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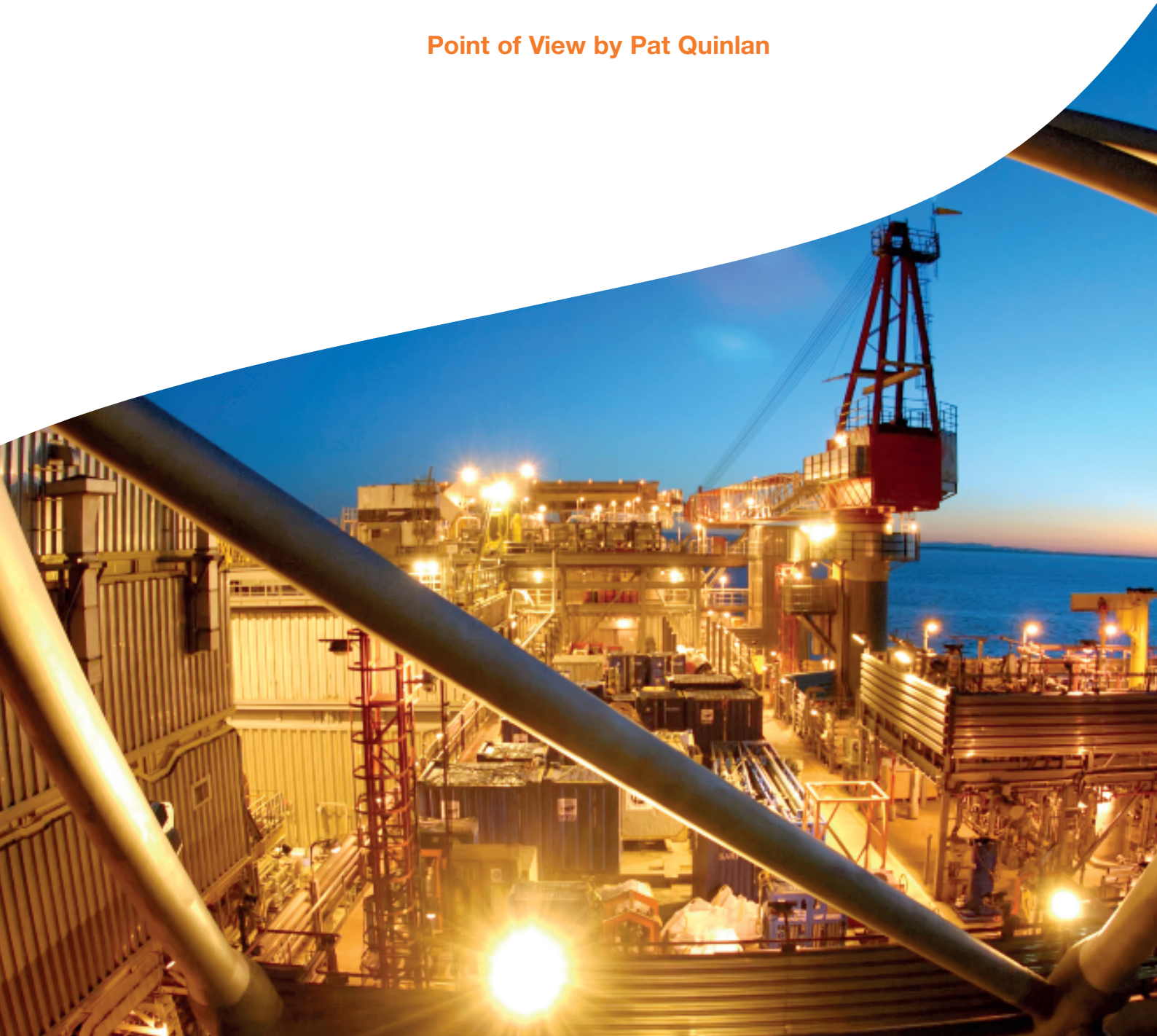
The Gulf of Mexico blowout – Impacts, opportunities and future challenges

Point of View by Pat Quinlan



Abstract

There is little doubt that oil and gas exploration will become much more difficult following the Macondo disaster. There is a broad range of opinion as to the long-term impact of the blowout, but the consensus view among operators, regulators and suppliers is that exploration across the globe, and especially in the Gulf of Mexico (GOM), will be more restricted and expensive, with increased regulatory burdens, higher development costs, and anticipated project and productions delays.

Compounding these issues is the fact that the global appetite for oil is projected to grow for the foreseeable future. Increased demand coupled with natural declines in existing production is creating a formidable challenge for the industry to bring on new production capacity. The daunting task ahead is how to meet this global demand for new oil capacity, with its inherent and increasing reliance on offshore developments, in light of these challenges and pending new constraints?

Operators will have to adapt so as to explore successfully and safely. Many have already undertaken risk reviews of their project portfolios, exploration processes and safety procedures to assess their exposure and to ensure adherence to the best global practices. Moreover, companies are looking to technologies which can help them both add the additional capacities they require while at the same time reduce the risk of future incidents.

Clearly the era of easy, and most certainly cheap oil, is over.

The impact of the Blowout

The GOM accident has extracted a tremendous financial, environmental and human toll. The immediate efforts focused on containing the damage, getting the blowout under control and undertaking the massive cleanup effort and economic reparations required. The ultimate impact of this accident is less clear but its repercussions will certainly be felt, not just in the GOM, but throughout the industry for years to come. The well is now under control and attention has turned to the political and regulatory phase of events which may prove to be equally volatile.

The causes of the blowout are still being investigated by numerous regulatory bodies including the President's National Commission, the Coast Guard and the Minerals Management Board among others. The direct cause of the incident is not known but, like most accidents, it is expected to entail some combination of human error and failure in processes, equipment and / or systems.

The US Administration Department of the Interior has recently lifted its moratorium on deep water drilling; the various regulatory reviews continue and uncertainties on future regulation are preventing new projects to be launched. Already the industry and regulators are at loggerheads regarding a requirement to plan for a "worst case discharge" scenario - predicting the potential spill volumes and the amount of response equipment reserved to clean up such a spill. This regulation applies not only to deep water, but to all offshore drilling operations in the Gulf and a vigorous debate is underway as to how to arrive at those numbers. Many other jurisdictions have undertaken similar offshore regulatory reviews and a great deal of uncertainty remains. The exact outcomes and impacts of these reviews are unknown as yet. There will undoubtedly be a significant revision of regulations governing deep and all other offshore drilling and the industry will face increased public scrutiny, more comprehensive controls, higher costs and delays in future offshore developments. The subsequent changes may be both profound and structural – a true sea change in how deepwater assets are to be exploited in the future.

Such deepwater resources within the GOM are a critical component of the US oil supply. Any additional constraints on its development can only be detrimental to the US oil supply and will likely have a ripple effect on supplies globally.

Appetite for oil is growing while resources are being depleted

Despite the economic slowdown, global demand for oil has continued to increase. Recent estimates of the International Energy Agency (IEA) peg global oil demand at 86.9 million barrels per day (MBPD) in 2010 and 88.2 MBPD in 2011, reflecting increases of 1.6 MBPD and 2.2 MBPD over the 2009 levels[1]. Oil demand has remained effectively flat in the developed world but emerging countries are and will be the key long-term driver of oil demand. The primary factors driving this demand are economic growth and increased crude based transportation requirements in the developing world. Despite advances in vehicle efficiencies - bio-fuels and hybrid technologies - this is not expected to change for the foreseeable future.

Asia is driving oil demand growth and is conservatively expected to nearly double its current demand by 2030. China will continue to be the major driver of the increases. By the middle of the next decade it is expected to surpass the US as the largest oil consumer and by 2030 some forecasts project that China may require upwards of 60 MBPD – almost tripling the current US demand – should it continue its rapid pace of economic development.

While US demand remains relatively flat at about 20 MBPD, domestic US production accounts for only 5.3 MBPD of its required supply; 30% comes from the GOM alone and most of the new supply and the largest potential finds are coming from its deepwater fields.

Compounding the challenge of demand growth is the issue of reservoir depletion. In the unlikely event that 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.

For the US, the impact of production declines may be felt more immediately. The GOM is a primary source of US crude supply, constituting approximately 1.6 MBPD of production. Initial IEA predictions suggest that an an extended ban on deep water developments could see a near-term shortfall of between 450 thousand to 1 MBPD from these current levels within a two to five year period.

"We have to find ways of bringing on stream nearly 50 MBPD of new capacity between now and 2030"
Willy H. Olsen, Senior Advisor
INSTOK

Where will the new oil supply come from? The shift to deepwater exploration

The demands for additional production capacity are significant and will be a major challenge to the industry overall, whether under a growth or a no growth scenario. Supply from traditional reservoirs and sources has peaked and new supplies will have to come from new geographies and harsher operating environments, each with its own specific challenges. Conventional oil alternatives and pushes for energy efficiency hold great promise but their impact on global oil demand is expected to have a minimal impact for the next two decades. Similarly, improvements in operational excellence, the optimization of existing resources and advances in technology will help but will not be sufficient to close a supply gap of this magnitude. The oil supply shortfall will have to be made up elsewhere.

For the US, one obvious source will be to further exploit Canada's oil sands. From a supply and geopolitical risk perspective the oil sands hold tremendous potential with 178 billion barrels of proven oil reserves; only Saudi Arabia has more proven oil reserves. These massive deposits are already expected to become the US' top source of imported oil this year, "surpassing conventional Canadian oil imports and roughly equaling the combined imports from Saudi Arabia and Kuwait" according to IHS Cambridge Energy Research Associates (CERA).[2] While there is no chance of either a blowout or deepwater spill in oil sands, these developments have their own economic, operational and environmental challenges in addition to mounting political and social activist pressures.

1: International Energy Agency Oil Market Report: http://omrpublic.iea.org/
2: In: The New York Times: "Reliance on Oil Sands Grows Despite Environmental Risks"; May 18, 2010

Globally, onshore resources will be under renewed pressure to increase capacity. OPEC remains the primary source of crude production growth and the Middle East dependence, in particular, will continue for the foreseeable future. Iraq is now regarded as an increasingly important player with its stated potential of new productive capacity of 10-12 MBPD. Not surprisingly, the country is drawing considerable attention from both Western majors – the International Oil Companies (IOCs)- and the National Oil Companies (NOCs) despite its ongoing security and infrastructure issues.

Under any reasonable supply-demand scenario, offshore environments will have to be a continued source and focus for new oil additions. On a global level, the IEA estimates that 75% of all future non-OPEC supply is expected to come from offshore developments, with many of the most prolific fields in deepwater areas such as Brazil and West Africa. As illustrated in Figure 1, numerous other geographies have existing or planned deepwater developments underway as some of the most prolific future finds are anticipated to come from these offshore areas.

According to IHS CERA research on "The Role of Deepwater Production in Global Oil Supply"[3], 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.

Across the globe, 14,000 deepwater wells have been drilled to date and in recent years, deepwater plays have accounted for about half of all new discoveries. For the US, a deepwater drilling program is needed simply to maintain domestic oil production. Dependent on the degree of operational constraints and cost escalations imposed by any new regulatory regimes, the economic feasibility of these large and much needed developments will be challenged.

"Over three quarters of non-OPEC supply additions are expected to come from offshore fields"
Dr. Faith Berol, IEA Chief Economist

Challenges and Opportunities

The blowout and the subsequent moratorium have introduced another degree of uncertainty and risk to oil and gas exploration. These will prove daunting for some, but for others there should be a beneficial effect in either the near- or long- term.

GOM based operators and drilling companies have taken the hardest blow from the mandated cessation of all deepwater drilling. Planned operations have been set aside and previously contracted equipment has been left idle with capital investment stranded for the time being. The subsequent spin-off effect on regional employment and businesses along the entire supply chain – from seismic, to well services through to catering - has been severe.

Major IOCs and large US independents have the largest operational exposure in the GOM and were the most immediately impacted by the blowout. For these operators, the GOM represents one of the few remaining prolific fields accessible to them. Reserve replacement is the chronic issue faced by these companies due to the dominant control of global resources by the NOCs. At present 85 to 90% of known reserves are under NOC control and many oil and gas producing regions are effectively

Figure 1: Shifting into Deep Waters

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

inaccessible to many Western operators. Some IOCs have shifted their attention to alternative sources such as oil sands and shale gas. However, in order to replenish their oil reserves many will have to rely on challenging frontier areas and deepwater assets to secure future supplies.

The post Macondo economic realities and accompanying risks may demand that only companies with significant capitalization will be able to carry out deepwater drilling. For the independents with deepwater exposure or ambitions the impact may be greater as they simply may not have the necessary capital required to carry the risk of dealing with the financial consequences and liabilities of a major spill. Not only are the development costs expected to be higher but the US Congress is currently considering raising the present liability cap of US$75 million. If it is raised dramatically, this would undoubtedly price many of the smaller companies out of the deepwater plays altogether.

Smaller and newer entrants into drilling services and offshore equipment markets may no longer have the financial means, track record or corporate appetite to play the deepwater offshore game. Consolidation among operators and among contractors, whether through mergers or asset acquisition purchase, is likely to continue or accelerate.

The prospects of more demanding regulatory and technical requirements will slow drilling activity and drilling contractors will have to look further afield from the GOM to utilize their assets. In this event, it will be the best equipment and people that will be most in demand by other regions. The net effect will be that the overall quality of the equipment and expertise in the GOM will ultimately deteriorate.

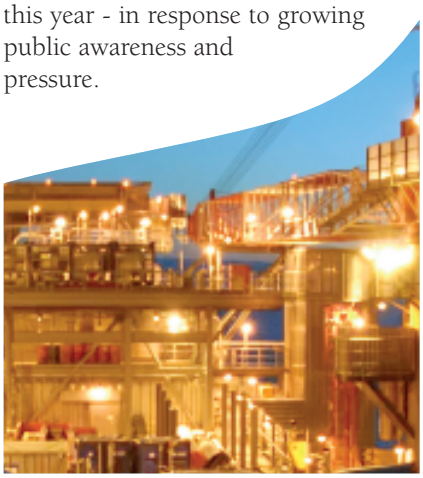
Restrictions on deepwater drilling will increase the risk of further US dependence on foreign oil; this is raising a broad range of domestic concerns - from a political, economic and even a domestic security perspective. Some environmental groups are raising fears about the increased risk of spills due to the additional tanker transport required to offset any related losses in domestic production. This coupled with the potential loss of the best equipment and people, may have one unintended consequence that could be to actually create a higher risk of environmental incidents.

Among those who stand to benefit are the NOCs. Although they already control the bulk of the remaining global reserve base, they need the best technology and expertise to optimally develop these assets and deepwater assets in particular. The immediate benefit will be felt by those that require deepwater drilling services and the requisite expertise to exploit those resources. Regions like Brazil and West Africa should more readily access the better quality capacity and personnel they need. In addition, should the independents be forced to withdraw from deepwater plays due to structurally higher costs, well funded NOCs (and select IOCs) will be in advantageous position to secure deepwater assets on favorable terms.

Global demand for services, technology and expertise will remain high and Oil Field Service “majors”, with their large capitalization, global reach and adept partnering arrangements, should fare well especially those that are well established with NOC clients. Certain niche Oil Field Services companies will benefit as well; those focused on onshore, unconventional and shallow plays should benefit from a shift of investment away from the GOM to these other plays. Similarly, offshore inspection and maintenance services and established equipment suppliers targeting remediation and equipment replacement should see an upturn in activity both domestically and abroad.

Oil prices, mid- to long-term should benefit due to the expected increase in global oil demand with most forecasts predicting pricing with a baseline well above the US$80 mark.

The Macondo blowout has certainly brought a high degree of public attention to these complex and intertwined energy and environmental issues. This can only serve to benefit those advocating a shift to a much greener energy policy in the US; it is expected that the Obama administration will soon announce several energy initiatives - particularly given that Congress failed to pass a comprehensive climate change bill this year - in response to growing public awareness and pressure.



How can technology help keep this from happening again?

Many companies and industry groups have undertaken major safety, spill response and environmental cleanup initiatives in response to the GOM disaster. Recently a consortium of IOCs led by ExxonMobil announced plans to develop a massive rapid response containment system for use in depths up to 10,000 feet of water. Initial cost estimates peg this development at about US$1 billion.

However, the overarching concern in the industry is, first and foremost, how to prevent such events from happening in the first place.

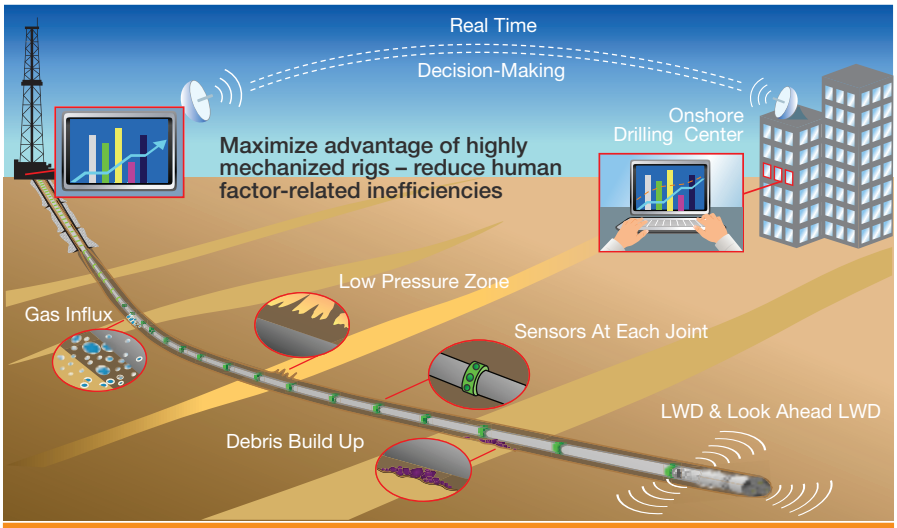
"Integrated Operations" (IO) holds significant promise in avoiding offshore drilling accidents. These changes to the traditional 'modus operandi' of the industry are becoming a critical element of the oil and gas industry efforts to advance safer operations. Statoil, one of the leading global deep water operators, defines IO as "*collaboration across disciplines, companies, organizational and geographical boundaries, made possible by real-time data and new work processes, in order to reach safer and better decisions – faster.*"

IO is a broad category of industry practices using real-time data in concert with collaborative and visualization technologies to improve communications and decision making between offshore operations and onshore drilling centers. The common principle is to improve the drilling operation by creating both real and virtual arenas for collaboration among various technical disciplines and service providers involved in the planning and execution of a drilling program. It uses technology to bring people together in truly integrated teams via the distribution and sharing of data, information and knowledge on a real-time basis. IO not only reduces the need for personnel offshore, but shortens decision time and improves decision making; moreover, it facilitates a safer operation.

As illustrated in Figure 2, real-time well data is fed from offshore operations to onshore drilling centers manned by experts from a variety of technical disciplines. The information collected by sensors on the platform and from within the well and reservoir. The data, sent to land by either satellite or over fiber optic cables, allows onshore based specialists to continually monitor operations, assist or even to lead the operation during critical drilling phases. The human experts are supported in their decisions by expert alert systems that are able to detect variations in patterns earlier than any human potentially could. At a minimum, such capability allows for increased surveillance and scrutiny of operations by onshore experts and many of the more developed centers have the capability to intervene, take control, and importantly, be able to shut down operations should the situation arise.

The concept of a dedicated drilling center began about ten years ago with the intention of creating a safer work environment offshore; indeed, some of the initial business cases were built on the reduction in the number of people required offshore and for having fewer helicopter trips to shuffle crews to and from offshore platforms. Once the foundational communications and collaboration technologies were

Figure 2: The Fundamentals of Integrated Operations



Improved onshore / offshore communication and collaboration enabled through real time communication, data sharing and visualization technologies.

established, improvements focused on adding additional functionality including more and better well planning, through fostering improved collaboration among geologists, reservoir engineers, drillers and key service providers who had traditionally done their work in isolation. This was quickly followed by the capability to do around-the-clock monitoring of well data from offshore to enhance safety, reduce human error and improve overall performance.

The primary focus is prevention. Through flagging up deviations in well drilling performance earlier in the process, center based experts are able to alert the offshore rig crews to take remedial action to prevent it from developing into a major incident.

At critical times even small anomalies may signify a trend which indicates the first stages of instability; if acted upon quickly the chance that it develops into something more serious is reduced significantly.

Recent advances hold further promise:

- Realistic simulations, using actual operational scenarios and real well data, are being used to prepare crews for seamless and safer redeployment offshore; operators routinely have their offshore crews rotate through the onshore centers to conduct business process rehearsals or to get them up to speed with the actual state of offshore activities in advance of onboarding.
- "Virtual worlds" applications, similar to those used in immersive and interactive online games, are being used to conduct emergency response rehearsals. Crisis management exercises are extremely difficult, if not impossible, to conduct in the real world. These innovative applications allow personnel to discover risks and learn to react correctly and quickly in exceptional situations and emergencies
- "Look ahead" tools that lie immediately behind the drill bit to capture critical operational data such as pore pressure while drilling could provide an additional valuable capability. However, the industry is facing challenges with developing the necessary sensors to focus either the sonic or electromagnetic signal ahead of the bit. These technologies will, in time, be an additional capability to the more usual Logging While Drilling (LWD) technologies typically used by the industry in more technically challenging wells.

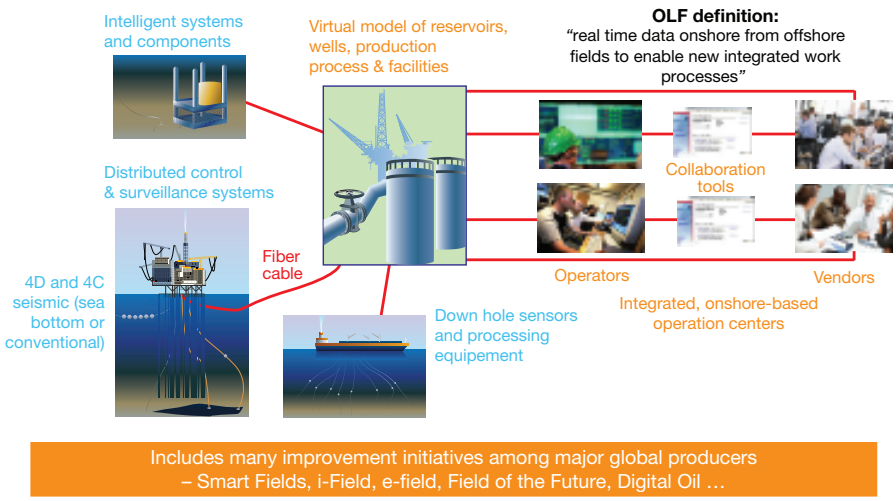
Most of the technology required for shore based centers is commercially available on the market, but making it work within any specific organization is a different matter. They require significant changes in work flows, responsibilities and in some cases a shift in culture. As with the implementations of any new technology, the biggest challenge is to manage the change in people, and to design the appropriate processes to take full advantage of the innovation.

The deployment of IO solutions is truly transforming how drilling is and will be conducted in the future. Such practices are becoming increasing prevalent around the globe and most visibly in Norway where the development and utilization of purpose built drilling centers have become a standard practice after almost a decade of practice and refinement.

As the facts about the Macondo blowout are not yet known, it is too early to claim that the deployment of advanced drilling centers may have prevented the incident from happening. What is clear is that these drilling centers will be getting a closer look as operators face continued pressure to ensure the safety of offshore drilling.

Figure 3: Defining Integrated Operations

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



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