

APPLICATION OF INTEGRATED OPERATIONS IN OIL AND GAS INDUSTRY TO MAKE PLANT WORK PROCESS SAFER, EASIER AND FASTER

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Abstract- As it is known, there are many different systems which play an active role in sustaining the work of many different types of plants and industries. Systems like electrical, instrumentation and telecommunications can be given as examples. These systems have to be managed according to the main processes developing in the plant, but the individual management of each of these systems cannot give the results that the plants need to grow and sustain the necessary quality levels. Because of these reasons, there is an important need to control all these available systems from one central point. Currently, the limitless possibilities of telecommunications field are used to integrate all plant systems into one united management and monitoring center.

Keywords: Integrated Operations (IO), Integrated Operations Center (IOC), Instrumentation and Control, Telecom.

I. INTRODUCTION

As it is known automated control systems are at the forefront of one of the most important trends in modern industry. The growth of advanced automation allows firms to operate equipment in the best possible way and maintain it when it needs to be maintained, rather than following a fixed schedule.

Generally in the oil and gas industry and also in others there are a number of factors that increase the importance of automation. One is the cost of production, of course. A big element of that cost is the need to have on-site staff, and this is one of the areas where automation is changing the game, because increasingly engineers can see real time analytics of platform activity wherever they are in the world.

Today's energy companies seek solutions for driving down project cost and complexity, reducing operating cost, increasing production and also making plant operations safer, simpler and faster. Therefore integrated operations which has significant advantages and benefits is the best way to solve and provide solutions to above mentioned items.

II. WHAT IS INTEGRATED OPERATIONS

Integrated operations call to mind an array of monitors with colorful 3-D representations of reservoirs, well-heads, risers, platforms and pipelines. This unique ability to envisage complex processes remotely and transmit vast blocks of data simultaneously to locations spread throughout the world creates a kind of supernatural insight into offshore oil and gas operations.

What an onshore operator can see, he or she can influence. Integrated operations allow expert teams to see what's happening remotely in real-time and act. What does this yield? Increased oil & gas recovery, accelerated production, reduced operating costs, longer life-spans, higher safety levels and extended field life.

It is also called Smart Fields®, eFields, iFields, 'Digital' Oil Fields, Field of the Future™ which are examples of initiatives that are aimed at creating value by bringing together the organization's people, processes, and technology to deliver and act on frequently captured data in real-time. IO improves production, drives recovery, reduces cost, and optimizes work processes and hence increases significantly productivity.

There are three key factors that need to be addressed to ensure that an IO program succeeds at its aims (Figure 1):

A. Technology

Underpinning of Integrated Operations is the availability of real-time data access remotely. Improved data management systems are required to manage these increased volumes of information and to distinguish between critical and non-critical data. A common IT architecture is necessary to provide a standard approach enabling data flows between different classes of applications. Service Oriented Architecture is a foundational component which allows for flexibility and integration.

B. People

People play a critical role in IO programs as they are causing a fundamental shift in the way they work. Training is necessary for onshore and offshore staff to fulfill changed roles. New skills and competencies are also required to adapt to a new technology.

C. Process

Managing these changes associated with the transition from traditional operations to IO is very critical to the realization of this technology’s full potential. Companies are moving away from their traditional functional processes in order to realize the full potential of IO.

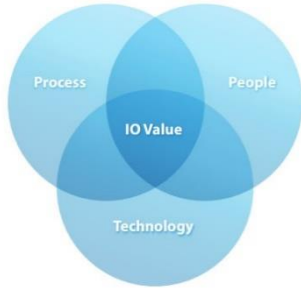


Figure 1. Three key factors

D. Keywords Mainly Describing Functionality of the IO Applications

- Automated notifications (related to equipment issues or workflow action, issued online or by SMS/e-mail)
- Application automation (where applicable)
- Advanced workflow built-in (people and applications)
- Graphs and trending functionalities
- Operational Knowledge Base (lessons learned, future references)

This approach (IO) should allow for a multidisciplinary conduct of work to happen independently of location. By providing easy access to necessary real-time data the application should allow people to work proactively rather than reactively - a key success-factor for operating in a safe manner.

E. The Need for an Integrated Operations Center (IOC)

An IOC would not have to be housed in a single facility, nor would it necessarily have to be provided by a single organization within the IT function. However, independent of how it is organized, the IT professionals who work in an IOC must have a common language and common goals. In addition, an IOC must have a broad charter. So whereas a NOC started out focusing just on networks, an IOC would be responsible for the operations of all components of IT. Also, whereas a NOC started out focusing on availability, an IOC would focus on availability and performance. An IOC must have efficient and effective processes

Many NOCs have already begun to shift away from having NOC personnel sitting at screens all day waiting for green lights to turn yellow or red. For example, our research indicates that a quarter of companies have eliminated or reduced the size of their NOC because they have automated monitoring, problem detection and notification. The IOC takes this trend to its logical conclusion by automating as many functions as possible.

As functions get automated, IOC personnel begin to spend more time on solving more complex issues. Hence, a key characteristic of a successful IOC is that the personnel that work there are highly skilled.

III. THE ELEMENTS OF INTEGRATED OPERATIONS

Companies offer a portfolio of technology solutions and services to optimize production and facilities operation and maintenance from wellbore to export. And one of them, as an example is ABB Company. And the key components of their offer for IO are [1]:

- ICT infrastructure and security
 - Data capture and access, including software applications for remote support
 - Production and operation intelligence and optimization
 - Condition monitoring, diagnostics and reporting
- And the solutions specific to the oil, gas and petrochemicals industry provided by ABB cover areas such as:
- Production and process optimization and control
 - Safety integrity and alarm management
 - Integrated systems for remote control and operation
 - IT security and communication network infrastructure
 - Condition monitoring systems and services
 - Emission monitoring and energy efficiency improvement
 - Multiphase flow assurance and optimization
 - Data capture and storage and collaborative work environments
 - Process control performance lifecycle services
 - Wireless sensor systems

If to say in other words below mentioned points, remote support and IO are enabled by proper asset infrastructure and facilities design. In particular, integration of the instrumentation, automation, information and communication technologies (ICT) with the operation and maintenance management systems is critical (Figure 2).

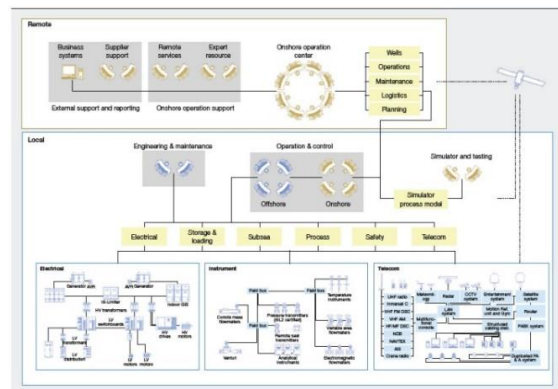


Figure 2. Remote support and IO

IV. BENEFITS OF INTEGRATED OPERATIONS

It should be noted that Added infrastructure investment cost is generally paid back in the operational phase.

The value of the potential of IO can be summarized as [1]:

- Increased production (3-5%)
- Reduced production losses, deferment or Increased Oil Recovery (20-40%)
- Reduced operation and maintenance expenditure (15-30%).

- Improved safety through risk reduction and improved work environment due to logistics and transport benefits.
- Reduced emissions, better energy efficiency and improved environmental surveillance and marine operations monitoring.
- Improved HSE
- More efficient drilling operations
- Better placement of wells
- Production optimization
- Better reservoir and production control
- Better monitoring of equipment and more efficient maintenance
- Better resource exploitation
- Increased regularity (uptime)

In two words the main benefits of the IO Program which as mentioned include, Production Increase, Ultimate Recovery Increase, Capex reduction, Opex reduction and Health, Safety and Environment (HSE) improvement. To achieve the best value from Integrated Operations technology, it is critical to identify the opportunities for implementation early in the development process or early in the field life and track them throughout to execution.

V. APPLYING INTEGRATED OPERATIONS

The application of IO in itself facilitates the integration of many departments, especially instrumentation, monitoring and telecommunications and paves the way for the creation of one unified center for monitoring and management of these departments and further increases the efficiency of the monitoring and control of automated systems. Thus, the condition of processes and other different systems of the industry, oil and gas plants can be observed, whenever any problem in those systems occur the alarm is turned on in the area, qualified staff members are sent to the specific areas to engage in necessary procedures, other necessary management procedures are completed and etc.

These are the main systems and subsystems which are united or integrated by the above mentioned IO:

- Instrumentation and Control system
 - PCS/DCS/PSD/ESD
- Fire & Gas detection and alarm system
- Telecom system
 - Voice & Data
 - CCTV
 - PA/GA
 - VHF/UHF analogue digital trunked radio
- Safety and Security Systems
 - Access Control
 - Intrusion detection
- Power network monitoring and control
 - MV / LV systems
 - Motor controls and etc.

As an example some of the proposals related to the integrated operations by ABB Company can be analyzed:

A. ICT and System Topology - ABB

The principal components in a system facilitating Integrated Operations comply with the ISA 95 Level 5 hierarchy standard (Figure 3) [1]:

- An efficient historian and data integration infrastructure with associated connectivity and interface solutions to gather and distribute all relevant data.
- An efficient and secure IT and communication networks infrastructure that facilitates remote access, monitoring and collaborative support.
- A comprehensive asset management system giving both maintenance and performance measures of all key systems and processing units.
- Daily operations and optimization applications.
- A common user interface.
- Collaboration rooms and workstations.

In addition to these technical components, associated work processes, appropriate operational philosophies and an organization with a mindset and culture suited to Integrated Operations are all required to fully exploit the opportunities provided by Integrated Operations. Cross-disciplinary decision-making processes and collaboration between different parts of the organization, or even between the operating company and suppliers and service providers, are all essential ingredients.

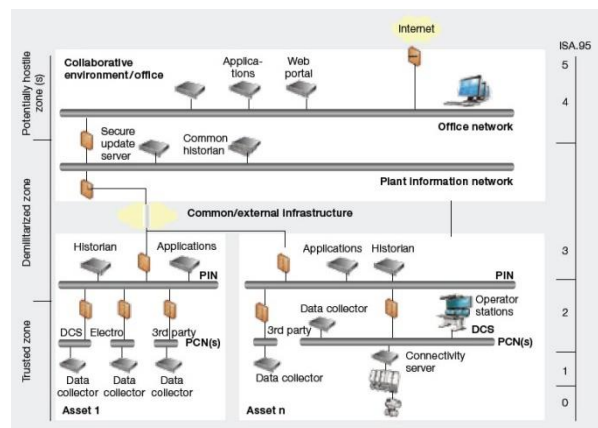


Figure 3. Principal IT topology showing layers of integration related to ISA.95

B. Seamless Integration of Telecommunications and Automation

Unique integration solutions empower the operator with a single point of access and common operator environment for all control and communication tasks, providing numerous operational and economic benefits.

Through close in-house cooperation between automation, safety, electrical and telecommunication engineers, it has identified commonalities, developed technology and created a powerful system architecture that fully integrates all plant telecommunications into a total OPC-based automation and telecom solution [2].

The Benefits of mentioned integrated solutions are:

- Uniform operation and user interface
- All information accessible from a single point of access
- Simple installation and configuration
- Automated actions, messages and event logging

- Transmitting equipment removed from operator desk
- Uniform system maintenance and reconfiguration
- Reduced engineering and interface requirements
- Less cabling and spare parts

C. Unlimited Telecommunications

The limitless opportunities of the telecommunications paves the way for more possibilities during the integration process. Integration of many different telecommunication systems like wireless, fiber optic and others in addition to security and alarm systems significantly expands the borders of application possibilities and also increases the connection and security between the subsystems of telecommunications department and the model itself [2].

D. Operations, Management and Maintenance

A complete solution for an oil and gas and also for other facilities will always consist of a wide range of products and systems from multiple manufacturers posing numerous functional and operational challenges. In an integrated telecom solution offered for example by ABB key design parameters include full functional interaction and easy, single-point management and maintenance from the very start [2].

As a small example this process related to Integrated Operations by ABB Company can be shown in Figure 4 [3].

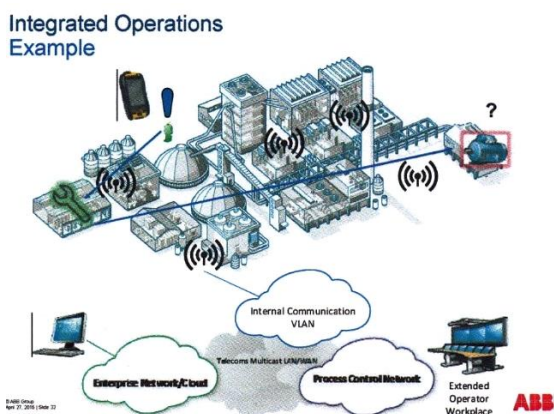


Figure 4. ABB integrated operations example

For instance, if some problem with one equipment in the area occurs, specifically with one of the pumps, automation system will receive a notification about the issue via the central management department by telecommunication connections. All the necessary information about the issues of the equipment will be presented in the screen of operator’s computer and for the security of the system all the electrical supply to the equipment will be stopped. Also, information about the technical issues with above noted troubled equipment is sent to the phone of the closest maintenance worker who is determined automatically with the help of GPS system. The worker comes to the equipment with all necessary tools and scans the identification number of the equipment with the camera of his phone.

A special software uses that identification number to search the general database and find all the necessary data about that equipment. After that, the worker with the help of operation and maintenance manuals and guides presented on his phone’s screen solves all the issues with the equipment and etc.

Above mentioned process is only a limited example of the potential of this system and as noted before this system has wider application possibilities.

E. Looking Ahead Towards an Integrated Future

As looking towards the future we see a continued convergence of technologies and applications - where the network and integration via different systems is very important. Voice, data, video, security and intrusion, and of course the main part of all industries power, control and instrumentation system integration are the features which make plants’ work process safer, easier and faster.

It should be noted that integrated operations also provides reliability and serviceability, standard, off-the-shelf products and systems will be increasingly utilized to build customized complete solutions.

VI. CONCLUSION

Although there were some companies that resisted and ignored the advantages of use of integrated operations system due mainly to the cost of installation, certain time period after the installation when benefits of this system like easier and faster productivity level in the plant, consistent guard against mistakes, also simplification of the monitoring and management of the security and all other processes and other advantages are seen it becomes apparent that this system is very useful and cost justified. Thus, the cost expenditures in the beginning bring more value to the company or plant and eventually exceed the cost spent installing the system and bring additional profit.

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BIOGRAPHIES



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