Well integrity briefing

Well integrity: There’s so much more we could know

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Introduction

As director and founder of asset-integrity company Wood Group Intetech, Dr Liane Smith has a unique, industry-wide perspective on well integrity issues. She’s normally jetting around the world advising clients but DecomWorld managed to catch up with her to ask: what’s left for the industry to do in getting to grips with well integrity? Here’s what she said...

Well integrity from the construction phase

Well integrity is high on everyone’s priority list. However, there is still insufficient focus on integrity at the design and drilling phases. We’re called on to help a surprising number of clients with wells that are only weeks into production, which means they’ve been handed over with problems. I’m sure the alerts are there during construction, but people are not stopping to address them because of cost and time pressures. But problems handed on will turn out to be equally as expensive and probably more expensive because once you move past construction your scope for addressing them gets narrower.

So we need to do the critical checks at all stages of pre-operational well life, and if the outcome of those checks is negative, people should not continue moving forward hoping that the problem will be resolved later. Even in subsea wells where you typically get better design and metallurgy choice and better attention to equipment selection detail, there are still integrity gaps leading to early-life annulus pressure build-up or equipment failures.

Incorporating a high degree of rigour in choosing equipment is key: for instance, choosing what has been used before in spite of more recent lessons learned on performance in varying circumstances. Human error plays a part as well. There is often insufficient time taken to interpret the results of pressure tests, inadequate attention to detail for joint make-up, poor cementing and poor evaluation of the cement bond. These issues very quickly show up as leaks.

Harnessing technology effectively

The industry has come a long way in terms of sensor technology. In quite a few wells we see there have been downhole sensors installed, but they’re not functioning, so valuable information is not coming through. For our software, we like to have a back up to cover gaps in accurate data from downhole. So we model downhole behaviour because it’s pointless to rely on data that does not exist.

Another issue is data capacity. Some of the logging equipment requires more memory capacity than is available now, so you get only a partial picture. But unfortunately people mistake a partial picture as complete overview. The multifinger calliper, for instance, is an industry workhorse and a great piece of equipment if properly interpreted. It’s only a partial statistical representation of what’s going on downhole which can be massively enhanced with back-up from our downhole real time corrosion modelling.

Being Proactive

Effective use of technology and data capturing are the first steps towards staying proactive and heading off potential problems in their earliest stages. Sometimes there is a misplaced understanding of cost because it does cost a bit more to use the data that we do collect in a smart way to tackle integrity issues early. Basically, it’s about how you make informed and
proactive decisions about a well’s operational life which will maintain the integrity and safely extend its life. That does save money, particularly in the North Sea, where robust integrity management can allow those old assets to perform safely well beyond original design life. In reality, relatively few companies currently look at the longer term, but when you’re at the “end of life” and want to continue operation you see the value of earlier good investments in the asset and its optimum management over the full life.

Reflecting lessons learned
There are ways to improve communication, record-keeping and reporting, that could eliminate an element of institutional amnesia in the industry, the result would be a positive impact on asset integrity. An example would be the decision, for instance, to upgrade to 13Cr tubing to better cope with harsh conditions. There follows a comprehensive installation programme. But then, at some point in the future, the policy is reversed because cost has reasserted itself as a priority, and 13Cr is dropped in favour of what was used previously. Thus the original problem is reinvented because the aggressive conditions haven’t changed.

A common reason for this is that the original team have moved on, taking project insights with them. This issue is compounded by high staff turnover brought about by a rising rate of retirement exacerbated by the current skills shortage.

Keeping track
Conditions in wells change over time. Higher water cuts, changing chemistry, lots more injection of fluids into reservoirs, resulting in higher CO2 levels and higher H2S levels: all these factors alter the performance of the original well design. People know fluids are changing but in far too many instances they do not go back to re-evaluate the new conditions, or their implications. As a result the necessary steps – whether changing the tubing or using chemicals to control the conditions – are not being taken.

The necessity for this is embodied in the concept of a “safe operating envelope”. The idea is that if conditions stray outside that envelope, a re-evaluation should take place. It’s included in the pending standard, ISO 16530, but it’s not yet automatic in the industry, and it should be.

Preparing to abandon
I’ve heard it said, and it sounds right to me, that the abandonment of wells should start at least five years before the actual work, on the grounds that you need to know so much about the well construction, history and data trends before abandonment to ensure a smooth and effective operation. Just having all the right data and history of assets comprehensively gathered is critical especially when you are making those decisions about the potential life extension, or need for abandonment and how to prepare the programme.

We see this problem most in dealing with shut-in wells. Wells are getting shut in, sometimes for years even if that was not the original intention. Conditions always change, so the fluids selected for suspending the wells originally may no longer be suitable. And yet, those wells might have been off the radar for operational monitoring for several years and nobody has any records about their conditions.
One manager confided to me that even contingency plans don’t help with such wells. “We almost have to go in with no plans and be ready for anything,” they said, “because we have no idea what’s going on down there.”

This is a huge headache for the industry. However, by investing in data collection and data evaluation, operators can gain much better visibility of well status and, crucially, identify and implement required actions in a timely manner.

Plenty of platforms in the North Sea have a couple of wellheads that are shut in. They are liabilities that are changing hands, and new owners have little or no useful information about them. The industry has tolerated the notion that, because they’re not producers, such wells are not a problem, but that’s not the case.

**Deferring costs**

The answer is simple: keep your eye on the well. Check the conditions of the annuli and, if pressure rises, investigate what’s going on with the fluid. We go to many suspended wells where fluid samples indicate bacterial action, for instance, which signifies a major, known risk of corrosion. So just putting in the right chemical treatment at the start, and monitoring to make sure it doesn’t need topping up or adjustment of the chemicals – these are all simple good practices the industry could employ but often doesn’t.

The wake-up call is coming, indeed has already sounded, as the difficult decisions cannot be deferred indefinitely. The industry urgently needs a more proactive approach to well integrity, especially in the context of ageing infrastructure and shrinking revenues. But we also stress to companies that you only have to take a few small steps to raise significantly the level of confidence you’ll have in your assets. It’s money better spent now.

- Dr Liane Smith will speak on “Unlocking Data for Enhanced Well Lifecycle Management” at the 2nd Annual North Sea Well Integrity & Abandonment Conference, 3-4 June 2014, Aberdeen. For more info visit [www.decomworld.com/wi](http://www.decomworld.com/wi)