

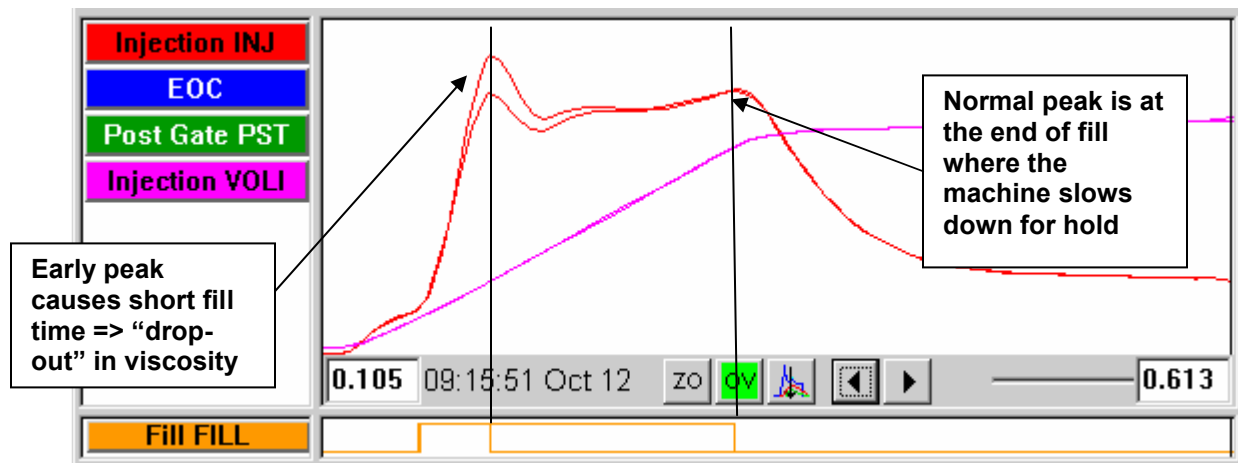
Auto-Set Fill Volume Feature of the eDART Sequencer

Overview

When using RJG's eDART™ to analyze data in decoupled molding the eDART™ needs to be told when the machine is slowing down to pack (or pack and hold in D2 molding). If this point is accurately defined the eDART™ can calculate accurate and stable *Effective Viscosity*, fill time, fill speed and other values.

Previous to software release 8.5 when a new mold was run the user needed to tell the eDART™ what this value is by either setting it with a the cursor on the cycle graph, making a short shot and using the Sequence Settings button on the fill tab or typing in the value on that tab. The problem is that customers often forget this step. Even our own consultants forget it.

If the fill volume is not set then the eDART™ concludes that fill ends at the peak injection pressure. Sometimes computations can become unstable or inaccurate because the peak injection pressure does not always occur at the end of filling. Here is an example of two cycles overlaid, one having an early peak due to a cold slug.



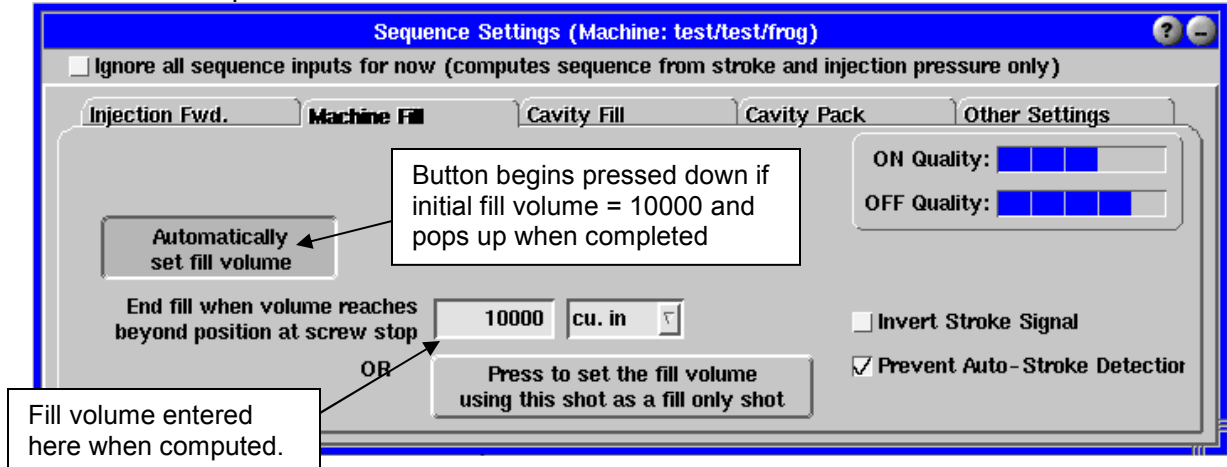
In order to automate the fill volume we have developed software (in release 8.5) to watch the speed behavior of the machine's injection unit and estimate when the machine is slowing from fill speed to slow pack. This software is built into the eDART™'s sequencer ("Sequence Settings" on the toolbar).

Operation

"Auto Set Fill Volume" starts automatically with the sequencer when you start a job that does not have a fill volume set yet. It is a sort of mole, running underground and watching the machine to determine where to set fill volume. Here are the rules:

- It will only attempt to set the fill volume if it has not already been set (value = 10000). Thus it can only "auto-set" fill once unless you manually tell it to try again (see below).
- It looks for the first dramatic slow down in speed after the start of injection. This may be the typical "corner" on the stroke curve on a D3 fill -> pack speed change or the beginning of the speed roll-off in D2.
- It waits for twenty stable cycles in which it computes approximately the same fill volume before setting it.
- Once has concluded that it has a good fill volume it places the value in the box on the Sequencer's "Fill" tab and begins using that as the end of fill instead of injection peak. It also turns off the "Auto Set Fill Volume" button on the Sequencer's fill tab (pops it up).

- If you want to force the sequencer to automatically set the fill again select the sequencer's Fill tab and press the "Auto Set Fill Volume" button.



Once set, whether manually or automatically, the fill volume number stays with the process setup (mold, material and cavitation combined). This can help with process setup when the job is re-started and you want to match the fill flow rate and fill time from a template values.

Limitations

Note: If any of these issues prevent the fill volume from being set automatically you may still set the fill volume by using the "Set Fill Volume at Cursor" on the cycle graph or typing the value into the Sequence Settings "Fill" tab value box.

- **Multiple Slow-Downs:**
If you set up a process with multiple fill speeds then the Auto-Set Fill Volume will pick the most "dramatic" speed change (slow-down) to choose for fill. This may not be correct because the algorithm cannot distinguish which slow-down point is the end of fill among several. You may need to set the fill volume manually.
- **Non-Dramatic Slow-Downs:**
If the injections speed sort of "rolls off" continuously starting at the beginning of the cycle then the Auto-Set Fill algorithm will not see any "dramatic" changes in speed. Thus it cannot decide where fill ends and pack begins. This might happen in the case of a severely pressure limited fill.
- **Press Control Oscillations**
If the press cannot hold constant speeds as programmed but oscillates then the Auto-Set fill algorithm can be fooled. It may think one of the oscillations is the most dramatic slow-down point, even more than the change from filling to packing. This is generally caused by poor tuning of the press's speed control.
- **Sudden Slow-Down at the Beginning of the Cycle**
Some presses accelerate very quickly but then overshoot their set speed and fall back to it. The Auto-Set Fill algorithm sees this as the "first dramatic slow-down". It doesn't look any different than it would if you set a speed change into the machine so it can get fooled and set the volume too early.
- **Velocity to Pressure Transfer Before Slow-Down:**
If the eDART is using Velocity to Pressure control to transfer the press and this transfer output fires before the press slows down then the eDART assumes fill ends at V->P transfer. In one case a customer had set up the V->P transfer on the eDART but not set up the machine to accept the external signal. So the eDART thought that filling and packing were completed when the press was actually continuing on through a pack phase.