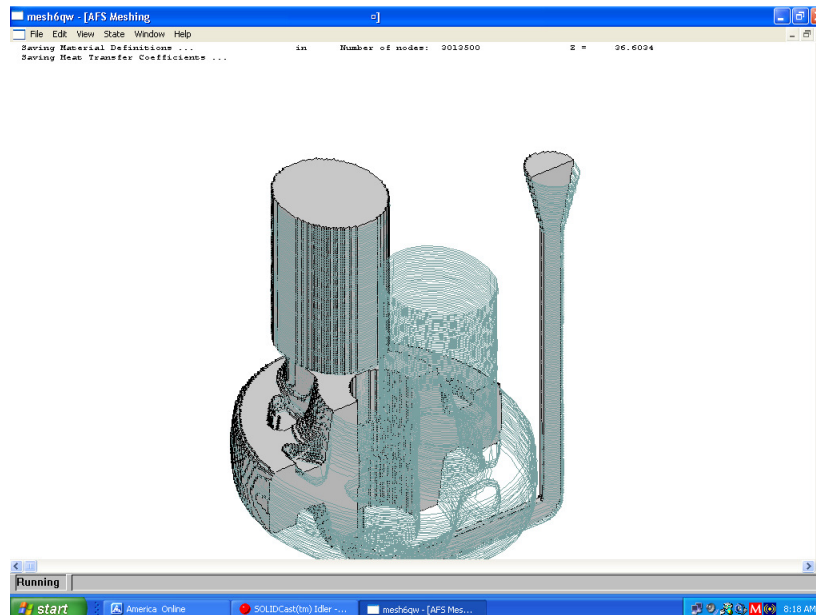


Now click the button labeled Apply. This places the Plane of Symmetry at $Y=0$. If you wanted to place the plane at a different location, just enter a different number in the field under Position. Also, it is possible to rotate an X or Y Plane of Symmetry to make, for example, a wedge shape from a round casting.

The Plane of Symmetry will appear on the model as follows:



The Plane of Symmetry is a rectangular block that covers half the model. This indicates that when the model is meshed, only one-half will actually appear in the mesh. This can be verified by meshing the model and viewing the result:



Here the meshing operation meshes only one-half the casting. The other half of the casting appears in outline (because this was an imported STL shape), but only the meshed half will actually be run in the simulation. After simulation, the data can be mirrored and displayed on the full casting model.

UNIT 30: Priority Numbers: Intersecting Shapes

If two shapes in a model overlap and are made of different materials, then the system needs to know which material should occupy that overlap region when the model is meshed.

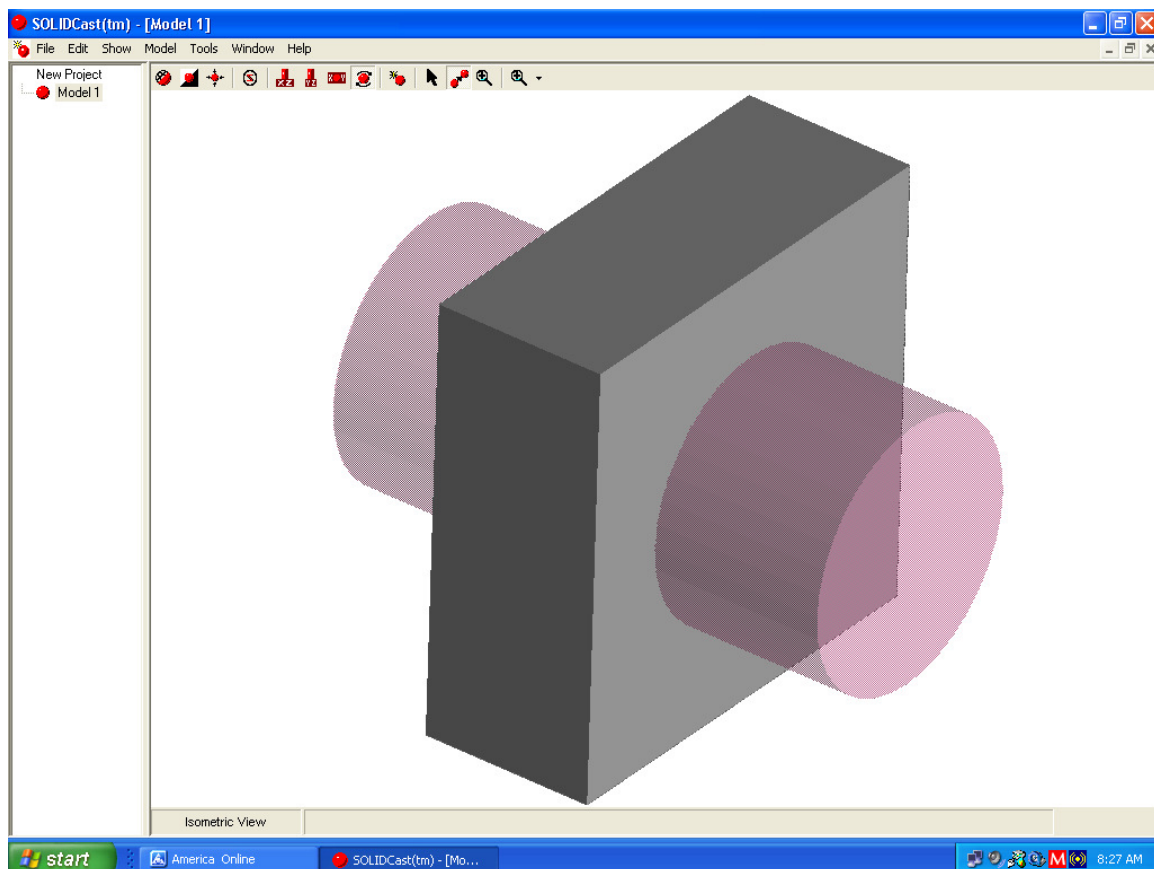
This is accomplished through the use of **Priority Numbers**.

Priority Numbers:

- Are assigned to EACH INDIVIDUAL SHAPE in a model.
- Range from 1 to 10.
- Are applicable ONLY when TWO OR MORE INTERSECTING SHAPES of DIFFERENT MATERIALS occur in the model.

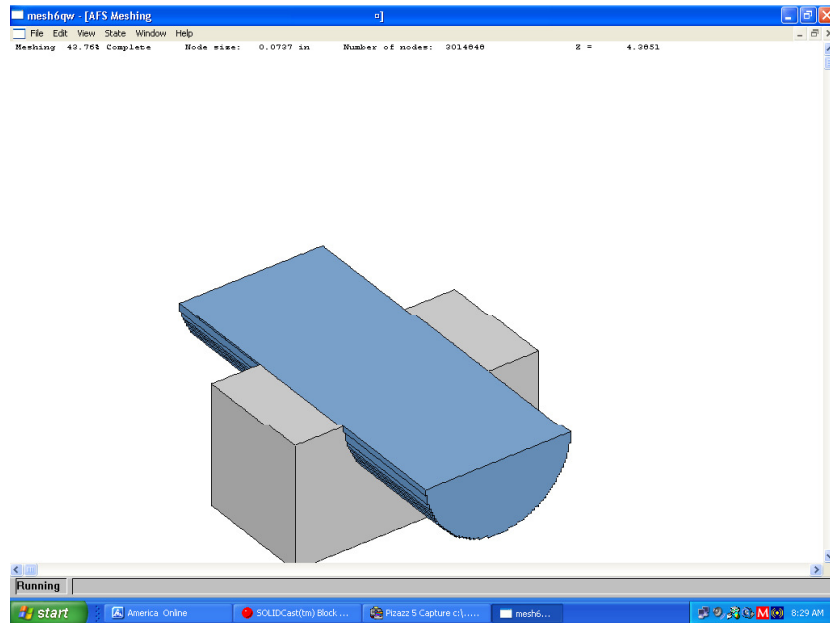
When two shapes intersect and are different materials, the SHAPE WITH THE SMALLEST NUMBER (CLOSEST TO 1) will appear in the overlap region.

Example: A solid cylinder (core) passing through a rectangular block:

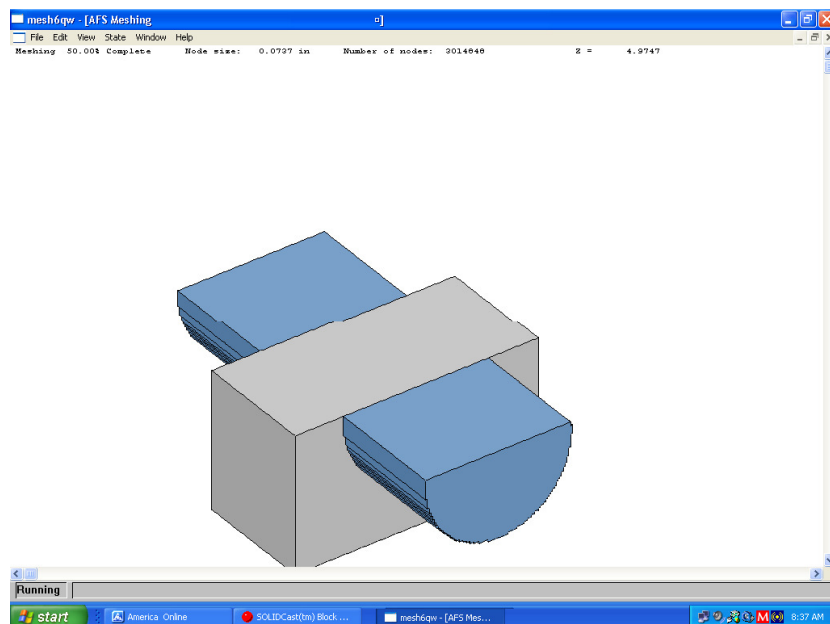


If we set the priority of the cylinder to 4 and the rectangular block to 5, then when this model is meshed, the cylinder will core a hole through the block, and the hole will be filled with the material that the cylinder is made of.

This can be seen in the following view of the mesh:



On the other hand, if we assign a priority of 6 to the cylinder and 5 to the block, then in the overlap region the block will dominate, as follows:

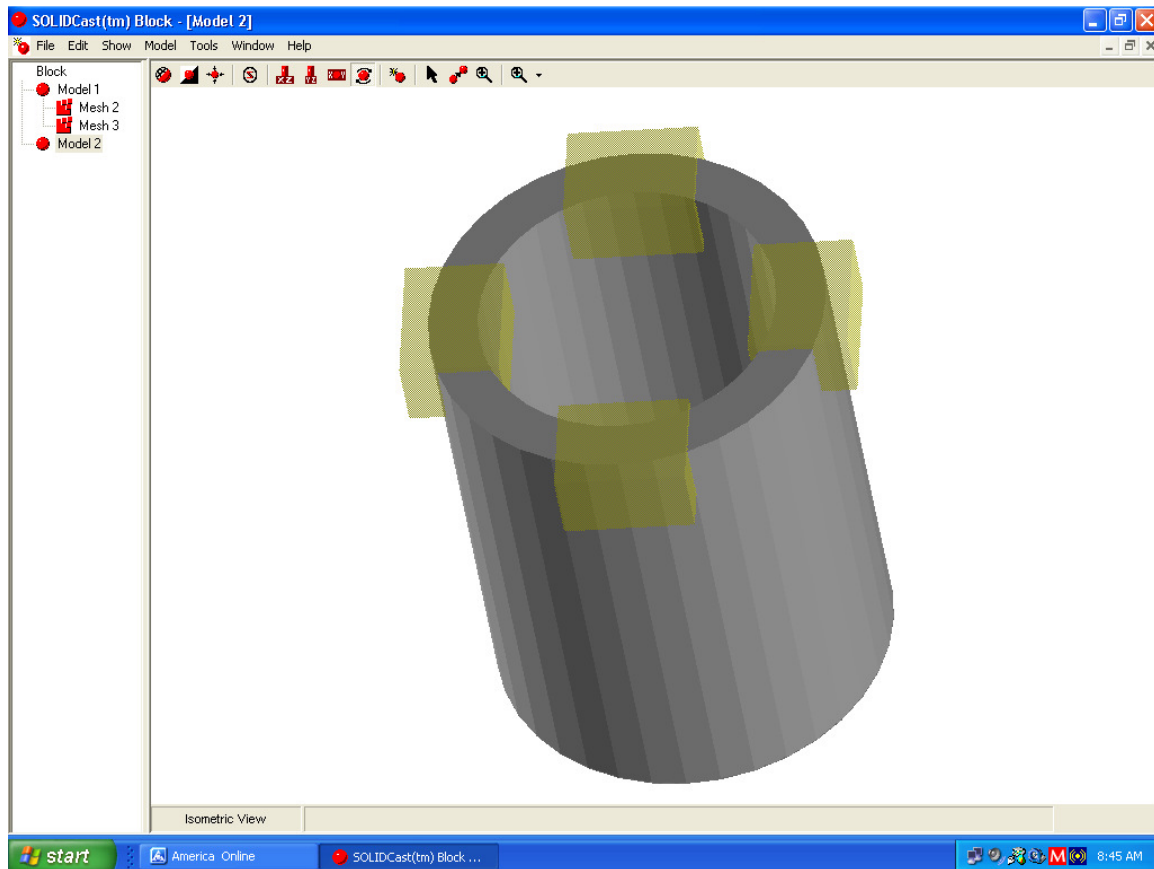


If we have overlapping shapes of different materials, priority numbers must be set correctly to produce the correct results.

UNIT 31: Void Material

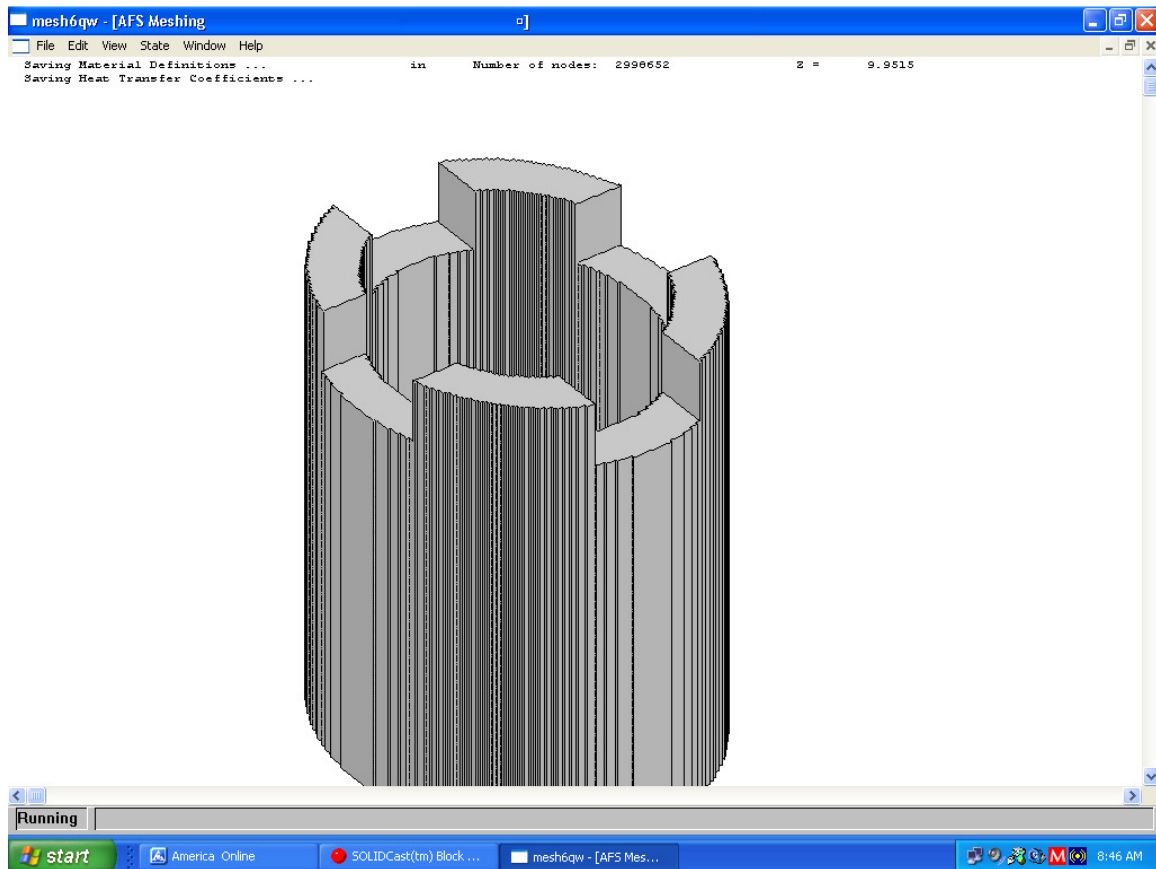
Void Material is a special-purpose material that is primarily useful in the investment casting process. Using Void Material, you can remove some material from one shape without replacing it with another type of material. This is useful for investment casting because the shell is then meshed around the net shape.

As an example, consider the following vertical cylinder. Four shapes made of Void Material have been added around the top of this cylinder to remove material and make four notches:



Note that it is necessary for the Void Material to have a **SMALLER PRIORITY NUMBER** (closer to 1) than the casting material.

The result of meshing this model is as follows:



It can be seen that the notches are removed from the cylinder, and no other material fills these features. When the shell is meshed, then the shell will be meshed around the net shape.

UNIT 32: Mold Filling

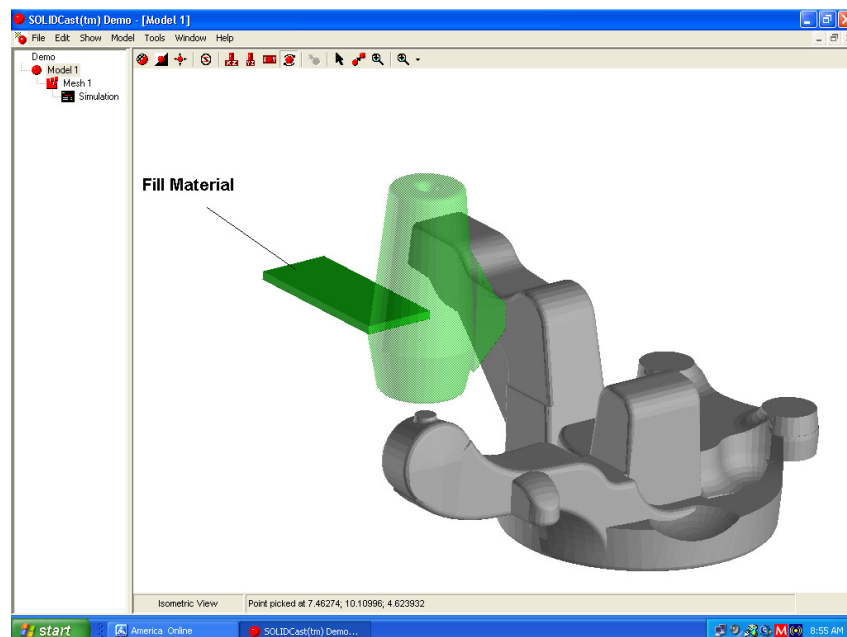
SOLIDCast can be used to simulate the filling of the mold cavity. Filling calculations are done using an order-of-fill algorithm taking the direction of gravity into account. If you have purchased the optional FLOWCast module, the system can also perform a full Computational Fluid Dynamics (CFD) analysis (meaning that metal velocity is calculated, and momentum, viscosity and pressure are taken into account).

The simplifications in the SOLIDCast fill algorithm provide for a rapid calculation for mold filling which gives a realistic starting point, in terms of temperature gradients in the casting and mold, for subsequent solidification calculations. If splashing, mold erosion or misrun defects are a problem in your foundry, you would want to run fluid flow simulations using FLOWCast. See the FLOWCast Training Workbook for full details on running fluid flow analyses.

To perform a SOLIDCast mold filling calculation, it is necessary to use the special-purpose material called Fill Material. You can make shapes out of Fill Material just as with any other material type. Where the Fill Material contacts Casting or Riser Material, the metal is assumed to begin flowing into the mold. If Fill Material is not in contact with either Casting or Riser Material a simulation error will result.

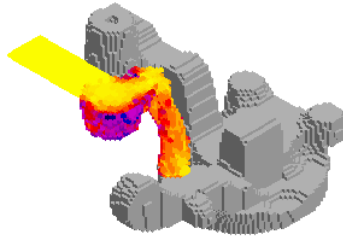
Generally, a shape of Fill Material is placed at the top of a sprue, or the entire gating system can be created of Fill Material and the filling of the casting simulated at the point where the gating system attaches to the casting. It is also possible to place inlet gates on the casting and simulate the filling of the casting cavity without creating a model of the entire gating system.

In the following example, a plate of Fill Material has been placed at the inlet location for the molten metal:

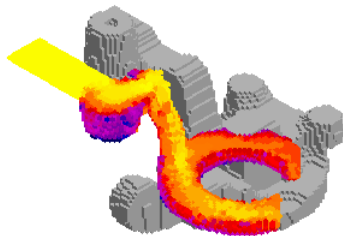


The filling of the casting will begin at this location when the simulation starts, as shown in the following sequence:

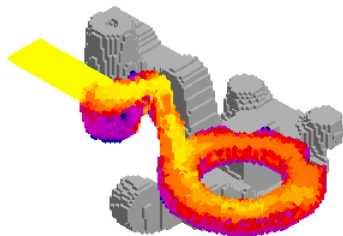
Mold Filling 9.93 % Full Time from start of fill: 1.21 Sec.
Min. Casting Temperature: 2424.68 F Max. Casting Temperature: 2551.84 F



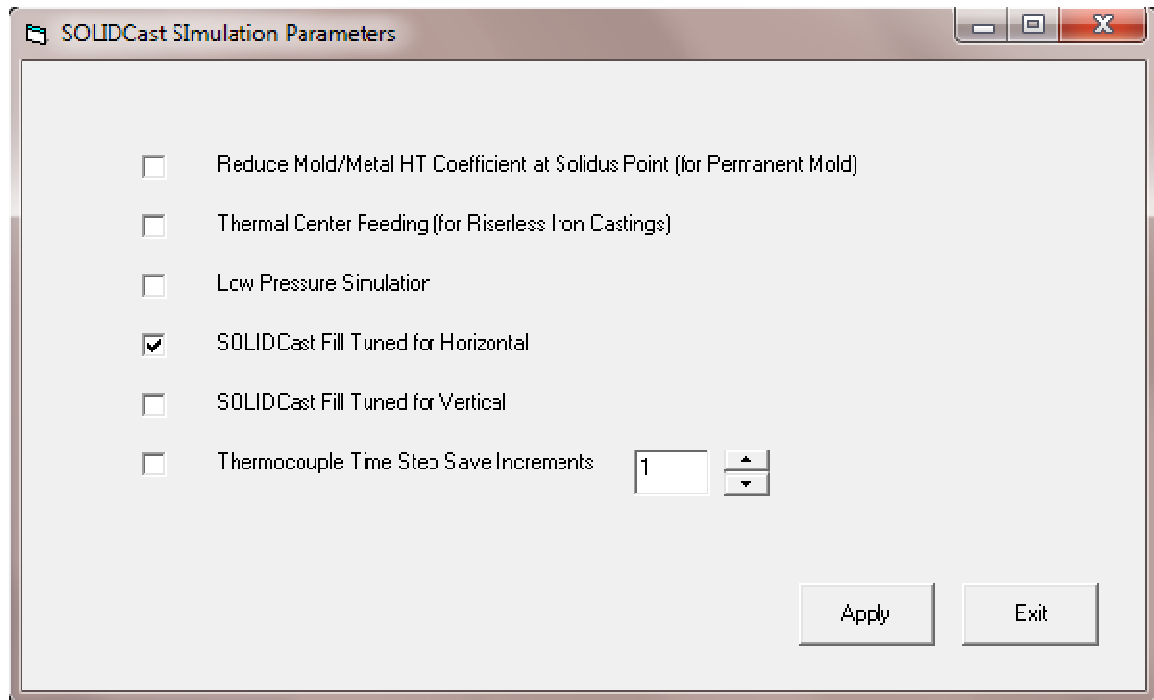
Mold Filling 19.86 % Full Time from start of fill: 2.21 Sec.
Min. Casting Temperature: 2394.95 F Max. Casting Temperature: 2552.00 F



Mold Filling 25.38 % Full Time from start of fill: 2.76 Sec.
Min. Casting Temperature: 2368.19 F Max. Casting Temperature: 2551.95 F



The behavior of the filling metal can be controlled to some extent by adjusting a parameter for either primarily vertical or horizontal flow. This is accessed by going to Tools...Simulation Parameters. You will see a window like this:



There are two entries related to the SOLIDCast filling algorithm. One box is checked if the flow is primarily in a horizontal direction, and another box is checked if the flow is primarily in a vertical direction. If no box is checked, horizontal flow is assumed.

Once a box is checked, click the Apply button. Now all simulations that use the SOLIDCast filling algorithm will use the selected parameters.

UNIT 33: Modeling Considerations by Process

Special considerations for the specific casting processes can be summarized as follows:

Sand Casting

- Turn off Internal Heat Transfer Coefficients
- Use a low External Heat Transfer Coefficient: Around 1.5 BTU/Hr-sqft-F
- Only use as much sand as is necessary to absorb the heat (1" for small castings, 4-5" for large castings)
- Generally make a rectangular mold when meshing

Investment Casting

- Turn off Internal Heat Transfer Coefficients
- Use an External Heat Transfer Coefficient: Around 10-20 BTU/Hr-sqft-F
- Use "Shell" option when creating the mold
- Use Void Material is necessary to remove material from shapes
- Use View Factor Calculations to take radiation into account

Permanent Mold Casting

- Turn on Internal Heat Transfer Coefficients
- Use an External Heat Transfer Coefficient: Around 5-7 BTU/Hr-sqft-F
- Use Internal Heat Transfer Coefficient recommendations as given in Unit 8
- Use "None" option when meshing if the mold is part of the model
- Use View Factor Calculations to take radiation into account
- Use Permanent Mold Cycling when running simulations
- Use the "Coarse"/"Fine" mesh option for warm-up cycles.

UNIT 34: Capturing and Printing Images

Since SOLIDCast is a Windows application, standard techniques used in Windows apply.

You can press the Alt-Print Screen keys to copy the current window to the Windows clipboard, or use Print Screen to capture the full screen. You can then go into many Windows applications and copy this image into that application by selecting Edit... Paste. Some Windows applications where this can be done are:

- Word
- Paint
- PowerPoint
- Excel

Once the images are in any of these programs, you can then print the images as a standard Windows print operation.

An alternative is to use any of a large number of commercial screen capture utilities. When you activate these programs, you can select a type of file to save images, a file name, and auto-incrementing of file names. After activation, you can then press Print Screen(or other Hot Key) at any time and a file will be created containing the image that you're seeing. Later, you can load this image into any of the Windows programs listed above for documentation and/or printing.

A quick search on the Internet will normally list a large number of low-cost or free utilities that can be used to capture screens and manipulate images. At FSI we have used

Full Shot(www.inbit.com)
Snag-It(www.techsmith.com)
Pizazz 5/Capture.Eze(www.screencapture.com)

all with good results.

UNIT 35: Model Editing

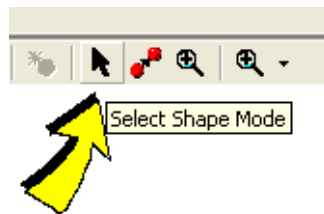
SOLIDCast allows you to select one or more shapes within a model, and perform editing functions on those shapes. This may apply whether you have only one shape (such as an imported STL file), or multiple shapes within a model.

For example, it is possible that when you import an STL shape, the shape may not be oriented correctly with respect to the Z axis (the +Z direction is considered to be “up”). Shape editing allows you to select the shape and rotate it so that the shape is oriented correctly.

Shape editing allows you to select one or more shapes and perform such operations as verifying or changing material type, changing priority, deleting or changing geometric properties such as length and radius of a cylinder.

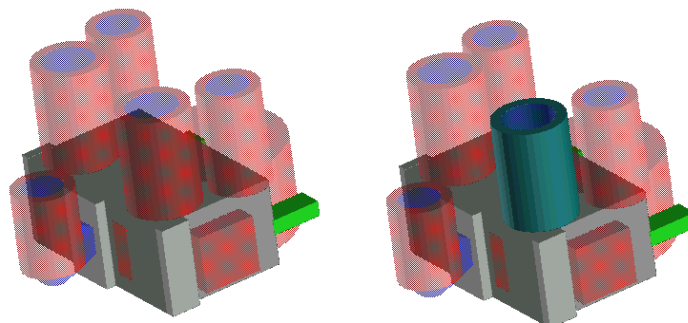
Selecting Shapes

Selecting shapes for editing is performed by clicking on the small arrow on the tool bar. When the mouse passes over this arrow icon, the label “Select Shape Mode” appears.



You will notice that when you click on the “Select Shape Mode” icon, it depresses and stays depressed. When you are in “Select Shape Mode”, you cannot rotate the model by moving the mouse. You need to turn off “Select Shape Mode” by clicking on the icon a second time, if you want to be able to use the Free Rotating Isometric View.

Once you are in “Select Shape Mode”, you just need to click on a shape to select it. You will see the shape change color. As an example, the following image shows a casting with multiple risers with sleeves. The image on the left shows the model as it appears in the model building window. In the right image, the riser sleeve closest to the view has been selected by clicking on this shape:



To select multiple shapes, hold down on the Ctrl key while clicking on the shapes.

To de-select one or more shapes, hold down on the Ctrl key and click on a shape that has already been selected.

If you want to select a shape that is inside another shape, you can hide a shape. First, select the outer shape, then select Show from the main menu and click on Hide Selection. This will make the outer shape invisible, so the inner shape should then be visible. If you want to select ONLY the inner shape, then just click on that shape. If you want to select BOTH the outer and inner shape, then hold down on the Ctrl key and click on the inner shape. Remember, the Ctrl key is used when selecting multiple shapes.

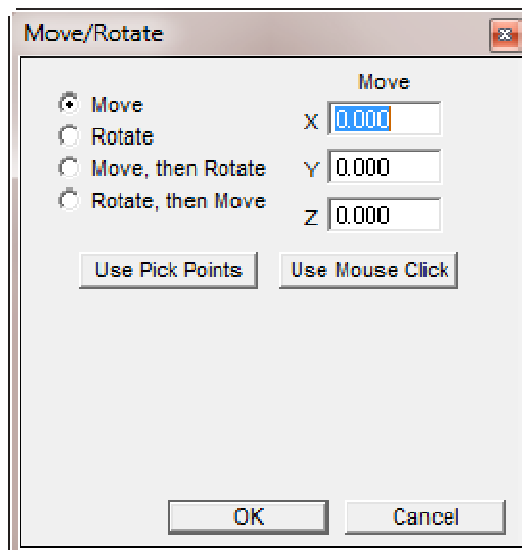
To de-select any and all selected shapes, while in “Select Shape Mode”, just double-click with the mouse in the clear space around the model. This will have the effect of causing no shape to be selected.

Deleting Selected Shapes

When one or more shapes have been selected, you can delete them from the model. From the main menu select Edit and then Delete Selected Shapes. A warning message will be shown that tells you that you are about to delete the selected shapes. If you want to continue with this operation, click on Yes, otherwise click on No.

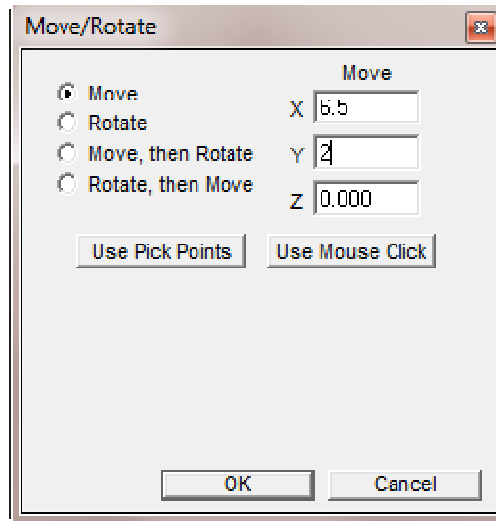
Moving Selected Shapes

When one or more shapes have been selected, you can move the selected shapes in three distinct ways. The first is to specify a distance in the X, Y and Z direction. From the main menu select Edit and then Move Selected Shape(s). You will see a window that appears as follows:



In order to move the selected shapes, type in a distance for moving the shapes in the fields next to X, Y and Z. The units for this distance will be inches if Metric Units (under System Parameters) are turned off, and millimeters if Metric Units are turned on.

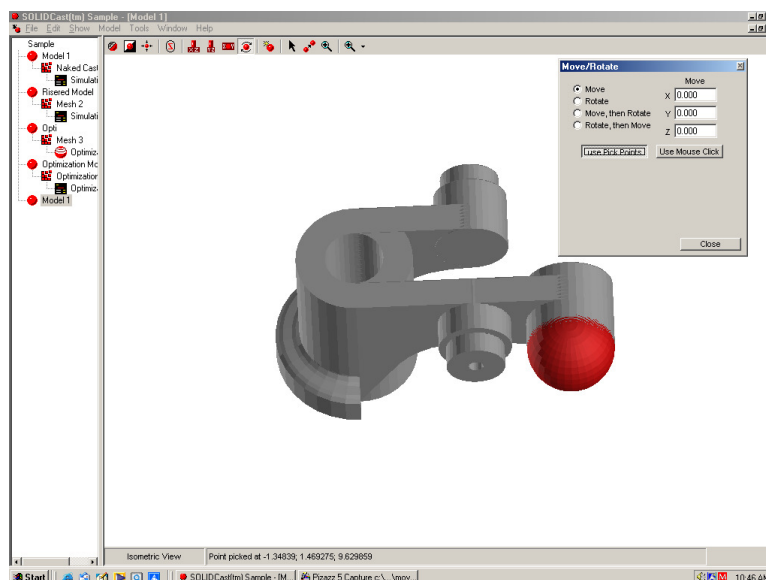
For example, to move the selected shapes 6.5 inches in the X direction and 2 inches in the Y direction, you would enter the following information into this window:



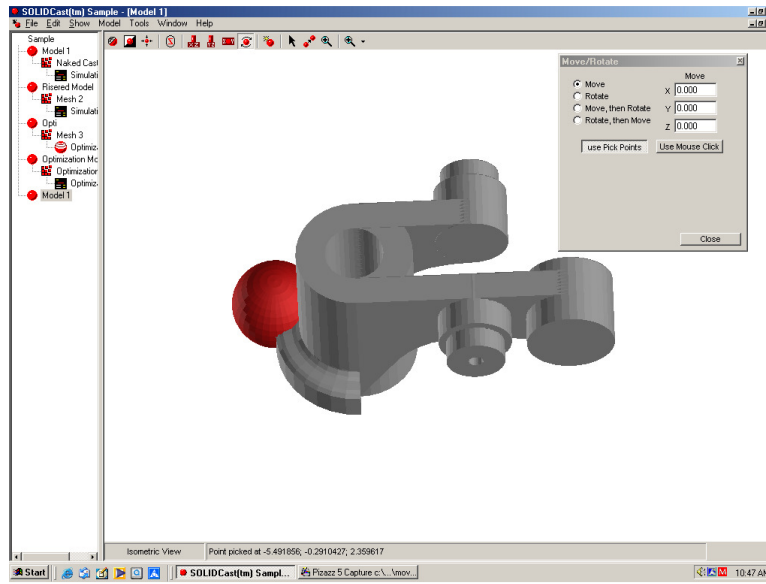
Then click on the button labeled OK. The selected shapes will be moved in the model.

The second move method called Use Pick Points, and is used in either a 2D Orthogonal View or in the Free Rotating Isometric View.

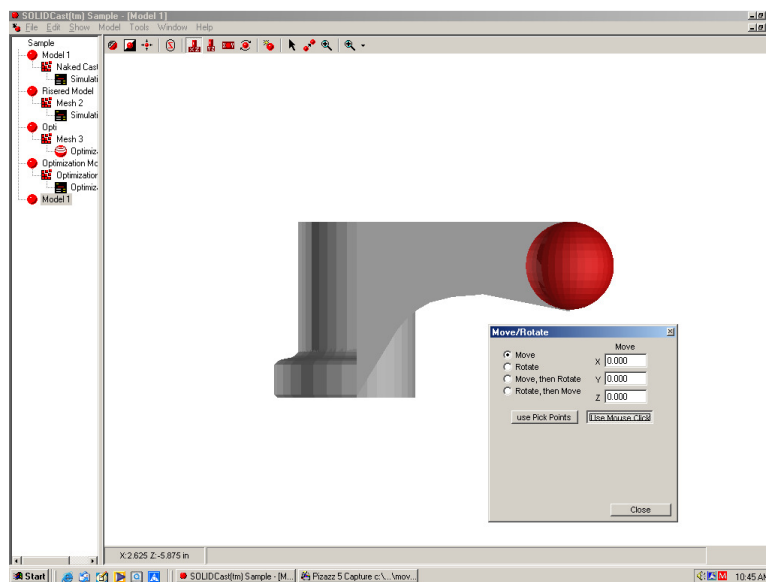
To activate the Use Pick Points move option, first select one or more objects in the model, then click on Edit...Move Selected Shape(s). You should see a window similar to the following:



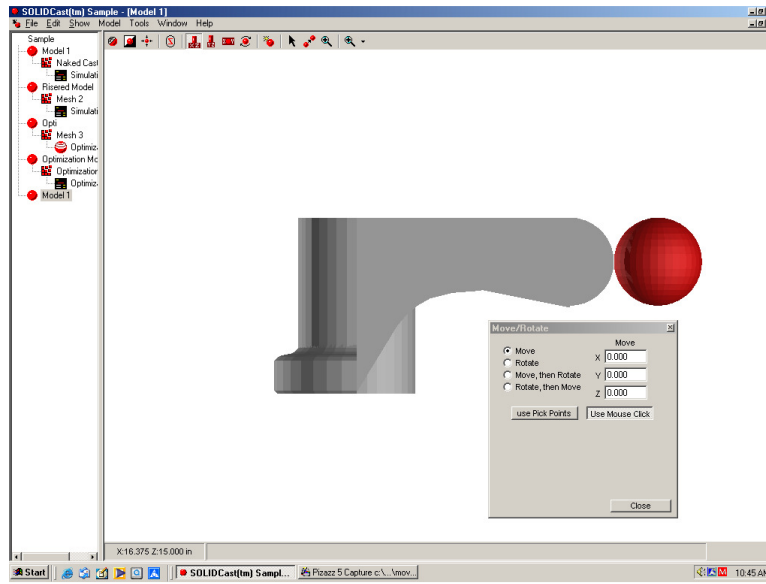
Click on the Use Pick Points button. Once selected, you can click on any surface on the model, and, at every even click, the system will calculate the 3D difference in position and perform a move using that data. This option can be used in any view, but the points clicked must be on a model surface. For example, if the first click was on the center of the selected sphere and the second click was on the lower radius on the left side of the part, the move might look like the figure shown here:



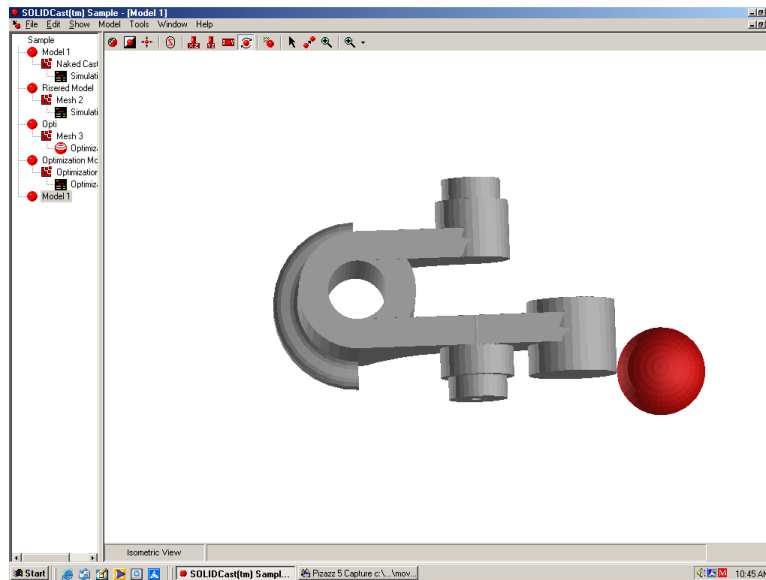
The third move option is to Use Mouse Click, and this option is available only in 2D Orthogonal Views. First, select the object or objects, then select Edit...Move Selected Object(s). Then click on the Use Mouse Click button, as shown here:



Now, each set of two clicks will perform a 2D move, based on the distance between the two mouse clicks. It is not necessary to click on the model for this function to work. Also note that if the view is changed between mouse clicks, the move data will be ignored. An example of a Use Mouse Click move is shown on the next page, where the first click was on the left of the selected sphere, and the second click was on the right side of the sphere.

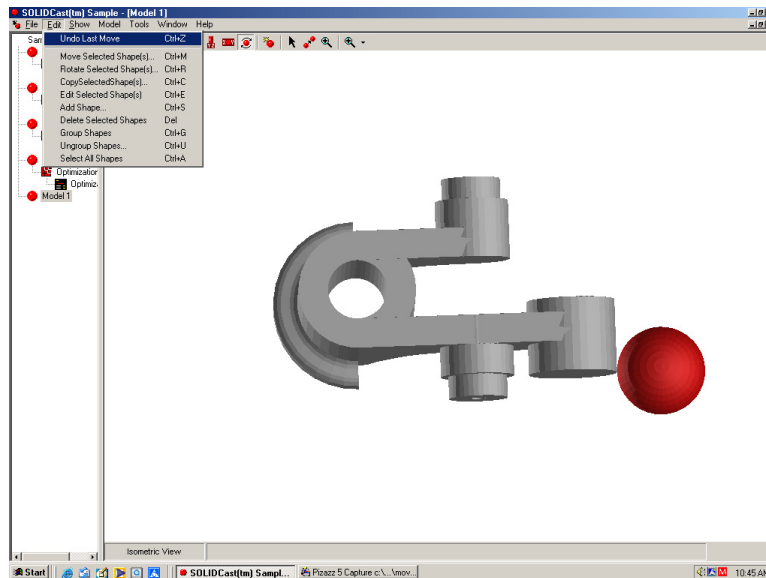


The figure below shows the same move from a top angle. As you can see, the sphere was offset in 2D only, and did not move forward or back in the third dimension.

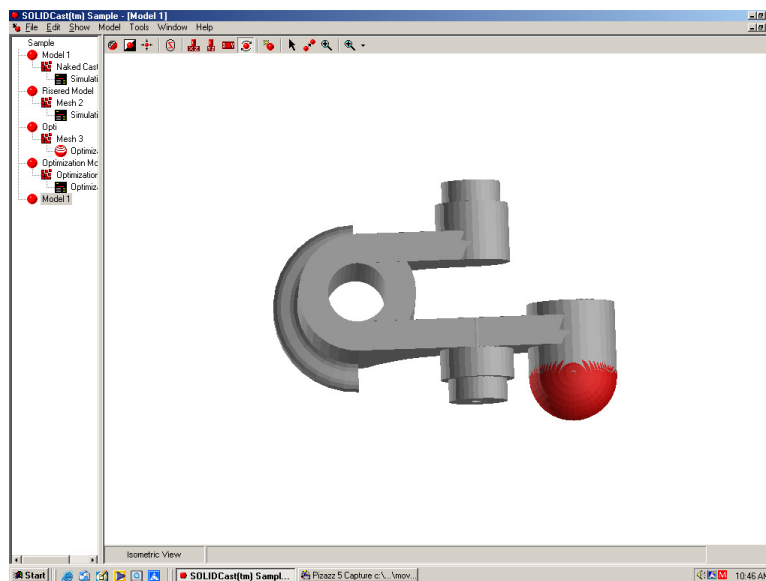


Undo Last Move

Once a move function has been executed, you have the option to undo the move. This function is activated by selecting Edit...Undo Last Move. This will restore the moved object or objects to their original position. An example of this function is shown on the next page. Note that the Undo function only goes one layer deep, that is, only the LAST move can be undone.



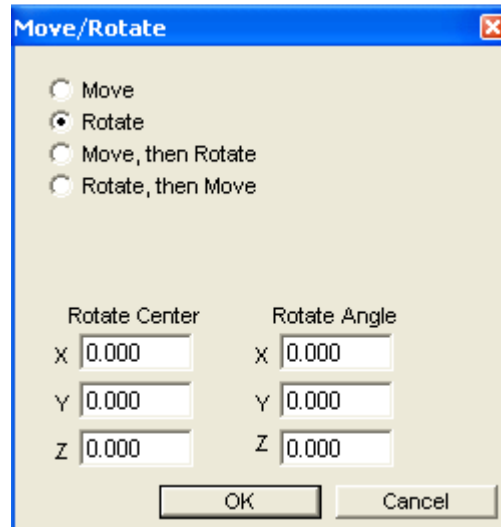
Sphere Position After Move.



Sphere Position After Edit...Undo Last Move.

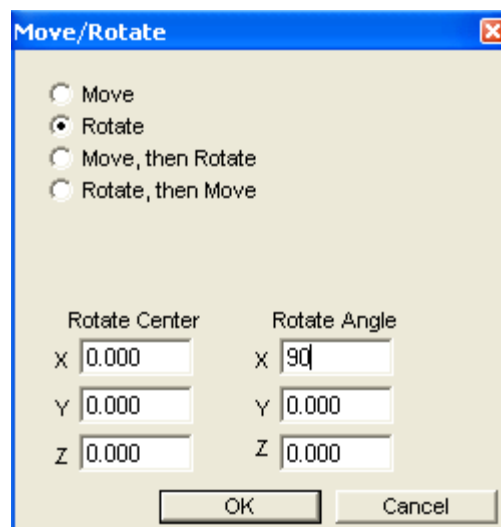
Rotating Selected Shapes

When one or more shapes has been selected, you can rotate the selected shapes about a point in space. From the main menu select Edit and then Rotate Selected Shape(s). You will see a window that appears as follows:



To rotate selected shapes, you must enter a point about which the shapes are to be rotated (the fields under Rotate Center in this window) and the angle of rotation, in degrees, about the X-Axis, the Y-Axis or the Z-Axis (the fields under Rotate Angle).

As an example, suppose we wanted to rotate a casting model 90 degrees about the X-Axis. This would be done by selecting all of the shapes in the model, selecting Edit and Rotate Selected Shape(s), then making the following entry in this window:



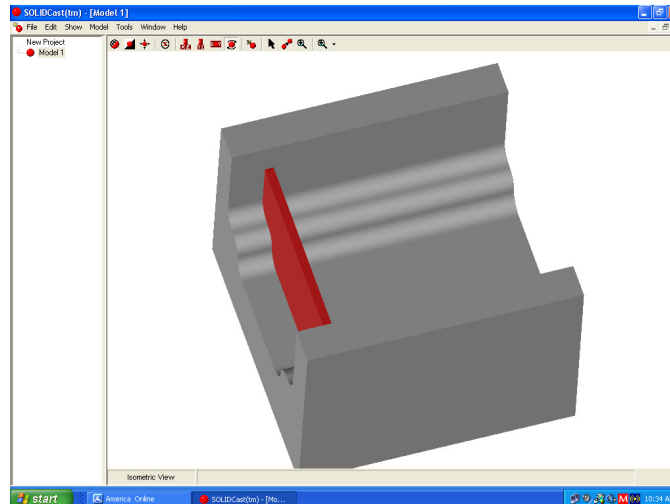
At this point, you would click on the OK button and the selected shapes would be rotated 90 degrees about the point (X=0, Y=0, Z=0).

Copying Selected Shapes

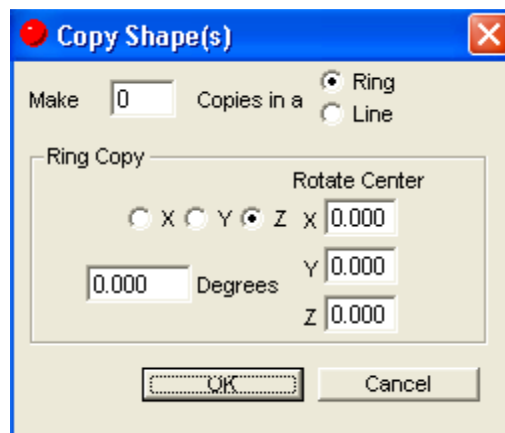
When one or more shapes have been selected, you can make copies. The copies may be created along a line from the original, with a given offset in the X, Y and Z directions, or they may be created in a circular pattern around a line parallel to either the X, Y or Z axis (a “Ring” copy). When copies are created in a ring, each copy will be rotated relative to the original shape.

Linear Copies

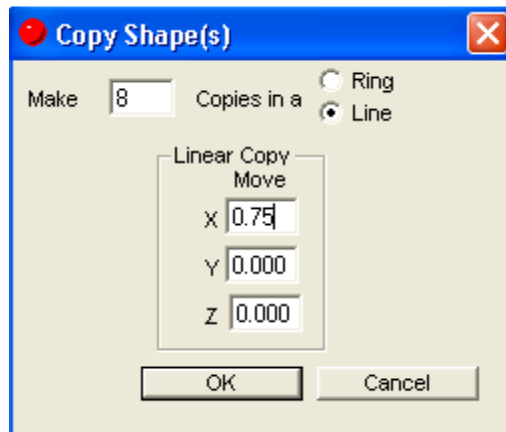
To copy shapes, from the main menu select Edit and then Copy Selected Shape(s). As an example, consider the following part in which the main body and one lateral rib have been created as extruded shapes. The objective is to create additional copies of the rib, with a spacing of 0.75 inches from one to the next in the X direction. We would first depress the “Select shape mode” arrow on the toolbar, then click on the rib to select it. This would appear as follows:



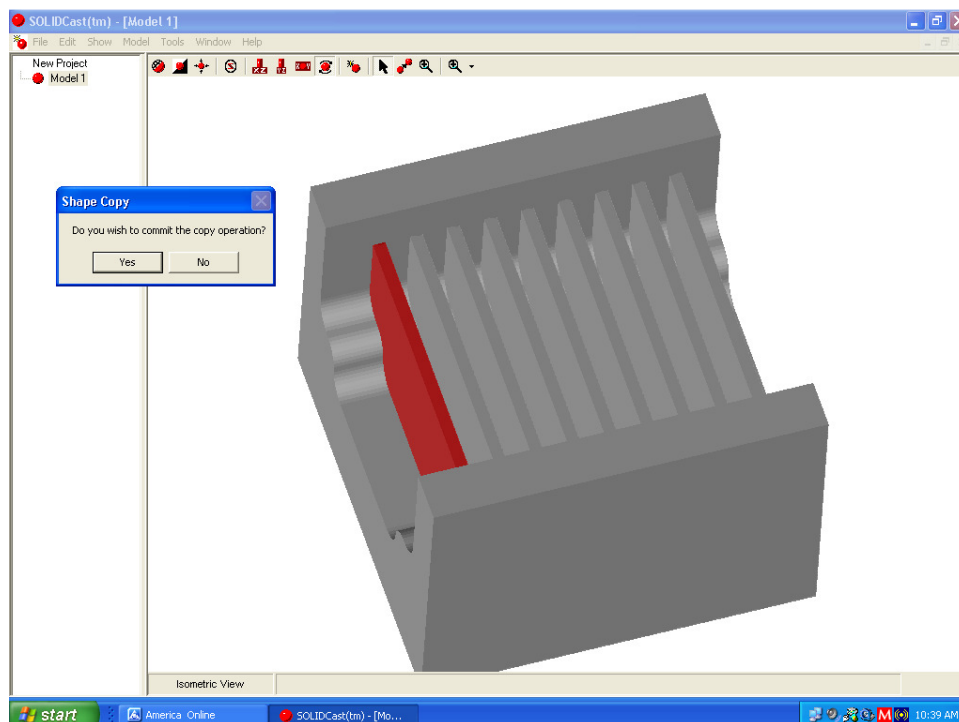
We would next click on the Edit... Copy Selected Shape(s) menu. The following box would appear:



This box is used to tell the system how to make copies. In this case, we want the system to copy the rib in a linear fashion, so we would click on the button labeled “Line”. We would then indicate how many copies we want (in this case 8) and the offset distance for each copy (in this case, 0.75 inches in the X direction), so the box would appear as follows:



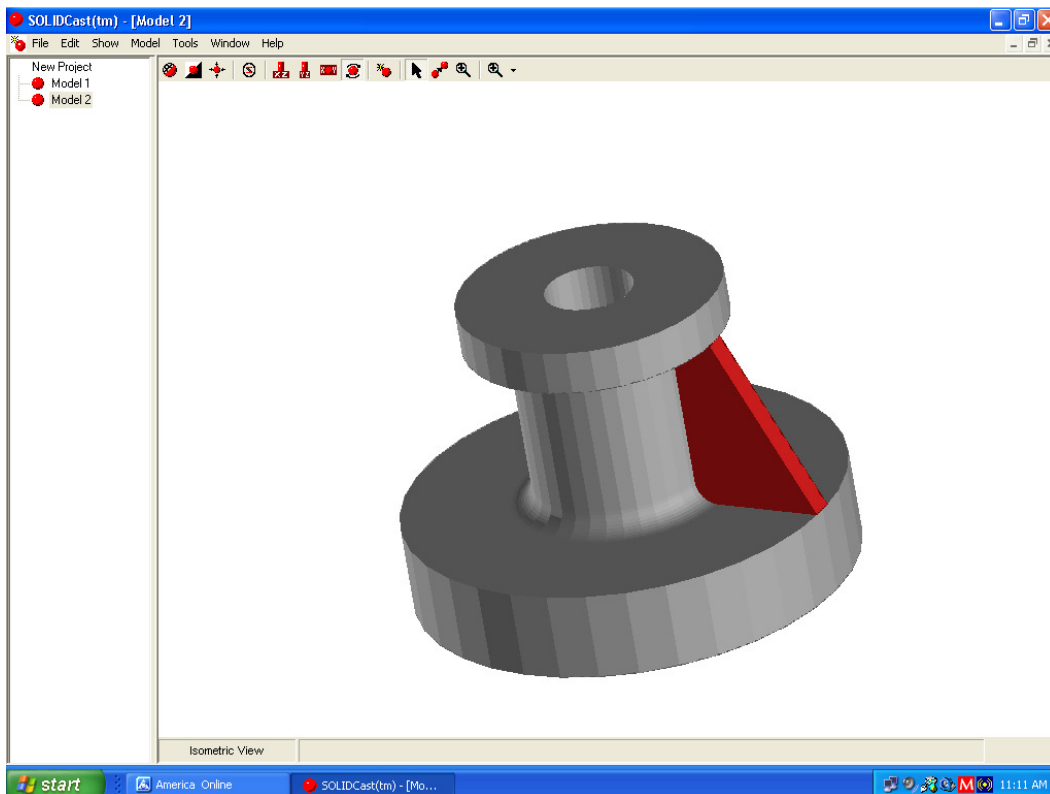
Clicking on the OK button would produce the following result:



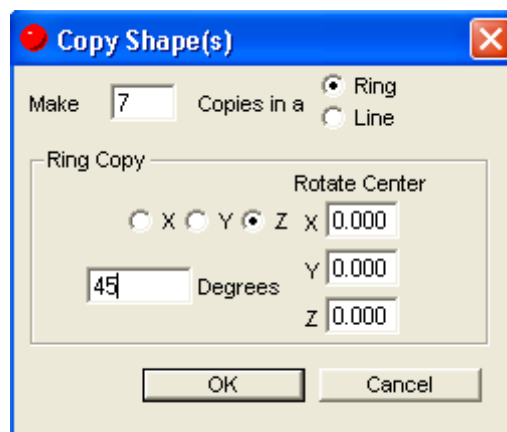
When performing a copy operation, the system asks you to verify whether the operation was performed as desired. If the copies do not appear as you wanted them (for example, if you entered the wrong offset) then just click the No button and the copies will disappear. If the copy operation is correct, then click the Yes button and the Copy Window will close.

Ring Copies

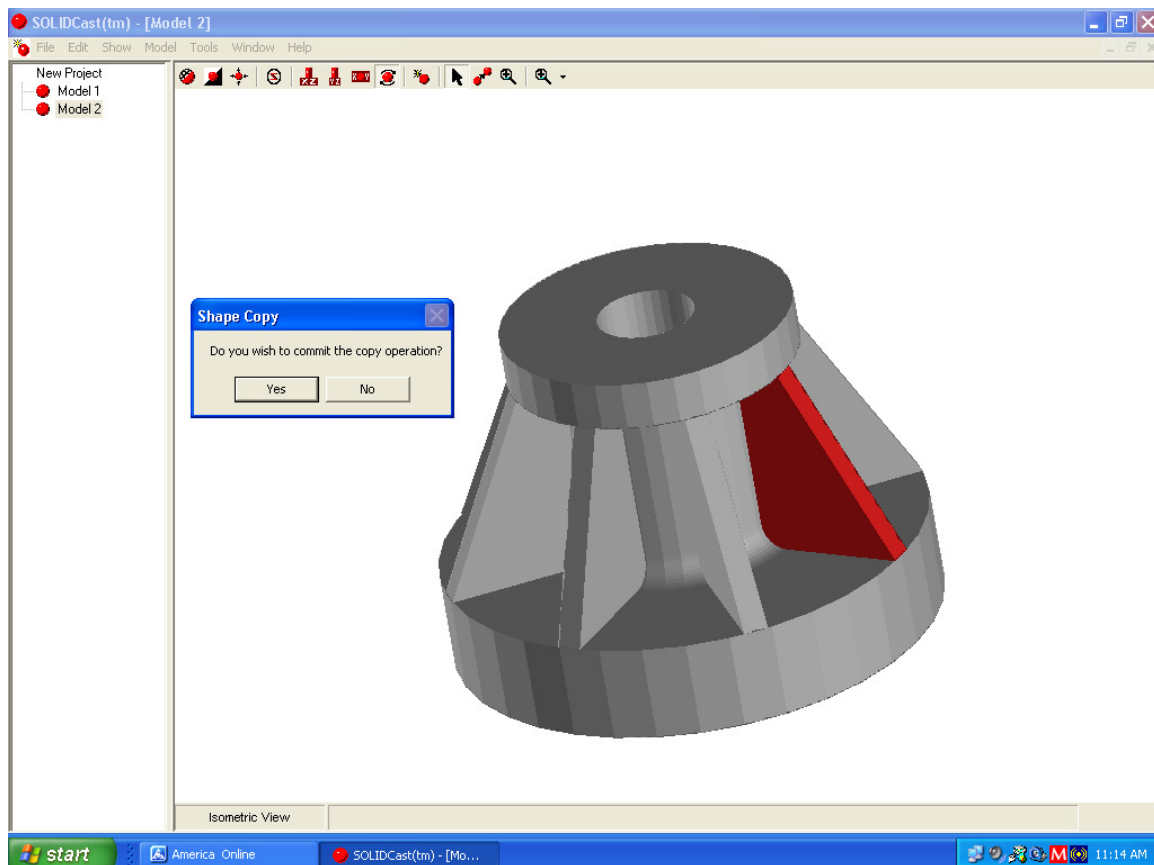
An example of a “Ring Copy” operation is shown below. In this case, we have a hub shape that has been created as a solid of revolution, and a rib that has been created as an extrusion. Here we want to copy the rib so that a copy occurs every 45 degrees around the shape. First, we select the rib as shown:



Next, select Edit... Copy Selected Shape(s) from the main menu. In the box that appears, make the following entries:



First of all, we click on “Ring” to indicate that this will be a ring-type copy operation. Next, we click on Z to indicate that we will be copying around a line parallel to the Z axis. In the Degrees field, we enter 45. Note that when you do this, the number of copies is automatically set to 7. The system assumes that, if you are making copies at 45 degrees, you will probably want 7 copies of the original (just as, if you entered 90, the system would assume 3). You can change the number of copies if you do not actually want the 7 copies as assumed by the system. In this case, 7 is correct. In the Rotate Center fields, we would enter values for X and Y (since we are rotating about Z) if the center of rotation was not at the (X=0,Y=0) point. In this case, the model was created with its center at (0,0), so we can just leave 0 for both of these entries. At this point we click on the OK button. The copies will appear as follows:

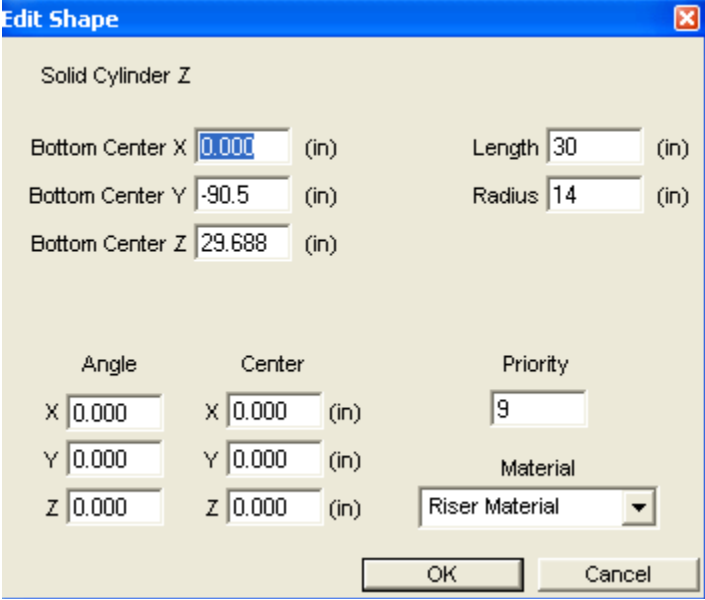


By clicking on the Yes button we commit to the copy operation, and the copied shapes then become part of the model.

Note that you can use Copy to make copies of an entire casting model so that, for example, you can create multiple castings to model a multiple-cavity arrangement of castings for production.

Editing Shape Parameters – For One Shape

If you have selected just one shape, then you can edit the parameters describing that shape. To do this, select a shape and then at the main menu click on Edit and then Edit Selected Shape(s). This option will display the parameters describing the shape that has been selected, and allow you to change those parameters. For example, suppose that you have selected a shape that is a vertical cylinder. The shape parameters will appear as follows:



Edit Shape

Solid Cylinder Z

Bottom Center X (in) Length (in)

Bottom Center Y (in) Radius (in)

Bottom Center Z (in)

Angle	Center	Priority
X <input type="text" value="0.000"/>	X <input type="text" value="0.000"/> (in)	<input type="text" value="9"/>
Y <input type="text" value="0.000"/>	Y <input type="text" value="0.000"/> (in)	
Z <input type="text" value="0.000"/>	Z <input type="text" value="0.000"/> (in)	

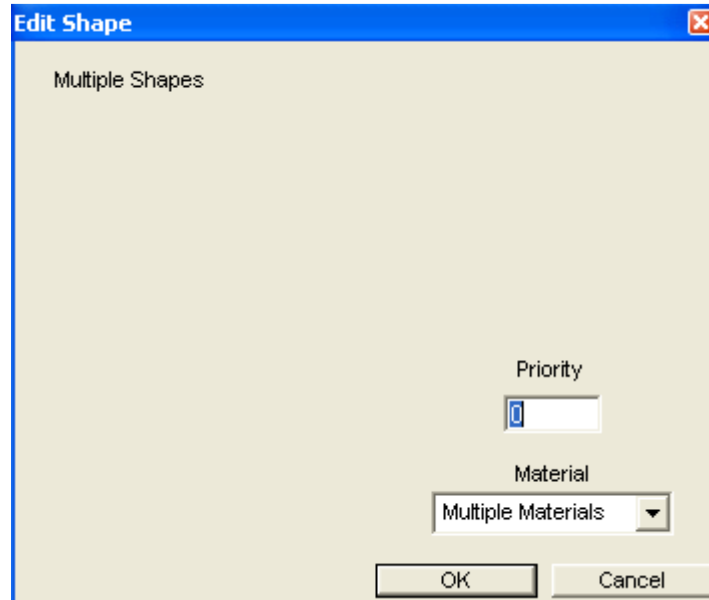
Material

Note that it is possible to change the coordinates of the bottom center of the cylinder, the length and radius, the priority, the material and the rotation in space of the cylinder. To make such a change, just type in the new data (or, for Material Type, click on the arrow to display a list of available materials) and then click on OK.

Editing Shape Parameters – Multiple Shapes

If you have selected multiple shapes, then you can also edit some parameters of the shapes selected. You cannot adjust the individual geometric parameters of each shape. However, you can adjust some things for all of the selected shapes.

If you select multiple shapes in the model, then at the main menu click on Edit and then Edit Selected Shape(s), you will see the following:



This allows you to specify a center and angle for rotation, priority number or a material type for ALL selected shapes. Once you make an entry here and click OK, ALL of the selected shapes will be changed to that rotation, priority number or material type.

Grouping Shapes

When you select a shape that is part of a group, then all shapes in that group will be selected.

You can create a group by selecting multiple shapes and then selecting Edit... Group Shapes.

You can ungroup a group of shapes by selecting that group and then selecting Edit... Ungroup Shapes.

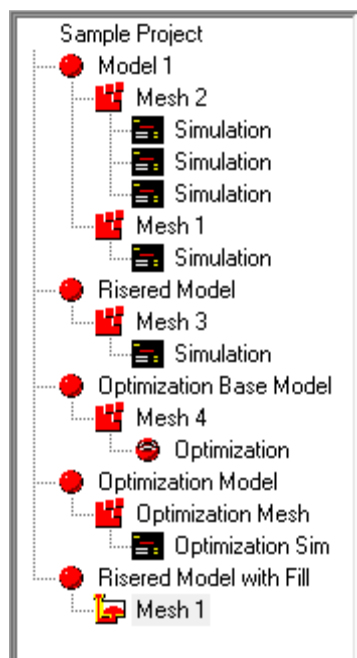
Note that when an Edit operation is performed (such as deleting), ALL SELECTED SHAPES will be affected, regardless of whether they are grouped or not. Grouping is just a convenient way of linking several shapes together so that when you want to select them again at a later time and perform some Edit operations, you only need to click on one of the shapes to select all of the group shapes.

If you select a shape that is part of a group, all shapes within that group are selected. You can select additional shapes by Ctrl-clicking on those shapes. This does not add these additional shapes to the group; it just causes all of these shapes to be selected so that an editing operation can be performed on all of them simultaneously. If you wish to add the additional shapes to the original group, you can do so by selecting Edit... Group Shapes.

UNIT 36: Editing the Project Tree/Archiving Projects

SOLIDCast organizes models, meshes and simulations into Projects. A project may contain one or more models, meshes or simulations. In general, a project should be thought of as a collection of related models, meshes and simulations, as well as fluid flow analyses and optimizations, if FLOWCast and/or OPTICast are used. Normally a project contains model variations for a single cast part, but this is not a strict requirement.

The Project Tree appears on the left side of the screen as you work in SOLIDCast. An example might appear as follows:



In this example, there are five models. Each model has one or more meshes associated with it. Four of the models have one or more simulations as well, and the fifth model has a FLOWCast fluid flow simulation. The fourth model is actually created from the third, as it is the optimized model, mesh and simulation that is the final result of using the automatic process optimization module, OPTICast. OPTICast and FLOWCast are optional modules that integrate with SOLIDCast, and are available from Finite Solutions.

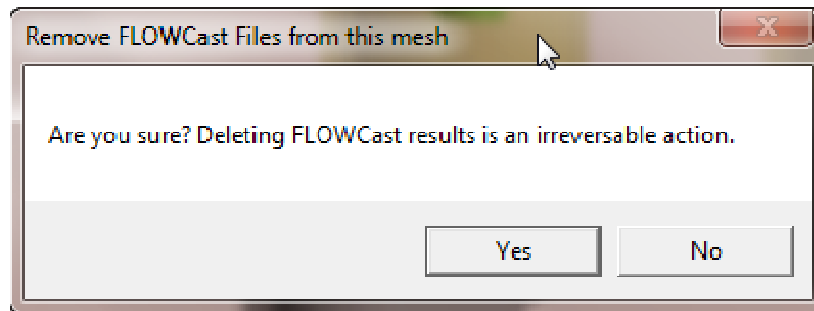
Note that you can name each entry on the Project Tree with whatever you want to type to identify an entry. When you create a new model, mesh or simulation the system uses default names, however you can change these names whenever you want. To change a name on the Project Tree, just triple-click on that entry's name. The name is highlighted and becomes editable. You can then modify or type a new name into the project tree.

If you want to delete an entry from the Project Tree, highlight that entry by clicking on its icon. Then select File... Delete Selected Item in Tree from the main menu.

Note 1: If you delete an item from the tree, all related items under that item will also be deleted. For example, if you delete a Model from the tree, then all meshes and simulations associated with that model (all those that appear directly under the Model) will also be deleted. If you delete a Mesh from the tree, then all simulations run with that mesh will also be deleted.

Note 2: If you delete an optimization entry, then you will not be able to go back and edit or reuse the optimization project. However, the optimized model, mesh and simulation will still be available on the project tree.

Note 3: To delete FLOWCast data(which can get VERY large!) WITHOUT deleting the mesh, select the mesh name on the project tree which has the FLOWCast icon, then select File...Remove FLOWCast Data... You will be asked to confirm this action.



If you say yes, the system will remove the FLOWCast entry from the project tree and delete all files associated with the fluid flow simulation, but will still keep the mesh. The FLOWCast mesh icon will change to the normal mesh icon.

If you want to delete the mesh AND the FLOWCast data, select the FLOWCast mesh icon and select File...Delete Selected Item in Tree... If you confirm this, the system will delete the mesh and the FLOWCast data, and remove the entry from the project tree.

CONSERVING DISK SPACE

Currently, models, meshes and simulations are not stored in a compressed format automatically by the system. Deleting unneeded entries from the project tree also deletes the associated files on disk, so this is one way to free up additional hard disk space. We also recommend that projects created by SOLIDCast be compressed by the user with WinZip periodically, in order to maintain a reasonable amount of free disk space.

It is a good idea to compress (zip) project folders and to move them to an archive media such as a CD, on a regular basis. Doing this involves basically three steps:

Step 1. Have WinZip installed on your computer

Step 2. Locate the folder which contains the project that you want to archive

Step 3. Zip the folder and move it to the CD.

Step 1:

For the first step, you may already have WinZip installed. If so, you can go on to the next step. If you don't have WinZip, you can download it for free from www.winzip.com. From there, you will get an executable file. Just run this file by double-clicking it to install WinZip, which will allow you to compress files and folders.

Step 2:

Once you have WinZip installed, you then need to locate the folder which contains a SOLIDCast project that you want to archive.

A SOLIDCast project contains all of the model, mesh and simulation files that are associated with that project. A Project Folder with the same name as the project contains all of these files. Normally, SOLIDCast project folders are found in a folder called C:\Projects on your hard drive. If you open this folder, you should see SOLIDCast project folders that have been created.

It is possible to save project folders in different places on the hard drive by changing paths, so if you don't see a C:\Projects main folder, you may have to go hunting for the project folders on your hard drive. (The Windows Search feature can be helpful here.)

Let's assume that you have a C:\Projects folder on your hard drive (keeping in mind that you may have project folders in some other location). Suppose that you create a project in SOLIDCast called "AP-100". This actually creates a folder called AP-100 within the C:\Projects folder. If you open My Computer on the Windows desktop, then open drive C:, then open the Projects folder, you should see a folder called AP-100. This is the SOLIDCast project folder for AP-100.

Step 3:

After locating the project folder, place the mouse cursor over it and press the RIGHT mouse button. You should see a menu item which looks like "Add to AP-100.zip". Click on this menu selection with the left mouse button. This will create a file with the name AP-100.zip. This file will be located in the Projects folder. This is the file that you want to put onto the CD.

Once you are sure that you have created a copy of the AP-100.zip file on the CD, you can delete the AP-100 folder and the AP-100.zip file from your hard drive.

Later, if you need to reload this project from the CD, just locate the AP-100.zip file on the CD and double-click it. This will bring up WinZip and will show all of the component files. Click on the Extract button. Make sure that the selection is checked which says "Use Folder Names". Then navigate to the C:\Projects folder, click the New Folder button and enter the name of the project (which in this case is AP-100). This will recreate the project folder on the hard drive. Then click the Extract button to unzip all of the files and subfolders into this folder. After doing this, you should be able to run SOLIDCast and load the AP-100 project in the normal way.