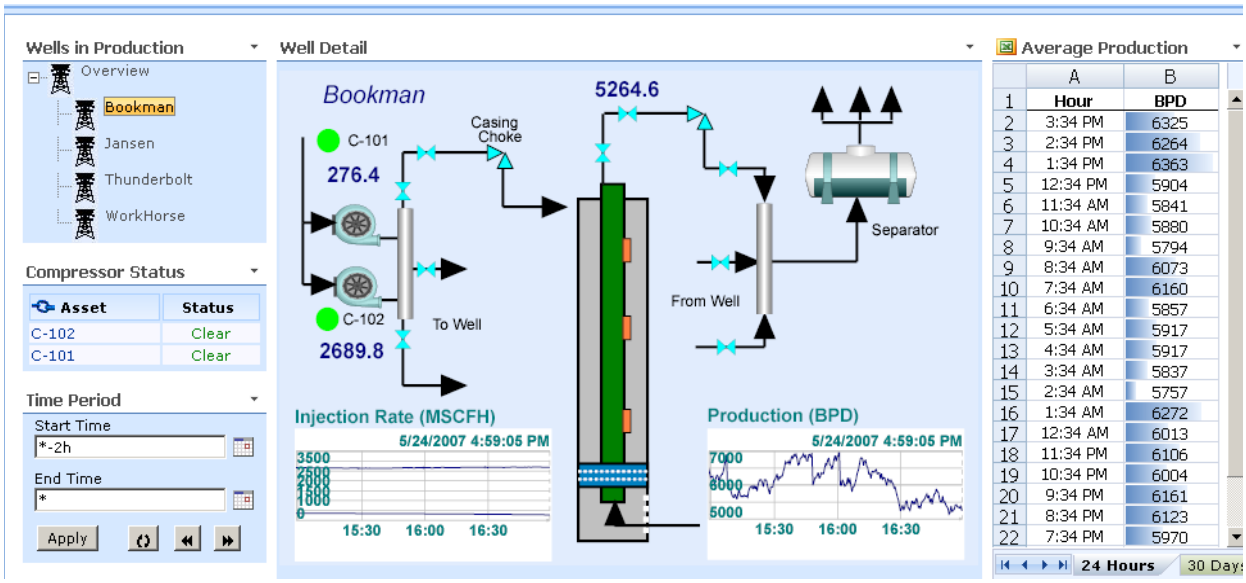
Society of Petroleum Engineers Digital Energy Conference 2007 – Houston, April 2007



Real time Microsoft Web Parts front end to OSIsoft PI Historian

If you want some strong advocacy for your digital oilfield effort, try the following claim from BP's Chris Reddick, '*BP's Field of the Future program has added one billion barrels to BP's reserve base*.' These are '*new barrels, not deferred production.*' Hence the strong interest in the Society of Petroleum Engineers 2007 Digital Energy Conference (SPE DEC) which now spans information technology from the upstream to downstream process side of the digital oilfield. This year saw increasing interest from operators and solution providers from the process side of the upstream/downstream 'fence.' The show was also characterized by more offerings from 'horizontal' vendors from outside of the oil and gas vertical. Some are in real oilfield use; others represent tentative marketing sorties into the cash-laden oil and gas sector. Dominating the horizontal vendors is Microsoft which is making inroads into upstream IT, piggy backing the rising influence of the process community and with some SharePoint flagship projects in Chevron and Shell. The above example from OSIsoft show some of Vista's shiny new tools applied to connect real time data from the PI Historian to Excel, via Microsoft's Web Parts. Company presentations included updates on Shell's 'smart fields,' Chevron's 'i-Field,' and much reflection on the difficulty of recruiting the 'renaissance engineer,' a hybrid PE/IT specialist. BP showed a Microsoft Virtual Earth-based application in its Arkoma Basin assets and an 'intelligent closed loop integrated digital system' for artificial lift operations in the San Juan basin. Schlumberger presented emerging semantic techniques for securing remote operations. We noted in our report from the AAPG[1] that Halliburton was increasingly integrating wireline and interpretation. At the DEC, Schlumberger came out with a similar 'crossover' in the form of a compelling mock up of a Petrel/Interact combo for geosteering. An excellent session on High Performance Computing confirmed the dominance of Linux in this space. BP's in-house clusters now have a 100 TeraFlop capacity. Concern was expressed about the need for better parallelizing compilers and for improved HPC software support with talk of possible funding for open source developments in this space. Finally, you may like to know one secret behind BP's billion new barrels. According to Reddick, '*Data management is the key to real time. BP actively manages real time data in some 20 fields around the world.*'

Highlights

Schlumberger's Operations Support Center
Chevron's Information Architecture for the digital oilfield
CIO round table
High Performance Computing session
Oracle back in upstream
OSIsoft real time Web Parts for PI system
AspenTech's Well Trends – drilling data historian
Sandia Labs infrastructure protection
Google Earth search for BHP Billiton
Web Methods process orchestration

[1] *Technology Watch 0704_8.11.*

Contents

Technology Watch subscription information

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TW0705_1 History of Smart Fields – Charlie Williams, Shell

Around 600 attended the Society of Petroleum Engineers' (SPE) Digital Energy Conference in Houston last month. Shell Chief Scientist Charlie Williams' keynote traced the history of 'smart fields.' These were initially more about communications than IT, with microwave links from offshore platforms to the Shell building in New Orleans. Early experiments in the mid 1970s with computer assisted operations equipment were abandoned and it was not until much later that the smart fields (SF) concept got traction. SF drivers include deep complex reservoirs, secondary recovery and the need for energy efficiency. Communications have made a lot of progress, but Katrina showed the limits of today's infrastructure.

Williams enumerated Shell's SF technologies including smart well control valves and monitoring with permanent downhole gauges, flowmeters and distributed temperature sensors. Getting data to the surface involves a tortuous path through packers, tubing hangers and the well head and into the surface control system. But these techniques have enabled 'smart snake wells' to produce from Shell's Champion West field in Brunei, long considered un-developable because of its stacked, faulted reservoirs. Champion West now contributes 25% of Brunei Shell's production from wells 8 km long with 4 km in the reservoir. A proof of concept on another Brunei field, Iron Duke, has involved 'retrofitting' smarts with pressure, packers and intelligent control valves. This resulted in a 15% production hike and a two year reprieve on water breakthrough. Mars was an early candidate for smartness and also leveraged other Shell programs – 'drill the limit,' 'produce the limit.'

Looking to the future, Williams sees computer assisted smart fields, proactively managed as a single dynamic system. 'Discrete' technologies are important enablers but it is the holistic management that is key. SF screening is important; Shell has a SF opportunities framing methodology. Williams warns of systems designed by engineers and management, but that operations can't handle. Williams concluded by saying that most all of Shell's new developments will be based on smart concepts, applying methods that focus on lifecycle value, not on hotspot areas of development. SF is not about technology but more about closing the value loop with technology used by and embedded within people, process and tools.

Q&A

What was hard?

Started with change management consultants, but ended up asking users what they needed. Smart is great for high end assets but – harder on brown fields where 'smart' can be too costly for operations to bear. But Champion West was actually enabled by smart field concepts.

Do you see smart field modeling tending towards a unified high level model? And if so how do you integrate today's multiple models of different granularity?

Shell is working on a unified database of all our model data. But it will be a long time before we have a single holistic model of all of the field. In fact this may never happen. Integration is a big problem – especially building interfaces between component systems. We are working to make this more seamless. The other issue is whether to build predictive physical models or learning-based systems. For smart field work our current preference is for active learning models.

How reliable is the technology?

Smart well technology is very reliable now – it has to be 99.99%.

Who drives this sort of change in an oil company? IT and or the business?

Many of our smart field people are IT pros. They go to operations and ask what they need to be successful and work with that.

If you have a collaborative environment for each asset, how do you connect them world-wide?

Our Real Time Operating Centers (RTOC) are already connected worldwide and help us share remote expertise. We expect the same for production operations control centers (POCC).

We always hear of 'people, process and technology.' If you spend $100 on smart field technology how much should go on people?

I'm not sure this is the correct approach. It is more important to think about how technology is introduced to people.

What's Shell's vision of real time data management and security?

There is a lot of concern here – especially around systems that are connected to the internet. This is a key component of our technology foundation.

How do you get management to align KPI[1]s of different groups?

[1] *Key performance indicator.*

It is easier to develop a good KPI when you have a lot of data. You can then customize what people see. In the old days you needed a systems programmer to create a custom report. Now it is easy to provide managers, engineers with what they need to see.

Yes, but how does management decide on KPI?

This is a management issue. We have done a lot of work on cascading KPIs throughout the organization. Management validates the decisions.

TW0705_2 Executive Round Table

0705_2.1 Operational transformation – Randy Krotowski, Chevron

Randy Krotowski (Chevron CIO) thinks the digital oilfield is an idea whose time has come. Most of the challenges have been solved, with 4D seismic, visualization and decision support centers. What remains are the 'people' challenges – convincing them that this is a good idea and especially, getting operations and engineers on board – 'you don't land airplanes with spreadsheets.' Chevron has iField engineers who are optimizing operations, data architectures, and making it easier to introduce new technologies. Field engineers may be frustrated if they don't have high speed access on site. Technology has been a barrier, but now we can benefit from the lower cost of technology. Chevron is leveraging the PPDM data model and 'PPDM XML web services' in its SEER data warehouse.

0705_2.2 'GeDig' digital oilfield – Ricardo Beltrao, Petrobras

Beltrao

Ricardo Beltrao described Petrobras' in-house developed 'GeDIg' system for integrated digital field management. Petrobras uses its own software to optimize operations on the 2,000 well Alto do Rodrigues offshore heavy oil pilot. The Barracuda-Caratinga collaborative offshore control center for digital operations (GeDIg) is located in Rio, some 450km distant. GeDIg offers an 'asset perspective' for production maximization, cost savings and new technology integration such as 3D/4D seismic. Petrobras evaluates new components and tools in pilot projects, capturing experience and developing applications – a lot is done in house. There is a governance model for pilot implementation with sponsor, executive committee etc. One example is the Alto do Rodrigues pilot – an offshore heavy oilfield with 2,000 wells. Petrobras uses its own software to optimize production. Lessons learned: you need commitment and top-level management. Workshops, scoping and peer review are critical. Keep it simple, prioritize the 'fast loop,' and go live at start up. We always like to validate new business cases with KPIs to prove GeDIg's worth. But we are still challenged by new workflows and defining roles and filling skills gaps.

0705_2.3 The 'renaissance engineer' – Iraj Ershaghi, Viterbi School of Engineering, USC

Ershaghi noted the 'IT-ization' of petroleum engineering. Much of today's buzz words and technology are not taught at school. Today we need 'renaissance' engineers with IT knowledge. The question then arises, do we train IT specialists in engineering or vice versa? Ershaghi answered with a medical analogy (where the same problem exists), 'would you prefer to be operated on by an IT tech who had retrained in surgery, or by a surgeon trained to operate sophisticated equipment?' Ershaghi also suggested that the SPE do more to communicate the fact that its technology is cutting edge. We need to sell better at universities where there is a huge problem with the low number of petroleum engineering students. The Chevron/University of Southern California/CiSoft's Masters in smart oilfield technologies is part of the answer.

0705_2.4 Continous reservoir surveillance – Joe Vandevier, Baker Hughes

Oil and gas is booming – a Goldman Sachs study identified 125 major oil and gas projects in progress. But 50% of the SPE's membership will reach 55 in next 6 years. Digital technology will 'help out' with the graying workforce. Oil and gas 'mission centers' offer 24/7 access to domain specialists. One real time data center in the Middle East controls over 100 drilling rigs. Remote operations are benefiting from contractor and oil company collaboration. The Troll Field, the largest field in the North Sea was thought to have an uneconomic oil leg. But smart multi-lateral wells offer control of water breakthrough and/or scale monitoring and treatment. All part of the 'growing'

application of sensing – with permanent downhole gauges. Continuous reservoir surveillance is a potential game changer.

0705_2.5 Q&A

What is the impact of silos?

Oil production is slow to change and the divisions of explore, drill, produce are impediments . Most progressive producers are working to tear down the silo boundaries.

Digital oilfield implementations take many years – what is the economic value case and ROI?

A smart well can produce a very quick payout – certainly not years.

The description of oil and gas as 'cutting edge' is correct, but it contrasts with other presentations where the industry is characterized as a technology laggard. The SPE needs to make up its collective mind on this one!

TW0705_3 'WellTrends' time-based drilling data – Mike Strathman, AspenTech

Strathman

Mike Strathman suggested that we should look again at time-based (as opposed to depth-based) drilling. The idea is to have a unified view of all real time data. By using a data historian, as deployed in the process control industry, all real time data is collected in one place. This allows for detailed analysis of current situations in the light of historical data, leveraging drillers' expertise and allowing for a quick response to operational issues. The data Historian is much more performant than an RDBMS. Time based information supports queries along the lines of 'what else was going on at that time?,' 'How long have we been drilling in this formation?' (an important question for 'snake wells'). AspenTech's solution in this space is the InfoPlus.21/Web.21 combo of Historian and analytics. A new 'WellTrends' package displays log data and allows drag and drop of data streams to log tracks. The system was designed for up to 100 wells streaming in at the same time with five active logs per well bore, 200 parameters per well at 5 sec intervals. The WITSML standard proved 'essential,' enabling data capture from Schlumberger and Baker systems AspenTech's historian. WellTrends gives access to historical data 'that was previously hidden away in ASCII files.' Structured query is possible across wells for intervals, times and other attributes. Time-based drilling data is becoming standard for AspenTech customers – but it does not replace the depth based database.

TW0705_4 Pipeline data visualization in Virtual Earth – Mike Weber, BP North America

BP's Arkoma Basin unit is co-visualizing Pipesim and SCADA data in a Microsoft Virtual Earth-based 'MAPS' solution from IDV Solutions (OITJ February 07). Phase I of the project resulted in map-based visualization of Pipesim model data. Phase II extends this to data from OSIsoft's PI Historian over the 520 wells in the Red Oak field. Microsoft SharePoint services and Web Parts also ran as did Schlumberger's Avocet production data server. The plan is to offer 'evergreen' models, to perform 'what if' operating scenarios and in general, to 'break down silo boundaries' with visualization of basic schematics, maps and bubble maps. The 'robust' modeling environment provides automated start up, a flexible model scheduler and data management. A movie showed VirtualEarth with check boxes turning map layers on and off and bubble maps of production. Pipelines can be animated and flagged when pigging needs to be done.

Q&A

Anadarko – how much work did it take?

R&D and facilities and operations paid – it was not too expensive – cheap compared with downstream! The tool can be used in other assets.

Bandwidth ?

We 'piggy back' onto Microsoft Virtual Earth and layer our data on their map. This is easy and performant. There is no client-side application.

TW0705_5 Real time drilling data visualization with 'Complex Hull' – Steve Knudsen, Sandia Labs.

Sandia Labs is working on a dynamic drilling simulator to provide diagnostics while drilling. Some 20 parameters are monitored and the question is, 'how to present the data to the driller.' Enter some R&D work on the 'Convex Hull[1]' (CH) – used extensively in engineering packages such as Interactive Data Language (IDL), LabView and Matlab. To generate a CH, find set of lines that satisfy 'below and beyond' criteria. This can be done in multiple dimensions. The computation provides a measure of 'complexity'. Measurement while drilling data is presented analyzed with the CH. Components of the data set (weight/torque on bit, RPM, etc.) can be visualized as movies of (for instance) the CH of WOB vs. TOB. This produces a strange 'thing,' wriggling around. Drillers get a feel for 'normality' by watching changes in the CH in different circumstances. CH gets 'big' as driller backs-off to reduce drill string vibration. A 3D movie shows WOB, TOB and RPM – another wriggly thing jumping around. A large CH can indicate bit damage. Sandia is working on the visualization of higher dimensional complex hulls – but these are 'hard to understand.' Are multi dimensional calculations more meaningful than 2D cross plots?

Q&A

Visualization is great but it is hard to interpret these things. Have you thought of building 'advisories' for different situations encountered?

Yes. But we need more work to understand what multi-dimensional 'anomalous' behavior means.

Can you use this for bit selection?

The technique has been used nine times – so we don't have enough data yet. Drillers also prefer seeing data from the tools rather than the CH. But the CH offers more rich information than a simple cross plot.

Thought of using gaming visualization techniques?

Yes. This looks like a fruitful field for visualization – using lighting, shading etc.

TW0705_6 Field of the Future – Chris Reddick, BP

Reddick stated that BP's Field of the Future program has added one billion barrels to BP's reserve base[2]. This is not deferred production – 'it's not about just getting oil out more quickly.' Increase production and reserves are delivered through use of real time data. This means getting compatible with the real time data world. BP's new projects get real time data infrastructure – communications, hardware and automation. BP also plans to retrofit such infrastructure on brown fields. 'Short wavelength' optimization impacts production while 'long wavelength' impacts reserves. BP's 'framework for value' addresses reservoir losses (water injection), well losses (sand and slug management – 'beam up' times, sand alerts), plant losses (rotating equipment monitoring). Also ran – 4D/life of field seismics, intelligent wells, real time reservoir management and more. Reddick recommends caution when comparing high level business cases (that are almost meaningless) and highly granular competing analyses. The challenges of providing a clear business case and assuring people/process integration should not be underestimated.

Q&A

What basics are you rediscovering?

Well flow models are now easier to build and use.

What is the ROI on the billion barrels of new reserves?

We have not developed a business case for accessing these. This is a long term game – made up of components like well control which itself has a massive ROI.

TW0705_7 Oilfield Ontologies – Bertrand du Castel, Schlumberger

Schlumberger Fellow Bertrand Du Castel gave a suitably erudite and rather obscure presentation on the application of semantic web technology to homogenize security across various digital oilfield subsystems. The Internet, SCADA systems, and ISO 27001 all expose different security models. What is missing is a common security 'ontology,' a problem that extends across other facets of 'remoting' operations, real time, automation and 'augmentation.' Citing Thomas Sheridan's book, 'Humans and Automation,' Du Castel described the 'prize' as 'goal-oriented, distributed workflows' enabled by ontology, process model, interaction and 'interstriction' models. Bayesian logic leveraging Norsys' Netica also ran. All will interact through a services-oriented, semantic web, OWL and UML and BEPL. Du Castel showed pilot smart fields where composite business process modeling has been deployed. Du Castel's buzzword bonanza included state models, action models and more books 'Model Driven Architecture and Ontologies (Description Logics) by Jan Dietze. The plan is for automation systems to be

[1] *http://en.wikipedia.org/wiki/Convex_hull*

[2] *In 2006, BP's exploration effort added 1.4 billion barrels of oil and 1.3 trillion cubic to its proved reserves of 17.7 billion barrels of oil and gas equivalent.*

linked by a services-oriented architecture (SOA) *à la* semantic web[1], blending web technology with artificial intelligence (AI)/ontologies, intelligent agents, and Baysian decision support. Add in some ontology, OWL and UML and home in on business process modeling with Active BEPL. Du Castel concluded with a real world smart field business process model leveraging Bayesian reasoning.

TW0705_8 CIO Roundtable

Reddick, Lefebvre, Parker, Estellita, Paul, Masada and chairman Mahdavi.

0705_8.1 Gary Masada, Chevron

Masada

Chevron has process for everything. One process aligns IT capex with business to maximize value. An unexpected consequence was a 5 year view of people needs. This information was shared with staff to influence personnel development plans and hiring. After 2 decades of experience of downsizing, most Chevron employees have never experienced growth. IT head count has risen by 50% and staff are getting younger. Attrition is low and 'folks have fun in IT – there are many interesting projects.' Chevron now has a global IT talent manager and programs for mentoring, college recruitment and training – 'Horizons for IT.' Chevron is also a believer in 'renaissance engineers' a.k.a. 'earth scientists with a nasty IT habit.' IT enables the technology that enables the business.

0705_8.2 Marcelo Estellita, Petrobras

Estellita

The IT component of Petrobras' digital oilfield initiative is 'GeDIg[2],' the 'digital integrated field management' program. Petrobras considers its in-house development culture as a 'real competitive advantage.' The GeDIg stack builds on process control, the PI Historian, the E&P data store, middleware and applications. GeDIg includes real

[1] *World wide web inventor Tim Berners-Lee's crusade for more data tagging in a next generation web. This has spectacularly failed to get any significant traction since it was first announced in 1994.*

[2] *Intriguingly, if you Google "petrobras gedig" most references are understandably in Portuguese. But the second language is Norwegian!*

time data cleansing and predictive analytics. Predictive analytics leverage SOA, visualization, data mining, etc. etc. Petrobras is sponsoring Masters and PhD programs and international conference attendance for its employees.

0705_8.3 Brit Parker, ConocoPhillips

Parker

Parker spoke about 'life after ERP.' 'What did we get from ERP?' A move from mainframes to client server computing. A lot of outsourcing of development around core systems. While this was great for downstream, it has not been so easy to integrate upstream data and processes. CEOs and CFOs are asking questions – 'they think we are done!' We now need to think about the impact on people, and what do about data, including real time. All of which creates opportunities. You can get drilling costs from around the world OK, but drillers do not report consistently so it is unclear what the numbers mean. But we do get 'presentable' real time data from the Historian. Meanwhile we live with the pain of ERP systems and look forward to extracting real value from such systems – 'it's not going to be easy.'

0705_8.4 Chris Reddick, BP

Reddick

The digital oilfield is about increasing production and reserves with real time data. This implies change management and value measurement. Data management is the key to real time. BP 'actively' manages real time data in some 20 fields around the world. This has solved sand management issues (1-3% production gains), slugging, instability management (1-2% production) and remote collaboration produced a $500k value in 3 months in the North Sea. $2m extra revenue was generated through process optimization at one LNG plant. A 'common framework' for defining digital oilfield opportunities can be useful. It is preferable to address a few high impact opportunities. You need clarity of business case. This is hard to achieve and harder to measure.

0705_8.5 Q&A

You referred to 'predictive analytics?'

BP – This is one use of real time data. For instance we continuously and mine large pressure and temperature data sets streaming in from fields. After two years of production, we know as much about connectivity as 10-15 years of conventional monitoring would have produced.

Chevron is also a big user of data mining techniques.

Three top issues?

Chevron – deliver on plan. If you don't execute, you will be executed!

ConocoPhillips – Integration of our major acquisition and a 'target rich' environment in operations. You need discipline to select the right targets for optimization.

Total – Field monitoring, 3D visualization and work with HR on change management and improved use of collaboration tools and concurrent engineering.

BP – We have set up several laboratories to experiment with technologies. We'll take the best ideas and apply them.

BHP Billiton – Real time data is flooding in and there are no policies for retention. What should be done with the flood of engineering data?

Oxy – Once every well is tied-in you have data flooding in and you are buying the next set of terabytes of storage. We may be looking for a silver bullet that doesn't exist. As storage costs decrease it is getting harder and harder to find your way through the data. We deploy more and more stuff in the field and data is increasing commensurately. If anybody has the answer see me afterwards – I'm just buying more storage!

BP – It should be feasible to extract reservoir connectivity from real time data. Other uses include sand management. You need to create a data library to be more effective.

Chevron – The rate of data acquisition is greater than storage. We are heading for overflow!

Energistics – We are surprised that data standards have not been addressed here.

BP – ProdML is a worthwhile initiative which we fully support. But how far do you want to take this? How many data types?

Schlumberger – This is a good topic for the SPE subcommittee on systems integration.

We should focus more on process than tools. IT should be transparent to users. How do we optimize processes?

ConocoPhillips – I agree, it all comes down to process and change management.

TW0705_9 Information Architecture for the digital oilfield – Hugh Sardoff, Chevron.

Chevron's San Joachim Valley (SJV) business unit has several 'field of the future'/'digital oilfield' initiatives or, as Chevron prefers, the 'integrated oilfield' or 'i-Field.' The SJV has thousands of wells and several large facilities in a small geographic area. Workover scheduling is 'a real issue' that necessitates cross-discipline collaboration. In the past, a workover might have been completed, but the well not put back on stream because the increased capacity had not been notified. In the i-Field, plant owners are watching workover progress and are ready with capacity as soon as the well is back online – all part of the 'i-Field transformation.' In the office, there are too many interfaces, data duplication, de-centralized information ('my data' not 'our data') compounded by data 'hoarding' in Excel/Access. Other problems are lack of integration, the difficulty of customization and of 'onboarding' new data.

The 'To Be' vision is of a streamlined, 'level zero' upstream foundation a.k.a. the SQL Server-based 'Minerva' Repository[1]. This sets out to improve security, reliability and to provide 'agility' with communication paths and standards, using a 'Lego' approach so that different businesses can build different components of the solution. These include 'first mile' connectivity to wellsites, real time data interfaces, and a 'standard, services-oriented architecture across Chevron's global upstream.' Sardoff commented on the lack of SOA maturity. Chevron uses Microsoft's latest SQL Server 'standards.' But SOA will be the key. ProdML and WitsML are deployed in a 'consistent' data architecture. The project has exposed data quality issues that need addressing as well as a need for a code development/management capability. The architecture leverages the PPDM data model, business intelligence, services and a presentation layer.

Q&A

This is an operationally mature area – will it be applied elsewhere?

Yes it will be used in the Gulf of Mexico and Europe.

What about data standards?

The data organization inside Chevron tried to understand what was there and drove the data architecture. We are in the process of levering PRODML. PPDM is core to our architecture.

TW0705_10 Intelligent, digital closed loop integrated system – Peter Oyewole, BP

Peter Oyewole's presentation covered an 'intelligent, closed loop integrated digital system' as deployed on BP's San Juan Basin prolific coal bed methane field. The system manages tubing flow control, plunger lift and other artificial lift systems and has resulted in increased gas production, better equipment reliability and in the development of an efficient cheap deliquefaction process. Remote operations connect RTUs to Invensys' Industrial Application Server. Data is fed to Maximo for work order generation, E-Choke (for choke analysis) and FDA (field data analysis). Multiple SCADA interfaces are integrated through an abstraction layer to Modbus. The

[1] *See also Oil IT Journal on Chevron's SEER project - http://www.oilit.com/corporate/2article/0704_14.htm.*

system allows BP to switch to and from plunger and artificial lift as appropriate and to control tubing flow. Condition-based soap injection and other remedial actions are also enabled.

200,000 I/O points feed data to SQL Server and Invensys 'InSQL' Wonderware historian. Visualization is via Wonderware InTouch (showed a neat schematic of the production system) with an interface to Maximo for work order generation. Citrix server for client visualization. MI-Swaco's eChoke model and FDA (field data analysis[1]). RTU application design leverages abstraction and modular code that separates physical from process I/O. HART Bus also ran. Some ten different, incompatible SCADA systems were deployed – these were integrated through an abstraction layer to Modbus, Accol, and Control Microsystem's SCADAPack.

Q&A

Shell – What about the practicality of implementation and power supply required?

Yes there were initial investments. Remote ops, solar panels – 12/24V ops. Go to IT guys for control at distance. Vendor came up with the goods – this is a very flexible system.

Chevron – Plunger lift technology is already available from many vendors. Do you see yourselves moving further along the in-house-development route?

Our big push is for a fully autonomous system. We want to be able to change vendors, rather than to rely on a specific vendor's solution. You can't 'tweak' vendor programs for optimization. Our system can be changed overnight.

Is maintenance included in the system?

Yes with Maximo.

TW0705_11 High Performance Computing Session

0705_11.1 Out-compute to out-compete – Suzy Tichenor, US Council on Competitiveness

The special session on high performance computing (HPC) began with a video from the 'US Council on Competitiveness,' (USCoC—www.compete.org). The video showed how HPC is essential to weather forecasting, the US Navy, medicine, the entertainment industry (the movie Madagascar used over 12 million CPU hours) and, seismics. Curiously, the video was narrated by a penguin, a reference perhaps to Linux[2]' ubiquity in HPC. The video was produced by Dreamworks – with a long list of contributors (not Microsoft). The USCoC's Suzy Tichenor believes companies need to 'out-compute to out-compete' and in this context, HPC is an 'innovation accelerator.' HPC provided critical compute horsepower for Chevron's Jack development. HPC has been used to simulate a Pringle cracker! Procter and Gamble solved the problem of Pringles flying off production line with CFD[3] code. For Chevron, HPC provided critical compute horsepower for Jack development. Barriers to take up include lack of talent, lack of scalable production software, cost/ROI issues. HPC is a bi modal market with a big missing middle. A new public private partnership, the DoE INCITE program (www.science.doe.gov/ascr/incite/) and www.compete.org address some of these issues.

0705_11.2 Petascale problems in oil and gas – Jim Clippard, Shell

Jim Clippard enumerated some 'petascale' problems such as 'seeing' (seismic) and 'draining' (reservoir modeling) the earth. Compute-intensive reverse time wave equation migration 'makes the invisible visible' in the sub salt section of the Gulf of Mexico. Achieving such compute horsepower involves power and heat issues. Shell's facility costs $20k/year in electricity. For Clippard, the future is parallel, even though programming such machines is a challenge. Bottlenecks such as memory and interconnect latency differ for different jobs and machines. There is a need to manage heterogeneity, 'IT folks hate this!' Ultimately users will be able to push a button on the desktop and have an HPC cluster run in the background.

0705_11.3 BP's 100 TFLOPS – Keith Gray, BP

Keith Gray has 'one of the most fun jobs in the company,' managing BP's 100 TeraFlop HPC installation. BP's focus is on subsalt seismic imaging and has 'delivered results and shown breakthroughs to the industry.' BP's compute capability has grown one thousand fold in the last eight years. The seismic machine now sports 14,000 cores and 2 Petabytes of storage. All of which implies a significant effort in data management, code optimization and parallelization. There is also a need to strike a balance between systems that let R&D develop its ideas while production users have the scale they need. Some very large memory systems offer straightforward FORTAN programming for researchers. Gray believes we may have pushed too hard towards commoditization and are

[1] *Possibly from http://www.bqr.com/.*

[2] *It was not clear whether the penguins were a reference to Madagascar, the movie, or Linux, now the operating system 'that dares not speak its name!'*

[3] *Computational fluid dynamics.*

seeing fewer breakthrough technologies.

0705_11.4 HPC strategy – Stephen Wheat, Intel

Wheat implied that Intel is No 1 on the Top500 list of supercomputers[1]. Supercomputing has moved on from around 100 GigaFlops in 1993 and a 'ZetaFlop[2]' is expected by 2030. A real world 'Exascale' problem is a model of a tiny bit of the human brain. The US Department of Energy is holding a 'Town Hall' meeting on Exascale for Energy, Ecological Sustainability and Global Security next week. A 'large' cluster today is 8-10,000 nodes. Soon, 40-50,000 sockets/nodes will be 'large'. Intel's silicon roadmap extends out to 2011 (for sure) and more speculatively to 2017 with 8 nanometer technology. The approach is to deploy new architecture on old technology, then shrink to new technology and repeat. Intel has one teraflop research chip with 80 cores and expects to reach the Petaflop with 5,000 processor chips but here are 'issues' with memory access/bandwidth.

0705_11.5 Independents and HPC – Tom Halbouty, Pioneer

Pioneer has two clusters – one for reservoir, one for seismic test (not production). The technology 'trickles down' from majors to independents. Halbouty advocates joining up with universities and going beyond 'shareholder short termism,' looking to the future.

0705_11.6 Q&A

What are the challenges regarding application software?

There is some ongoing research with ISVs but these are often financially fragile and have few resources for software rewrite.

Landmark – We really need a paradigm shift to avoid a complete code rewrite. Compilers have to solve the problem. Currently in many 4 core systems, one core actually works while the others just hang around!

BP – We also need to hire smart people – I see we are all about the same age.

HP – There is a problem regarding investment in code. The ISVs are pressured to get more for less. Money is going into hardware not software - which is a subsidized activity – as Mr. Wheat knows! If we don't fix this the yawning gap will stretch and the software for the petabyte machine will not be there. Take up has been poor for the HPCS[3] program.

BP – Three years ago we had to make a cluster investment decision and arbitrate between the shared memory needs of the R&D community and the parallel processing requirements of the seismic computing fraternity. In the end, the system deployed 'irritated both communities equally.'

Framework – We have been developing some open source software for clusters but have had very little feedback from industry. Where is the industry collaboration in HPC?

Pioneer – Perhaps we should be leveraging federal investment opportunities?

USCoC – There are political challenges. Some administrations feel that partnerships are not a good use of tax dollars and prefer technology transfer. But the pendulum has shifted back to a degree. The Incite program has been challenging regarding IPR.

BP – We are very interested in open source. All our clusters run Linux with a mix of open source and commercial debuggers. We also use an open source job scheduler.

Shell – We are in the same boat. But we are cautious about un-maintained code. There is nobody to 'squeeze' till it's debugged.

BP – We are willing to try any model – including paying for open source development.

Shell – We have partnered with government labs on the Petascale initiative.

BP – We are also involved in a number of partnerships – but it is hard to form something that will scale. Everyone has limits on CPU time. We prefer informal conversations with labs, comparing notes. We send our system administrators and programmers to chat for a few days.

Intel – The debate goes on regarding 'big iron' and aggregated 'small iron.' Moore's Law overcame the big systems of yesterday. Now, rising core counts will bring parallelism to every aspect of code.

TW0705_12 Data cleansing with WebMethods – Paul Gregory, Intervera

Gregory compared the 'currency' of Wikipedia with the 'trust' of the Encyclopedia Brittanica. G&G wants both currency and trust in its upstream data. Unfortunately, data entropy militates against this. Intervera's software

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[1] *Hard to see why – the Intel Itanium is only N° 7 on the current (November 2006) list – www.top500.org.*

[2] *1,000-fold scaling is Giga, Tera, Peta, Exa, Zeta and Yotta!*

[3] *Probably DARPA's High Productivity Computer Systems initiative http://www.highproductivity.org/.*

works against entropy, 'tuning' data management to data temperature, leveraging SOA, middleware, data quality tools and process modeling/workflow tools. Scott Schneider (Volant Solutions) showed a proof of concept data integration platform integrating data quality – 'I+Q'. This takes OpenWorks project data and imports data into a PPDM 3.7 master data store. Data is cleansed on the fly, stored in the master and is available for project population. WebMethods is used to 'counter data entropy with automated effort.' A commercial version of this tool 'Match' will be out next month. More from www.intervera.com and www.volantsolutions.com.

Q&A

How do you keep the adaptors up with Landmark/SIS data base changes?

There is no secret sauce. Sometimes it is easy, sometimes not. The WebMethods framework makes it easier to build and maintain adaptors.

TW0705_13 Andrey Bakulin, Shell – 4D as smart field enabler.

Permeability can vary rapidly by orders of magnitude and it is the outliers that control reservoir flow. Lateral variations are not captured by wells. Hence 3D (4D) mandated. Draugen field – even in the excellent (4 Darcy) reservoir, recovery is less than 50%. A 4D survey cost $4 million and generated $84 million of 'accelerated production.'

TW0705_14 Leadership Round Table

0705_14.1 Well lifecycle portal – Cathy Tomkins, Chesapeake

Tomkins

Focus on quality and ownership. IT did not get to play a big role historically and Chesapeake has ended up with point solutions. IT is 'not privy to all asset team meetings!' Chesapeake plans to build a collaborative solution around its existing well lifecycle system. The Portal concept will pull key information together so users can find data quickly and allow more time for analysis.

0705_14.2 Digital oilfield evolution – Herb Yuan, Shell

Yuan

Oil fields are getting deeper and targets smaller, creating 'cost challenges.' Oil and gas has deployed technology successfully and it is now 'a natural way of doing business.' The digital oilfield is not a 'big bang,' rather a gradual evolution. Yuan offered a different slant on the 'people challenge.' Technology needs to be made repeatable so that it can be implemented by 'regular people,' not experts. Yuan has been talking with Shell's global downstream IT about 'touch points.' The conclusion is that 'integration is going to happen because IT is already there, acting as an enabler.' Upstream and downstream already have common suppliers and applications (especially SAP). The question is 'how best to leverage IM across the upstream and downstream?' Yuan offered the audience a 'personal challenge,' consumers are now very aware of oil and gas, especially with gasoline at $3. How should we communicate who we are and what we do – to friends and neighbors? Energy is a noble activity.

0705_14.3 The 'token downstreamer' – Mike Gibbs, ConocoPhillips

Gibbs

Gibbs' message to the upstream, 'Your product is only any use to a refiner. Without us you'd just have a lot of black goo!' Refinery concerns center on safe operations, costs and reliability improvements. Refining is a small margin business, the difference between demand and capacity has shrunk to a few percentage points and vulnerability to disruption is a reality. Downstream IT is different with lab systems, data historians and control systems. A firewall separates the process control IT from the business – although the platform is getting closer all the time. Downstream IT reaches out to the consumer at the point of sale. Here standards for credit card payments change almost on a monthly basis. Other domains include transport, scheduling, bar coding of piece parts (lube cans) and eventually RFID. Technical challenges include more and more metering and measurement. Supply chain activity means knowing 'where the barrels are?' at any time – offering support for traders through centralized applications. Gibbs hopes to broaden the use of technology through improved usability.

0705_14.4 A brief history of software integration – Mike Pfister, Halliburton

Pfister

Pfister has just rejoined oil and gas from four years outside of oil and gas. Halliburton can't operate like Microsoft and expect clients only to use Halliburton's own products. Halliburton acknowledges that you will use third party products and offers workflow, openness – a 'non discretionary' part of offering. Openness is provided through software development kits (SDK) that give access to embedded features in Landmark's software – or to let you develop your own. Pfister offered a brief history of software integration from '3rd generation' (many to one, like OpenWorks), '4th generation' (one to many, OpenSpirit) and '5th generation' (many to many – a.k.a. DecisionSpace a.k.a. the 'next generation infrastructure for real time and remote operations'). Other 'neat stuff' includes the 'wired truck' that tells the driver 'slow down, a bad curve is coming up.' This is enabled by GPS accelerometers, seat belt and gas consumption monitoring. Halliburton is also moving telemetry down hole, doing 'smarter stuff with pipe.' Ultimately, 'a down hole tool is just another node in the network.'

0705_14.5 Q&A

There is a perception in the upstream that the IT grass is greener on the downstream side of the fence. What is your take?

Upstream has more money but we have more control and vision of what happens. There are still huge opportunities to improve downstream IT.

With the exploding cost of drilling, IT is often on the chopping block. If you were a dictator what would you push through?

Shell – There is no question that there are cost pressures. We are under pressure to travel less and have just installed high definition video conferencing. This is so good you can see people frown!

HP – IT cost optimization needs to be done on a global basis.

Halliburton – I think that there are many opportunities for rationalization. We have had decades of IT feeding frenzy – buying portals and new tools. IT spend has reached a plateau and we are now learning how to use what we've got. We need to improve discipline and governance.

What ROI threshold is needed for the get go?

ConocoPhillips – We never 'buy software'. We look for a solution. For all discretionary IT expenditure over $100k we expect a 50% ROI.

Buy or host?

ConocoPhillips – We are not into hosting yet.

Halliburton – Hosting is a great way to try out software.

Shell – We expect to see more and more. When we have tried it, it works well.

Who is in the driving seat, the oils or service companies?

Halliburton – I hope that we are driven by our customers.

Chesapeake – We tend to follow the majors' bleeding edge stuff.

Shell – We diversify, keeping high value stuff in house.

What are your main problems?

Chesapeake – People, change management.

Shell – Data. There are no 'points for style in data.' No best practices even though things may be done well locally. It is hard to achieve a shared mindset across the company. We need to embed IT in the business.

ConocoPhillips – A&D – the process of acquire, integrate, dispose, acquire and integrate again is hard. We need to 'unwind' a tightly integrated company.

Halliburton – Cash! A ceiling on resources.

HP – Software investment to unlock the potential of the technology.

Chesapeake – Standards remain an issue. It all seems a struggle – what's your perspective?

Shell – We have pushed ProdML. I am on the Energistics/POSC board and am adamant about standards. But in Shell, uptake takes time. Things should get better as standards get embedded in products. Standards are not natural – they feel bureaucratic. But BP, Shell and Chevron are pushing for standards.

ConocoPhillips – PIDX has worked great as a downstream standard for transactions with other companies' terminals. It works well.

HP – Regarding IT Standards, HPC is a Linux play today. Microsoft is an 'aspirational' player. It is a good thing to avoid a platform monopoly – keep options open.

TW0705_15 Industry at 'do or die' point – Phiroz Darukhanavala, BP

Oil and gas is deploying smart drill rigs, with real time analysis of samples and decisions are now taken at rig site 'by geeks and roustabouts.' Maintenance is tracked by handhelds – perhaps with 'location intelligence,' position sensing to track cans of fuel/lube oil and affordable wireless monitoring of rotating equipment. Previously much critical data was lost to maintenance. Battery powered wireless self healing networks are on trial on board BP's oil tankers. The question today is 'how to manage, how not to drown in data?' And how to avoid wasting the data resource – through unused drilling or seismic data. This is a 'personal challenge' to make more and better use of data. Darukhanavala estimates that 75% seismic data is 'underused' and 50% of logs are 'discarded unused through constraints of time cost.' We still talk about real time (RT) data – but today, RT is not fast enough. We need predictive analytics. Don't react – predict before it happens. This is happening in refineries – fixing a problem before downtime – getting information to the operational coal face.

BP is opening up its global processes as remote working takes off. Teams in the 'Gulf of Mexico' step across the hall to 'Nigeria' – or go upstairs to Caspian. And get home in time for tea. Remote working lets expert teams collaborate, create new processes and initiate rapid problem solving.

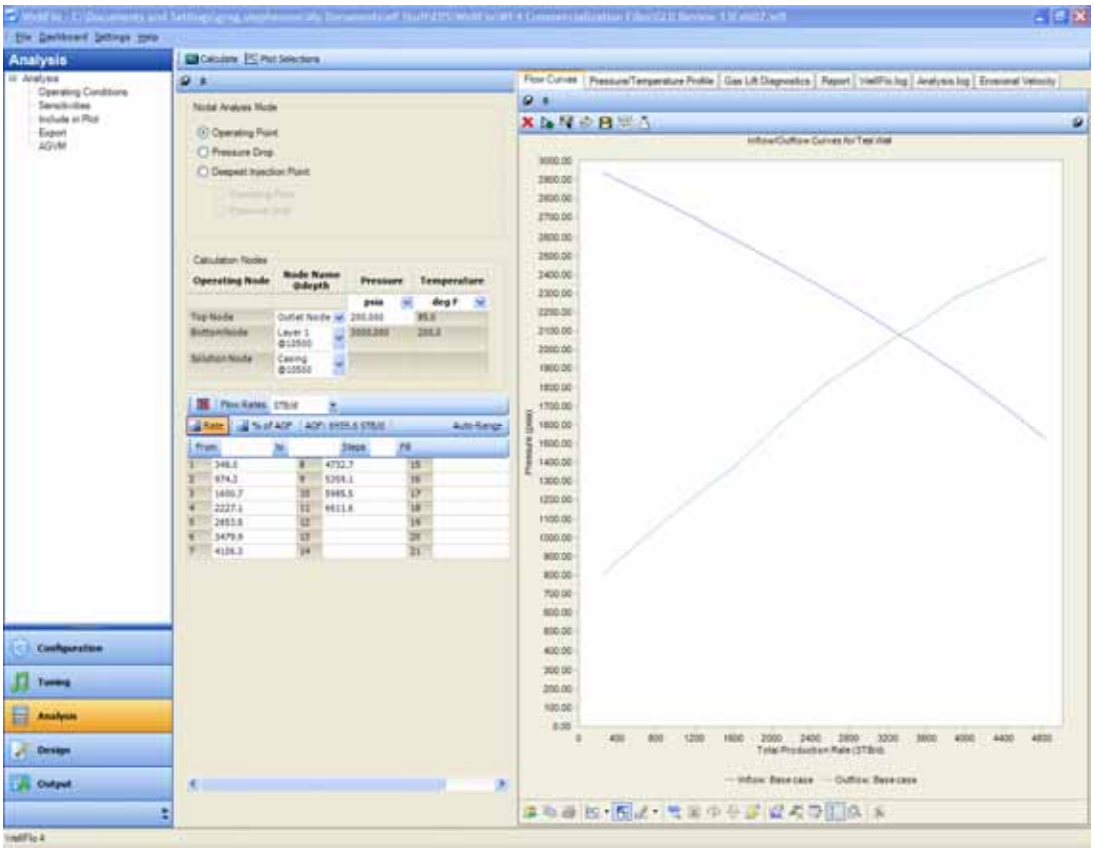
Turning to the 'people' theme, Darukhanavala believes that opportunity and success go to those who are digitally literate. A combination of roustabout and geek – neither has an automatic edge in the new mix. But the 'renaissance' person is a tall order – people are used to be in either operations or IT. In future they will go back and forth, influencing who is recruited and how they are trained. But the two worlds must be bridged in the future. The industry is at a 'do or die' point. Darukhanavala concluded his talk with a challenge – to shape a digital conference 'dedicated to renaissance people.'

TW0705_16 Exhibitors

0705_16.1 Energetics – Interactive Energy Roadmap

The on-line ieRoadmap (Interactive Energy Roadmap) lists energy control systems projects with sponsorship from the Process Control Systems Forum (PCSF). The ieRoadmap is a part of an industry-defined plan secure control systems in the energy sector. The tool organizes projects across the public and private sectors according to key challenges. Goals are (1) measure and assess security posture, (2) develop and integrate protective measures, (3) detect intrusion and implement response strategies, and (4) sustain security improvements. The ieRoadmap tool was developed by Energetics Incorporated under contract to the US Department of Energy and is available at https://www.pcsforum.org/roadmap and www.energetics.com/csroadmap/.

0705_16.2 EP Solutions – Well Flow 4.0



WellFlow 4.0 GUI[1].

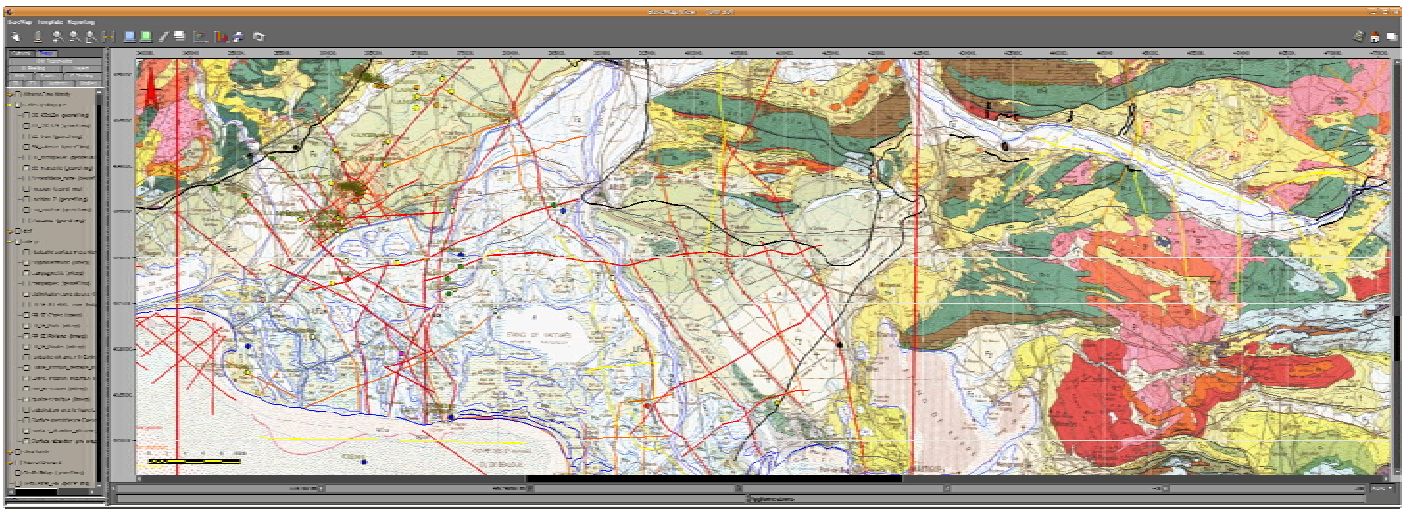
Weatherford unit eProduction Solutions has released WellFlo version 4.0. WellFlo provides modeling, design and analysis for electric submersible pumps (ESP) and gas lift, inflow and outflow performance modeling and other applications. WellFlo 4.0 software was specifically designed to aid petroleum engineers with five basic well completion and production engineering functions: configuration, tuning, analysis, design and output. More from www.weatherford.com.

0705_16.3 InSors' IG2 collaboration infrastructure

Chevron is to deploy inSORS's Grid IG2 network on its Tahiti and Blind Faith production platforms to link Houston-based field engineers and geoscientists with operations for engineering and emergency response. inSORS leverages Microsoft Office Communications Server (a component of Vista) – previously Live Communications Server. More from www.insors.com.

[1] *Image courtesy Weatherford.*

0705_16.4 Interactive Network technologies - JGeoToolkit



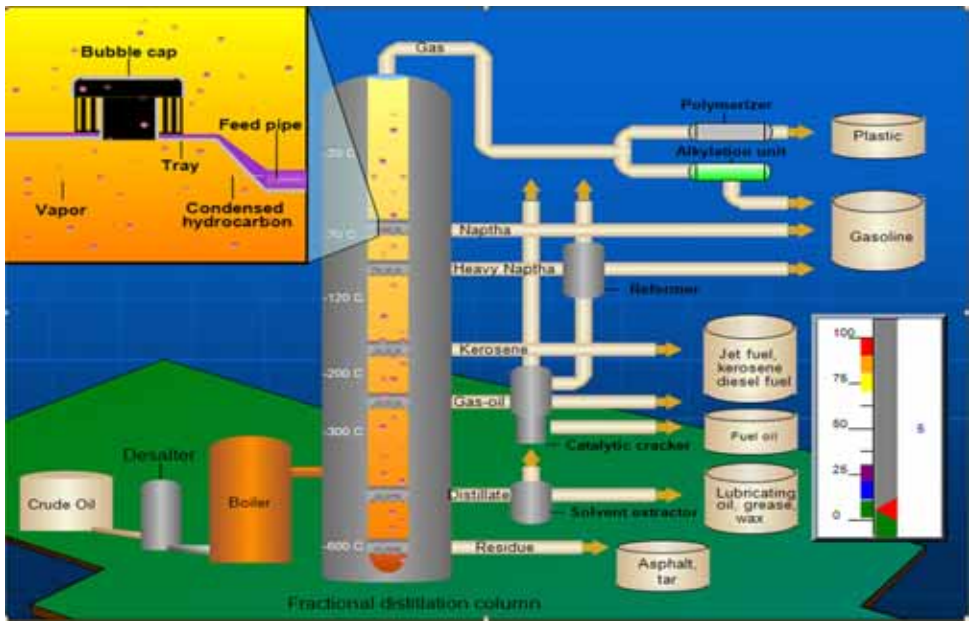
INT's JGeoToolkit used by Total in composite seismic basemap[1].

INT's JGeoToolkit provides real time rendering with continuous zooming and scrolling of complex scenes enabled by INT's 3D engine. This takes advantage of the available graphics hardware acceleration to display 2D shapes and images at high frame rates. Multi resolution generation on-the-fly minimizes texture memory usage. More from www.int.com.

0705_16.5 K2.NET's Black Pearl platform for

K2.NET's workflow development platform plugs in to Share Point/Visio/Visual Studio and orchestrates SAP and other applications to tune and optimize process. The tool is embedded in Stonebridge's Well360 product and is also used by Chesapeake to monitor production data in OSIsoft's PI System. InfoPath also ran. More from *www.k2.net/bp*.

0705_16.6 Kinesix KX EDGE



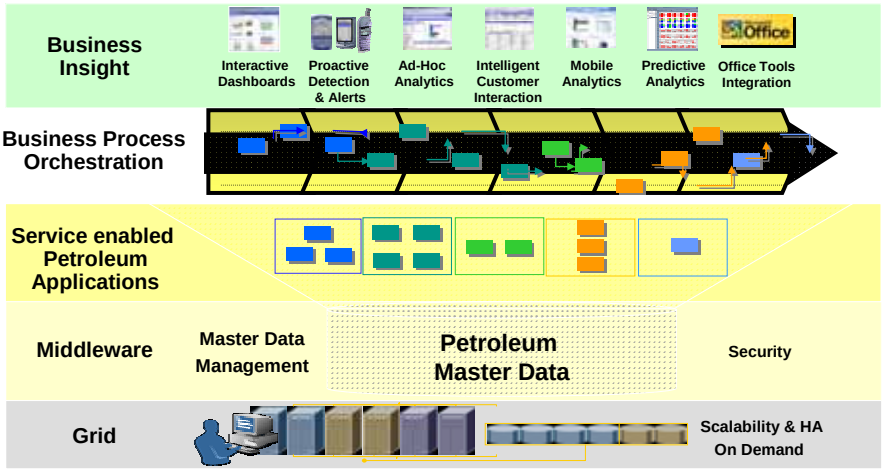
Real time data display of distillation column with KX EDGE[2].

Kinesix' KX EDGE adds graphical user interfaces to command and control applications for a variety of industries including oil and gas. KX EDGE 1.5 lets users monitor large data volumes with compelling real-time graphics and without special software. More from www.kinesix.com.

[1] *Image courtesy INT and Total.*

[2] *Image courtesy Kinesix.*

0705_16.7 Oracle's return to oil and gas vertical

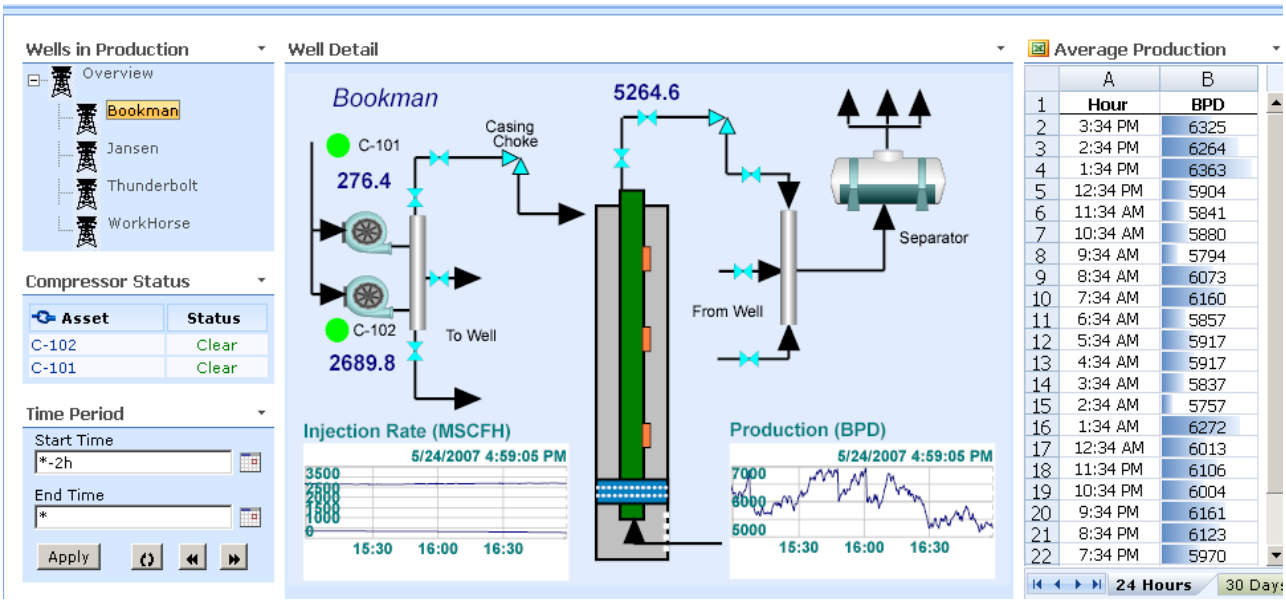


Master data management in Oracle's Well Data Hub[1].

Oracle is back with a revamped offering to the upstream. First with a 'line of business' application suite, representing a move from databases which are now considered as 'commodity.' Oracle's LOB apps target mid market companies 'that find SAP too expensive.' More concretely, Oracle is offering an 'apps unlimited' program with indefinite support for JD Edwards (JDE) and PeopleSoft. Oracle is also entering the SOA space with the possibility of building a hybrid application, leveraging its 'Fusion Application Stack,' a 'pure JAVA/XML' SOA infrastructure. Oracle plans to componentize JDE to offer oil and gas-specific applets and build solutions from objects. Fusion Middleware is compatible with IBM, TIBCO and interfaces with .NET despite some 'issues as to the degree to which Microsoft is committed to W3C standards.' Another project is the new Petroleum Master Data Management project a.k.a the Oracle Well Data Hub. This leverages a 'core data model' which could be PPDM or Seabed, adding data cleansing business intelligence and a portal/dashboard. The proof of concept Well Data Hub is in test with a supermajor which is using it to manage oil country tubular goods (OCTG). Three different naming conventions are managed in an Oracle Data Warehouse. According to Oracle, 'oil and gas is 5 years behind financial services re data warehousing and master data management.' More from www.oracle.com.

0705_16.8 OSIsoft – Web Parts front end for PI System

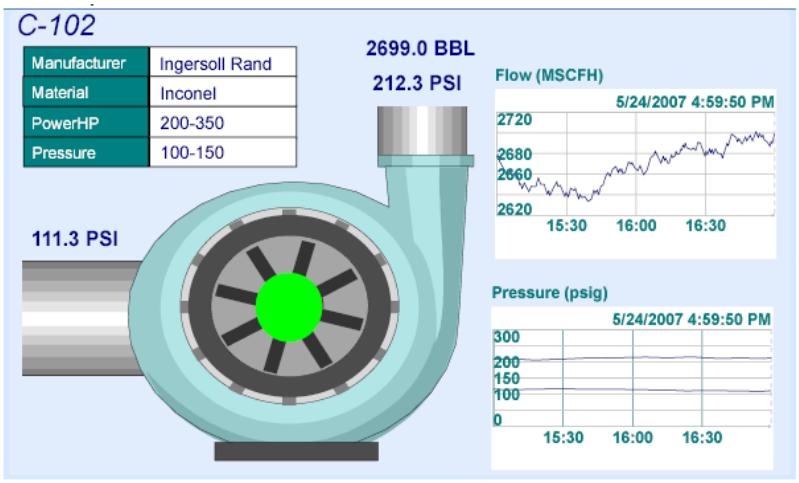
OSIsoft's Cheryl Dugger believes that standardization at the control system level is impossible since there are too many different systems installed. The answer is to standardize at the data/fabric level – i.e. at the Historian. Data lasts for the lifetime of an asset. Business critical data can feed up to the ERP system (inter alia). OSIsoft is currently negotiating 'prolific' software agreements with two majors for deployment and management of PI Systems. OSI connects and manages the system, warning of performance issues. OSIsoft now considers itself the primary gateway between process control (PC) and the business.



[1] *Image courtesy Oracle.*

Real time process monitoring with Web Parts and OSIsoft PI System[1].

Real-time display of production data from well selected in tree view. The above demonstrator shows compressor status. On screen controls can change data time frame. The screen also shows the new Microsoft Excel web part connecting to PI system through OSIsoft' DataLink. The shaded bar graph in each cell shows a new feature of Excel formatting.



Data drill down to compressor detail.

Data drill-down allows navigation to more detailed well equipment. Windows Live Messenger is used to show on-line status of equipment owners. A chat session can be launched directly from the web part. Other web parts connect to work orders in the asset maintenance system. More from www.osisoft.com.

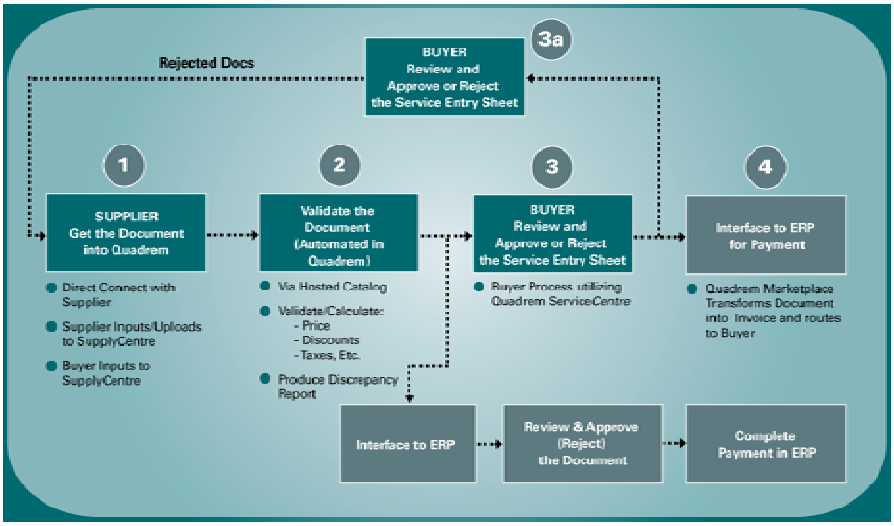
0705_16.9 PointCross – IEPS Dashboard

Integrated E&P Solutions from PointCross.

PointCross and CBM Ingeniería Exploración y Producción have configured PointCross' IEPS Dashboard (built on PointCross' Orchestra enterprise platform) to orchestrate many of Pemex' E&P processes. These span geological, geophysical, and engineering decision workflows and processes including drilling, facilities and seismic acquisition. OpenSpirit was used to access data in industry data sources to deliver a 'corporate wide system of record.' IEPS' XML data-model configurator leverages the University of Tulsa's Petroleum Abstracts E&P taxonomy to cross index people, roles and business contexts. Multiple search engines allow the creation of 'tagged expertise models' and asset metadata. Development and deployment is done collaboratively with the client. More from www.pointcross.com and www.cbmex.com.mx.

[1] *Image courtesy OSIsoft.*

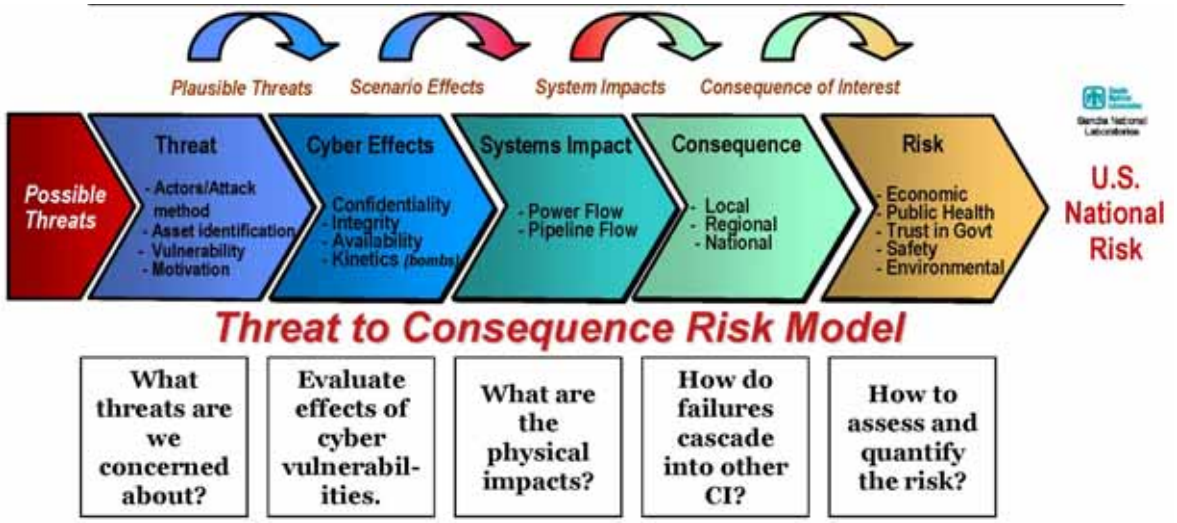
0705_16.10 Quadrem – eInvoicing for complex services



Oilfield e-commerce – Quadrem's electronic field ticket[1].

Quadrem's solutions automate complex services purchasing and eInvoicing with integration to both the buyer's ERP and suppliers' backend systems. Quadrem developed the eInvoicing for Complex Services solution for BHP Billiton Petroleum. Suppliers receive orders from the BHP Billiton's SAP system and send invoices through the Quadrem eMarketplace platform leveraging a central catalog of approved service items for validation of contract compliance and discount availability. The invoice is stored in the Quadrem platform and a pro-forma invoice is sent to SAP. Upon approval, Quadrem releases the invoice, which is automatically loaded to the BHP Billiton Petroleum SAP system for payment processing. eInvoicing for Complex Services solution supports attachments such as field tickets and other supporting information and is compliant with SAP iDoc, PIDX, RosettaNet and xCBL standards; ANSI x.12 to ISO UOM code conversion. Audit trail capability assures Sarbanes-Oxley compliance. More from www.quadrem.com.

0705_16.11 Sandia Labs – Institute for Infrastructure Protection



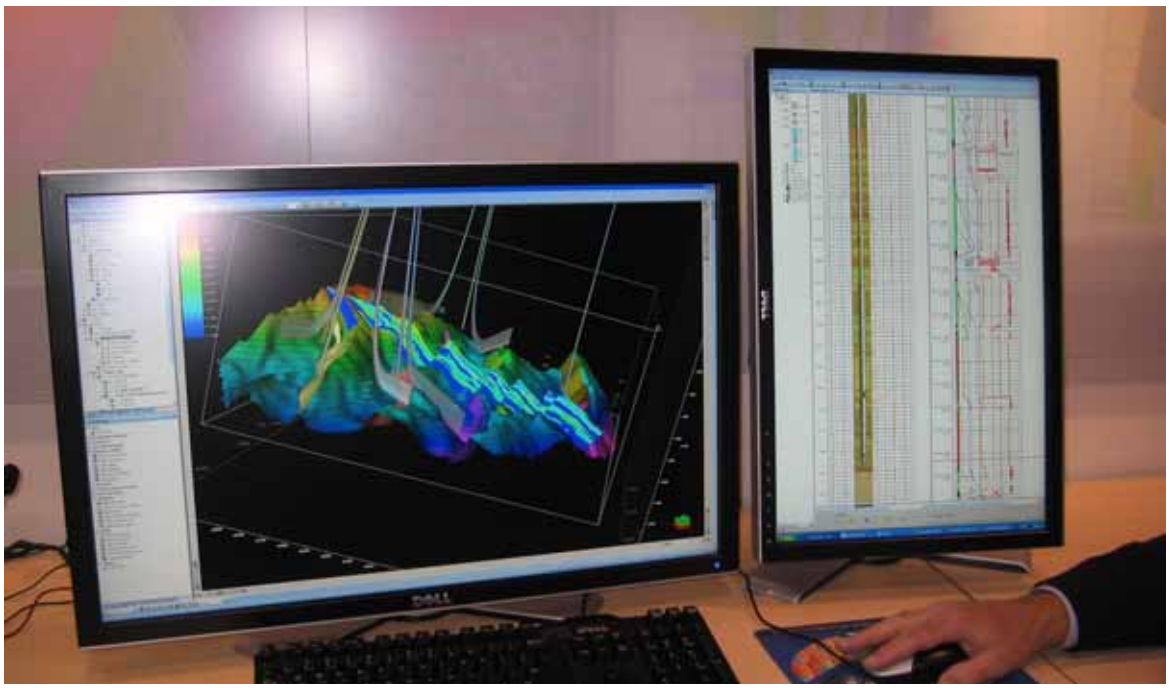
Sandia Labs' framework for cyber security risk analysis[2].

Sandia Labs is a consortium member of the Institute for Information Infrastructure Protection (I3P) (www.thei3p.org) which is working to safeguard process control systems (PCS) against cyber attack. PCS are vulnerable to a range of cyber threats with potentially serious consequences. The Sandia Labs-backed I3P has launched a $4 million PCS security project to make control systems more resilient to attack. More from Eric Goetz (egoetz@thei3p.org).

[1] *Image courtesy Quadrem.*

[2] *Image courtesy Sandia Labs.*

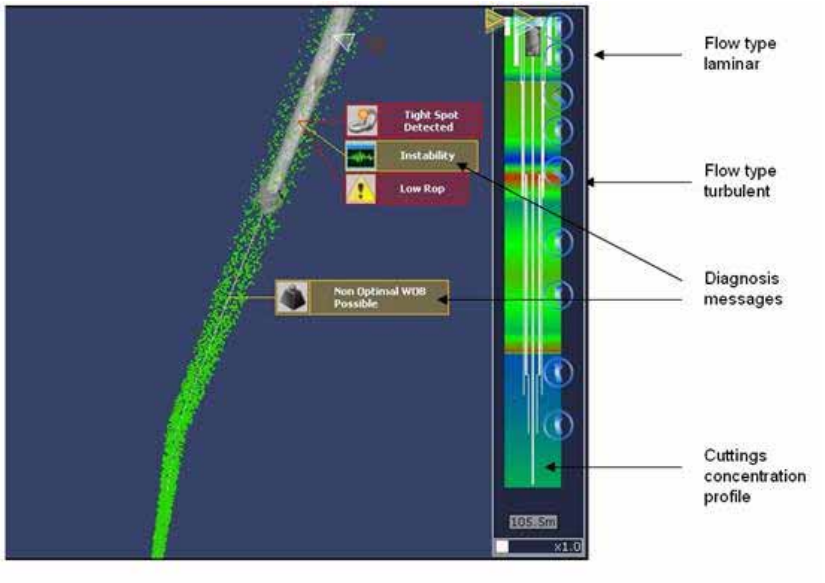
0705_16.12 Schlumberger Operations Support Center (OSC)



A tale of two cultures – Petrel and InterAct[1]

Schlumberger's Operations Support Center (OSC) integrates global real-time infrastructure, drilling expertise and professional services to link the wellsite to the office. There are three levels of support. Silver level – vendor neutral data collection and delivery from rig to office and monitoring tools with optional rig connectivity and collaborative environment. Gold level adds a Schlumberger operations surveillance engineer with access to Schlumberger's InTouch knowledge management. Platinum level adds well placement, drilling optimization and geomechanics and third party services. All of the above leverage Schlumberger's global InterACT infrastructure, a WITSML interface to third party vendor data. Real-time enabled applications include Petrel 2007.1, the PERFORM Toolkit and Interactive Petrophysics. More from www.slb.com.

0705_16.13 Sintef eDrilling Project



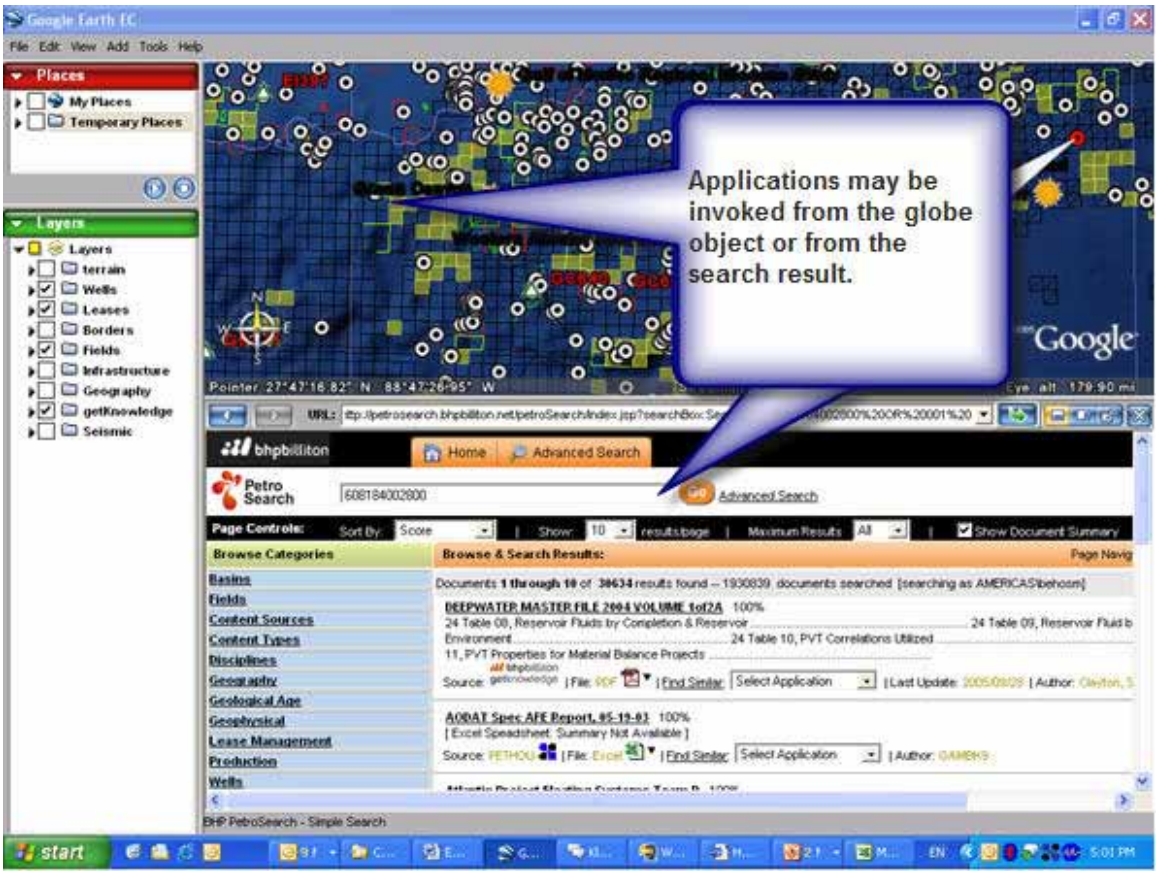
e-Drilling alarms and diagnostics[2].

[1] *Image courtesy Schlumberger.*

[2] *Image courtesy SINTEF.*

Sintef's eDrilling project is funded by ConocoPhillips and the Norwegian Research Council, and is executed by SINTEF Petroleum Research, Hitec Products Drilling, Maritime Hydraulics and First Interactive. More from www.sintef.no.

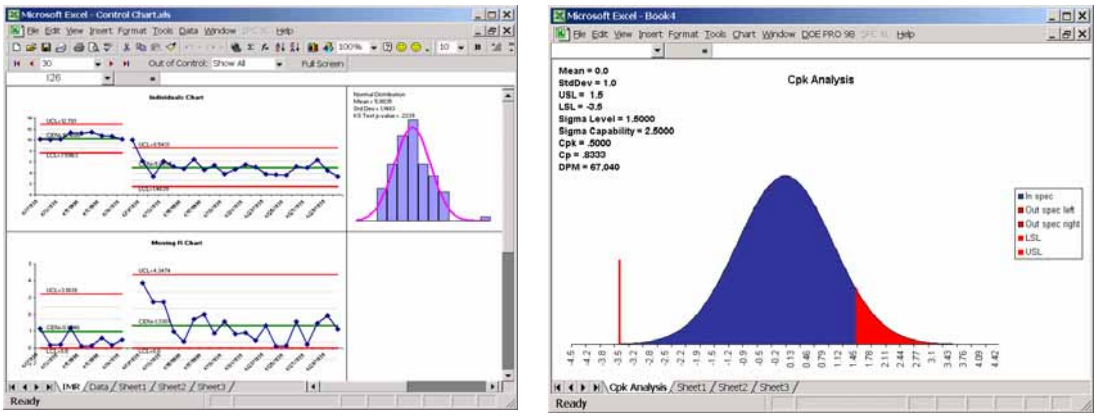
0705_16.14 Tomium's Google Earth helper app for BHP Billiton



Tomium-developed Google Earth search application atop BHP Billiton's PetroSearch[1].

Tomium has developed a Google Earth (GE) extension that offers BHP Billiton geographical search across structured and unstructured data. GE was linked to well, field, basin, seismic and lease data. Information can be retrieved with either Google or BHP Billiton's in-house 'PetroSearch' application. PetroSearch adds a standards-based taxonomy, allowing for search across multiple data sources. BHPBilliton has a single GE Fusion server supporting its world wide operations. 'Roundtrip' capability lets a user review search engine results, filter them and go back to Google for related information. BHP Billiton now plans to add real time data to the GE interface for visualization of production and cash flows. More from info@tomium.com.

0705_16.15 Variance Reduction – Six Sigma

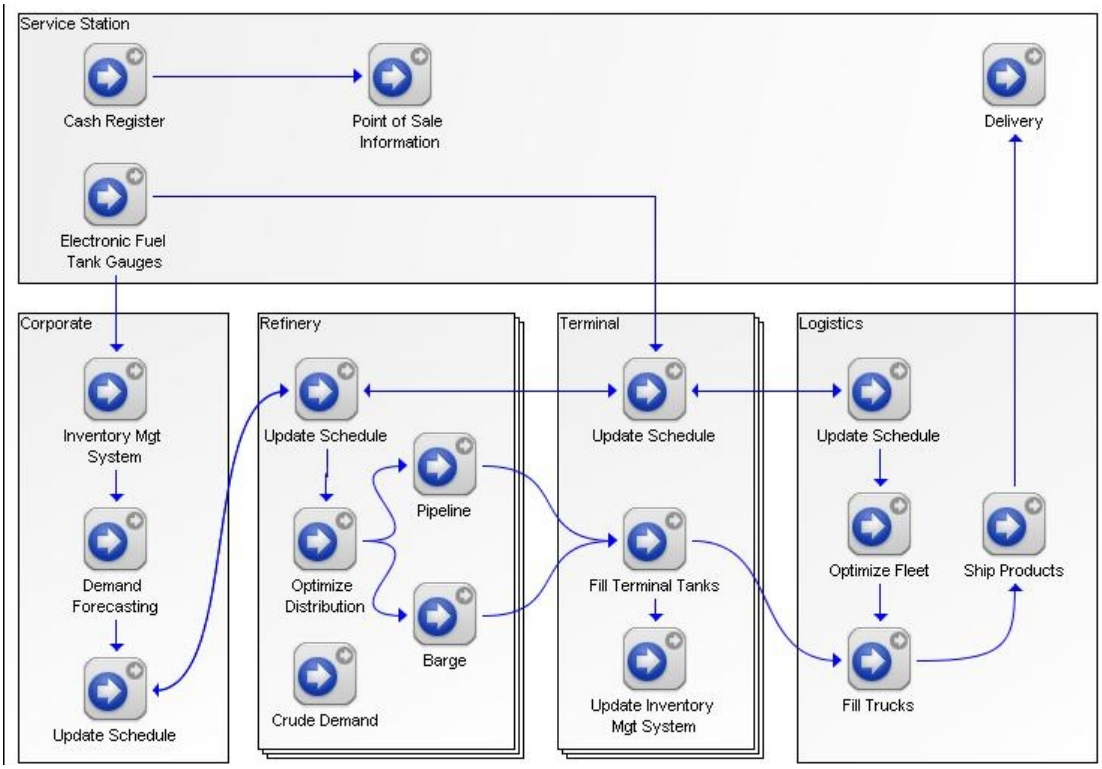


Variance Reduction's Six Sigma analysis[1].

[1] *Image courtesy BHP Billiton and Tomium.*

Variance Reduction International, Inc. (VRI) is deploys 'Lean Six Sigma' (LSS) methodology for Chevron, Texaco, Aera Energy, Baker Petrolite and Halliburton. A structured roadmap, Define, Measure, Analyze, Improve, and Control (DMAIC) is used to improve processes and support data mining. VRI uses SPC XL from SigmaZone to create control charts, histograms, paretos and other statistical analyses within Microsoft Excel. VRI also offers Six Sigma mentoring and training to the oil and gas vertical[2]. More from www.VarianceReduction.com.

0705_16.16 WebMethods Fabric – process orchestration



Downstream 'replenishment' process orchestration with WebMethods[3].

WebMethods' Fabric is a comprehensive business suite that combines integration, Service Oriented Architecture (SOA) and Business Process Management (BPM). webMethods Fabric components are 'self-diagnostic, predictive, and proactive.' WebMethods' is used in Volant's EnnerConnect solution to access a variety of upstream data sources. More from www.webmethods.com and www.volantsolutions.com.

TW0705_17 Technology Watch Subscription Information

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[1] *Image courtesy Variance Reduction.*

[2] *See also SPE paper No. 84434 'Application of Lean Six Sigma in Oilfield Operations,' Buell and Turnipseed (Chevron).*

[3] *Image courtesy WebMethods.*