(((ECHOMETER)))

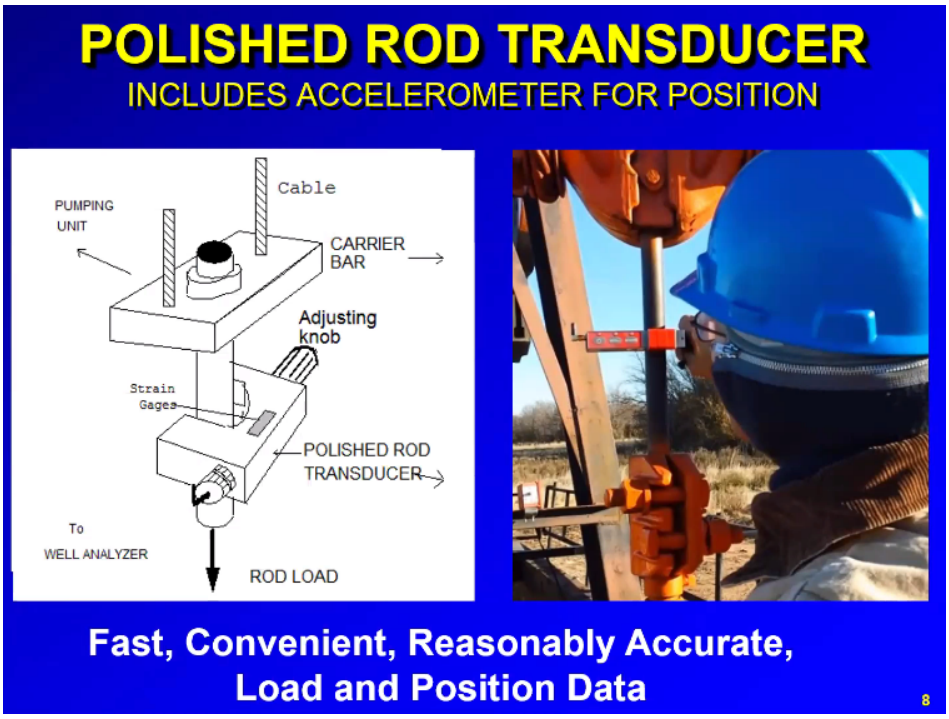
Ask Echometer – Q & A Session 9 – July 15 2020

Dynamometer Workshop

Does or should orientation of PRT (parallel or perpendicular to carrier bar) matter to accuracy of data?

Question answered at time: 46:11

Remember the PRT has to measure the diameter change of the polished rod so it has to be perpendicular to the orientation of the polished rod, and it has to be aligned properly so that the points of measurement are across the diameter. It must also be parallel to the carrier bar.



For TAM to calculate Wrf then a most accurate value of oil density is needed then. Right?

Question answered at time: 47:38

Yes. One of the uncertainties here is that in the tubing, where the rods are located, there is a mixture of oil, gas, and water. You have to have the correct densities of at least the oil and the water. One of the questions you have is 'What is the percentage of gas that you have in the tubing?' The Wrf is going to be affected by that

particular number. I think in the calculation, TAM assumes there is no gas in the tubing – only a mixture of oil and water and the two densities. But then you have the option of changing that in the detailed analysis. The tubing fluid gradient is a topic that we may want to discuss in a future session.

Does the PRT have a load limit?

Question answered at time: 49:15

No. There is not limit to the load that you can measure with the PRT. Remember, the PRT measures the change in diameter, it does not measure the actual load. But one thing to keep in mind is that you are measuring a very small change in diameter, so if the well is deep, and the change in load is significant, you normally get a much more accurate measurement. When the well is shallow you have a much smaller change in load because we're measuring .0001 of an inch of change. The reason to mention this is that on shallow wells, you have to be extra careful making sure you have installed the PRT correctly, and that there are no other loads. Especially in the case of the wired PRT, you want to make sure that the cable does not pull on the PRT and generate and extra load which is not related to what is happened to the polished rod. One recommendation is to loop the cable around the handle of the PRT.

What causes my pump card and surface card not to mirror each other?

Question answered at time: 51:28

The surface card that you see is created from measurements being taken at the surface by the dynamometer sensors. Within the sensor we're acquiring acceleration, and then we're also acquiring load or with the PRT we're getting an indirect calculation of load. And then, within the program there's something called the Wave Equation. The Wave Equation takes into account how the load propagates through the rodstring up to the surface. So we take the measurements at the surface and apply the Wave Equation and that gives us an idea of what's happening downhole – what's happening at the pump to give us the surface card shape that you see. The images are different because the loads propagate through the rodstring depending on the type of rodstring that you have, depending on the load, depending on the movement.

Another way to look at it is we have a different polished rod movement compared to the plunger movement, which is represented by the downhole card, and there is rod elongation and shrinkage that is affecting the travel on the pump card compared to the surface card. There are different factors that affect the bottomhole card shape.

Does unanchored tubing have any effect on the CBE test?

Question answered at time: 54:13

No it should not have any significant effect.

I always test hermeticity of the valves before CBE. If there is a leak, I don't take the CBE. Is that a good practice?

Question answered at time: 55:45

It depends on how serious the leak is. We're relying on the load changing which means that if the decrease in load is very significant, or if the load drops in a matter of 5 or 10 seconds, it's very difficult to run the test. If the leak is not significant then you may try to run the test.

Are valve tests with PRT just as accurate as they are with load cell, or is the accuracy gap even less due to static condition?

Question answered at time: 1:31:35

It's important when you use the PRT that the polished rod is not being bent by misalignment. That will tend to cause diameter changes that aren't representative of the fluid load pulling on the rodstring and changing the diameter. The other thing is that the PRT is sensitive to temperature change. It's a good practice to go ahead and install the PRT when you get to the well and allow it to acclimate to the temperature of the polished rod. This helps the data to not drift as much when using the PRT. If you see the minimum loads and peak loads not at the same level when using the PRT, that will have an effect in the change in load and it may look like the valve is leaking when it is just the temperature changing at the PRT.

Is the pump slippage equation based upon 100% runtime during a 24 hour period?

Question answered at time: 1:33:32

The pump slippage equation was developed at Texas Tech University using a test well that was full of water, and the pump cards were full pumps filled with water. So yes, it assumes that slippage is based on a pump that's full. And then the runtime can be adjusted to adjust the amount of slippage per day. The runtime is a percentage of the day, but the slippage is a calculation of the percentage of the pump card.

Oil viscosity taken into determining the amount of Slippage occurring?

Question answered at time: 1:34:35

Yes. In TAM the oil viscosity defaults to .76 which is the viscosity of the water that was at the temperature of the Texas Tech test well. In TAM you have an input to change that .76 to another value. When we talked about pump slippage in the previous presentation (Session 6) we also provided an EXCEL spreadsheet where you input the water gravity, oil gravity, reservoir temperature, bubble point pressure, and then the viscosity that you want to use is the viscosity at the average pressure across the pump with the bubble point pressure being the intake pressure. So it's going to include the effects of how much gas is in solution based on your pump intake pressure and that will then give you an average viscosity based on the oil and water percentage if you're above about 30API gravity. If you're below 30API gravity then the viscosity probably should just be the oil in the well adjusted for reservoir temperature and bubble point pressure.

Not only Oil but "Fluid" viscosity is considered.
Inputs to Pump Slippage Calculations (Patterson equation) are:
D=Plunger Diameter (inches)
P=Pressure Differential
C=Clearance (inches)
U=Fluid Viscosity (centipoise)
L=Plunger length (inches)
SPM=Strokes per Minute

Most barrels are -2. If "plunger" clearance is -3, then true "pump" clearance would be -5. So is TAM requesting only plunger clearance or pump clearance? If only plunger clearance, what barrel clearance does it assume?

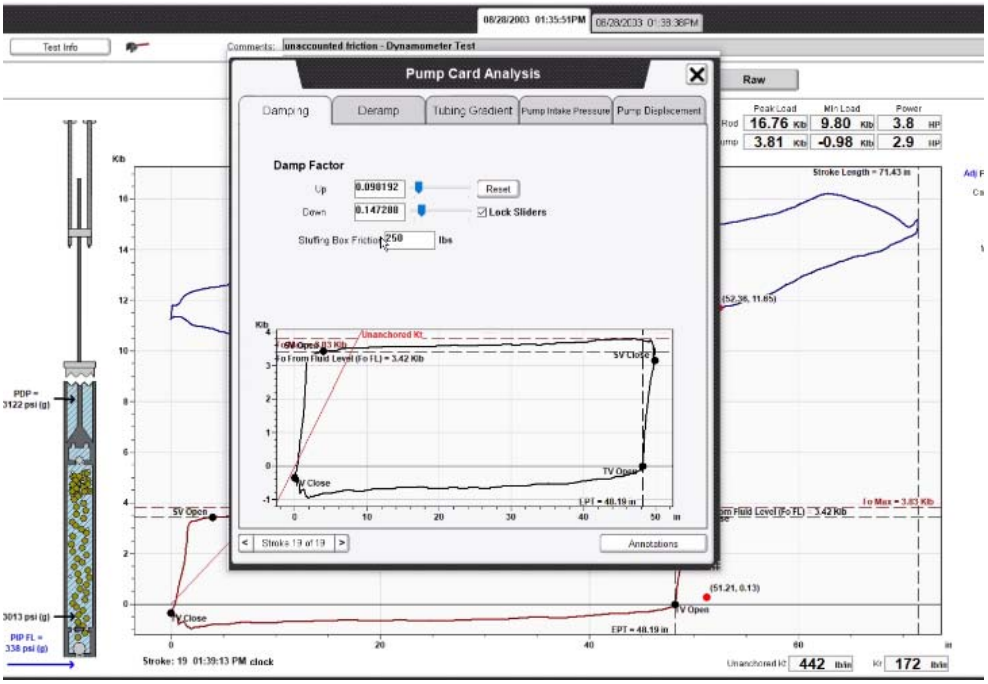
Question answered at time 1:36:14

TAM is requesting the total. It is the OD of the plunger subtracted from the ID of the barrel. So in the example presented in the question, the clearance entered would be .005 inches.

How do we know when we have over-manipulated inputs like stuffing box friction?

Question answered at time: 1:37:21

If the damping factors are raised too high, the card begins to concave inward. When the top of the card is fairly flat, that's about all you can change.



If the pressure on top of the plunger, and the intake pressure below the plunger aren't changing during the upstroke, then the load line is going to be flat if you have the right fluid dampening removed. If the pressure is changing throughout the stroke, the load line won't be flat.