March 18, 2004

Material Density

Synopsis

Material Density is a small tool used to tell the eDART the density of the material. Once entered the eDART calculates the summary value "Shot Weight", "Theoretical". This may then be picked up by third party programs using RJG's Active-X interface and used to make records in your database or to print labels on the part.

Computation & Disclaimer

Notice first that we have called the value type "Shot Weight". This is because it includes all the material moved forward by the screw until its furthest forward travel. This includes the runners and sprue, if any, and all the cavities.

As you can see we have named the value "Theoretical". The value is computed very simply as follows:

"Shot Weight, Theoretical" = "Peak, Shot Volume" x "Current Setting, Material Density"

However viscoelastic polymers are highly compressible. So there are many factors that may cause the actual weight of the shot to not match the weight as found on a scale.

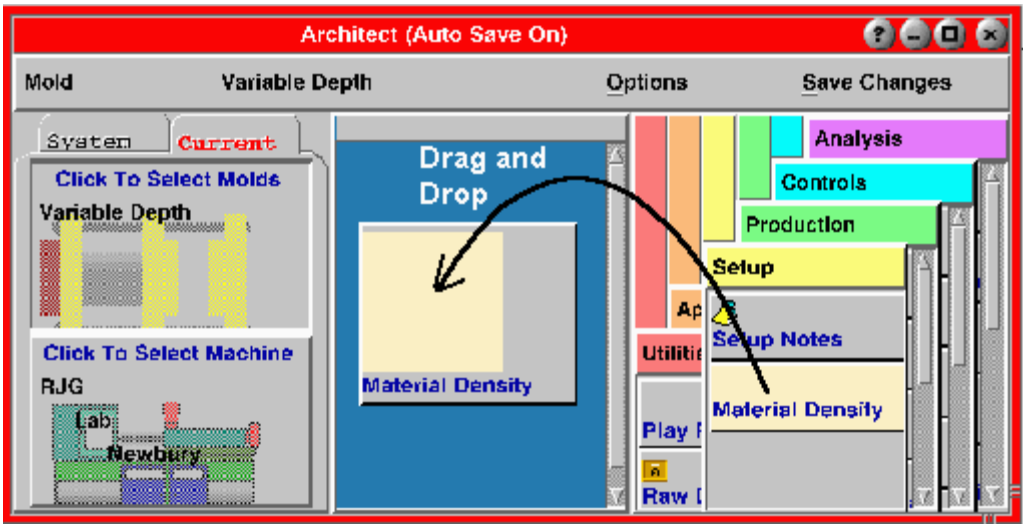
1. Compressibility: The injection unit will compress the material and move forward slightly when it does. This motion does not necessarily move much material into the part. The actual compressibility is found in the PVT curves.
2. As the viscosity of the material varies (e.g. from lot to lot) then pressure drops and compressibility can vary as well. This will introduce error into the theoretical shot weight.
3. Check ring leakage: The screw may move forward and some material may blow back over the check ring. Thus the "Peak, Shot Volume" value can be higher than would be expected.

It may be possible to adjust the published density of a material to approximate the actual shot weight more closely. However the check ring leakage and material variation will still cause the accuracy to vary.

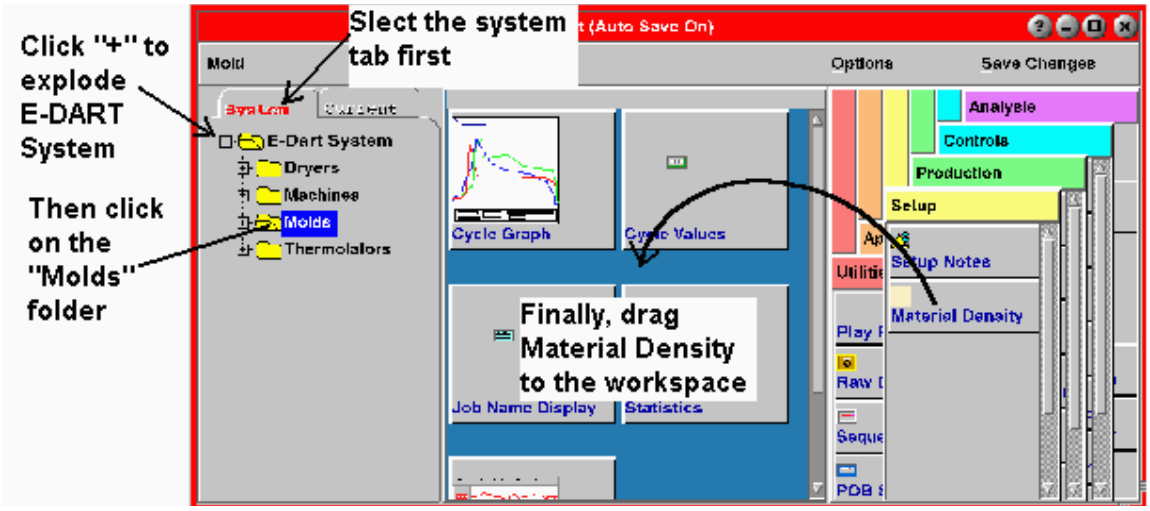
We recommend the more accurate method of making a correlation between cycle integral of cavity pressure and weight. We have found over the years that cycle integral generally correlates best to part weight. The you can compute a scale factor (or curve fit, if necessary) to convert cycle integral to part weight.

Starting the Material Density Tool

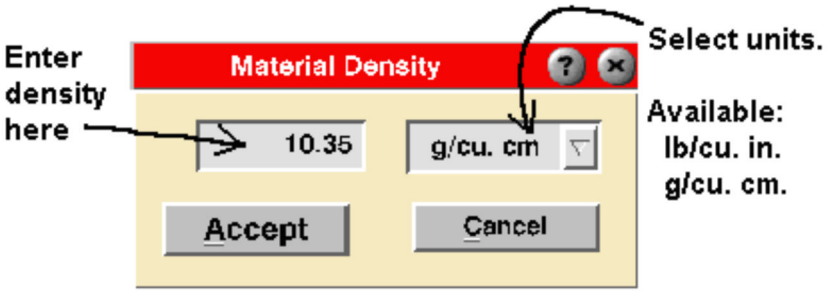
If you plan to always run the material density tool for one mold, use the Architect to drag it onto the mold's workspace. The Material Density tool is found on the Setup list of tools in the Architect.



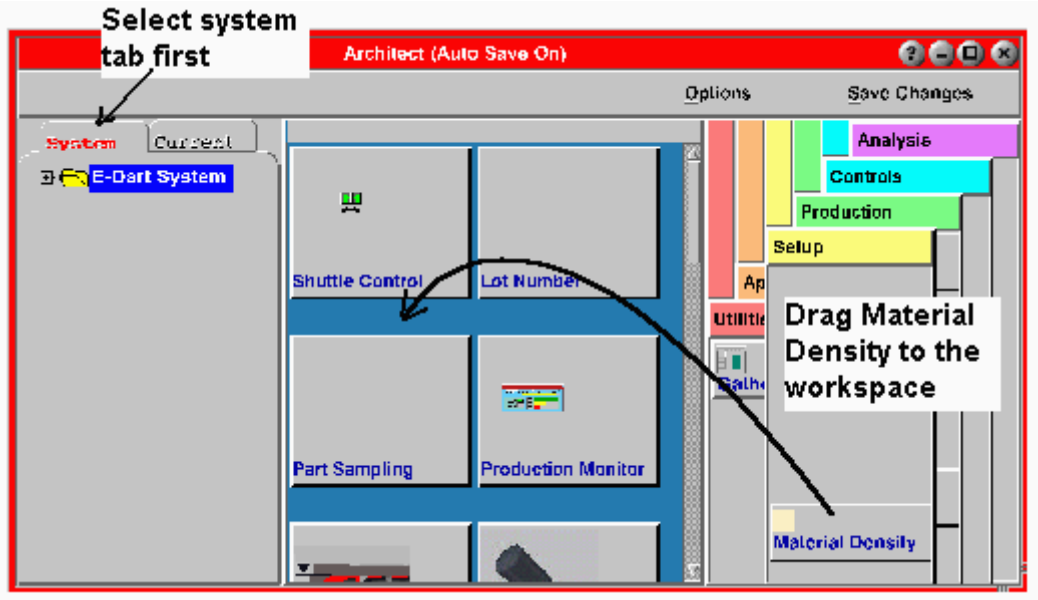
If you want to have the Material Density run with any and all molds you can use the Architect but drag the Material Density tool onto the "Molds" folder workspace (by selecting the System tab, exploding E-DART System and clicking molds before dragging).



In both of these cases the Material Density will start automatically with a job start and load the material density last set. If the density has never been set then the Material Density tool will pop up and allow you to set it the first time. It looks like this.



The third method is to put the Material Density tool on the eDART's main menu by dragging it on the E-Dart System workspace.



We recommend that when you add Material Density to a mold (or "Molds") that you also put it on the main menu. This way you can check on the current value or change it by bringing it up. If the material density is set autmatically at job start then the tool will not be visible on the toolbar. It must be "launched" again to change the value.