IDENTIFYING AND MITIGATING COILED TUBING RISK IN THE GULF OF MEXICO

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INTRODUCTION

With an aging subsea well stock, shelf assets requiring frequent well work to maintain recovery and the necessity to access deepwater wells, offshore well intervention is becoming a vital element of increasing GoM production - with coiled tubing often being the most desirable method of intervention. However, key coiled tubing planning and process challenges need to be addressed in order to avoid equipment failures, overruns and increase coiled tubing project certainty.

Due to this Offshore Network spoke to Roderic K. Stanley, co-chair of the API Resource Group for Coiled Tubulars, to best understand how to navigate coiled tubing risk for GoM operations.

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1) The Gulf of Mexico industry is realizing the growing opportunity that adopting coiled tubing technology can bring to recovery efforts, but what do you see as the main risks coiled tubing presents?

Coiled tubing is actually a fairly delicate piece of equipment. The tubing itself is relatively thin-walled, and there is little room for operational damage. Since the tubing is constantly bent and straightened, often at high internal pressure, even the smallest of flaws, whether caused mechanically or by corrosion, can lead to premature failure.

Although this is commonly known, the industry appears to take the risk that is inherent in the assumption that tubing remains undamaged through its theoretically calculated life. While it is difficult to get data on the cost of failures, multi-million dollar losses were mentioned in a seminar last year, especially when the tubing is used offshore.

Apart from the obvious safety concerns, time for lost production, fishing and repair is very expensive – making coiled tubing reliability a critical commercial risk that needs to be mitigated in the Gulf.

2) Based on your experience, what can be done to mitigate the risk of coiled tubing failures in the Gulf of Mexico?

At present, very few users know the true state of their coiled tubing at all points in its life, but rather, rely on theoretical models for accumulated fatigue and corrosion.

As such, common operational damage to the tubing remains totally unknown unless the tubing is inspected. This can cause unwanted premature failure, which has been shown by many recent coiled tubing evaluations. Assessing the state of the tubing’s wall at regular intervals, and performing the necessary repairs when needed appears to be essential – but this has not caught on with regulators or the industry as well as one might have hoped.

This approach has been adopted for drill pipe for many years, and is well accepted, and even mandated in some areas, but a similar approach for coiled tubing has not taken off. I suggest this would greatly mitigate the risk of coiled tubing failure in the Gulf.
3) **What would the industry need to do in order to develop standardized approaches to coiled tubing inspection and manufacturing to aid tubing reliability?**

At present, we have coiled tubing manufacturers in the US and China, all using the same method of manufacture. A manufacturing standard has actually been written (API Spec SST). API Spec SST documents what the industry currently does to manufacture this product. It also defines the current grades and their tensile limits, testing and inspection methods, and documentation.

The API has also issued licences to 2 mills to manufacture standard grades to this standard and to Q1, so that is a start towards standardization. Other mills are now seeking API certifications and licences and the onus is on users to purchase these standard grades.

However, this has been and continues to be a slow process, which I believe could be accelerated with more high level attention from the well operators across the GoM.

4) **What role do you believe new coiled tubing technology has to play in the Gulf of Mexico and what risks does this new technology present?**

New higher grades using existing manufacturing technology (high frequency welding of plate into tubing), and at least one other existing OCTG tube-manufacturing technology are under investigation and may prove viable for the Gulf of Mexico and other offshore environments.

New technologies and methods always come with new risk. Perhaps some newer and different tests and inspections, other than the ones used today need to be developed and added to those that are documented in API SST to mitigate this risk.

Some discussion on these potential new tests is certainly required throughout the scientific community, in API meetings for example. Strings are now getting to 35,000-ft in length and are used in sourer and hotter conditions as wells get deeper, so we need to see what test methods are appropriate.
Further, operational risks must be carefully thought out knowing the condition of the tubing at all times, which implies the availability of good inspection tools. From their experiences with casing, tubing and drill pipe, operators are well placed to contribute to this discussion.

5) You are currently working towards a new Recommended Practice for coiled tubing, API RP 5C8. Can you advise the benefit you believe this would bring, your current status on the project and the core goals of the integration?

Draft 5C8 covers Care, Maintenance and Inspection of coiled tubing – all of which are aimed at lengthening the life of a string more towards its theoretical fatigue life limit, and knowing its condition as it ages.

With so many new smaller companies coming into the coiled tubing business, the practices recommended in the document, if followed, should lead to both less early failures on coiled tubing jobs and therefore better profit for the tubing user.

When published, it may also help in the training of coiled tubing operators to enable them to know and understand more about the product they are using.

All of this is obviously designed to encourage safe and efficient coiled tubing Operations – a topic which is critical in the Gulf of Mexico.
RODERIC K. STANLEY

Roderic K. Stanley holds a Ph D in physics from Florida State University (1978), along with lower degrees from Texas A & M (Commerce, TX) and the universities of Manchester and Nottingham in the UK.

He has been associated with the manufacturing, testing, and inspection of oilfield tubulars since 1978 with a variety of companies including Baker Hughes, NL McCullough, Lone Star Steel, Quality Tubing and ItRobotics, and executive director for the International Pipe Inspectors Association and Coiled Tube Resources Management.

For 12 years, he worked in various technical and quality roles for the two electric weld tubing mills, and continues to maintain a scientific role via his research into techniques for the inspection of coiled tubulars. He was also involved in the ISO 9001 programmes at both steel mills.

Under his guidance, the API Specification 5LCP (Coiled Line Pipe) was written and published in 1999. As co-chairman of the API Resource Group for Coiled Tubulars, he is presently also involved with the production of RP SC8 (Care, Maintenance and Inspection of Coiled tubing), the second edition of API Spec 5ST, and the third edition of API Spec 5LCP (Coiled Line Pipe).

He has given many papers at the Society of Petroleum Engineers (SPE) and American Society for Nondestructive Testing (ASNT) meetings, and is a technical editor for both societies. Currently he is listed on 4 patents in the inspection of oilfield tubulars, and two for the integrity and thickness of coating applied inside coiled line pipe.

He is a member of the SPE, ASTM, and British Institute for Nondestructive Testing. He is a fellow of the ASNT, and will present the Mehl Honour lecture in November 2007.

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