

**London Petrophysical Society Seminar
Well Integrity and Cased-hole Logging**



11th Dec 2013

			Name	Company	Talk Title
	09:00-09:25		Registration		
	09:25-09:30	5	Iain Whyte / Mike Millar	LPS	Welcome & Introduction
1	09:30- 10:05	35	Simon Sparke	Tullow Oil	A history of well integrity and an initiative for the future
2	10:05 -10:35	30	Peter Robinson	NRG Well Examination Ltd	Well Integrity - Regulation and the Future
	10:35 - 10:55	20	Break		
3	10:55 - 11:30	35	Bill Hunter	Halliburton	Cement Job Design & Effective Drilling Fluid Displacement
4	11:30 - 12:05	35	Robert Lee	Shell	Well Abandonments in the Brent Field: Understanding Annular Isolation
	12:05 - 13:05	60	Lunch		
5	13:05 - 13:40	35	Virginie Schoepf	BP	casing and tubing integrity
6	13:40 - 14:15	35	Dimas Azuaje	Weatherford	Well Integrity and diagnostic services
7	14:15 - 14:50	35	Ram Sunder Kalyanaraman	Schlumberger	Tortuosity affects cement placement – Imaging the geometry of the annulus
	14:50 - 15:10	20	Break		
8	15:10 - 15:45	35	Ian Leslie	Baker Hughes	Flux leakage based corrosion measurements
9	15:45 - 16:20	35	Neil Simpson/Tobben Tymons	Archer	Well integrity issues in a Dual string, multi-zone producer
10	16:20 - 16:55	35	Ross Brackenridge	Senenergy	Cement Evaluation Workflow
	16:55 - 17:30		Discussion and Closing Remarks		
	17:30 onwards		President's Evening - Christmas Dinner at The King's Head		

Simon Sparke
Tullow Oil

A history of well integrity and an initiative for the future

Abstract

Without any doubt, there have been tremendous advancements in technology within the oil industry. Many advancements are driven by painful and costly experience which in turn cause change in legislation. In this presentation we will look at the past, the present and one perspective of the future in well integrity standards, record keeping and various handovers in stages of in the well life cycle. We will share an insight into how Tullow Oil manage well integrity and some of the tools that have been created to document and manage the process.

Peter Robinson
NRG Well Examination Ltd.

Well Integrity - Regulation and the Future

Abstract

The well integrity regulatory regime is well established in the United Kingdom. The Offshore Installations and Wells Regulations were introduced in 1996 as part of the goal setting suite of regulations put into place following the aftermath of the Piper Alpha tragedy in 1988. The regulations set the goal to be achieved by industry in respect of well releases and the methods or standards for achieving the goal are left to industry to develop, therefore allowing technology to be evolved to achieve the goal rather than detailed prescriptive regulations being written by government who are not necessarily expert on the applicable standards.

Following the Macondo and Montara blowouts there have been a number of implications that have had a world-wide repercussions. In the UK the industry has worked to generate or update a suite of guidance documents that relate to well integrity. In Europe the EU Parliament has issued a Directive on safety of offshore oil and gas operations. In other parts of the world regulations are being updated largely to mirror the European, rather than the American "rule- based", model

The presentation discusses these developments and will outline the potential repercussions.

Bill Hunter
Halliburton

Cement Job Design & Effective Drilling Fluid Displacement

Abstract

This presentation will provide an overview of key elements of the primary cementing process and look at areas of planning that need to be considered if adequate well integrity is to be achieved. In particular, key factors necessary to achieve effective displacement of the drilling fluid in the annular space between the casing and open hole will be discussed. Two aspects associated with the assessment of the quality of the resultant cement sheath will also be touched upon.

Robert Lee
Shell

Well Abandonments in the Brent Field: Understanding Annular Isolation

Abstract

Well abandonments may be regarded as repetitive operations of cutting and pulling tubulars and setting cement plugs. However, the Brent campaign has developed an increased understanding of isolation assessment and barrier integrity, providing a number of opportunities for improving performance. From the wells abandoned so far, not only are many lessons being carried forward for those remaining, but also there are lessons to be taken into account regarding the design and execution of new wells, making future abandonment a simpler process.

Virginie Schoepf / Garry Williams
BP / Epidote Ltd

Multifinger Caliper: Applications

Abstract

Multifinger caliper tools range from 24 fingers for use in small pipe ID up to 60 fingers for larger pipes. Survey objectives are diverse: getting accurate inner size dimensions of the pipe prior to setting a completion element (e.g. plug); well integrity motives (monitoring casing wear during drilling operations, assessing metal loss and corrosion; measuring pipe deformation linked with production cycle, reservoir depletion, active tectonics...); investigation of productivity issues (presence of scale).

It is usual for operators to outsource the processing and interpretation of multifinger caliper surveys - quality assurance is often done based on a printed interpretation report and log prints. The awareness level of this type of log can be enhanced in the petrophysical community by increasing knowledge of the tools' physics and measurements' outputs. Caliper analysis is not an automatic process, but is based on a human interpreter's decisions -for this reason deeper involvement of production petrophysicists and development of expertise in multifinger caliper will return several benefits: better auditing, improved quality of acquired and processed data, better integration of caliper results with the engineering team, more consistent results with time lapse studies, and better decision making when caliper data highlights a problem.

After briefly presenting the principle and physics of multifinger caliper tools , we will review the main processing steps. Through examples such as deformed pipe and time lapse studies, we will discuss best practice in the use and storage of raw and processed data.

Authors: Maryam Haider and Virginie Schoepf, bp, Steve Helmore and Garry Williams, Epidote Limited

Well Integrity and diagnostic services

Abstract

As the operators focus on unconventional markets and aging reservoirs has increased so has the focus on Well integrity. Every phase on the well life cycle has its own challenges to maintain well integrity and as such when the well is on its production/intervention phase there are downhole threats that need to be monitored and assessed to prevent loss of future wells and asset integrity. The same is true before the plug & abandonment phase.

These downhole threats could be classified into two categories:

1. Failure of the cement barrier between to support and protect the casing as well as to provide hydraulic isolation between zones or to prevent migration of formation fluids to surface.
2. Failure of the casing, completion elements or production tubing to provide an unobstructed conduit from surface to TD i.e. no leaks

As such the challenge from the wireline perspective is to assess those threats with advanced technologies that can provide the most complete and accurate picture to assist the Oil Operator in taking an informed decision on how to manage his well integrity issue, if any. The most widely used technologies nowadays are:

- Ultrasonic measurements for both Cement evaluation and casing evaluation.
- Magnetic flux leakage for casing evaluation
- Mechanical calipers for casing evaluation and
- Cement bond logs for cement evaluation.

There are additional techniques used for well integrity monitoring such as eddy current (for casing evaluation) and fluid movement evaluation that can not be covered here due to time constrains.

Ricardo Formoso
Schlumberger

**Improved understanding of cement placement using advanced ultrasonic measurements
– A case study from Deepwater Africa**

Abstract

Drilling in progressively deeper water environments requires that even more attention be given to well integrity because of the serious implications to health, safety and environment. Conventional cement evaluation tools have been available for many years and have been useful in most scenarios, but in more complex and challenging deepwater operations, the need exists for advanced cement evaluation techniques to increase confidence in ascertaining wellbore integrity. There are limitations on cement evaluation for light cements and thick casings. Furthermore, there is usually limited information about the “Third Interface” (i.e. between the cement/formation or cement/next casing), which can provide valuable information about wellbore integrity.

An integrated approach to cement evaluation has been adopted. This approach is based on a cement evaluation service that incorporates 360° circumferential information about cement placement, annulus imaging, and petrophysical evaluation of the formation to ascertain zonal isolation and cement quality behind casing. The azimuthal information is used to understand whether the cement placement was affected by the well deviation and if there are changes in cement quality from one part of the borehole to another. Annulus imaging is used to evaluate the annulus material. Petrophysical data is used to determine if the formation rock and fluid properties contributed to the quality of the cement behind casing. The principles of ultrasonic measurements and unique flexural measurements, and how they aid in cement evaluation, are also considered.

Ian Leslie
Baker Hughes

Flux leakage based corrosion measurements

Abstract

Presentation will summarise many of the most common causes of corrosion. Examples of the different corrosion types will be shown with different characteristics typically found.

Secondly the physics of Flux leakage type Wireline measurements will be explained. Examples of current tools types will be made and a typical processing method explained showing advantages and disadvantages to this type of measurement.

**Chris Nussbaum
Archer**

SPE 163938: Strategic Rigless Approach in Identifying and Curing Complex and Multiple Completion Leaks in Malaysia

Authors: Shahril Ahmad, Mohamad Nazri, Mohd Zulkifli, Petronas; C. Nussbaum, S. Batumelai, Archer

Abstract

Well integrity diagnostics have become key pre-requisite criteria while dealing with uncertainties in the well completions of mature assets. This is the case in Malaysia where most of the wells on the production platforms have aged more than 30 years and yet are still producing. Locating the cause of integrity issues relies on being able to identify leaks and/or flow behind pipe. Typically, conventional technologies have been used for anomaly detection, but in general these may lack clarity.

The paper examines the need for high quality information to support the implementation of integrity remediation interventions. Through case study, it presents application of a new diagnostic approach utilizing high definition technology sensitive to the ultrasound energy created by fluid flow through completion leaks or small restrictions and channels in annuli.

Fields D and BN are two of several mature fields operated by PETRONAS Carigali Sdn. Bhd. where ultrasound technology has been implemented aggressively in order to mitigate complex and multiple completion problems involving tubing and annulus leaks. This paper presents the role of accurate data diagnostics when planning a rigless remediation. It shares experiences and best practices developed while implementing the technique in these fields.

This paper was presented at the SPE/ICoTA Coiled Tubing & Well Intervention Conference held in The Woodlands, Texas, USA, 26–27 March 2013

**Ross Brackenridge
Senergy**

Cement Evaluation Workflow

Abstract

Assessing the quality of down-hole cement is an essential step to ensuring wells are developed, produced and abandoned in a safe and efficient manner. Without Hydraulic Isolation in place the well could produce undesired reservoir fluids or much worse lead to a pressure build up in the annulus which could have catastrophic consequences. The presence of cement alone does not ensure Hydraulic Isolation, the cement must be inspected using Cement Bond Logging tools. Too often the results of Cement Bond Logging jobs are confusing to the well operator due to differences in service company tool types and inconclusive field data sets. This software module is designed to address this issue by providing the tools required to do an independent assessment of data from all the major tool types and extract clear conclusions on the quality of the cement in place.