Transformation - Time for Decisive Action

On behalf of the Executive Committee, we are delighted to welcome you to the 4th SPE Intelligent Energy Conference.

The conference theme, “Transformation – Time for Decisive Action”, builds on the successes and momentum achieved by our industry since the inaugural Intelligent Energy Conference in 2006. Today, the energy industry faces one of the most dynamic environments in its history. At the conference in 2010, the industry backdrop was one of depressed commodity prices due to lower hydrocarbon demand and global recession. Now we are in the midst of another upcycle, albeit volatile, and are simultaneously wrestling with a changing geopolitical landscape and significant shifts in the regulatory environment.

We also are living through an era of unprecedented change in technology – especially in the areas of computing, telecommunications, information, and social media. These changes are profoundly affecting the choices of where and how we conduct business, and are allowing us to introduce business models and workflows that can reduce human involvement and accelerate automation of many critical activities.

While it is clear that our industry has started along a path of transformation, it is also clear that we do not yet share a common direction or charter. Operating and service companies developing the world’s resources today are all at very different stages of digital enablement. Many see digital enablement as an intrinsic part of their technological future, but still struggle to articulate the business benefits and make a case for investment and transformation.

In this environment, we have a unique window of opportunity to transform the way we conduct and represent our business – before public opinion or government regulations make those decisions for us.

The 2012 Intelligent Energy Conference will be an important event in this transformation, as we explore what the evolving digital hydrocarbon industry will look like and how we can accelerate the pace of implementation of intelligent solutions. To that end, we have designed the conference to bring early-career staff together with experienced professionals to encourage the debate between “digital natives” and “digital immigrants”. Fueling these discussions are thought-provoking keynote speakers who will emphasise the pace at which the world outside the hydrocarbon industry is changing.

During the conference, we will hear from groups within our industry who hold the keys to accelerating implementation:

- CEOs and business leaders, who drive the pace of change today
- Early-career professionals, who will own intelligent energy solutions in the years to come
- Asset managers, who, in specific sessions, will highlight the business approach for making intelligent energy solutions work in a sustainable way

Also critical are those whose vision and ability to execute on their goals will make significant impacts on our success:

- CTOs and leading technologists, who will paint what the latest generation of intelligent energy solutions could look like
- NOCs, IOCs and service companies, who will share experiences, technologies and services through an extensive exhibition floor
- Technical presenters, whose papers will highlight examples of value delivery and new opportunities created by intelligent energy technologies

We believe that the collection of speakers, exhibits and papers, promises to deliver the best Intelligent Energy event yet. We look forward to making the most of this special opportunity to take decisive action for intelligent energy by meeting you in the stunning facilities in Utrecht in March.

Derek Mathieson, President, Products and Technology, Baker Hughes

Edwin Verdonk, Vice President, Subsurface Expertise and Technology Deployment, Royal Dutch Shell

On behalf of the programme committee, it gives me great pleasure to invite you to the 4th International Intelligent Energy Conference.

Our industry faces a number of ongoing fundamental challenges. Firstly, the accelerating decline rate of existing reservoirs and the smaller size and complexity of newer ones require increased technology intensity and integration to enhance reservoir understanding, improve production management, and increase recovery. Secondly, operations are ever more challenging as we continue to move to deeper, harsher, or more remote locations. Thirdly, to address the demographic challenges in our industry, a large and more diverse number of employees will be hired, and will need to be trained, deployed and supported.

The industry is constantly looking for means to improve drilling operations, enhance production management and recovery rates, mitigate risks, and improve safety, quality and efficiency. In addition, the industry needs to accelerate the development of people while leveraging knowledge and expertise across the breadth of oil and gas operations.

At the 2006 conference, we looked at technologies and tools to enable intelligent integrated operations. In 2008 we focussed on the process, people and organisational aspects to accelerate implementation. In 2010, excellent examples of value creation from many companies were demonstrated and we better understood the challenges of moving to an ‘adoption at scale’ phase.

In 2012, we will look at the entire transformation cycle, set our vision to achieving the sustainability stage of making intelligent energy ‘business as usual’ in our industry, and understand the decisive actions required to get there. The number and quality of papers submitted to the 2012 conference has been outstanding and the spread of authors and participating companies is impressive. To provide an additional forum for participants from operations, we have introduced the concept of discussion sessions on day-2 of the program. In these sessions, we will have short paper presentations followed by a longer discussion with invited participants from field operations and management. We hope you will find these interactive sessions interesting.

Sanjay Kanvinde, Global Real Time Manager, Schlumberger. Programme Committee Chairperson.
The digital oilfield is already a reality, with oil and gas companies seeing the benefits in terms of enhanced production levels resulting from the implementation of intelligent energy solutions and real-time integrated operations. Intelligent Energy this week will challenge some of the world’s top experts to define the key issues and drive the decisive actions that will take the industry to the next level.

BP is one company that has seen quantifiable results from implementing intelligent energy solutions. At the end of 2011 the operator had increased its production levels by an estimated 73,000 net boe/d from the application of its Field of the Future® program. It has an internal goal of reaching 100,000 boe/d by 2017. The company will highlight its vision for the digital oilfield, the challenges it has overcome, and those it still faces at the SPE Intelligent Energy International 2012 conference and exhibition this week.

Programme committee chairman Sanjay Kanvinde, Global Real Time Manager at Schlumberger, said: “We hope and expect that the collaboration of peers in the digital community won’t stop at the conclusion of the convention. We anticipate that the rich set of ideas resulting from our time in Utrecht will provide context for future workshops and, quite possibly, drive ongoing conversations among colleagues as a matter of routine.”

Co-chair Derek Mathieson – President of Products & Technology at Baker Hughes – is keen to encourage as much audience participation as possible, in person or remotely. He commented: “Audience participation is critical to the success of this year’s event, as we challenge our colleagues to debate the scenarios that will drive decisive action in the future. For that reason, we’ve opened up the scene-setting opening session to anyone who can access the Intelligent Energy website. Participants can join us via live webinar, in the audience at Utrecht, or even after the session via recording to join the conversation and shape the transformation of intelligent energy.”

Direction of debate guided by audience and online input
Special online areas have already been set up for visitors to flag up and comment on what they see as crucial areas for discussion and debate ahead of the event. The ‘Vision 2020’ portal can be accessed directly via www.intelligentenergyevent.com. The conference itself will feature daily plenary sessions, as well as a full technical conference programme throughout the three days of the show.

BP, under the heading ‘Empowered by Realtime’, will discuss the choices, changes and challenges that the industry faces in the ongoing journey towards the digital oilfield. Using a range of recent projects from its 10-year-old Field of the Future® program as examples, it will demonstrate the increasing benefits that digital technology is bringing to production, reservoir and facilities management for the oil and gas industry. BP personnel will present papers on a range of topics including an overview of the Field of the Future® program and the challenges faced; virtual flow metering; dynamic flow modelling; the development of the second generation of digital oilfields on the Skarv and Vathall projects offshore Norway, and the benefits and challenges of implementing real-time technology.

IBM, meanwhile, will give attendees an opportunity in the area of Smarter Asset Management to investigate the company’s innovative approach toward implementing intelligent energy initiatives such as Enterprise Asset Management and Turnaround Optimization. Also on display will be IBM’s Service Management for Chemicals and Petroleum, which features state-of-the-art products such as Maximo for Oil & Gas. This helps companies optimize operational intelligence through standardization, convergence, collaboration, and the adoption of better operational practices. Additional capabilities in the areas of Integrated Operations and the Value of Smarter Oil and Gas Fields will also be on show.

Also showcasing its abilities will be collaborative and integrated technology provider BB Visual Group, which comprises Visual Solutions AS and its B2 Integrated software suite of collaborative application sharing and well planning tools; Visual Development AS, developers of software technologies for implementing ‘many to many’ collaboration work; Visual Acuity Ltd., consultants, designers and project managers of collaborative technology integrations for oil centres, collaboration centres and training facilities; and OilTeams SRL, providing WITSM tools and services for well monitoring.

New digital oilfield tools tackle heavy oil
Taking integration to the next level, model-based technologies aid in heavy oil production and maximize the potential of the digital oilfield. As the formal part of the Schlumberger Information Solutions (SIS) 2012 Global Forum wound down and the technical talks took center stage, two final presentations highlighted the promise that new systems and workflows can bring to the oil and gas industry.

Pippa Murphy, a senior geologist for SIS, showed the crowd on March 14 in Monaco a case study that helped optimize SAGD operations in heavy oil sands in Canada. Heavy oil resources count for half of the world’s oil reserves, with 350 billion barrels in China, Venezuela, Canada and Nigeria. While these countries are reserves-rich, they present harsh operating conditions and very viscous oils, creating an extreme development challenge.

Although heavy oil in Venezuela can be developed through multilateral completions and cold production, the Athabasca oil sands in Alberta, Canada, must either be mined or developed through SAGD operations. Both development scenarios are capital-intensive, with the latter including steam generation, upgrading facilities, pipelines and surface well pads. “These facilities need to be right-sized with respect to the geology,” she said.

The basic concept of SAGD development is to drill two parallel wellsbores about 5 m (15 ft) apart. Steam is injected into the upper wellbore, and the resulting steam chamber makes the oil less viscous and able to flow toward the producing wells. It sounds simple enough, but Murphy’s team identified three key challenges: facies heterogeneity, thief zones, and the need for proper well placement.

Facies heterogeneity manifests itself as mud sections that act as barriers to steam movement. Thief zones are pockets of water and gas that pull the steam away from the producing wells. And with the high number of wells required to develop these reservoirs, optimal well placement is key to provide maximum reservoir contact.

Murphy’s project used reservoir simulation to study the potential development and hoped-for convergence of the steam chambers as production advanced. Using one integration platform, the multidisciplinary team developed a workflow cycle that added new geological understanding and caused the operator to reconsider the well-pad placement based on the new information. Meyer Bengio, vice president of petroleum engineering for SIS, discussed “Consistently Hitting Targets - Integrated Product Integration.” In his talk, he discussed the advances in production technology that have led to a data explosion. “Installed instrumentation systems, wireless infrastructures aim to automate monitoring tools,” he said, and as a result, production has increased by 9% while capex has been reduced by about $200,000 per well.

Yet these types of reservoir optimization are still not mainstream. “They’re hard to maintain and difficult to operate,” Bengio said. The answer, he said, is model-based production with smart alarms and other optimization tools. The SIS solution is Avocet, which uses data connectors, web interfaces, water flood management, a reporting engine, and schematics to “crack the problem.” The ultimate benefit from these tools is model-based surveillance, he said.

“Avocet gives service company personnel the ability to calibrate the equipment,” he said. “It takes the pain out of the system and instead integrates and focuses on value.”

Visit Schlumberger on booth B20
Intelligent energy has come through a somewhat tumultuous incubation phase over the last decade and is now embedded in many parts of our operations, in the way we conduct business and in the technology we use that supports many of our activities. There is a spectrum of maturity levels across our industry, from those still wrestling with adoption to others who are exploring true business innovation in this space. There are still very few standards that have emerged, the learning curve for adoption has not lessened, infrastructure and cultural inertia are still present while technology continues to race ahead.

Many believe we are at an inflection point in the cycle today where decisions need to be taken on what defines the identity of intelligent energy, what catalysts may propel this to a much wider scale adoption, and whether we have reached a plateau or the beginning of a much broader journey. In this panel session we will explore the challenges of entering into the adoption cycle while technology continues to diversify, examine what the decision landscape across the sector looks like today, and debate what grand challenges for our industry may yet be addressed with this technology.

Facilitator:
Judy Murray, Manager External Affairs, ABS (Former editor, Harts E&P)

Speakers:
Gerald Schotman, CTO, Shell
Satish Pai, Executive Vice President, Operations, Schlumberger
Dr Nabeel I Alafrag, Manager, Southern Area Reservoir Management, Saudi Aramco

How can we better educate the public about our industry?
How do we meet the expectations of the iPhone and YouTube generation?
How do we exploit masses of data and computing power to make better decisions with fewer engineers?
What knowledge can we share to jointly create a smart energy supply chain?
How can we anticipate to share the benefits of our efforts?
How can we better educate the public about our industry?
Growing up in the digital age

The industry needs to take decisive action if it is to take the next step and broaden its journey toward widespread adoption of intelligent energy solutions.

Intelligent energy technologies and solutions have come through a tumultuous “incubation phase” over the past decade to the point where they are now embedded in many aspects of E&P operations. However, there is still a spectrum of maturity levels across the industry, from those still wrestling with adoption to others who are exploring true business innovation in this space. At present, even its most devout advocates would admit there are still very few official standards that have emerged, that the learning curve for adoption has not plateaued, and that infrastructure and cultural inertia are still present – while the technology itself continues to race ahead.

Many believe the oil and gas industry is at an inflection point in the cycle where decisions need to be made on what defines the identity of intelligent energy, what catalysts can propel it to a much wider scale adoption, and whether it has reached a plateau or the start of a much broader journey.

There are key questions as the industry moves forward and as company leaders have very practical reasons for deploying intelligent energy concepts, technologies, and solutions on oil and gas assets to address specific operational issues and capture identified opportunities. Many intelligent energy successes have been achieved, including a growing and documented number of projects benefitting from increased production, improved safety performance, and reduced manpower. But most agree that more needs to be done so that intelligent energy concepts can help to maintain operational levels in the face of today’s significant operational pressures and assist in the development of deepwater, harsh environments, and remote resources that would otherwise be technically or economically unfeasible. This must be done at a time when the industry is also dealing with skills shortages and the demographic change to the next generation of its workforce as well as the increased importance of cyber security in a digital world, and increasing regulatory scrutiny and requirements.

Digital enablement

According to Edwin Verdonk, vice president, Subsurface Expertise and Technology Deployment at Shell, the industry has a unique opportunity. “While it is clear that our industry has started along a path of transformation, it is also clear that we do not yet share a common direction or charter,” he said. "Operating and service companies have made many fundamental changes, but have not yet fully come to grips with how to develop their own processes." With these and other enhancements, the software is set to underpin the relevant standards, guidelines and procedures and feed experiences into the overall corporate program.

Adoption at Scale. In this stage, companies formulate what the evolving digital hydrocarbon industry will look like and how it can accelerate the pace of implementation of intelligent solutions – topics he will be raising in his role as co-chair of the SPE Intelligent Energy International conference and exhibition.

The event is well timed. Today the industry is in the midst of another upcycle, albeit volatile, simultaneously wrestling with a changing geopolitical landscape and significant shifts in the regulatory environment. It also is in an era of unprecedented change in technology – especially in the areas of computing, telecommunications, information and social media. These changes are profoundly affecting the choices of where and how the industry conducts its business, allowing it to introduce business models and workflows that can reduce human involvement and accelerate automation of many critical activities. But many fundamental changes still remain:

- Maintaining the safety and operational integrity of facilities in ever harsher environments;
- Pushing the frontiers of exploration and development into deeper water, higher pressure environments, more viscous oil plays, and sensitive areas such as Arctic developments;
- Grappling with skills shortages and the demographic change to the next generation;
- Dealing with emerging economies such as China and the increasing role of national oil companies versus international oil companies;
- Managing security in a digital world and coping with cyber attacks;
- Handling increasing regulatory scrutiny and requirements; and
- Balancing manual control versus full automation.

Schlumberger’s Sanjay Kanvinde is the chairman of the SPE Intelligent Energy International program committee. He described the industry as currently transforming itself through three maturity stages:

- Innovative Enterprises start small-scale innovative implementations in an individual asset or region, usually driven by local leadership. In many cases, technology or service companies contribute to these specific successes. These initial successes catch the attention of senior management, and companies get organized to move to the next stage. Often the leading asset or region continues to innovate with technology, processes, people management, and business models and feeds experiences into the overall corporate program.

- Adoption at Scale. In this stage, companies formulate usual,” delivering a new level of performance. Business models and organization capabilities continually improve to deliver sustained value. Various companies, regions, and industry segments are at different levels of maturity and are striving toward the sustainability stage of making intelligent energy “business as usual.”

Kanvinde also highlighted three challenges to be met as the industry goes forward: “The accelerating decline rate of existing reservoirs and the smaller size and complexity of newer ones require increased technology intensity and integration to enhance reservoir understanding, improve production management, and increase recovery,” he said. “Secondly, operations are ever more challenging as the industry continues to move to deeper, harsher, or more remote locations. Thirdly, to address the demographic challenges in our industry, a large and more diverse number of employees will be hired into our industry and will need to be trained, deployed, and supported.” The industry is constantly looking for means to improve worker productivity while leveraging knowledge and expertise across the breadth of oil and gas operations.

E&P is the official media partner for the SPE Intelligent Energy International conference and exhibition in Utrecht.

Redefining the well engineering process

Maximising efficiency is at the forefront of the Oil and Gas Industry. Knowing the complete design process, the relevant standards, guidelines and procedures and the exact status of your project has never been more critical. Furthermore, there is an increased focus on the oil and gas industry and well engineering processes in particular following recent incidents.

In order to react to this, SPD Limited (part of the Petrofac group) has recently launched WellAtlas®, an integrated well design and management system that allows enhanced control and management of its accredited Well Delivery Process on a global basis. The product was extensively tested by SPD’s Well Construction team and now underpins SPD’s delivery process to both internal and external customers.

WellAtlas® is built on ‘cloud’ technology and guides an organisation’s well engineering team through the Well Delivery Process using tools that include integrated lessons learned, risks and action tracking modules. Full auditability is achieved using document control techniques as well as a task-based system to ensure that engineers have the necessary inputs, outputs, knowledge and processes to deliver a well construction project to the highest standard. WellAtlas® is the driving force to incorporate a well engineering process that allows enhanced control and management system, documentation, project and senior management control, making it a unique one-stop solution to well engineering needs, accessible from anywhere in the world.

WellAtlas® has been successfully deployed to a major UKCS operator and is currently under review by several others. Ongoing deployments include two major UKCS operators. Sodexo Development and WellAtlas® is driven by the increased internal demands of SPD and the requirements of external clients. Version 2 of the product is already in the latter stages of development and enhancements such as multi-lingual capability and multiple process handling with the customer able to develop their own processes. With these and other enhancements the software is being used in the UK and all future well engineering projects, both for SPD and for its customers.

For more information please visit SPD on booth A13.
KNOWLEDGE SHARING ePOSTER PRESENTATIONS

KNOWLEDGE SHARING ePOSTER SESSIONS

Knowledge Sharing ePoster sessions are a valuable means of promoting discussion both within specific disciplines and across widely different research areas.

Knowledge Sharing ePoster presentations will be made during coffee and lunch breaks on Tuesday 27 March, Wednesday 28 March and Thursday 29 March 2012. Each Knowledge Sharing ePoster presenter will have a specific time that they need to be present in order to make their presentation and network with attendees.

Please see below a list of the Knowledge Sharing ePoster presentations.

SPE-148650 Are We Poor at Explaining Things? K. Jeffery, Digital Energy Journal


SPE-149815 Protection of Petroleum Industry from Hackers by Monitoring and Controlling SCADA System A. Vijay and U. Ugni, RGIPT

SPE-149197 Upstream Situational Awareness – Comprehensive Events Based Surveillance Solution R.A. Archer, M. LeBlanc, J.O. Reed and J. Reichardt, Knowledge Reservoir


SPE-149579 Optimising the ROI of Digital Technologies in Production Operations A. Prakash and A. Bansal, Infosys


SPE-149780 Integrating Mathematical Optimisation and Decision Making in Intelligent Fields D. Echeverria-Ciaurri, A. Conn and U.T. Mello, IBM; J.E. Onwunalu, BP

SPE-149785 Oilfield Data Mining Workflows for Robust Reservoir Characterisation K.R. Holdaway, SAS Institute

SPE-149999 Lessons and Insights from Unexpected Places J. Davidson, Halliburton; M.J. Lockmann, Landmark Graphics

SPE-150008 Improving Oil and Gas Installation Safety through Visualisation of Risk Factors A. Braesh and S. Sarshar, IFP


SPE-150053 Reducing Production Losses from Rotating Equipment Using a Standardised Approach Across Multiple Assets G.J. Hickey, P.J. Hocking, B.R. Gamblin and B. Grange, BP

SPE-150069 Real-time Drilling Engineering: Hydraulics and T&D Modelling for Predictive Interpretation While Drilling R.B. Jorjas, Schlumberger

SPE-150100 Real-time Prediction and Avoidance of Pack-offs and Other Off-bottom Events While Drilling R.W. Brooks, N. Zhao, A. Mahoney and J.G. Wilson, PPCL


SPE-150138 Temperature Transient Analysis in a Horizontal, Multi-zone, Intelligent Well K.M. Muradov and D.R. Davies, Heriot-Watt U.

SPE-150145 Connecting a Global Digital Oilfield Community through a Collaboration Platform S. Cepcoo, SAAIC, A.D. Simonato, Chevron

SPE-150185 Methodology for Overcoming Bottlenecks Leading to a Successful Implementation of a Collaborative Working Environment B. Al Azawi, ADCO; P.J. Maley, Kongsberg; S.V. Jakeman, A.A. Bin Amro, I.T. Al Hamdadi and I.M. Al Bishri, ADCO

SPE-150189 Permanent Distributed Temperature Sensing (DTS) Technology Applied in Mature Fields – A Forties Field Case Study M.R. Figueroa, C. Costello and P. Sordy, Apache; E.P. Balster, Schlumberger

SPE-150201 Improving Management and Control of Drilling Operations with Artificial Intelligence G. Gola, IFE; R. Nybe, SINTEF; E. Lunde, Statoil

SPE-150211 Efficient Use of High Frequency Data through Production Data Management System Implementation R.W. Holy, Schlumberger; A. Creemer, Corridor Resources; M. Mohajer and M.Fuerherr, Schlumberger


SPE-150245 Cross-Industry Perspectives on Remote Collaboration, Optimisation and Operations C. Romater, Honeywell

SPE-150253 A Framework to Assess Value of Intelligent Petroleum Fields and Integrated Operations D. Strusunskas and A. Tomasgard, NTNU; A. Nystad, PetroManagement

SPE-150211 Transformation of Data Systems into an Information System for Continuous Improvement of Wellbore Construction Workflow Processes R. Lamborn, M.L. Lang, P. Flinchy and A. Srinivasan, Baker Hughes


SPE-150396 Achieving Excellence in E&P Offshore Logistics J. Favilla and D.A. Claessens, IBM

SPE-150424 Intelligent Field Management: Real Time Monitoring and Proactive Optimisation of Greater Ekofisk Area ConocoPhillips Norway A. Madhar, A. McIntosh and J. McAlonan, Weatherford; J. Musatfin, ConocoPhillips.

SPE-150438 The Use of Sustainable Asset-Width Models to Support Continuous Improvement at BP’s Operating Assets M. Woodman, BP Exploration Operating Co Lt B, Stenhouse, BP

SPE-150448 Growing the Marketplace for Permanent Reservoir Monitoring Using 4D Seismic G. Watts, ; D. Norberg, Facitium; P. Norberg, Facitium AS; B. Nicholson, Facitium AS


SPE-150451 Drilling Teams Learn Faster using the WWH-Method T. Koroveld, SINTEF Industrial Mgmt; B. Bremdal, Narvik University College; E. Nystad, IFE

SPE-150459 Making Intelligent Energy Solutions Deliver Value in a Sustainable Way M. Dalsmo, ABB

SPE-150464 Turning Real Time Fiber Optic Data Into Valuable Information P. Kinghorn, Shell; P. Paterson, Shell; T. Schmidt, Shell Global Solutions; S. Yawa-narajah, Shell; L. Nas, Royal Dutch/Shell Group

SPE-150477 Using a New Intelligent Well Technology Completions Strategy to Increase Thermal EOR Recoveries – SAGD Field Trial J. Shaw, WellDynamics; M. Bedry, Halliburton

SPE-150499 IO Design Gives High Efficiency and Good HSE Results B. Moltu, StatoilHydro

All details correct at time of press.
BP Norge enhances its experience in digital oilfield technology by creating two 2nd generation ‘fields of the future.’

BP pioneers generation of digital oil fields

BP Norge installed its first fiber-optic communications link to the Valhall and Ula fields in the North Sea in 1999. Since then, it has substantially developed the implementation of its trademarked ‘field of the future’ program of digital technology, ranging from the first advanced collaboration environments for drilling and operations to the world’s first life-of-field seismic array on the Valhall field using advanced remote monitoring tools.

In 2005, BP embarked on two major facilities projects. The first was a new field center for the Valhall field and the second a greenfield development for the Skarv field based on an FPSO unit. These projects would enhance BP Norge’s existing experience in digital oilfield technology and create two second-generation fields of the future.

BP Norge, on behalf of its partners, operates three field centers: the Valhall hub, consisting of the Valhall and Hod fields; the Ula hub, consisting of the Ula and Tambar fields; and BP Norge’s new Skarv field.

A digital infrastructure

The installation of low-latency, high-bandwidth fiber-optic has been a communications breakthrough in 1999 underpinned the successful implementation of the technologies in BP’s Ula and Valhall brownfield hubs and was a turning point for the operation of BP fields.

The Valhall field center is shown with the new field center in the foreground. (Images courtesy of BP Norge)

The new Valhall process hotel platform development includes the provision of a 294-km (179-mile) high-voltage direct current power (HVDC) cable delivering 78 MW of power into Valhall. It was augmented the HVDC cable to include its own fiber-optic communications cable, adding a new dimension to the robustness of the fiber-optic communications to the Valhall field and opening up the potential for remote control of the field from shore.

Fiber-optic communications were successfully implemented in the southern part of the North Sea and convinced the Skarv partners that it was important to provide similar wide-bandwidth, low-latency communications to the field.

New greenfield facilities challenges

In late 2004, due to subsidence at the seabed of the original processing facilities leading to subsequent reduction in the air gap between the bottom of the deck and the sea, work began on the front-end engineering of a new production and hotel platform for the Valhall field. This became known as the Valhall Redevelopment Project.

With a life expectancy of 2050 and beyond, the project was considered a better way to resolve the subsidence problem than jacking up the old facilities. BP implemented the project as a field of the future, making use of all the capabilities of the new digital technology to facilitate remote engineering and control.

The company developed a field-of-the-future automation blueprint outlining the project and what its contractors were expected to deliver to meet the company’s requirements. This was important to ensure that the engineering contractors delivered the required sensors necessary for best-in-class remote performance monitoring and optimization of critical process plant and equipment. An audit in 2006 proved its success with a high degree of conformance to expectations.

Located 200 km (120 miles) west of Sandnessjøen, Norway, the Skarv field development concept was based on an FPSO designed for the area’s harsh environment. It was agreed in the early stages of the engineering of the project that a fiber-optic telecommunications infrastructure to shore should be implemented on Skarv based on positive experiences from Ula and Valhall.

The field of the future automation blueprint was also successfully coupled Skarv into the specifically updated for Skarv to cover marine and subsea aspects. Since 2005, this blueprint document has evolved into a set of company standards addressing automation, remote performance management, advanced collaborative environments, and digital infrastructure, and it is now applied globally to all new major projects across BP.

Remote control

BP adopted a degree of remote control management (RCM) for the Valhall field from shore and combined it with the extensive use of advanced collaborative environment (ACE) technology. The installation of a second independent fiber-optic communications link associated with the HVDC provided the robustness of communications needed for remote operation.

Based on a review of value, risk, and tactical considerations, all the primary processes, surveillance, and control of the safety systems remained offshore while some specific functions, such as controlling the wells, would be done from shore.

The control room was designed to reflect the same look and feel as an offshore facility, with the same access to wireless communications and PA systems. A large video wall with high-quality audio equipment was provided offshore and onshore to give staff the feeling of being in the same room.

With more than 100 drilled wells and approximately 100 wells yet to drill, significant value is to be gained through well optimization. Well management complexity is increasing due to a shift from primary to management on offshore platforms, and the use of more advanced wells. As a result, it is leading to more fragile wells requiring scale management and careful well surveillance. Well management was improved by strengthening communications between the onshore support and operators, thus improving the well operator’s skills and capabilities.

Valhall, with its lifetime expectancy of more than 40 years, is expected to remain a highly complex field to operate. New technical capabilities and work practices are constantly under development, and the general industry trend is to move an increasing amount of the control and administration functions from offshore to onshore. The operational onshore control room will provide improved flexibility for harvesting potential benefits from these new capabilities in the future.

Remote performance monitoring (RPM)

Valhall has 40 individual RPM applications, which have been assessed as providing high value, whereas Skarv, with more marine and subsea infrastructure, has 46 RPM applications.

Condition monitoring and RPM were recognized as key components of the Valhall and Skarv projects. The systems and techniques that are being provided under the projects fall into two broad categories:

- Those that are well defined and understood and that should be expected to work reliably and quickly, and be available from plant start-up; and
- Those that are less well defined, where there is less experience, or where the facility is known to require configuration/set-up/optimization during early stages of operation (nominally the first 12 months).

Learnings and challenges

Installing some of the best technology available on two new installations will enable BP Norge to continue to develop and improve concepts begun more than 10 years ago on its brownfield installations. Many lessons have already been learned, but certainly many are still to come in the years ahead.

Using blueprints to deliver a true field of the future installation has been a great success. Not all applications or capabilities that were initially envisaged have survived to handover of operations, but the reasons for this are well understood and can be corrected in future editions of the blueprints.

As one of the first companies in the world to try to perform remote control on a major oil and gas field, BP has found the projects challenging, requiring a great deal of effort and attention to detail. The company is confident, however, that the safety benefits will justify the investment in time and resources. It has been important for senior engineering staff responsible for RCM on the new assets to align themselves with their specialist contractors.

The Skarv FPSO has been equipped with a fiber-optic telecommunication infrastructure to shore.

Each category requires its own management to realize the expectations for the effectiveness of the techniques employed and to identify additional opportunities. With ACEs, both onshore and offshore, the asset teams will support the day-to-day business of the fields, while the engineer- ing support teams are responsible for following up and operating the RPM tools using their own ACE environment together with their specialist contractors.

Collaboration is key

BP Norge has put an ambitious strategy in place for its most recent developments on Skarv and Valhall and has made a significant step in the industry’s progress towards the second-generation digital oilfield. To drive recovery and uptime, an increasing amount of cross-discipline collaboration is required, and various technologies will have to be developed and deployed to obtain the maximum economic recovery from all fields. Remote condition monitoring, real-time data analysis and interpretation, real-time high-fidelity data, and collaboration technology are in this portfolio of technology, and BP Norge has progressed significantly with a recognition that there is still much to do on this long journey.

Elder Larson and Paul Hocking, BP Norge AS
The industry has been challenged to visualize disparate datasets together as they are acquired in real time and in the context of relevant earth models. The goal is to process an enormous volume of information so collaborators can make accurate and timely decisions on something that will never actually be seen. A real-time 3-D visualization service can help achieve these goals.

People have long relied on printed maps rather than a textual list of instructions for directions to find their way around. Maps provide a visual way of analyzing and processing spatial data because they clearly show orientation and scaling that describe the relationships with other objects and their relative positions. People understand things visually more easily, especially when the information describes things in space.

In addition to providing a spatial reference, visualization of information on a map allows many types of data to be shown together in context, which clarifies the big picture. Viewing different datasets together in context provides more information that enables better decisions in less time.

Minimum acceptable separation distance calculations are displayed in 3-D. Tubes represent aggregation of positional uncertainty in the wellbore planning process. Areas show where ACR passes. Dumbbell symbols and connecting lines show the direction along ACR calculation between offset well and planned well. (Images courtesy of Baker Hughes)

In the oil and gas industry, everything related to drilling a well also has a spatial relationship. The location and distance among offset well paths, structure and position of relevant formations, and the site of the target reservoir all can be described and visualized in 3-D space. With advances in LWD tools, azimuthal measurements and image logs can provide additional intelligence related to the spatial orientation and scaling of other features, all in real time. Many of these downhole technologies produce highly accurate measurements – and more data than ever.

Visualization in 3-D

The use of data visualization for decision-making, particularly in real time, has become critical in today’s challenging drilling environments. Many drilling applications can benefit from real-time 3-D visualization, from well planning and directional drilling using 3-D clearance calculations to drilling optimization, reservoir navigation, and real-time formation evaluation using 3-D wellbore placement inside a geologic model. Baker Hughes recently introduced its WellLink 3-D visualization service to optimize wellbore placement by providing real-time 3-D visualization of wellbore-related data. The integrated decision support and visualization platform enables operators to make accurate and timely decisions within a true collaborative environment by aggregating data into a single visualization environment.

“Baker Hughes has introduced its WellLink 3-D visualization and decision support solution that will never actually be seen. A real-time 3-D visualization service can help achieve these goals.

The stabilizer (in purple) above the steering unit is at the bed boundary between the brown and yellow layers. This stabilizer likely has been caught in the interface between these two layers, which might not be recognized easily without the visualization in geologic context. The bending moment is represented as a ribbon and is color-coded based on the ratio between maximum applicable bending to the BHA and the moment value. The blue symbol represents the direction vector.

A downhole tool provides orientation data with respect to high side, resistivity values, and signal quality. This information can be processed seamlessly and rendered as a single data point in which color, size, and distance from the tool sensor represent the summation of all related information. All downhole data are viewed within the geologic context, which provides greater understanding of the wellbore placement and plan-ahead decision that may be required.

Collision avoidance

One of the most critical missions in drilling is ensuring wellbore collisions do not occur. Traditionally, collision avoidance has been performed using a series of 2-D manual tools, which often are cumbersome to operate. Outputs from these tools sometimes are difficult to understand and analyze and easy to misinterpret. The ability to incorporate information typically displayed in 2-D reports in a 3-D environment is a significant improvement. Displaying traveling cylinder plots with no-go areas from a static report in 3-D, for example, can simplify the understanding and provide the next step toward a more automated solution.

Tubes displayed along offset well paths represent the minimum allowable separation distance, providing a visual interpretation of how far the planned or currently drilled reference well path must be from the offset path in question. By visualizing anticollision rule (ACR) calculations, visualization of wellbore collisions can help achieve these goals. For example, failure cases of the ACR can be color-coded automatically in red to alert personnel immediately to potential problems.

Finally, 3-D symbols showing the amount of available space for drilling provide a contextual representation for the planner or drilling engineer to quickly determine where to steer the well to avoid a collision.

Reservoir navigation

The goal of reservoir navigation is to accurately place and keep the wellbore in the pay zone by avoiding premature or unplanned exits leading to nonproductive time (NPT). The availability in recent years of advanced LWD measurements has made the task of placing the well in the right zone easier. However, with more challenging wells being drilled, more complex criteria have to be met while drilling. Three-D visualization facilitates collaboration, enabling the team to place the wellbore optimally.

For example, a deep azimuthal resistivity reading from...
UNCONVENTIONAL GAS DEVELOPMENT REQUIRES UNCONVENTIONAL SOLUTIONS

Factory wells for tight gas

With the huge number of wells required for shale gas or coal-bed methane development, companies are implementing lean manufacturing models for these “gas factories.”

When developing a shale layer or a coal-bed methane seam, an operator is mapping the formation with multiple pads, multiple wells and multiple horizontal runs. It is a very repetitive process - drill, frac, produce; drill, frac, produce; drill, frac, produce...

“It’s more like a factory than the old, conventional process. It is a lean manufacturing model,” said John Gilmore Jr., director, upstream oil and gas, global industry solutions, Invesys Operations Management. “You’ve got new wells added every day, but the character, sometimes the equipment and the operating mode of these wells will change very quickly as well. The concept that is being put forward is the ‘gas factory’,” he told Hart Energy’s E&P Online. “We are like a factory that is producing wells daily and then using those wells to produce natural gas.”

As Gilmore pointed out, there is a big spike in production from shale gas wells, followed by a rapid drop off and then an extremely long production life. These fields provide lower cash flow but a longer recovery time.

“You need a continuous peak. You need lots of wells to make these things work. Numbers approaching 5,000 wells or more are not unusual. You have to drill fresh wells at a high rate to keep production up and until the tail end of the decline curves start to accumulate to the point you can keep your investment going,” he noted. “I’ve been working with Arrow in Australia with coal-bed methane wells. Their plan is to add one comple- ted well per day. They have multiple crews. It takes about one week to frac and complete. Every day there is going to be a new well coming on. That’s thousands of wells literally. These wells are continuously changing. They are building wells every day,” he emphasized.

Given the sheer volume of wells coming onstream, what does the gas factory concept do to automation? How does it change the way we automate these fields?

“That’s the business that Invensys is in,” he said with a laugh. “We don’t deliver a new automation system to you each day. It has to be a system that grows every day with you. It must be highly flexible and highly adaptable.”

Because of the well life-cycle, the automation mode has to be able to deal with change. For example, “that first spike out of a shale-gas well may be enough to strip water. But as that tails off in a year or so, you’re going to have to come in with some kind of water injection. That’s going to be added to the operations load. Then later, you may not have enough pressure to get gas into the pipeline, so you add a compressor. And, all of this depends on the economics,” Gilmore said.

“You need span of control. You want to have a great span of control, but you have large well counts and still need to hold down the costs. Lean manufactur- ing, by its concept, relies on comprehensive reporting. You must know where your problems are to avoid them or at least respond to them quickly. Our model is to go after this with what we call a self-configuring - as much as possible - automation system,” he explained. “It is a system that once it is designed and structured, it can be reconfigured as these new wells are added. The new changes in the operating mode of the wells are basically defined by the operating personnel as part of running the facility,” he continued. “This is what we call our ‘well field application’. It has multi-trends capability and you can add these trends by yourself.”

Gilmore noted that the well field application is in service now in North America in around 15,000 wells. “If you’re going to have span of control, the operator needs to be able to see what is happening at that well right now,” he emphasized. “We provide a graphic view of each unit. But, that goes against the problem of low cost and low support. We think we’ve solved that problem with the system being self-configuring.”

To be self-configuring, the operator would need to enter a few key words, define the type of RTU being used and designate the communication link. “You literally check what equipment is located at that well. If you need to add a piston pump, for example, to unload water, all you need do is check a box in the system. If you’re authorized, push a button, and 15 to 20 minutes later the change can be seen on the screen. All the work is done; all reports are updated; all of the trending is done. Everything is now updated with the new configuration. You do the same thing to create a well.”

Anyone in the company can have access to the data from the chief executive officer to the pumper in the field. “If you note, you’re looking at all the wells. This might be the field manager, asset manager or the pumper. Each one is looking down at his or her sector. They’ve got color-coding of which ones are in trouble and can check on any area. If they are in operations view, they can look at each well individually.” Gilmore stated. And, the pumper doesn’t have to go into the field office to get a list of things to do. He can use his cell phone to access the same screens. “He’s doing it from home and making his decisions there.”

“Some customers have been putting wi-fi links at remote wells. When he gets to the remote well, he can do what he needs to do and report what he has done. He can then check the next well to work on. This is empowering the pumper to get out and do his job while keeping in close communication,” he continued. Some clients are also using Invesys’ SmartGlimace tool to show the agenda or similar tools on handheld devices such as iPads, iPhones and BlackBerries.

“Unconventional gas is changing the way we’re going to supply hydrocarbon energy to the world. It has significantly changed the price points in North Amer- ica, and it will soon have that effect in the rest of the world.”