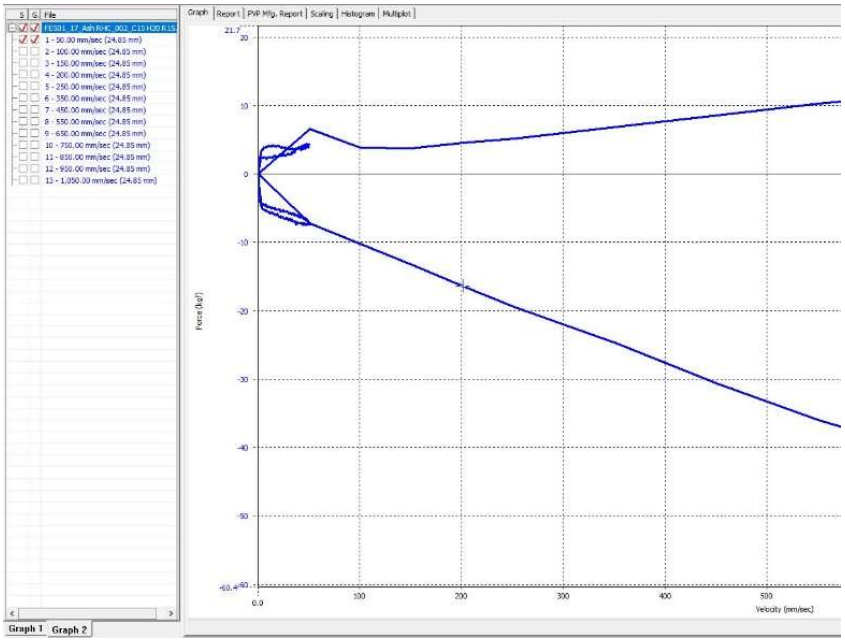
CTW Automation
P.O. Box 1601 / Lexington, NC 27293
423 N Lee Street / Salisbury, NC 28144

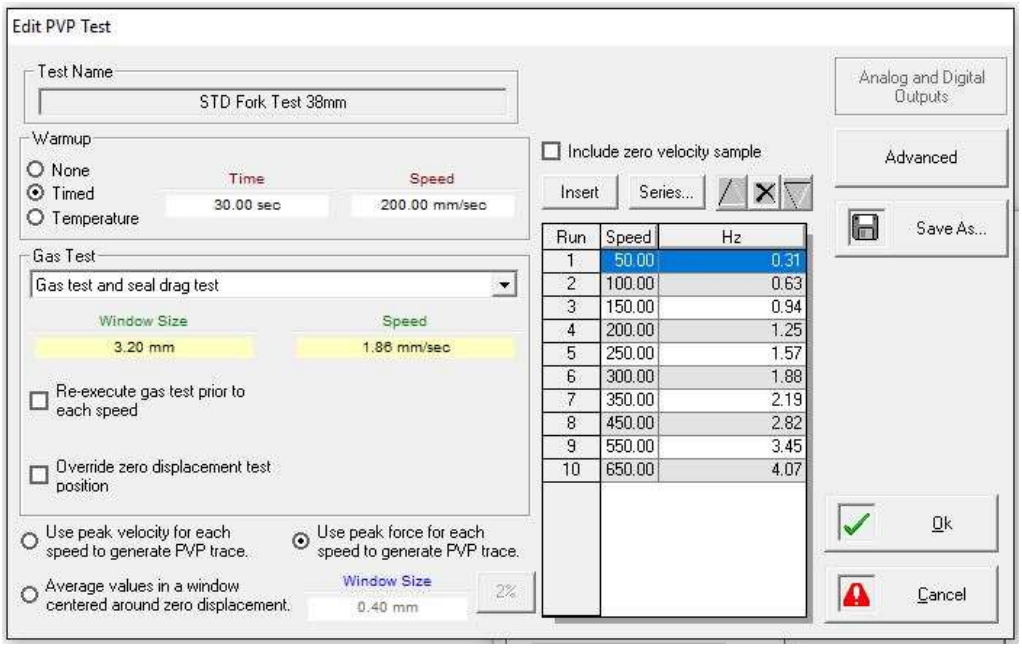
Roehrig Shock 6.5.52 and the PVP Methodology

Q: Original question from customer: what is going on with the PVP graph at the one speed where the PVP point does not match the CVP graph?



A: There are several ways for the Roehrig software to perform a PVP test and they can give and display varying results all with the same data. This can be very confusing but we will try to sort it out.

A PVP is simply a composite graph made of points taken from a collection of individual CVP runs. They can be generated in three different ways. In Roehrig Shock, these are done in the individual Test itself. You can see in the lower left corner the three PVP options.



Use the Peak Force for each speed regardless of whether it occurs at peak velocity

- If the damper/fork has any type of spring component this can easily result in the point coming from a section past peak velocity as the spring generates more force past the peak. Bicycle shocks are notorious for this.

Use the Peak Velocity for each speed regardless of whether it is also the peak force

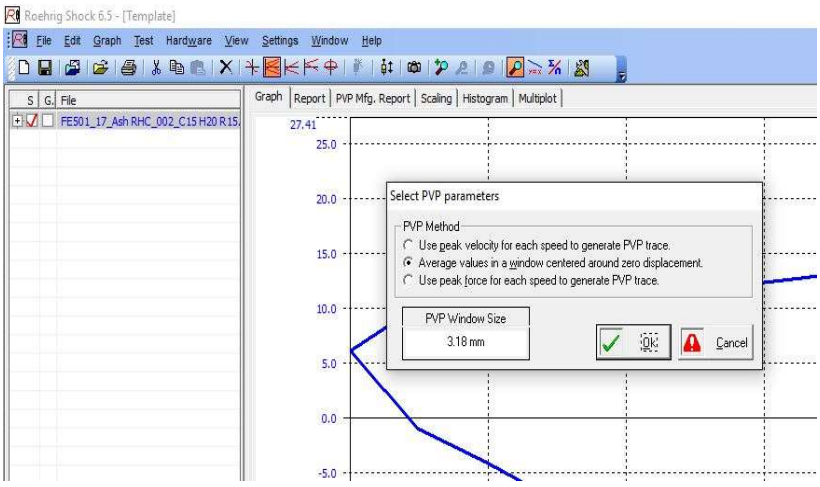
- A good method but can have issues if the machine has electrical noise and thus a velocity noise spike throws off the data. Not very common.

Use a small window centered around zero displacement (mid-stroke) to get the force

- This is still the best methodology for repeatable results. It provides a small average so that damper to damper, your data is more consistent and rejects "noise" issues.

Each method can easily give different numbers all from the same data.

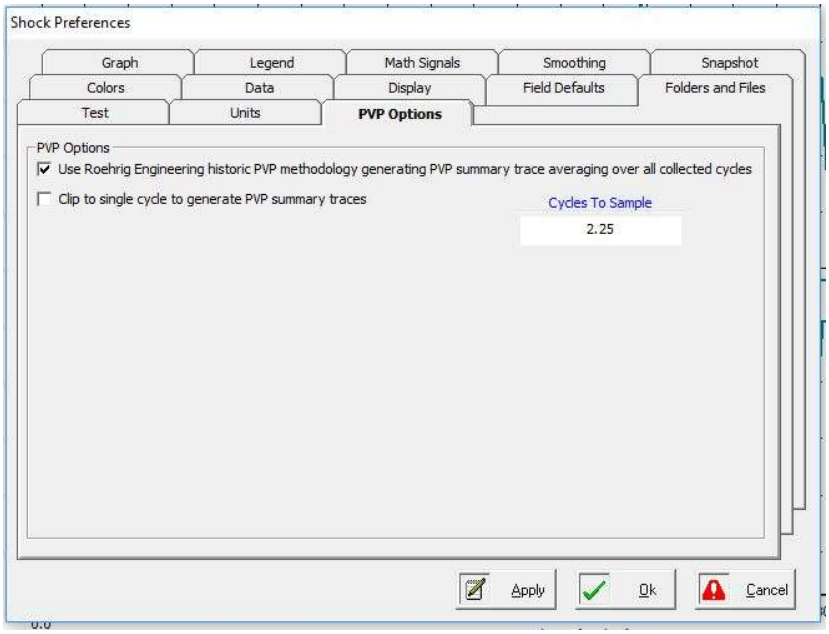
Roehrig Teaching Spot - There is a nice feature in the software that does allow the user to go back and Re-evaluate the PVP using a different method. We used to use this often to correct a bad procedure or issue. Under the "Edit" tab you can see the "Revaluate PVP" option, when you click on it you can apply a different method.



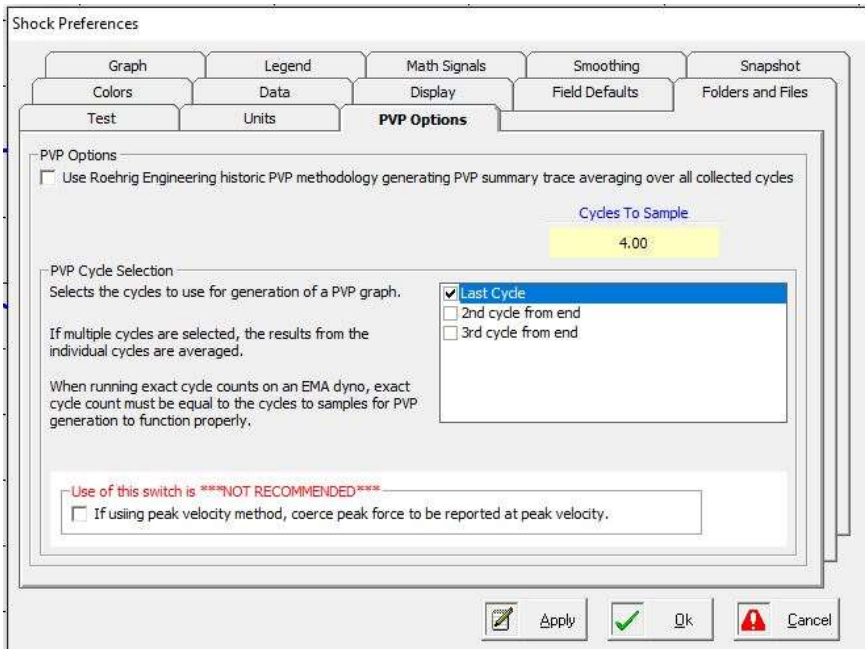
Now, the second thing to understand before we move on is that the CVP on the screen is not necessarily where the data is pulled from. A Roehrig dyno Test runs a particular number of cycles for each speed. If you have not changed this from the default, it is most likely 2.25 cycles to be run and collected for each speed. And if you have not specified which cycle to use for the PVP (F12/ Edit Preferences / PVP Options tab) then you will see a CVP from the second cycle but the PVP will be from the first.

**** And if the first and second cycles are different then you will have issues. ****

The picture below is the default setting. If you uncheck the box for the "Use Roehrig Engineering historic……" then you will get a larger picture as seen in the second picture.



Now that your choices are opened-up, you can determine the number of cycles to run and then which cycle to use. This creates a much better method for being consistent.

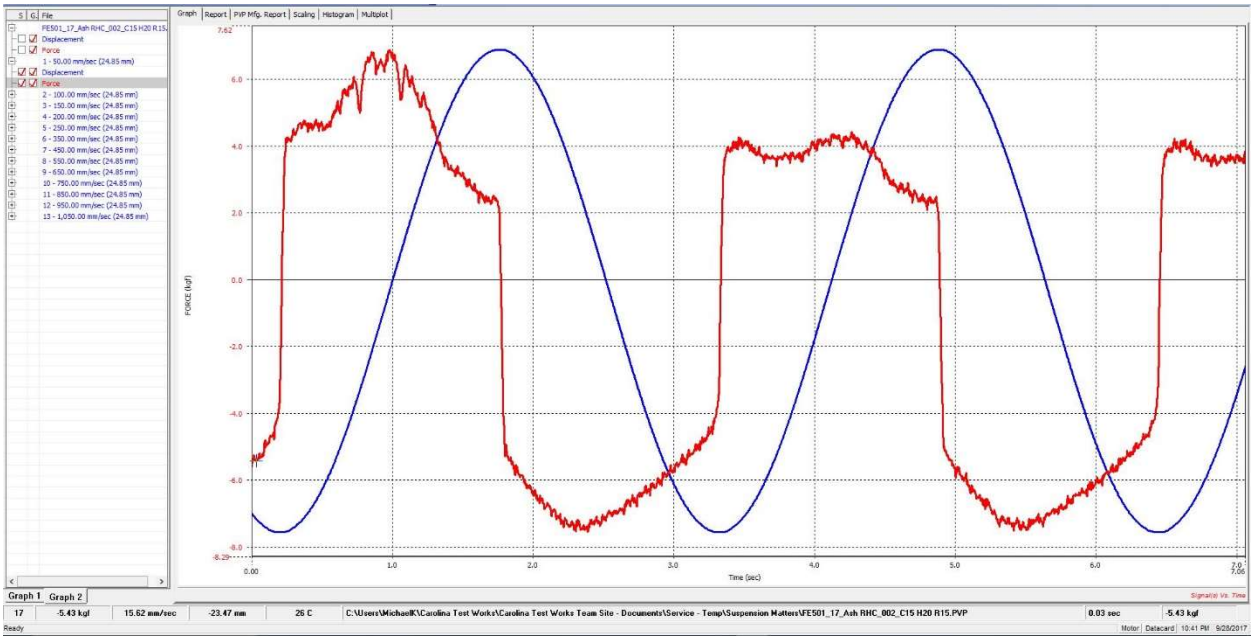


Back to the original problem, the CVP displayed and the PVP data point do not match. This happened based on some default settings and the odd chance that the damper did not do the same thing on each cycle; that is the key. If the damper does the same thing from start to finish you will never notice this event. I will show below the Signal vs Time data for the first speed (the one at issue). It will be the Force and Displacement signals in time.

CTW Automation
P.O. Box 1601 / Lexington, NC 27293
423 N Lee Street / Salisbury, NC 28144

Blue = Displacement and it runs for 2.25 cycles.

Red = Force and you can see it starts out with a peak, a spike on the top (compression) but then settles in over the following cycles. The PVP point came from this first cycle while the CVP data on the screen came from the second cycle and that's is why we have the problem. Bingo!

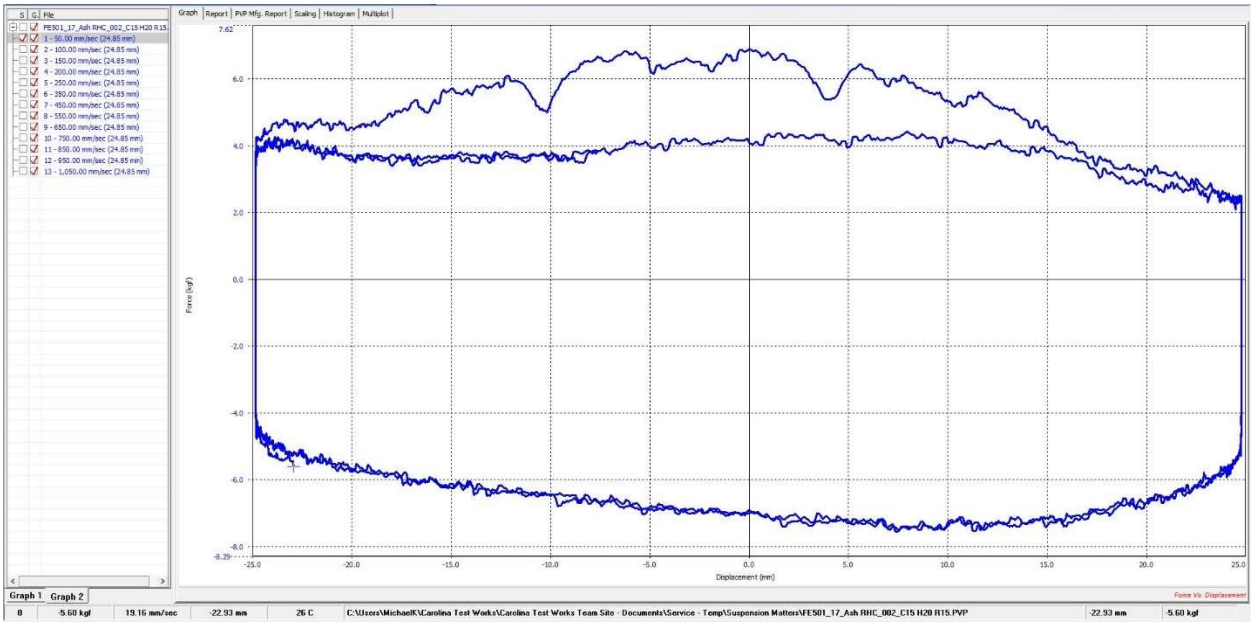


Why? In this case, this is a Fork. The User did not run any type of warm up or cycle for time to get the system loose. They did a seal drag and gas test and it went straight to the first speed. This could have created some friction and drag that had to be overcome but was clearly measured by the machine. Also, this could be showing the importance of good fixturing. If the damper/fork is not aligned well there could be side loads that cause additional friction and could show themselves in the data files like this particular event. Running 3 to 4 cycles and using the last cycle will solve most of these problems.

Also, this was not the only speed to show a problem. The User only noticed this one speed because it was obvious, however, there were a few other speeds that did the same thing it just does not show up as much. All of them would be fixed by the same method.

Another way to look at issues would be to view the PVP in the Force vs Displacement graph and make sure to view all cycles. You can do this in the F12 area, under Test tab. The picture is of the first speed, all 2.25 cycles and shows that the first compression stroke had real friction issues that go away after it is moving.

CTW Automation
P.O. Box 1601 / Lexington, NC 27293
423 N Lee Street / Salisbury, NC 28144



If your Force vs Displacement curves do not overlay from each cycle, this could be reason for concern. But now, you have a greater understanding and can look further into your data to get the answers you need.

Thank you and until next time.

CTW