The economic value of integrated operations

In the wake of the 2010 *Deepwater Horizon* crisis, and the uncertain regulatory environment that followed, oil and gas operators in the U.S. Gulf of Mexico increasingly need comprehensive, up-to-date information to make smart decisions.

From getting to first oil to maximizing production in existing wells to detecting and resolving potential problems as quickly as possible, Integrated Operations (IO) can help make the most of resources – people, assets and processes.

"It's difficult to over-estimate the potential impact of fully integrated operations," says John Oyen, Manager of Business Development for ABB's North America Oil, Gas & Petrochemical business unit. "It can change the economics of an oil platform."

Many Gulf operators have already taken a first step toward IO by employing always-on videoconferencing from the platform to land-based control centers and technical facilities – allowing experts with specialized knowledge to be centralized, rather than deploying them to platform locations.

While the benefit of this is dramatic and immediate, it's also just the beginning of the payoff IO can deliver. Achieving the full benefit of IO requires a multi-disciplinary effort that extends well beyond videoconferencing. It involves the widespread use of:

- Advanced information and communications technology (ICT) and real-time data;
- Implementation of advanced sensors and remote monitoring;
- And introduction of new work processes based on real-time analysis of the data being generated.

IO in context

The industry has coined many names for the IO concept, ranging from Smart Fields, the Digital Oil Field and Field of the Future to i-Field, e-Field and Intelligent Energy. Despite the differing names, these initiatives all have the same core goal: Use ICT and streamlined work processes to improve operational performance through increased production, reduced O&M (operations and maintenance) expense, and enhanced safety.

Oyen says ABB uses the unbranded "integrated operations" label because of its descriptive clarity. It's the terminology used in ABB's close work with Norway-based Statoil to integrate deepwater extraction operations in the North Sea. It also draws on the company's broad experience integrating operations in power generation and process industries, he notes.

Those industries have challenges similar to the issues gas and oil operators face in the Gulf. All are dealing with an aging workforce that has made it difficult to retain specialized expertise cultivated over years of on-the-job experience. Further, all must be able to adapt to an ever-shifting landscape of regulation, safety and environmental issues. Finally, all are under constant pressure to perform at peak to satisfy rising demand without sacrificing operating margins.

So how does IO ease these pressures?

"It's all about changing the way we work to protect the significant investment that's been made in offshore assets," Oyen says. "It means getting people from different disciplines working together – in the same software environment where possible – making proactive decisions based on real-time data and independent of location."

Many of the benefits from IO don't lend themselves to dollar-amount estimates of their value. These include:

- Improved safety through an integrated safety system;
- Improved work environments;
- Reduced logistics and transport costs;
- Reduced emissions;
- Increased energy efficiency;
- Facilitation of environmental surveillance, marine operations and monitoring.
  Where IO can be readily quantified, its value is significant.

Asset management

- Benefits: 3-5 percent increased production; 20 to 40 percent potential reduction in production losses; and 15-30 percent potential reduction in operating and maintenance costs.

Asset management includes preventive maintenance, response to issues and predictive maintenance. While IO offers benefits in the first two categories, the most significant savings are achieved by enabling the move to predictive, or condition-based, maintenance.

It's an important step. Traditional maintenance programs work by assigning resources to inspect and repair assets on a set schedule – regardless of how well they might be operating. And because equipment can fail between scheduled maintenance visits, resources also must be dedicated to equipment that has already failed – resulting in safety and environmental risk as well as costly downtime.

Predictive maintenance, on the other hand, deploys resources when monitoring indicates equipment is beginning to operate outside of tolerance. That means assets are tended before failure, while fewer resources are dedicated to working on equipment that doesn't need the attention.

The net benefit is twofold: improved utilization of maintenance resources, and the ability to run operations closer to the design limit. According to the US Department of Energy, "Studies indicate that a proper predictive maintenance program saves between 8 percent and 12 percent more than a purely preventive maintenance program."[1]

Operational Efficiency

- Benefits: Potential improvements in production of 3-5 percent – more as wells move toward tail-end – through production optimization.

By using an integrated suite of products to control, monitor and manage flow, it is possible to make meaningful improvements, for example, in reservoir recovery end of life or extension of end of life for platforms, Oyen says. The art and science of this is to begin obtaining data during well test, and to monitor accurately and continuously. But the data must be actionable, Oyen emphasizes. This can be achieved by integrating the data with a control system, such as ABB's 800xA and using ABB's IO applications like Active Flow Control or Active Well Control, which can respond predictably – without human intervention – when states change during ordinary operations.

The integration of monitoring, controls and data delivery also provide earlier warning – and faster response – to conditions that require operators to act. Oyen points to slug control as one example of IO at work. While damage from gas slugs traditionally has been addressed on the platform with large, costly slug catchers, it can now be mitigated electronically using fast-acting control valves and a control system that is able to identify a slug long before it becomes a problem.

Integrated safety

The final report from the chief investigator for the National Commission on the BP *Deepwater Horizon* Oil Spill and Offshore Drilling concluded that human error, not mechanical failure, was the root cause of the explosion.[2] In fact, most safety incidents are caused by human error. When placed in such a context, the potential value of improved safety simply cannot be quantified.

Better understanding and control of production, increased

predictability, improved maintenance planning and greater regularity all help avoid hazardous situations and reduce the probability of accidents and environmental disasters. In addition, remote operation and maintenance allows an offshore facility to run with fewer workers on board, thereby reducing the number of people affected if an incident occurs.

In addition to the benefits from remote operation, IO can help operators schedule maintenance tasks more efficiently. For example, condition monitoring can reduce testing requirements for equipment such as gas detectors, and the testing can be arranged to occur at a time with less operator load. If a safety analysis of planned activities identifies a "high operator load" situation, the onshore control room can assume responsibility for some operations – which then frees up the offshore operators to oversee the testing and maintenance activities.

Achieving integration

Achieving the seamless interconnectivity required by IO has traditionally been viewed as an engineering process – resulting in high-cost programming and ongoing maintenance. Even then, operation of such a network was complicated and prone to bugs.

But advances in technology – such as ABB's System 800xA control platform – have simplified the process of integrating disparate systems, even when third-party components and subsystems are involved.

Obviously, the highest levels of integration – and the greatest cost optimization from IO – can be achieved when building a new facility from the seabed up. At that time, all systems and equipment can be selected based on their compatibility with the integration scheme. Building an operation this way may cost about 10 percent more than the traditional approach of putting each system out to competitive bid. But Oyen says the cost is more than recovered before production ever begins.

Savings in reduced engineering work required for integration – combined with the ensuing adherence to construction schedules – usually more than cover the incremental cost of components. But Oyen also emphasizes integration does not have to be an all-or-nothing project. Even existing operations can be integrated in a phased process as components, systems and sub-systems are repaired and replaced.

"Basically, systems integrated in the same software environment are going to start up and run more smoothly than systems with different software and protocols integrated together," Oyen says.

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References

[1] US Department of Energy (2010). Predictive Maintenance. Retrieved January 2012, from http://www1.eere.energy.gov/femp/program/om_predictive.html.

[2] National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling. Council's report (Released 02/17/2011). Retrieved January 2012 from http://www.oilspillcommission.gov/chief-counsels-report.