INTELLIGENT WELLS – NO LONGER A FRONTIER TECHNOLOGY

Today, easily recoverable reserves are becoming harder to find and deeper formations need to be explored to meet future demand. In an increasingly uncertain environment, intelligent well technologies offer a more flexible approach to the management of hydrocarbon assets. Through real-time monitoring of downhole behaviour and interventionless control of individual zones, production can be optimized and NPV increased. **But what about the problems?**

How can you justify such a **large initial expenditure** on a concept whose **value is so difficult to define** and on a technology which is **without an established track record** for the entire life of the well?

All of these questions and more will be discussed at Oil & Gas IQ's Intelligent Wells international forum

Among the highlights:

Hear why **KERR-McGEE** is deploying intelligent well technology in the Gulf of Mexico to optimize production. David Harris will explain how his team planned and implemented this technology, and he will show you exactly how they justified the business case for applying it.

Learn from **ANADARKO** how it managed to fast-track its first intelligent completion in under a month. Kevin Renfro will illustrate how his team weighed the risk and reward of complexity with the reliability of simplicity in selecting an appropriate level of intelligence.

Address the value-risk-cost dilemma with examples from **SHELL's** impressive portfolio of intelligent wells in the Middle East, Central Africa, and the Gulf of Mexico.

Understand how **PRONETA** aims to achieve spacecraft-levels of reliability in oil and gas projects by adopting analysis techniques used in the aerospace and defense world.

Then, in a unique and exciting morning packed with quality case studies, you will be invited to take a journey from simple low cost, low complexity intelligent wells – through mid-range models and more advanced completions – to the world's most complex intelligent well. Along the way you will hear from **AMERADA HESS, CHEVRONTEXACO**, **SHELL**, and **SCHLUMBERGER**.

Whatever stage you are at in your intelligent well planning, this is an unmissable opportunity to learn from the valuable experience of others

So why attend this conference?

- No other event is so specifically targeted and value focused, or boasts such a wide range of unique and innovative case studies
- A great opportunity to network with industry leaders enabling you to benefit from valuable practical experience and shared best practice
- Learn the lessons of early implementers and avoid potentially costly mistakes

The market for intelligent completions has been estimated at $1bn in 5 years

Shell have realized millions of dollars in value from using intelligent wells

With a single intervention costing from $100,000 to several million dollars …

CAN YOU AFFORD TO WAIT?

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The affordability of hydrocarbon resources around the world today has been driven by 50 years of advances made in the oil and gas industry. In particular petroleum engineering services and facilities have experienced major developments. Since the company's formation, Schlumberger have excelled in innovative engineering practices, the practical application of these ideas and their continued proof in the field. At the very core of Schlumberger heritage is the team's detailed understanding of subsurface conditions, learned through decades of continually demanding logging requirements in remote and hostile locations. This insight, coupled with best in class engineering practice and a true global network, has enabled us to provide you with the next generation of reservoir exploitation tools. Permanently installed subsurface measurement devices now mean that you can gain real-time information on reservoir behaviour, allowing the prospect of improved productivity and increase recoverable reserves. Schlumberger is delighted to sponsor this event and so allow you to share your opinions and concerns amongst industry experts in this exciting new era of intelligent wells.

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Do you offer services or technology related to intelligent wells? The delegates at this conference are actively looking to optimize the productivity of their assets with new intelligent technology. If you think your company can benefit them, you need to have a presence at this event. There is no easier way to tap into the minds of the decision-makers you want to reach and raise your profile in their eyes. We have a variety of packages available to suit you. For Sponsorship and Exhibition opportunities call +44 (0)20 7368 9500 or email sponsorship@iqpc-oil.com

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Intelligent Wells

2 Day Conference: December 12 - 13 2002; Pre-Conference Masterclass: December 11 2002

The Doubletree Houston at Post Oak

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INTELLIGENT WELLS

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Book two and get a third place free if you register before 25th October 2002

A multidisciplinary forum offering practical strategies to extract maximum value from intelligent completion technology

2 Day Conference: December 12 - 13 2002; Pre-Conference Masterclass: December 11 2002
The Doubletree Houston at Post Oak

Join the exclusive delegate list for Oil & Gas IQ's 2nd international intelligent wells forum

Learn from the practical experience of large and small operators around the world who have already adopted intelligent well technology. Hear how they have successfully **implemented and integrated** the technology, overcome **cost objections**, determined **precise value** and managed **reliability fears**. Find out how you can:

- **Justify initial investments** and conduct accurate cost-benefit analyses
- Identify and **maximize the value** of intelligent completion technology
- Evaluate the aerospace model to **minimize mission-critical reliability issues**
- Increase value by **improving reservoir management** capabilities
- **Implement intelligent completions** across the complete spectrum of assets from land to deepwater
- Embrace the benefits of **fiber optics** and other **new technologies**

Join us to explore all the key issues including:

- Determining value
- Cost/benefit analysis
- Reliability
- Retrofitting
- Intelligent oil fields
- Fiber optics
- Justifying the business case
- High vs. low cost completions
- Determining appropriate intelligence levels
- Well candidate selection
- Real-time data management
- Multidisciplinary skills management

Complemented by a full-day pre-conference masterclass, focusing in small groups upon the weighty issues of **defining value, justifying expenditure**, and **overcoming reliability** issues with acknowledged intelligent well experts

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"Much ground covered, case histories honestly discussed."
Expro Group Integrated Services Ltd

"Well organised, well attended. Top speakers! Full marks to IQPC" **EnCana Corporation**

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PRE-CONFERENCE MASTERCLASS: 11TH DECEMBER 2002

The science of the successful intelligent well: How to extract maximum value with minimal cost and fewest problems

Attend this one-day masterclass and put theory into practice. Facilitated by Schlumberger, and Kerr-McGee, you will have the unique opportunity to work with like-minded peers and discuss the three biggest barriers to intelligent well implementation: **defining value, justifying the business case** and **ensuring reliability**.

Through a mixture of interactive presentations, group work, and discussion, you will spend quality time working in small groups and take back practical results and advice that can be applied to meet the challenges facing your own organization.

This is a unique opportunity to directly address the challenges facing YOU! Bring your questions, thoughts, opinions and experiences to the masterclass and be prepared to share and compare!

08.30 Coffee and Registration

09.00 **Introduction: Establishing the importance of value**

The oil and gas industry is, by its very nature, associated with the taking of risk. However, operators today seem to work in a decidedly risk averse culture, which is slowing the widespread uptake of intelligent completion technology.

Therefore, before any useful discussion of intelligent wells can begin, it is vital to assess the value proposition they represent. In undertaking this assessment you will discuss the question of whether it is even possible to precisely determine value in this way. This session will focus on the practical strategies you can take to identify value potential at every step of the decision-making process. Topics for interactive discussion include:

- Precisely where can value be identified and extracted?
- What are the barriers to wide-scale adoption?
- Who are the users of the e-well data and where will the data be processed?
- Can value be added by retro-fitting intelligent wells to existing field developments?
- Who gets the value added and who takes the risk – service companies or operators?

10.00 Coffee and networking break

10.30 **Assessing the business case: Successful techniques to justify initial well expenditure**

Intelligent wells require a long-term investment strategy of up to 5 years, but this often conflicts with the much shorter-term financial and production goals being set by operators. So having considered and identified the precise value potential, how can we use this to try and build long-term investment into oil and gas economic planning models? Working in small groups, you will deal with the following questions:

- Who makes the initial decision to pursue this technology?
- Do the accountants understand the potential that intelligent wells could bring to the bottom line?
- Can we afford not to install intelligent wells?
- Cultural differences between operators and partners – how does this impact the overall risk profile of the project?
- How do we align the business models of service and oil companies to ensure that there is mutual benefit from the adoption of intelligent wells?
- Where does the future lie – can we describe an intelligent field for the future and outline the technical, cultural, and economic barriers that need to be overcome to realize the vision?

12.30 Networking lunch

13.30 **Innovative strategies to counter reliability fears**

Although reliability is essential to unlock the potential of the intelligent well, there are challenges in terms of the long lifetimes involved, high risks and high costs associated with failure, along with the difficulty to diagnose problems, retrieve failed parts, and learn lessons from equipment within the reservoir. This session will explore several innovative strategies to address these reliability issues to help overcome the barriers many perceive as a key impediment to the acceptance and growth of this important technology. Some of these strategies are borrowed from quite different areas of technology such as aerospace, medical, pharmaceutical research and the risk assurance industry.

Examples will be given to illustrate the key tools and techniques that were developed in these alternative industries and you will discover how they can be applied to focus on and improve the reliability of your intelligent well applications.

15.00 Coffee and networking break

15.30 **Wrap up and deliverables**

Having discussed these three critical issues, this session will bring the lessons learnt from each session together to take an important holistic view of intelligent wells. Building upon the practical strategies gained earlier in the day, you will have the chance to ask all of your remaining questions and tailor a unique strategy to your own organization's needs.

16.30 Close of the masterclass

About your workshop leaders:

Tony Veneruso, *Reliability and Testing Scientific Advisor*, **SCHLUMBERGER**
Tony has lectured on reliability engineering and high temperature electronics at the University of Maryland and managed product development assignments for various technologies for Schlumberger. Prior to this, Tony managed the US geothermal logging instrumentation development program at Sandia National Laboratories, and served as a member of the technical staff for the US Department of Energy's nuclear weapons program.

Ian Bryant, *Director of Research for Reservoir Monitoring and Control,* **SCHLUMBERGER**
Ian joined Schlumberger-Doll Research in 1993, where he has managed the development and field testing of permanent reservoir monitoring and control devices since 1998. Before this, he worked for Shell International's Research Laboratory in the Netherlands where he helped develop a 3-D modeling system for locating bypassed oil, and later served as senior production geologist with Shell in New Zealand.

With expert advice and guidance from:
David Harris, *Worldwide Deepwater Completions Engineering Manager,* **KERR-McGEE**

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Day One: Thursday 12 December 2002

08.30 Registration and coffee

09.00 Chairman's greetings and opening remarks
Oliver Laurence, *Well Completions and Producivity - Marketing,* **SCHLUMBERGER**

09.15 **Intelligent wells: The state of the art**
The term 'intelligent wells' means different things to different people. Is a well 'intelligent' if it has next generation monitoring capabilities, or is downhole flow control a prerequisite? This session will introduce and answer the following questions, providing a valuable starting point for further analysis:
- What different types of intelligent completions technologies are available and what can each deliver?
- Understanding – in a risk averse culture – the differing value to be gained from production optimization and reservoir management approaches
- How can intelligent wells help achieve downhole production reconfiguration and commingled production, thus reducing costs and accelerating production?
- How tangible are the risks/benefits? What can be proved and how realistic is the latest reliability data?

David Walker, *Product Line Manager,* **BJ SERVICES**

10.00 **Justifying the business case through a cost benefit analysis**
CASE STUDY
The Kerr McGee intelligent wells which lie in the Boomvang and Nansen fields were completed over a year ago. Utilizing relatively simple on-off hydraulic shifting sliding sleeves, their implementation and operation has been a genuine success story. Prior to their completion, David Harris and his team spent a great deal of time carefully considering the business case for their implementation. David will disscuss in detail:
- Justifying the business case for intelligent well completions for projects in deepwater Gulf of Mexico
- Making a realistic estimate of suitability and the economic indicators of performance
- Defining the business drivers that justify the risk and expense
- Actual savings when compared with the cost of single or multiple well interventions
- Defining project economic enhancements

David Harris, *Worldwide Deepwater Completion Engineering Manager,* **KERR-McGEE**

10.45 Morning coffee and networking break

11.15 **Defining value: An insight into the value proposition of intelligent wells**
CASE STUDY
The value and cost of intelligent wells are appreciated differently in onshore environments in the Middle East and Central Africa compared to, for example, subsea developments in the Gulf of Mexico. As Shell is operating in a wide variety of environments, an interesting debate is taking place about the value, cost and applicability of intelligent wells in many differing scenarios. This presentation will outline this debate, discussing amongst other issues:
- Addressing the value-risk-cost dilemma: Which factor should be prioritized?
- Determining base intelligent well functionality requirements
- Assessing cost ceilings and identification of regrets
- Considering the pace of uptake of intelligent well technology

Rolf van Kleef, *Smart Well Technology Advisor,* **SHELL INTERNATIONAL E&P**

12.00 **Determining an appropriate level of well intelligence and fast-tracking an intelligent completion**
CASE STUDY
The Anadarko experience throws a spotlight on three critical intelligent well factors – assessing the options available, selecting an appropriate level of well intelligence, and then determining the speed at which the well should be completed. Kevin Renfro will discuss two Gulf of Mexico intelligent well completions and examine the following issues:
- Intelligent well value justification: Eliminating a future rig mobilization for a recompletion vs. managing a reservoir
- Evaluating the risk/reward advantages of complexity vs. the reliability of simplicity
- Anadarko's step-by-step progression from shallow to deep to ultimately ultra-deepwater projects
- Fast-tracking an intelligent well: Opportunities and pitfalls when attempting to accelerate first production

Kevin Renfro, *Senior Staff Engineer,* **ANADARKO**

12.45 Networking lunch

14.00 **Interactive round table one: Intelligent wells or intelligent fields – where should the focus be?**
ROUND TABLE PROBLEM-SOLVING
The Oil and Gas industry is changing and processes need to be streamlined in order to effectively capitalize on new technology and maximize asset value. Linking field-wide sub-surface events to surface facilities is critical to success. This session presents you to with an opportunity to work with your colleagues and identify the key issues and problems related to tying surface management with sub-surface management.
Facilitated by the Chair

14.45 **Maximizing value through real-time data optimization**
The greatest value is generated from intelligent wells if the full spectrum of downhole data is utilized in real time. It is also important to obtain information away from the wellbore to understand fluid movement within the reservoir. This data can be obtained through a fully instrumented oil field, sometimes called the "e-field". However, there are significant challenges inherent in creating control systems to manage the performance of the asset in this way:
- The challenge of extracting value from continuous streams of such data: What data is important for reservoir management decisions?
- The different workflows required to manage asset control systems in real-time
- Integrating real-time downhole and other subsurface data into workflow processes for better decision making and optimal reservoir management
- What new technology e.g. (fiber optics, etc) is needed for the fully instrumented "e-field"?

Gene Sparkman, *Director,* **ENERGY RESEARCH CLEARING HOUSE**

15.30 Afternoon coffee and networking break

16.00 **The holistic implications of a move towards intelligent oil fields: How to build additional value functions and how to optimize them**
Estimating the value of smartness means modelling and calculating the response of the hydrocarbon production to process control actions (e.g. valves) based on available information from downhole and surface measurements. When applied to an entire field this becomes even more complex if smart and conventional wells are functioning side-by side. This presentation will discuss:
- The importance of taking a holistic approach to intelligent well technology
- Cost elements like process monitoring, sand management, injections and artificial lift
- The benefits and challenges related to process control automation on this scale
- What role do traditional simulation tools have and what new tools are needed?
- The impact of intelligent wells on whole field management: How will intelligent and conventional wells interact?

Fridtjof Nyhavn, *Senior Research Scientist,* **SINTEF PETROLEUM RESEARCH**

16.45 **Intelligent completions, subsea wells, and IWIS: Spreading best practice, achieving compatibility and reducing costs**
Lack of appropriate standards for completion equipment has led to a proliferation of specific, proprietary, individually engineered solutions. Each of these designs had to be individually developed, qualified and tested, which led to high costs, long lead times, technical risk and functionality problems, particularly in subsea wells. The cross-industry Intelligent Well Interface Standardization (IWIS) panel - comprising operators, subsea vendors and downhole equipment suppliers - was set up to reduce technical risk, learning curves, costs and lead times and to improve reliability in intelligent wells. But how can you benefit from their work? Learn how:
- A standard for subsea electronics interfaces has been developed to ease these specific problems
- The sharing of participants' best practice has helped accelerate the adoption of intelligent well technology
- The panel is working towards similar benefits across range of areas such as wellhead penetrations, fiber optics and data integration

David Blacklaw, *Steering Committee Representative,* **IWIS INDUSTRY PANEL**

17.30 End of day one

Day Two: Friday 13 December 2002

08.30 Registration and coffee

09.00 Chairman's greetings and opening remarks
Oliver Laurence, *Reservoir Monitoring and Control – Marketing,* **SCHLUMBERGER**

09.15 **Case study: The 'low cost' intelligent completion**

CASE STUDY

Though maximum value is the universal goal, the cost of an intelligent completion is a consideration that is difficult to ignore. Indeed, bottom-line considerations often play a major role in deciding whether or not to embrace intelligent wells. A low cost intelligent completion, however, may not mean failing to fully optimize full reservoir value, as Amerada Hess have proven in their Garden Banks/Northwestern development. Utilizing 'smart' hydraulically operated sliding sleeves, you will learn how Amerada Hess justified, selected, installed, and operated their low-cost smart completion and how they are currently enjoying the flexibility to manage the reservoir using the existing field architecture – in the process maximizing production whilst eliminating costly rig-based interventions.
Douglas Bolingbroke, *Gulf of Mexico Offshore Completions Engineer,* **AMERADA HESS**

10.00 **Case study: The 'medium cost' intelligent completion in a subsea sand control environment**

CASE STUDY

ChevronTexaco has successfully installed two direct hydraulic intelligent well completions (with infinitely variable valves) in the Typhoon Field - deepwater Gulf of Mexico. Due to its implementation in a sand control environment featuring zones with pressure differential, the completion involved more risk than usual. In addition to detailing the completion and operation process, Robert Pourciau will also share the lessons you can learn from the multi-scenario development plan that was designed to ensure improved NPV. The presentation will include:

- Cost/benefit/risk analyses in development plans
- Intelligent well drivers: Stacked reservoirs, marginal targets, economics
- Design, installation and operation of equipment
- Lessons learned

Robert Pourciau, *Deepwater Completion Engineering Advisor,* **CHEVRONTEXACO**

10.45 Morning coffee and networking break

11.15 **Multiple case study: 'Advanced' Gulf of Mexico intelligent completions**

CASE STUDY

Shell has long been foremost among industry leaders in the application of intelligent well technology. Their experience and willingness to prioritize value maximization has led them to pursue more complex and advanced intelligent completions – including the use of fiber optic technology. Darrell Hebert, who heads the team in the Gulf of Mexico charged with overseeing intelligent well operations will cover the Shell experience including:

- Deepwater subsea intelligent well completion design
- Subsea system design impact
- Functional requirements related to cost and reliability estimates
- Quality assurance program

Darrell Hebert, *Staff Completions Engineer*, **SHELL INTERNATIONAL E&P**

12.00 **Case study: The greatest show under the earth – the world's ultimate intelligent well**

CASE STUDY

The prospect of intelligent wells and intelligent fields has been talked about for a considerable period of time. While the number of intelligent wells is gaining momentum, the overriding factor, which appears to be stifling the mainstream adoption, is the perceived reliability of relatively complex systems over the anticipated lifetime of the project. To demonstrate that advanced monitoring and control systems could be integrated into a single completion, Schlumberger undertook to design, engineer and install the world's ultimate intelligent well. Find out how;

- A horizontal well was placed within a 10 foot oil rim with real-time geosteering from remote locations
- A gravel pack completion was landed incorporating fiber optic DTS systems, permenant pressure and temperature guauges by zone, integrated zonal isolation, 3 all electric variable downhole flow control devices and deeplook permanently installed resistivity arrays
- Having precisely placed the measurement and control devices these devices were then used to pro-actively manage production through the instant coupling of monitoring and control

Ian Bryant, *Director of Research for Reservoir Monitoring and Control*, **SCHLUMBERGER**

12.45 Networking lunch

14.00 **Interactive round table two: The importance of multidisciplinary skills management – moving from processes to people**

ROUND TABLE PROBLEM-SOLVING

Following on from yesterday's interactive session, which examined integrated processes you will now examine the human side. Working in small groups and using yesterday's conclusions as a springboard you will brainstorm potential solutions to the problems and challenges outlined below:

- What skills are needed to effectively extract value from the information generated by intelligent completions?
- How can multidisciplinary teams establish core competencies?
- Establishing a model for technological communication and culture change within the organization
- Ensuring effective collaboration in the face of new skills demands and decision making processes

Facilitated by the Chair

15.00 Afternoon coffee and networking

15.30 **Multidisciplinary reliability: How can we achieve spacecraft-levels of reliability for the entire life-cycle of oil & gas projects?**

This case study uses an innovative analysis technique originating in the aerospace and defense worlds, applying it to an intelligent well system spanning downhole, subsea and topsides. It combines engineering analysis with economic modelling to maximize system reliability and thereby optimize asset value. Discover how to:

- Quantify the value of functionality and the potential cost of failure
- Assess the reliability of a complex system design
- Highlight areas of a system design that need priority attention to improve system reliability
- Ensure gauges, controls and valves work when required and do not cause 'mission-critical' failure
- Confirm whether proposed improvements to the system, intended to enhance reliability, really would deliver the desired benefit

John Hother, *Principal Consultant* **PRONETA**

16.15 **The future of intelligent well technology: Fiber optics as a means for continuous monitoring and faster communications offshore**

Continuous reservoir surveillance and optimized reliability of downhole instrumentation is a goal of most intelligent well projects. Where downhole conditions are characterized by high pressure and temperature, operators are incresasingly turning in the direction of fiber optics to achieve their ambitions. This session will address this new technology and evaluate the pros and cons of fiber optics:

- The potential applications of fiber optics in downhole monitoring
- Fiber optics and temperature independence? Is this the answer to the reliability hurdle?
- Addressing the requirement for greater instrumentation: Using fiber optics to understand your reservoir and ensure production optimization
- High or low tech fiber optics: Reservoir monitoring vs. optical valve activation
- The challenges posed by delicate subsea installation and connection

Brian Schwind, *Director, Advanced Technologies,* **PPI TECHNOLOGY SERVICES**

17.00 Chairman's closing remarks and end of forum