Integrated Operations: A New Approach in Plant Operations

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INTEGRATED Operations, commonly known by its acronym IO, is an initiative being pursued by many oil and gas companies globally. IO is also known by its various branding names in various companies such as Smart Field, Intelligent Field, Digital Oil Field, Field of the Future, etc. At PETRONAS Carigali Sdn Bhd (PCSB), which is the operating subsidiary of PETRONAS, its integrated operations initiative is known as PINTAR, which is an acronym for "PETRONAS Integrated and Real-time" Operations.

The objective of this initiative is to capitalise on the advancement of digital Information and Communication Technology (ICT) towards improving the plant or offshore platform operations, i.e. by collecting information pertaining to process and utility systems in real-time and using that information to monitor and control the performance of the plant, and facilitate proactive intervention so as to minimise downtime. This improves cumulative production or productivity which in turn enhances the company's overall business performance.

The technology itself has been utilised for quite some time, for example, in the space programme of NASA, military operations by NATO and in Formula One racing. With the rapid advancement in telecommunications and computing technology, interest in their applications has expanded to the global oil and gas industry.

IO CONCEPT

There are three equally important main components which make up and support the entire IO environment, namely:

1. **Business Process**
   This is a work process or workflow which determines and describes the flow of data or information from one end to the other, and which has to pass through various parties or individuals for them to review, approve or analyse the situations related to plant operations and performance.

2. **People**
   These are subject matter experts and/or various parties who will make the technical and business decisions in accordance with the level of authority assigned to them, in accordance with the business process or workflow.

3. **Technology**
   This represents the ICT tools used to facilitate and automate the flow of data or information in real-time. It has been rather difficult to gather huge amounts of data in real-time in the past due to the limitations of bandwidth and the speed of data transfer available from telecommunication and control systems. Now, with the advancement of ICT systems, faster data transfer rates for real-time information management purposes are now possible, especially with high speed telecommunication infrastructure using fibre optic cables.

All three components described are inter-related and inter-dependent, especially when teleconferencing facilities are integrated into the entire IO environment. Again, the availability of a high-speed telecommunication link is vital. In the Norwegian sector of the North Sea and in the Gulf of Mexico, where IO has successfully been implemented in offshore platforms, the telecommunication network infrastructure is based on fibre-optic cables extending from the offshore oil and gas fields to the land facilities, thus providing a reliable communication channel linking the offshore platforms and the onshore offices in real-time.

IO FUNCTION LAYERS

IO is made up of various functionality layers from the point of data collection by means of various sensing devices linked to their respective monitoring and control systems until the point of displaying the results of the analysis and/or plant status to enable the operator or higher management to make operational or business decisions respectively.

Functionally, those layers, which also indicate the flow of data or information, can be summarised as follows:

1. **Data Gathering**
   This is a computer-based system that captures the field data depicting conditions or status of the processes and utilities, normally provided by Distributed Control System (DCS) or Supervisory Control And Data Acquisition (SCADA) system and various utility control panels, with field devices (electronic sensors) feeding the data on process parameters, status and conditions of the utilities to the control and monitoring system in real-time. The electronic sensor itself has now evolved into a "Smart" sensor with diagnostic capability that helps the operator to monitor its health status. After that, all these data are normally sent and stored in a "Data Historian" server, such as the 'PI Server', on the platform or in the plant, and duplicated at the other end at the onshore offices.

   This is where the telecommunication link is vital to ensure real-time data transfer at high speeds is possible especially for offshore platforms. In Malaysia, offshore platforms are located within a distance of 80km to 160km from shore.

2. **Modelling, Analysis and Optimisation**

These activities require special software to undertake modelling for specific process and equipment health checks, so that comparisons can be made between "what is happening now" and "what it should be". This will diagnose any deficiency or shortfall in either the process or utility systems. Therefore, the affected system can be automatically controlled or manually intervened in order to bring it back to normal operating conditions with the help of experts who, at the same time, are able to access and view the information from anywhere via remote access facilities.

Models are developed based on the available historical data and trends, and will help the operator or expert in identifying the symptoms of potential problems. This triggers the effort to mitigate the problem before it occurs. Similarly, the health check can also be done on field devices such as transmitters or rotating machinery (e.g. generators or pumps). The maintenance philosophy utilising the concept of monitoring their operating performance and health is known as "predictive maintenance" or is generally also referred to as Condition-based Maintenance (CBM). CBM can minimise or replace the normal "planned preventive maintenance". In principle, the maintenance is performed on a need basis rather than by routine.

For the oil and gas industry, the optimisation capability is very much needed in order to optimise the use of fluids, gases or chemicals to enhance production, or for the purpose of reservoir pressure maintenance

From the above, the utilisation of resources either in the form of material use or manpower can be optimised and, in return, significantly reduces operating cost (OPEX).

3. **Collaborative Work Environment (CWE) for Improved Decision-Making**

Having real-time data or information on a 24-hour basis, and the capability for it to be accessed from anywhere in the world will definitely assist in faster and more precise decision-making pertaining to technical or business aspects of the operations. Immediate decisions can be made upon consultation with the relevant experts, who will be able to access and view the same database at the same time as the decision-maker. This mode of working is known as the Collaborative Work Environment (CWE). A collaboration centre which is normally equipped with audio-visual facilities will usually also be provided. This is the place where a group of experts in their respective fields can sit and discuss in front of the big screens displaying real-time information on any particular operational or business issue. Again, a computer-based system and telecommunication link is critical in providing this kind of work environment.

IO is very much dependent on the integration capability of the various monitoring and control systems and software used for data handling or data management. This integration capability is termed as "interoperability" which overcomes the limitations of traditional proprietary systems. Various international standards to address this interoperability requirement have been developed and published such as ISO-15926 by POSC-Caesar Association (PCA)/ISO, WITSML and ProdML by Energistics, and those of a few other organisations.

CONCLUSION

IO has changed the way we use to operate and maintain the production facilities and has today created a totally different work environment enabling faster and more informed decision-making. Thus, improved performance of the industry by minimising downtime and increasing the level of safety can be expected.

If the telecommunication infrastructure is reliable and is able to guarantee the continuous availability of real-time data and video surveillance, it will be possible for production facilities to be totally unmanned and operated remotely. This would be quite similar to the concept applied by NASA in their space programme, or in a Formula One race where a collaborative environment enables a pit crew to monitor car performance in real-time and communicate important information to the driver to assist him in making decisions that could improve his chances of winning the race.

In conclusion, IO has brought a new dimension in operating a plant or production facility, by greatly improving its business value. The IO concept can also be applied to various other industries. ■

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