

# IO, IM position subsea system providers as valuable partners

When IO and IM programs are implemented appropriately, they help operators increase recovery, reduce operating expenses, increase efficiency in execution, and optimize asset availability.

**Tayo Akinkunmi, Kevin R. Knight, and  
Ingvar Koppervik, FMC Technologies**

Recent years have illustrated that the concepts and practices of integrated operations (IO) and integrity management (IM) are growing in importance to operating companies. The primary goal and benefit of IO and IM program implementation is to better understand the subsea asset. To best understand why these programs are important to the success of an operation, it is important to recognize the strengths of both programs and how they are applied in concert to extend the life of the field.

## Program application

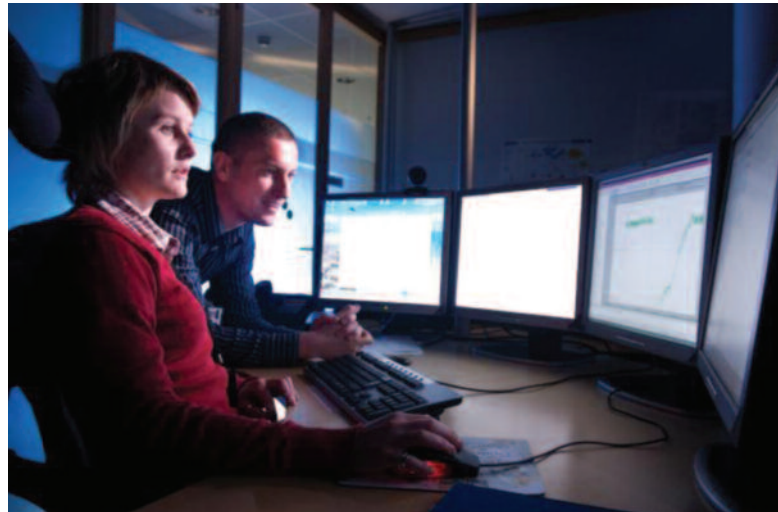
IO programs focus on recognizing problems, providing solutions, and facilitating actions. IO implementation that achieves maximum benefit can be characterized by the incorporation of key elements, including:

- Real-time, condition/performance monitoring systems;
- 24/7 online, global response;
- Rapid response coordination; and
- Well-defined work processes.

Real-time raw process data are gathered from subsea control system(s) and imported into the condition monitoring system, where they are loaded into algorithms precisely designed for specific key performance indicators (KPIs). Each resultant performance index is compared against established operating parameters and its historical trend analyzed over time – all of this is performed autonomously and in a matter of milliseconds. The result is a system health indication that helps the operator recognize suboptimal performance conditions and address them early to minimize the severity of monetary and operational impacts.

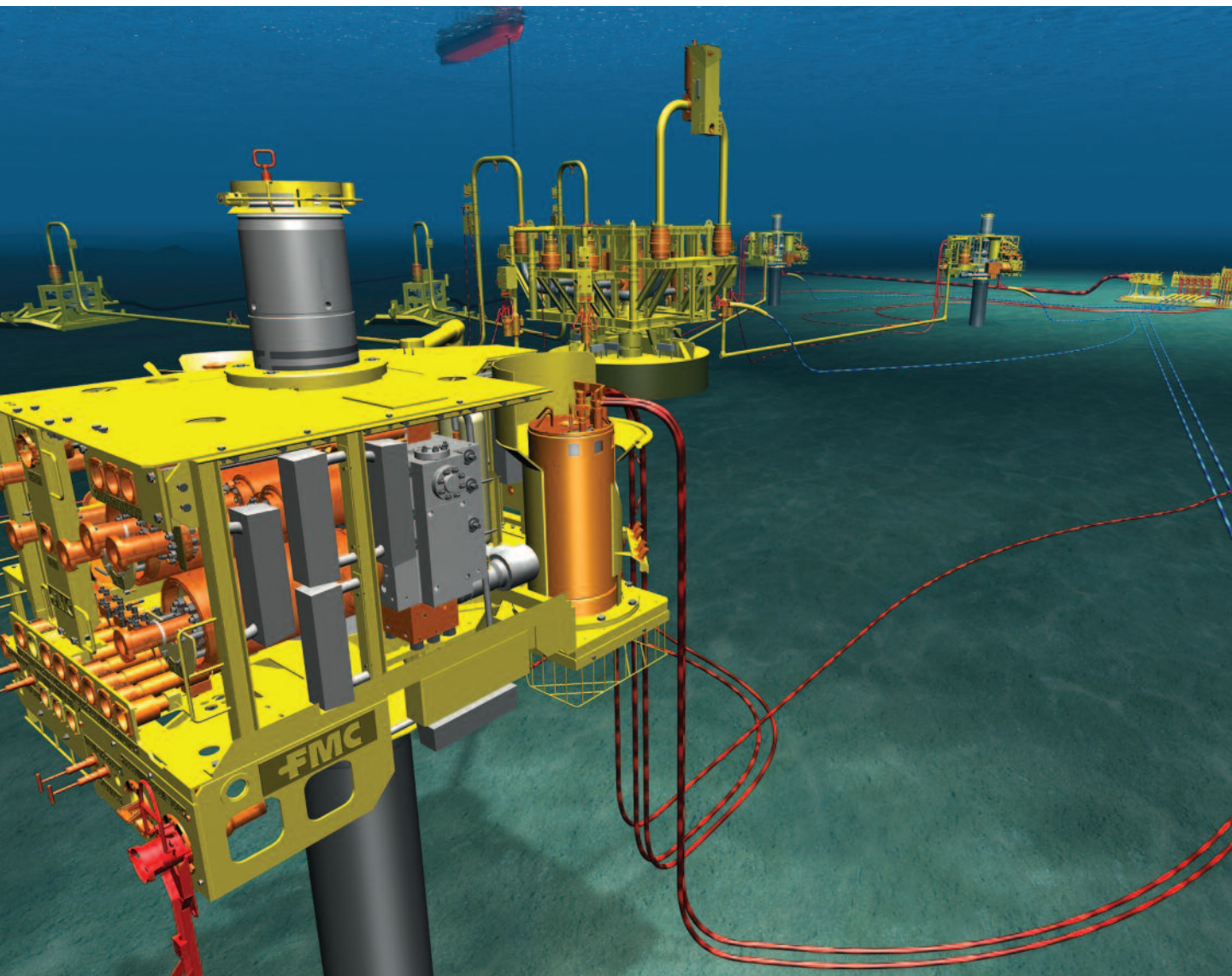
Complete subsea system design and integration, data retrieval, and a deep understanding of performance life and failure modes make the subsea system provider the most knowledgeable resource on subsea systems. Participation by the subsea system provider in this process is integral to the success of the program.

Oftentimes, IM accompanies IO. IM aims at sustaining safe productive operations by managing risk for the offshore and subsea assets. Program implementation includes risk identification, establishing mitigation plans, developing and trending KPI, and interpreting the resultant performance data within the context of system operations.



**IO implementation achieves maximum benefits in part through real-time, condition/performance monitoring systems and 24/7 online global rapid response coordination. (Images courtesy of FMC Technologies)**

It is important to understand that two distinct opportunities exist in IM. The first is that real-time data can be analyzed to determine short-term responses to degrading conditions. The second is that offline data can be used to justify changes in operation to increase efficiency. The key is to have an environment in which new learnings and insights into system performance can be recycled to continuously improve the asset's designs, maintenance and inspection philosophies, analysis, and performance evaluation. Typically, IM efforts focus on risk impacts to schedules and the bottom line. However, by shifting this focus to the health of the asset and its operations and invoking intelligent operationally justified preventive maintenance programs, an IM program



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becomes a best business practice with respect to safety, operations, and operating expenditures.

When properly employed, these two programs become quite integral to, and support, one another in their administration and execution. Free and timely data exchange and the development of carefully planned event responses are absolutely vital to their individual and collaborative successes.

### **Reaping the rewards**

The benefits of IO and IM programs are very real and worthwhile. The implementation challenges that are present can vary depending upon whether the programs

are being developed for a brownfield or greenfield operation.

Brownfield implementations rely heavily on comprehensive collection and analysis of as-built documentation, a complete understanding of the system's operational baseline, a firm grasp on the existing data gaps, and the return on investment. Achieving this requires a complete, topside-to-subsea audit of the asset, which can be an arduous task for any program administrator. This process can be especially arduous if the administrator is seeing the asset and systems for the first time and is not experienced in the design and integration of subsea systems.

When a subsea systems provider couples its knowledge and experience with optimized work processes and strategic asset planning, the company can work closely with the operator to extract the most benefit from appropriately timed equipment pullbacks (i.e., for maintenance, upgrade, etc.) to effectively fill gaps and gain additional value from the monitoring system. Making the most of these opportunities and employing gradual but progressive disbursement of technological advances allows the asset to remain current, safe, and reliable. These efforts support boosts in field production that otherwise could not be realized.

Additionally, the softer revenue (i.e., collected performance data, lessons learned, system insight, etc.) can provide operators with advantages when planning new projects.

Greenfield implementation of IO and IM can be incorporated as early on as the concept and front-end engineering and design stages of the development to aid in the full and successful realization of these valuable systems.

Operators are able to make decisions based on lessons learned through other assets' operations concerning critical performance characteristics. Fit-for-purpose data and communication systems that adequately support the technologies and processes that help make IO and IM programs so effective are integrated seamlessly into the planned architecture. Technology and system design are not the only areas affected, however. Operations and culture are affected as well. Establishing an environment integrating all operations in the fetal stages of the project promotes early collaborative communication and development across all stakeholders including vendors, service providers, project personnel, operators, engineers, and asset owners. This positively impacts the efficiency and effectiveness of operations. The engaged, full-service subsea system provider interacts with the operator's organization in all of these capacities, making it a fitting and valuable partner in greenfield and brownfield projects when making IO and IM programs a reality.

Properly implementing and reaping maximum benefit from IO and IM can be a rather complex process that requires a commitment to continuous learning and improvement for the benefit of the asset involved and for future assets. The associated continuous learning cycle takes the form of four distinct phases that repeat throughout the life of the field. These phases are:

1. Design and build.
2. Install.
3. Monitor/predict/resolve.

#### 4. Improve.

The subsea system and service provider is an invaluable resource in traversing the learning curve and maintaining excellence in production operations. Its aftermarket divisions (i.e., customer support and service) provide engineering and technical experience in a variety of areas including installation, commissioning, interventions and workovers, maintenance, refurbishment, preservation, storage, and technology deployment.

The successful implementation of these programs is dependent upon four main areas of support:

1. Properly identifying the risks associated with the field.
2. Developing KPI to be used for risk-based inspections and real-time condition monitoring systems.
3. The ability to respond to trouble notifications through a structured rapid response program that plans and executes short- and long-term solutions prior to complete failure.
4. A culture of continuous improvement where analysis changes as the knowledge of the asset changes.

Operators need not look any further than their established relationship with the subsea provider to find expertise in all of these areas. Its knowledge base spans the full history of the operator's installed base, making a partnership an advantageous and key element for the successful structuring, implementation, and administration of IO and IM programs for both greenfield and brownfield assets.

The subsea system provider becomes an effective partner to the asset owner by providing services that go beyond simply manufacturing and selling equipment. This partnership is a vital element in an operator's successful implementation of IO and IM programs. Because operators ultimately are responsible for providing the rationalization of new programs, the subsea provider's breadth of knowledge and experience base is paramount in the process. A clear set of criteria by which to evaluate potential subsea system suppliers is used to determine the best partner to develop the intelligence to drive the IO and IM programs. Many providers, in fact, already supply several aspects of the IO and IM programs to customers, but only upon request. Integrating all of the offered services into an effective and successful IO/IM program allows the subsea system suppliers' knowledge, skills, and expertise to combine to benefit the operator. Choosing the subsea system provider is essential to success and ensures continuous and reliable production operations over the life of the field. **ESP**