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The Contribution of Digital Technology
How can Integrated Operations Help ?

Dr Ian Moore

Principal, EMEA

Oil & Gas Services, Centre of Excellence

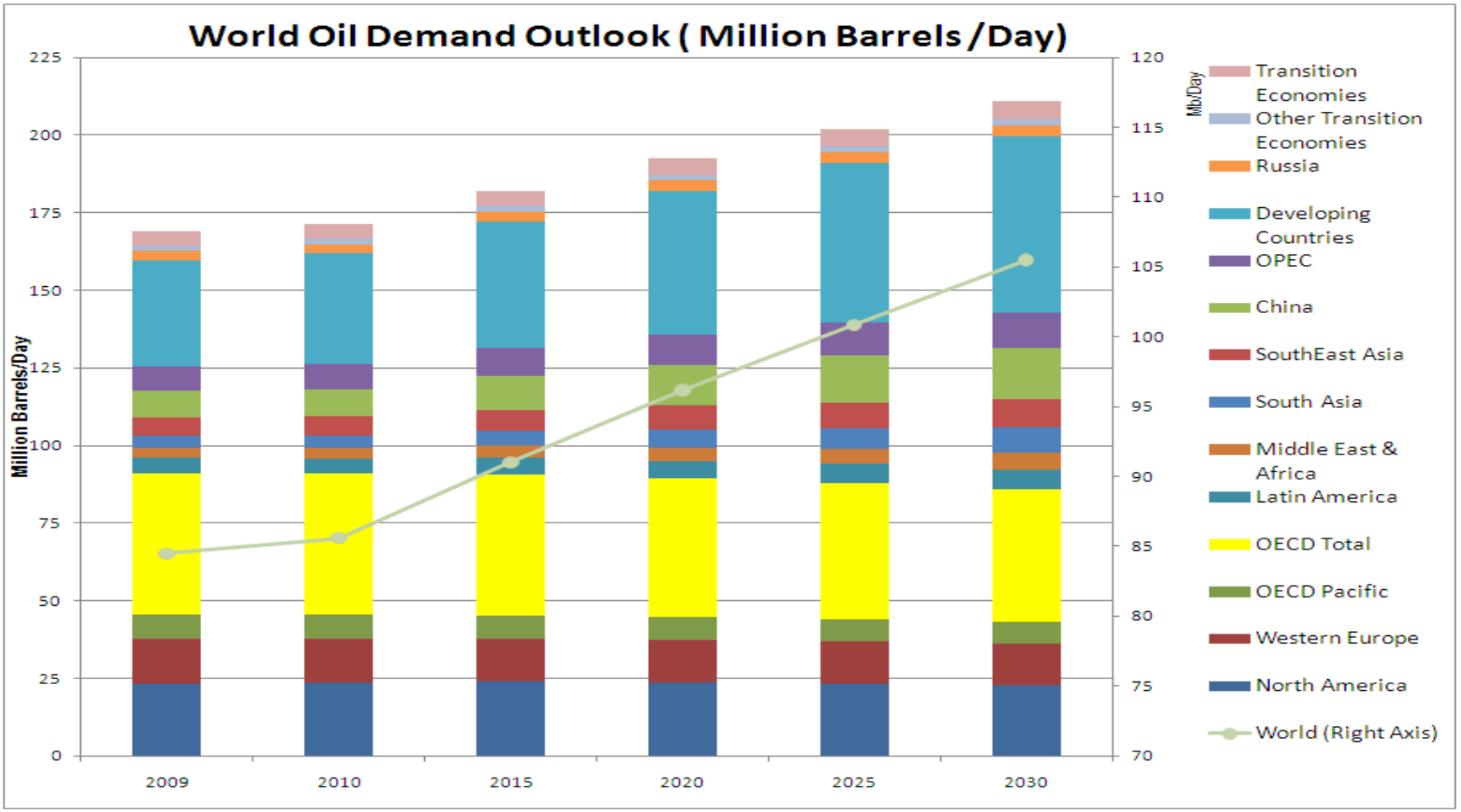
Capgemini provides global consulting, technology and outsourcing services

The Oil and Gas CoE is comprised of senior subject matter experts with extensive E&P industry backgrounds located in major centres; Houston, Calgary, Beijing, Netherlands, Norway and the UK

Overview

- Oil and Exploration in the future will be more challenging following the Macondo tragedy; with its reliance on offshore developments, geo-politically risky regions and environmentally and economically challenging alternatives.
- Offshore developments are a key component of the required future supply
- Operators will have to adapt and transform to explore and develop successfully and safely – rehearsing in advance of operations and making more use of simulation tools and techniques
- Digital Technologies through facilitating real time collaboration can help reduce the risk of future incidents, while at the same time provide additional capability to improve field management.

Some commentators now see oil demand topping 105 + MBPD MMBPD by 2030



Source - World Oil Outlook Jan 2011

The competition for oil can only intensify in light of this demand and some unforeseen developments …

- Macondo … challenges to deepwater developments
  - US consumes < 25% of the world's oil with 5% of the population, it produces only about 20% of its requirements ~ 5mmbpd
  - 30% comes from the GOM alone and most of the new supply and the largest potential finds are to come from its deepwater field; slowed development could create a steep decline … 500Kbpd to 1MMbpd in just a few years
- Japan Earthquake … "nuclear renaissance" has stalled… more demand on oil and gas
  - In the past weeks, several governments have shelved plans, ordered reports on the safety of nuclear plants. China's government has suspended approvals to build new nuclear projects and ordered a rigorous safety review of all its existing plants.
- Middle East Turmoil and uncertainty … still unfolding and the effects are unknown

Heightened Regulatory Challenges, Social Unrest in key regions and Increasingly Effective Environmental Activism

Increased Demand Forecasts aside ….
Production declines alone are a Major Challenge

- Compounding the challenge of demand growth is the issue of *natural reservoir depletion*.

- Even if world oil demand was to remain flat, projected **new production capacity to address current decline rates alone will be 45 to 50 MBPD by 2030**
  - more than twice the current Middle East production and four times the current output of Saudi Arabia.
  - ~ >half of today's global production will have to be replaced

Where will this new supply come from?

Source - International Energy Agency Oil Market Report: http://omrpublic.iea.org/

Deep Water and Frontier Exploration has to be a major part of the oil supply solution

- According to recent research on “The Role of Deepwater Production in Global Oil Supply”, *offshore fields may soon constitute up to 40% of global oil production.* Deepwater developments are where most of the remaining “elephants” are to be discovered.

- On average such fields are much larger than onshore discoveries with the average size of deepwater finds in 2009 being 150 million barrels – about *six times the average onshore discovery*.

“Over three quarters of non-OPEC supply additions are expected to come from offshore fields”

Dr. Faith Berol, IEA Chief Economist

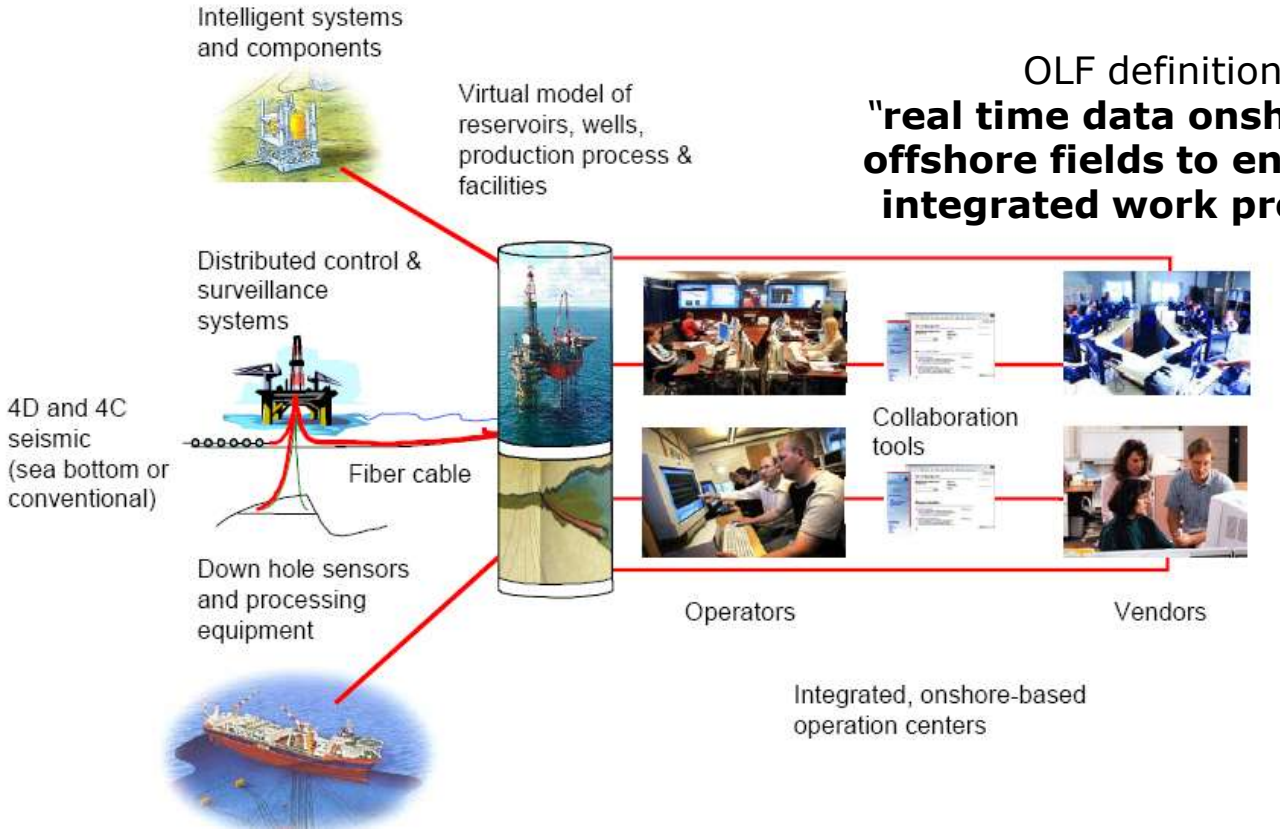
Source - IHS CERA: The Role of Deepwater Production in Global Oil Supply; June 30, 2010

The challenge to offshore development?

- Following the Macondo tragedy the industry needs to demonstrate to the various stakeholders that *we can drill and operate safely and effectively* in deep water and new frontiers
- Across the globe, 14,000 deepwater wells have been drilled to date
- Deepwater plays have accounted for about half of all new discoveries.
- The industry has a great track record of HSE and we have the technical capability to develop this needed resource

Technologies that facilitate Integrated Operations can further reduce the risk…

Integrated Operations are a broad categorisation of transformation initiatives related to the integration of real time data, technology, and operational work processes

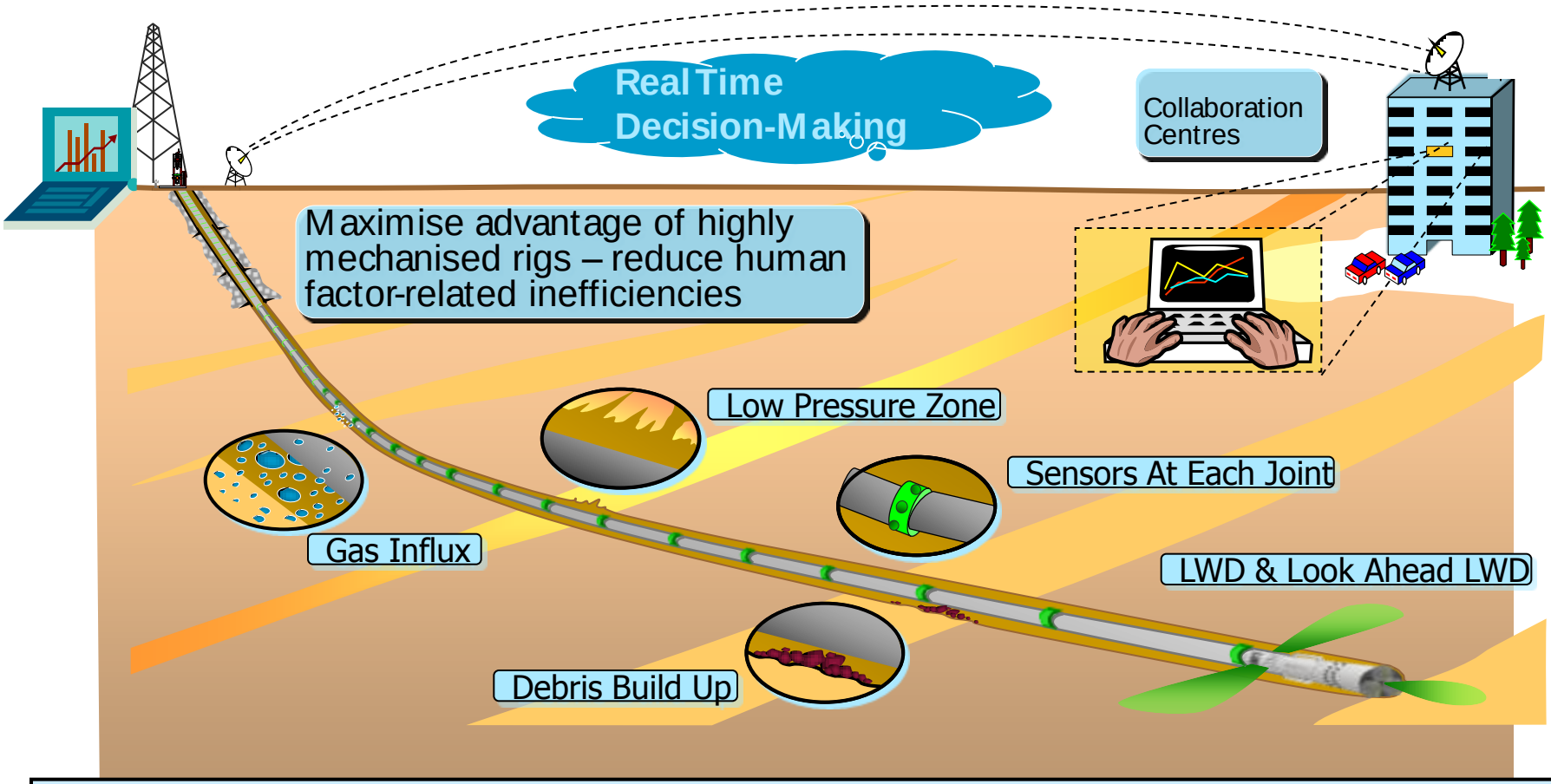


OLF definition :

"real time data onshore from offshore fields to enable new integrated work processes"

…it is really about operational excellence enabled by collaborative and visualisation technology

How does Integrated Operations work? The Fundamentals ….

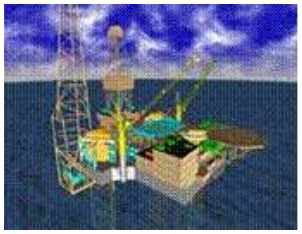


…through improved on shore/off shore communication and collaboration enabled through real time communication, data sharing and visualisation technologies.

First Generation IO - establish collaboration /visualisation between offshore, onshore and across disciplines

Drilling & Completions

Real time drilling optimisation
Look ahead tools/avoid hazards
Factory drilling process over multiple rigs

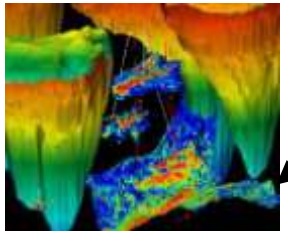


Facilities

Smart instrumentation with on-line diagnostics
Advanced controls to enable optimisation & automation
Appropriate video surveillance

Reservoir/Wells

Fully instrumented/intelligent wells
Down hole flow control (DHFC)
Real time analysis and models
On-Demand seismic acquisition



Shift support, work processes and decision making to Onshore Collaboration Centres

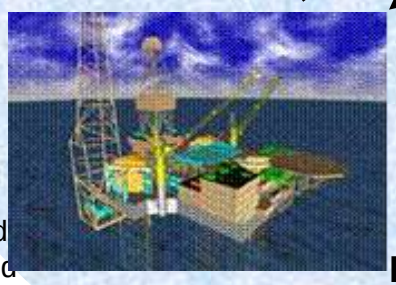
Integrated Operations offers significant promise in avoiding offshore drilling and operational accidents.

2nd Generation IO - shift work processes to both real and virtual locations– linking all stakeholders - suppliers, SMEs

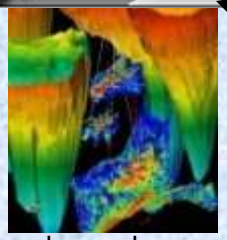
Remote Collaboration Centre
- Remote support – 24hrs a day
- Competency & Mentoring Support
- Staffed with Ex-Asset Coaches
- Multi Region?

Support Centres of Expertise
- Performance improvement
- Proactive
- Regional (serving multiple BUs)

BU Collaboration Centre
- Remote support, management & control
- Planned (condition-based) intervention
- Full-Field optimisation (med term)
- Access to global expertise
- Including HIVE capability



Facilities
- Highly automated
- Minimally manned
- Remotely operated
- Smart instrumentation
- On-line diagnostics
- Advanced controls

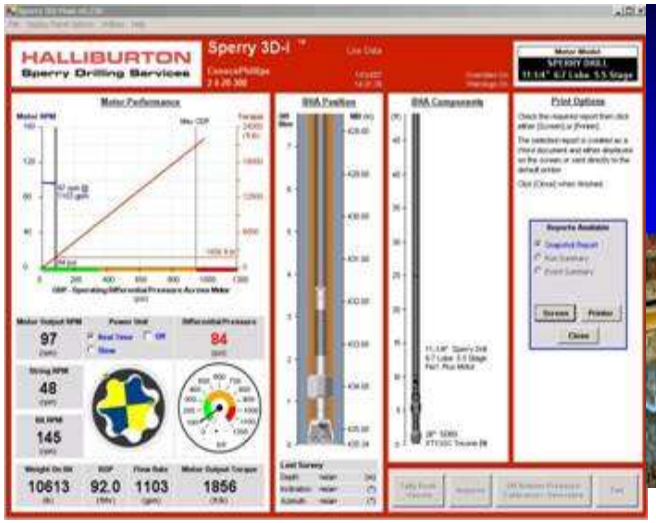


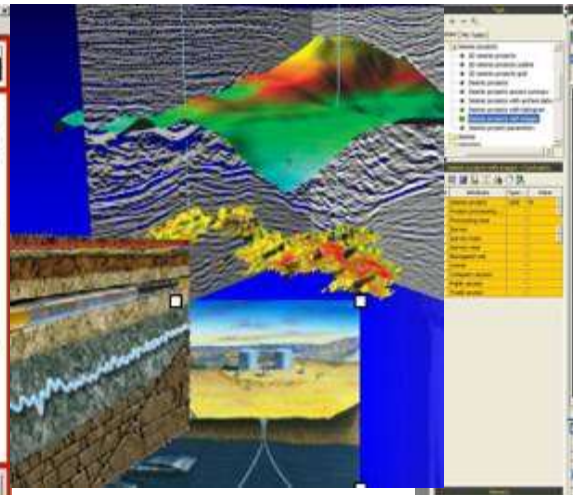
Reservoir
- Repeat seismic on demand
- Wells fully instrument
- Automated option generation
- Real time measurement linked to reservoir optimiser controlling down hole flow control

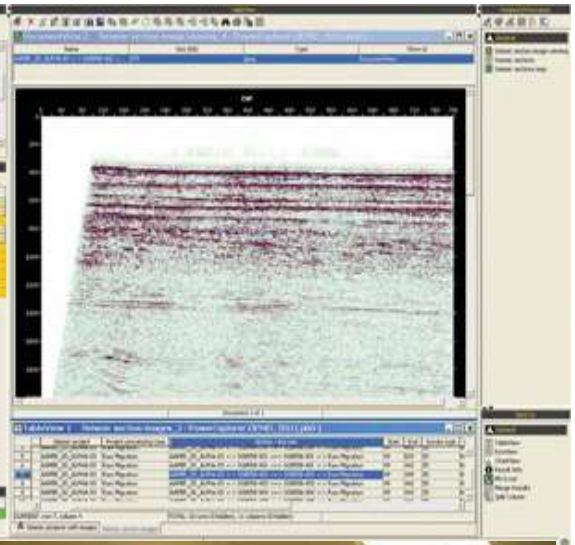
Vendors & Partners
- Monitoring
- Active engagement

Global experts via desktop
- Specialist & peer support

Real time visualisation and sharing of data to support the *best decision making* through collaboration across disciplines

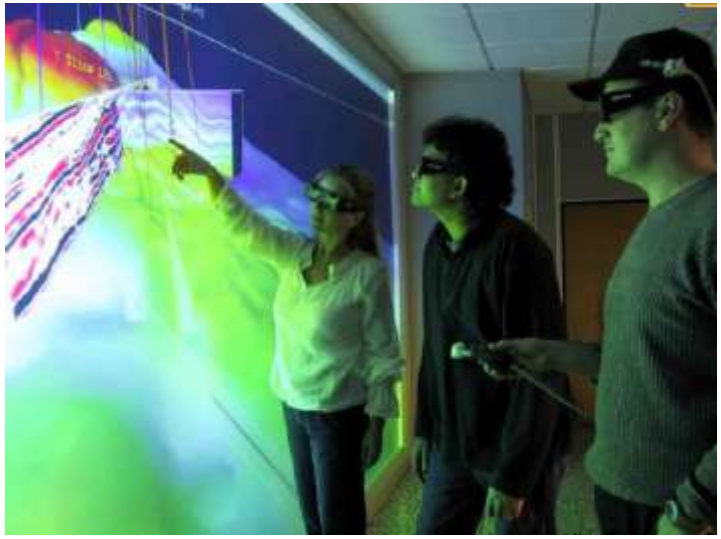


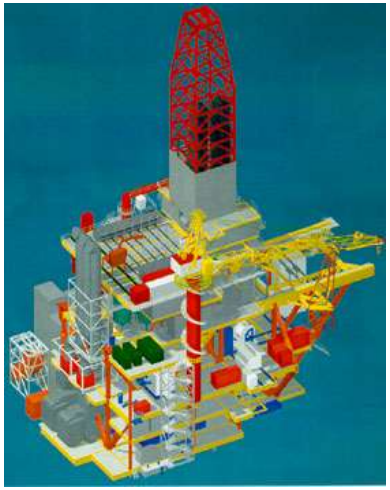




Collaboration is no longer limited to the physical location all stakeholders can be linked in as needed – anyone, anywhere@anytime

- Require foundational **Collaboration Tools -** Visualisation Systems and On-Offshore communications and collaborations solutions
- Visualisation of same information at the same time in different formats allows broad and remote collaboration
- Training and simulation of events will become the norm for all operators prior to performing well operations, an analogy can be drawn with the regular use of flight simulators in the Aviation world and the simulation tools used by the Military





Monitor, Support ... and even *Remotely Control* operations from Centres if required.

Multimedia collaboration between onshore and offshore operations centres …

…resulting in one team that works together on a continuous basis offshore and onshore, and can practise well control scenarios before a well is spudded.

Source: Statoil

Could Digital Technologies have helped to prevent the Macondo tragedy?

- Most accidents that occur are usually the combination of a number of smaller incidents (and potentially un-reported) that by themselves would probably not be catastrophic.

- However, when these apparently inconsequential 'out of the norm' incidents come together then the platform for a catastrophic incident could be created that overwhelms both the existing technologies and also the 'command and control' structure.

- Could technology have prevented the Macondo tragedy?
  - Technology could have detected small anomalies that may indicate a trend of the first stages of instability; if acted upon quickly the chance that it develops into something more serious is significantly reduced.
  - Realistic simulations, using actual operational scenarios and real well data will be used to prepare crews in the operations centres to conduct business process rehearsals before stepping foot offshore.
  - The use of 'virtual worlds' applications from the immersive and interactive online gaming industry can be used to conduct emergency response rehearsals.
  - It is too easy to claim that the deployment of advanced drilling centres may have prevented the tragedy – but what is clear these technologies are being more closely looked at as operators face continued pressure to ensure the safety of offshore drilling.

Summary and Conclusions

- Oil and Exploration in the future will be more challenging following the Macondo disaster; with its reliance on offshore developments, geo-politically risky regions and environmentally and economically challenging alternatives.

- Offshore developments are a key component of the required future supply

- Operators will have to adapt and transform to explore and develop successfully and safely – rehearsing in advance of operations and making more use of simulation tools and techniques used by other industries.

- Digital Technologies through facilitating real time collaboration probably can help reduce the risk of future incidents, while at the same time provide additional capability to improve field management.

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