The influence of an intelligent operations philosophy on design and operation of remote large-scale oil and gas developments in Australia

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Extended Abstract

In the past decade, there has been a quiet revolution in the way leading oil and gas companies operate—enabling safer operations, significantly improving performance, enhancing production and improving recovery factors through the use of digital oilfield techniques and an integrated operations philosophy. Effective project and operations management systems and processes remain fundamental; when these are combined with modern ways of working, strong benefits result.

This extended abstract describes the work of Integrated Energy in supporting the establishment of such a program at Woodside Energy Ltd, Perth, WA. Woodside has called its integrated operations program iOps—Intelligent Operations. Today major operators such as Shell, BP, Statoil, ConocoPhillips, Chevron, Saudi Aramco and Petrobras have significant programs in place with names such as Smartfields, Field of the Future, efield and ifield, and are quoting strong returns across the world\textsuperscript{1,2,3}. To be effective, these programs involve a transformation in the way of working, using a comprehensive approach that considers people, process, organisation, technology and the physical working environment.

iOps is a way of working that includes optimised and remote operation of reservoirs and inherently safer, more reliable facilities; predictive decision-making driven by intelligent, real time data and diagnostics; and collaborative support from remote centre(s) and supplier locations.

iOps key objectives are:

- Reduced facilities manning and personnel risk exposure.
- Improved health, safety and environment (HSE).
- Improved integrity and reliability of wells and facilities.
- Optimised reservoir depletion, increased ultimate recovery.
- Improved efficiency and reduced operating cost.
- Improved quality and more timely decision-making.
- Improved staff satisfaction, retention and attraction.
- Sustained culture of continuous improvement.

In the authors’ experience, to effectively deliver the benefits from an iOps way of working, a balanced approach—which addresses people, process, organisation, technology and environment—from the beginning is required. Integrated Energy were contracted by Woodside in June 2010 to assess the technical and organisational feasibility for iOps related to a remote, large-scale, greenfields LNG project in north WA, with reserves located in deep water. The objectives of this assessment were to:
• Identify and scope the functions, work processes, and related initiatives that will most benefit from real-time data sharing and collaboration among operational staff, and engineering personnel, and supporting companies, regardless of their physical or virtual location.

• Investigate the physical, network and technical infrastructure in Woodside’s facilities to determine issues, opportunities, and changes required to support a high-performance intelligent operations model.

• Analyse the findings against industry best practices, comparable models, and lessons learned from many similar collaborative, decision-support environments.

• Develop design options for intelligent operations, people, process, technology, environment and organisation, including layouts and bandwidth requirements.

• Provide high-level cost estimates and business case with measures.

• Provide a strategy map, communication plan and support, scope and schedule.

• Build alignment and consensus.

The assessment involved more than 70 one-on-one interviews and 15 workshops, as well as several presentations to the wider Woodside stakeholders. The concept for iOps was developed in a highly interactive way and shared back progressively, allowing ideas and concerns to be heard and incorporated. The key functions for iOps to support were developed considering the operational criticality for the project and the degree to which an iOps way of working could make a difference.

The assessment work confirmed iOps as feasible and valuable to Woodside. A clear consistent view from Operations was that there was no other way to successfully operate efficiently on such a remote development. The concept for iOps is illustrated below in Figure 1.

Figure 1. iOps network concept.

Perth iOps Centre

The iOps concept is characterised by a high degree of communication and collaboration both in and between all onshore and offshore facilities. At the heart of the concept is the Perth iOps Centre, which allows for a high degree of remote operation. A conceptual design for the Perth iOps Centre is shown below in Figure 2.
Figure 2

The Perth iOps Centre is designed to be a highly visual, collaborative environment with a large amount of real-time information available. Workspaces are flexible and can be customised according to various phases of the operation, as well as critical events such as shutdowns and campaign maintenance. Information can be viewed on a number of large screens, with interactive multi-touch desktops and portable devices.

Technology enables collaboration on the floor and/or with others outside the iOps centre, with video, live data, models, and trends easily available in order to make fast, informed decisions. Personnel at the project facilities onshore or offshore are enabled by technology to have the information they need and, therefore, feel supported by iOps and are included in the decision-making process.

The centre is designed to work 24/7—many such centres choose to run 24/7 to be more supportive to operations, to become proactive rather than reactive, and for better response to incidents. Real-time and tactical decisions are made in the core of the centre, supported by longer term or strategic decision-making around the outside. The entire value chain from reservoir to customer is represented and tracked in real time. Key performance indicators are always visible to give a clear picture of the operational status.

Three immersive environments on the floor allow users to visit the site virtually from a real-time, first-person perspective, drawing information from an existing 3D model. This enables a number of possibilities, such as virtual meetings on site with other personnel (perhaps located in different parts of the world), running through a job safety analysis, conducting training and simulations etc.—all in a safe environment and without the need to visit the site. The iOps centre facilitates a culture of collaboration and teamwork, with aspects such as continuous video link with onshore/offshore sites and personnel rotations through different facilities helping to create a one-team, supportive culture.

Business case

The iOps business case has three elements: Health, safety and environmental Benefits. Benefits for people. Quantifiable economic benefits. Health, safety and environmental benefits include reduced exposure, reduced probability and enhanced manageability of HSE-critical events. Benefits for people include attraction, development, and retention.

The quantifiable economic business case for iOps was established in dollar terms using solid empirical evidence and analytical methods from the oil and gas industry in the past decade—that is, this way of working yields financial bottom-line benefits in ultimate recovery, production availability, reduced Opex and reduced Capex. The ability to clearly quantify the economic value helped justify upfront investment in communications infrastructure, supporting information systems, process improvement and change management.

Remote operation

Remote operation is a key element to the iOps concept. This includes the ability to reliably control a facility process and interrogate, diagnose and troubleshoot from a remote location, regardless of distance from the facility. This ability to remotely operate a facility aligns with the project objective of minimum manning for the
facilities, and reduces the risk to personnel by removing specific disciplines from the facility to a safe centralised location.

**Real-time decision-making**

Critical to enabling informed decision-making for iOps is quality real-time information, supported by suitable simulation and optimisation tools. There is a need to build from a solid foundation of field devices, communications and IT infrastructure, through appropriate validation and to then build appropriate tools for simulation and optimisation.

Remote connection can improve condition monitoring and process optimisation for a wide variety of equipment including both stationary and rotating machinery. It aims to optimise the use of condition data and make the data available to key technical staff, whether in the plant, a central engineering or production office, Woodside offices or at the equipment OEM premises. One aspect of this is remote access to the data and bringing the data to centres where experts in various disciplines can work together towards solutions. The Perth iOps centre is an ideal environment for this kind of collaboration.

**People, process and organisation**

Many roles in the organisation need to be developed with an iOps way of working in mind; iOps will also shape the selection criteria, required competencies and training needs. iOps also enables more rapid learning, both individually and collectively, in preparation for operations once drilling and subsequently production commence. Work processes also need to be aligned to support the iOps way of working.

While the Perth iOps Centre physically co-locates the functions required for enhanced decision-making, the importance of keeping functional strength is recognised. This can be achieved through reporting relationships, processes such as functional meetings and knowledge sharing, systemic sharing of information and collaboration technology. A range of organisational options related to the level of 24/7 manning, operational staff rotational through the iOps centre, attraction, reward and retention mechanisms have been identified from which the detailed organisational design will be determined.

Technology is seen as a key enabler for iOps. It must be reliable, easy to use and well supported. The connectivity between the field installations and the office, providing reliable transport of data, images and communications is vital.

The physical environment is important to optimise personal interaction and promote collaboration. Similarly, critical to the creation of one integrated working environment is commonality of architectural design, layout, furnishings, finishes and fittings for all the various facilities onshore and offshore.

**Conclusion**

- Integrated Operations is a way of working which can enhance HSE, substantially increase project value, and support development of people, for a modest project spend relative to the benefits.

- Integrated Operations is proven in major oil and gas centres around the world and, with appropriate front end thinking and engagement, is technically and organisationally feasible for remote oil and gas developments for Australia, enabling a remote-operations approach.

- A staged approach to design and implementation is recommended which addresses people, process, organisation, physical environment and technology at each stage.

- Engaging an objective, third party consultancy helps the team articulate a shared vision and drives progress.

**Notes**