(((ECHOMETER)))

Q & A Session 7 – July 1 2020

Use Acoustic Fluid Levels to Analyze and Troubleshoot Gas Wells

Related to Slide 54 where you have a hole in tubing – Why does the same tubing hole look much bigger on the tubing shot than on the casing shot?

Question answered at time 1:12:27

The scale of the trace on the tubing shots differs which makes some difference (100 mV vs 31.6mV). Also, the collars on the casing shot make a lot of noise and take up a lot of energy from the shot. So, the energy is much less on the casing shots by the time the pressure wave hits the hole.

At the beginning of the presentation on Slide 4 – Can you always see below a tight spot in the tubing?

Question answered at time 1:13:36

The example on this slide was kind of a neat tight spot. This was a collar slot that was supposed to be at a deeper depth in the tubing. It has little latches that latch into the collar recesses. And for some reason it unlatched from the bumper spring and it blew up the hole. It doesn’t have a standing valve in it – if it did you wouldn’t be able to see past it. But this is a bumper spring with collar stops held in a joint of the tubing that you can shoot past.

So, the answer is, if there is a partial obstruction, you can shoot past it. But if there’s an obstruction and tubing is completely sealed off, you can’t see anything past that obstruction. It’s just going to repeat.

Does a hole in tubing reflection kick affect the collar count marker?

If the hole is large enough to disrupt the collar count, then the software will likely stop counting collars at the depth of the hole.

Question answered at time 1:15:08

What is the possible percentage of liquid fallback in a gas condensate well?

Question answered at time 1:16:17

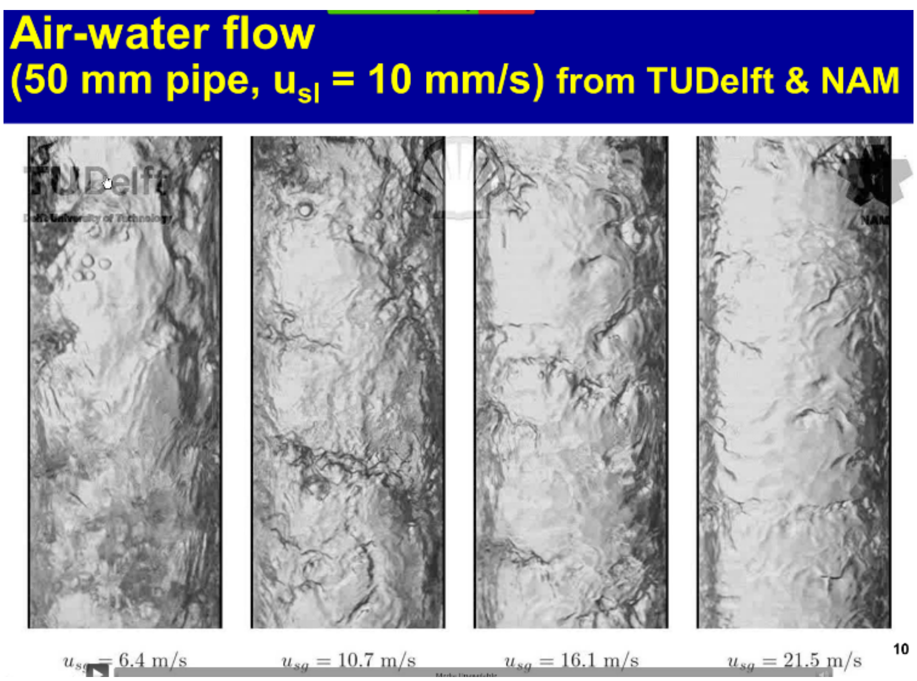
There's a rule of thumb. If you are liquid loaded and you try to vent the well, the rule of thumb is 7% of liquid falls back per 1000ft of depth. So, if you have a well that is 10,000ft deep, it's going to lose 70% of the liquid load if you try to blow it out by venting the well. And normally you won't have any liquid come up because even though it says 7%, most of the liquid won't come up.

So, on a well that is liquid loaded, if you try to vent the well to bring liquid out of the well and unload the well, then you will lose 7% of the liquid per 1000ft of depth.

<u>Question related to Slide 9 – What would be the impact of the liquid mist flow in the gas phase of the acoustic shot? Is there a certain liquid percentage volume above which attenuation is suspected?</u>

Question answered at time 1:17:21

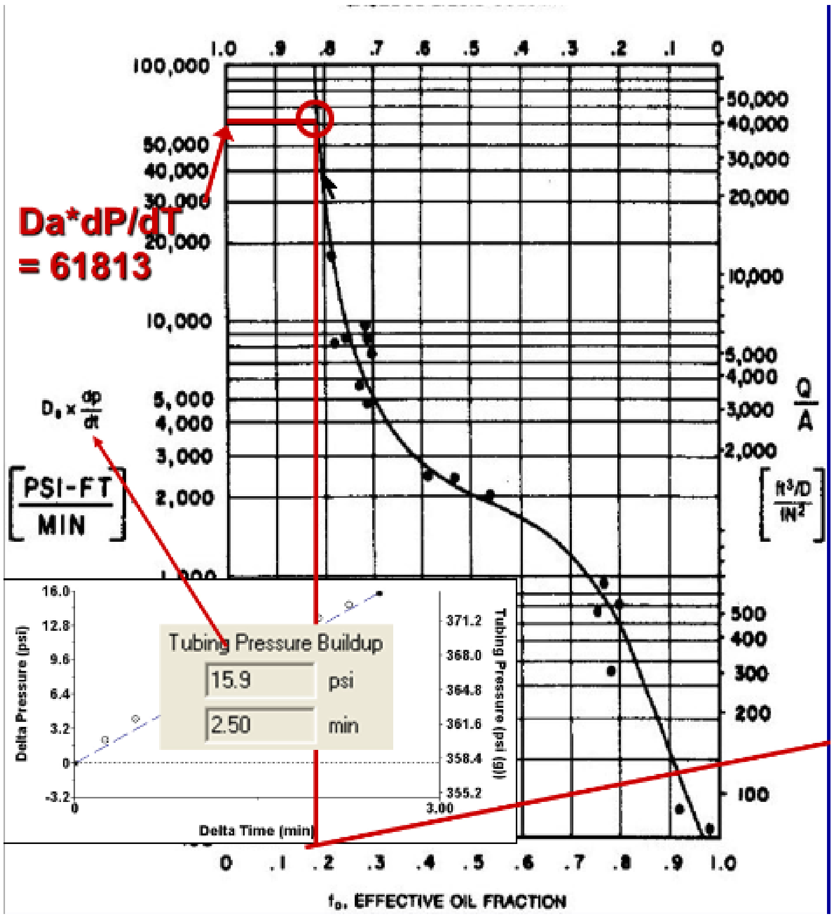
In the far right example (21.5 m/s) there is not enough mist to block the fluid level shot. In the far left example (6.4 m/s) there's going to be a liquid level because you're below critical rate. If there's enough mist to make an interface you typically won't see past the top of the mist. But if the liquid is primarily on the tubing wall, then you can shoot through it.



<u>Question related to slide 27 – If a well is flowing below critical rate, how accurate would a single shot be for calculating the PBHP?</u>

Question answered at time 1:18:54

Pretty good. The correlation we developed is good for wells where the gas velocity is below critical. So when you look at the curve:



It represents the percent liquid in a liquid loaded well. It's in effect the gradient of the liquid based on the gas velocity. Or the gradient of the liquid when the gas flow is at or below critical rate.

<u>When measuring a fluid level in producing gas wells, how soon after shutting in the well should you start shooting the fluid level and how frequent should the subsequent shots be?</u>

Question answered at time 1:20:09

You want to be quick after you've shut the well in to get the normal operating conditions on a well. If you wait too long, the conditions, the liquid level, and the pressure have all changed and are not representative of normal operating conditions.

For a gas well with a packer, could a deep liquid level in the casing be a sign of tubing/casing communication?

Question answered at 1:24:16

It depends. If the casing was filled with liquid which is common for gas wells with packers. When you shoot the casing and the fluid level is down deep, then either the packer is leaking, there's a hole in the casing, or maybe there is a hole in the tubing. Usually if it's a hole in the tubing or a hole in the casing, the casing usually will add water and the tubing usually will leak out water. So if you have a hole in the tubing with a packer, then usually your liquid level is going to be down near the hole in the tubing and the water will have leaked out. But if it's a casing leak, and it's coming in from the casing, usually (not always but usually) the casing will add water and maintain a high fluid level. So it's either a packer leak or a hole in the tubing – probably.