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## Ask Echometer - Q & A Session 10 - July 22 2020

### Liquid Level Workshop

What is the Well pressure rating in a well you can work as maximum with an 1800 psi CO2 gas bottle? Is it the same with N2 gas bottle?

Question answered at time: 1:00:00

No it is not the same. The CO2 vapor pressure usually is going to be less than 800psi. So if you're trying to do an explosion shot and your well pressure is over 800psi then you would have to use nitrogen (N2) gas. But the working pressure of the gas gun remains the same.

Also if you have higher pressure wells, you may use a different type of gun than the remote fire gas gun (such as the Compact Gas Gun or 5000K psi Gas Gun) in order to use the well pressure to implode into the gun to fire the shot.

Are you able to adjust the sampling rate or Hz?

Question answered at time: 1:01:29

Specifically, for liquid level acquisition, the sampling rate is set at 1000Hz.

For plunger lift and for dynamometer analysis you can adjust the sampling speed and that helps when you have something that occurs at high speed. So if the plunger falls quickly, you need to sample faster, if there's a tag or sudden impact load, you need to sample faster. The normal default sampling speed for acoustic traces is 1000 hertz (1000 samples per second). And there's no option currently in the software to go faster. You can sample faster with the wireless equipment - up to almost 4000 samples per second but that is with a separate feature called General Data Acquisition. If you have any questions about GDA or higher speed sampling, you should contact Echometer and ask about it.

If we take three shots, none of them are consistently close, what should we do or consider to do a little better?

Question answered at time: 1:03:00

A question we see a lot is why the distance to the liquid is different on their shots. If you can see the liquid level on all three shots,

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you need to look at the round trip travel time (RTTT) and see if the round trip travel time is close to the same. Sometimes the difference in the distance to liquid is because the noisy acoustic signal collar count is not consistent from shot to shot. Normally what we see is that the echo from the liquid level is consistently the same and it's the depth determination that is off because of noise on the acoustic trace.

Find the shot with the best collar count and use that acoustic velocity for the other two shots and you will likely find that all of the shots are close to the same depth - unless you are changing conditions in the well (turning the well off/on or changing casing pressure).

On wells that have the TAC right above top perf & there's a lot of tail pipe below the TAC & the vertical well makes quite a bit of gas. I have a lot of trouble seeing below TAC. I can shut in the well for while, sometimes a few hours, & it allows me to see everything below, but is this good practice or is there a better way?

Question answered at time: 1:04:40

We wrote a technical paper on this issue called Tubing Anchors Can Reduce Production Rates and Pump Fillage. It is available on our website for download from the Technical Papers tab.

Tubing anchors can hold up a gaseous liquid column. Sometimes, if there's a large distance between the TAC and the intake of the tubing, gas can collect in that space between the pump intake and the bottom of the TAC, and then a gassy fluid level can form above the TAC. There are some tests you can do to help you figure out if that is the issue you are having. It's a little unusual, but not uncommon. Your wells might be holding a gassy fluid column above your anchor and gas fills from the tubing anchor down to the pump intake and it's difficult to control runtime when you pump the well.

If you're shooting a 10,000' well and you expect the liquid level to be near another marker (like an anchor), how would you determine which kick is the LL and which is the anchor? Same question if you're shooting down tbg. If you had a BSA in the tbg string and expect the liquid level to be near the BSA, how would you pick the LL vs the BSA?

Question answered at time: 1:06:00

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Normally the reflection kick off the tubing anchor is small. Usually the biggest change in cross-sectional area makes the biggest echo. And the kicks get smaller and smaller as you go deeper and deeper in the well because the energy is being reduced. The liquid level may not always be the biggest echo because there may be something higher up that makes a bigger kick.

Most of the time, the tubing anchor kick will be a small kick followed by a larger liquid level kick. If the Liquid Level is above the tubing anchor, then you will only see the LL kick.

Is there a possibility to get the liquid level in a gas producer well with a monobore completion from tubing?

Question answered at time: 1:08:17

We had a previous session dedicated to shooting fluid levels on Gas Wells (Session 7 July 1<sup>st</sup>). When you shoot a fluid level on a gas well, there's a consideration as to whether the gas is flowing above or below the critical rate. If you're above the critical rate, that means the gas has a high enough velocity that it can carry the liquid out of the well and the liquid level is at the surface.

So if you go to a gas well that is flowing at a high gas rate, you won't see anything because the tubing is full of mist or a gassy fluid. If the well is below the critical rate and you shoot the fluid level, you'll see a liquid level because that means that the gas isn't flowing fast enough to carry the liquid out.

There is a spreadsheet that we provided during that session where you can input the conditions in the well, and there are several papers that were provided that discuss critical rate. You should calculate, based on the surface pressure and gas flow rate and tubing size what the critical rate is and see if you're above or below the critical rate.

Below critical rate = Liquid Level

Above critical rate = Probably won't see a Liquid Level

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If I have a problem in the casing, is the acoustic trace going to reflect that problem?

Question answered at time: 1:09:50

Maybe. If you have a casing collar that leaks, then there's not really a hole and it's just leaking between the threads - so you probably wouldn't see that as an echo.

If you have a hole in the casing then yes you will see an upkick. When you shoot the tubing/casing annulus, you will need to determine if the hole is in the tubing or the casing. You can check this by shooting down both the tubing and the casing and seeing if the upkick shows up on both shots (tubing hole) or only the casing shot (casing hole).

Blockages in the casing look like liquid levels. If you have a block in the casing due to collapsed casing or solids or salt ring or some kind of problem, one thing you can do to determine if you are seeing the liquid level or seeing a blockage is to increase the casing pressure. Increasing the casing pressure should move the liquid level. If you increase the pressure and shoot the well and the depth to the reflection doesn't change, then you are not seeing the liquid level - you are seeing the blockage.

In a monobore completion gas producer well, and in the case to take the liquid level from tubing, is there a possibility to get problems with the perforations in the bottom of the hole? for example lose N2 by the perforations before get the liquid level.

Question answered at time: 1:40:55

Which better using N2 or Co2?

Question answered at time: 1:43:12

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If there a noise resulting from pump. I have to shut down the pump but after shutting the well the dynamic liquid level will be changed. Right?

Question answered at time: 1:45:05

It depends.

If you have a marginal well that's pumped off, that makes a small amount of liquid, then the liquid doesn't come in very fast. But if you have a well that produces 300-400 bbl/day and you shut the well down, then liquid is going to come in and up to the surface fast and compress the gas and make the pressure build up and change the conditions very quickly.

Is it possible to identify flow regime like annular flow in a gas well when identifying LL?

Question answered at time: 1:46:04

Not likely. When you have annular flow, that means you are typically above critical rate. So when the liquid level starts to form, the annular flow is reversed and it starts to go back down the well. During the session on Gas Wells is a video that shows the reversal of the film on the wall of the tubing that is a function of being above or below critical rate.

What is the ideal range of the percentage of tubing collars counted by the software? and why is not included in the software?

Question answered at time: 1:47:11

80-85% or more is recommended. But conditions may make it difficult to get a deep collar count.

After making adjustments in the software, is it possible to reset all of the values back to the original data received after the shot? For instance when sharing a file, someone edits the shot data, can it be reset back to the original?

Question answered at time: 1:48:32 Yes under Fine Tune.