

The Siemens logo is displayed in a white rectangular box in the upper left corner of the page. The background of the entire page is a photograph of an industrial refinery or chemical plant at dusk or dawn, with tall distillation columns and complex piping silhouetted against a warm, orange sky. The facility is illuminated by various lights, creating a high-contrast scene.

SIEMENS

Technical
article

Industrial Networks

Industrial communication enables the pathway
of digitalization in Oil & Gas

Volatile market conditions continue to impose big challenges to the Oil & Gas industry, where business uncertainty and reduced investment is becoming the norm. At the same time, this gives opportunity for Oil & Gas operators, to identify and implement new technologies that enable them to overcome their biggest challenges and reach long term goals.

This article examines and describes the benefits that a properly implemented industrial communication system, can offer to Oil & Gas operators. Furthermore, this document provides a brief overview about the role that industrial communication plays, as an enabler of digitalization in Oil & Gas. Also included is a brief overview of successfully implemented, real-world projects.

Historically, the Oil & Gas market has been normally characterized for being conservative when adopting new technologies. This is brought by concerns of availability, reliability and maintainability of the systems that ensure a continuous exploration, production, transportation or refining of hydrocarbons.

And through years of lessons learned, the implementation of cost-containment measures has taken the spotlight for Oil & Gas operators, as they aim to maintain a healthy balance sheet.

Together this provides the opportunity to assess existing processes and identify areas of improvement. Through the implementation of new technologies, capital and operational expenditures are optimized while adhering to important HSSE (Health, Safety, Security and Environmental) regulations.

Additionally, other challenges have been arising in the Oil & Gas industry such as lack of cross-domain, improvement of global collaboration and need to ensure data analysis. All this based mostly on the need to take more reliable decisions in a shorter time and tighter budgets.

These challenges lay the foundation for digitalization in the Oil and Gas industry, dramatically increasing the importance of secure and reliable data communication networks. These networks must ensure a constant flow of critical data, where a single communication failure can have a profound monetary or even human and environmental impact.

For this reason, it is paramount to differentiate between conventional and industrial communication technologies.

Conventional network technologies and components are designed to support office IT (Information Technology) networks, used in the daily business of a company. They are the backbone of any office environment enabling shared office printers, e-mail, external internet access, and VoIP services. A service interruption may have financial implications, but not in terms of health, safety or the environment.

In stark contrast, industrial communication technologies and components are designed to be used in extreme harsh environments and support critical applications. Clear examples are drilling operations, DCS, SCADA, ESD, F&G, substation automation or even rotating equipment, which are typical use cases in Oil & Gas deployments. In this case, a service interruption in an industrial network can have severe financial implications and bring an entire operation to a grinding halt.

Within the industrial communication landscape, it is possible to find several technologies that are able to fulfill the unique

requirements demanded by the Oil & Gas industry. A clear example is WiMAX (IEEE 802.16e), which has gained acceptance in the industry, as a versatile technology that can be deployed in many applications within the complete Oil & Gas value chain.

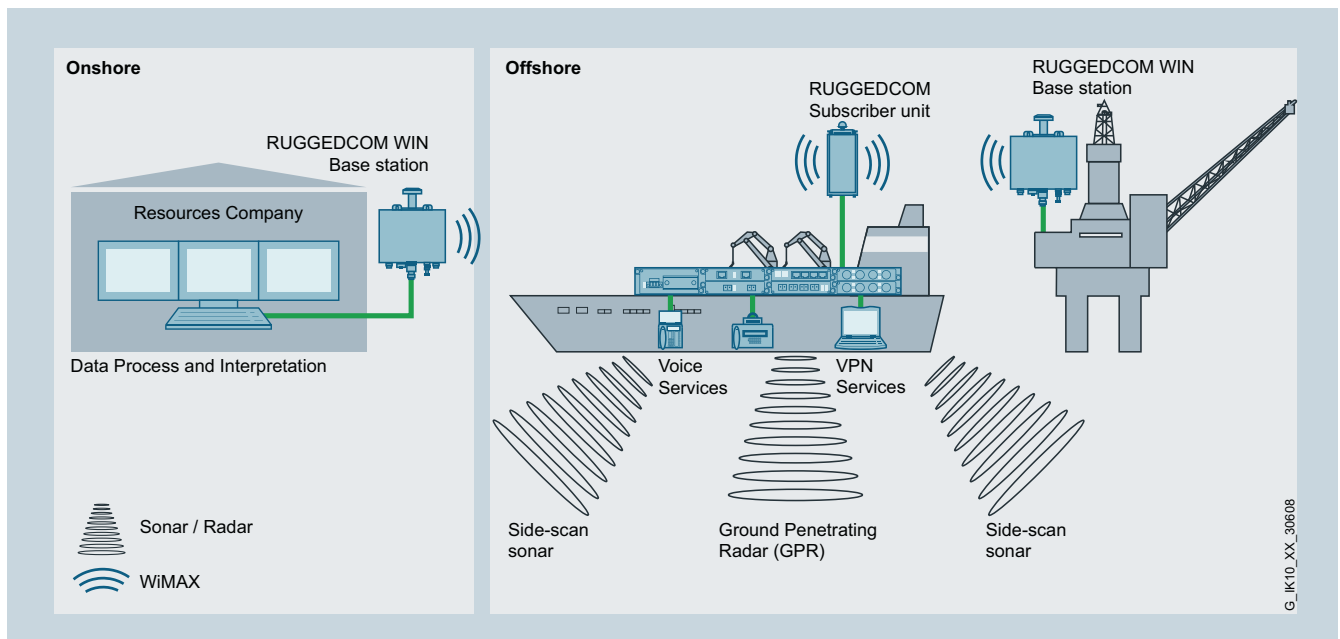
Maintaining a balance of price-performance ratio

Since the days of “easy oil” in shallow waters are gone, it is now common for offshore Oil & Gas operators to drill at depths up to 3 km. At these depths, deepwater exploration and production is required and introduces a new set of challenges.

Offshore exploration in deepwater is a high-risk business, that increases system complexity and leaves little or no room for error. Even with the key elements present such as sealing cap rock, porosity and permeability, there is no guarantee that the expense of an exploration well, will justify the millions of investment for its development.

A clear example is a project where a leading natural resources company in North America, faced several challenges while striving to improve its offshore exploration activities.

In this application (Diagram 1), RUGGEDCOM WIN based on WiMAX technology was the missing piece of the puzzle. It enabled this company to overcome these challenges and increase their deepwater assets in North America.



Exploration vessels with geophysical devices obtain information from subsurface structures that can be used to determine whether potential oil and gas deposits are present or not.

For this project, exploration vessels were equipped with geophysical sensing devices that collect information from subsurface structures. This information is analyzed to determine if oil and gas deposits are present. Reliable communication was a key component in reaching project milestones such as data acquisition, mapping subsurfaces, identification of potential deposits and formation evaluation.

The Ruggedcom Win solution facilitated to improve productivity, by enabling secure and reliable long haul wireless communication (up to 40 km) for moving vessels. Moreover, it allowed them to maintain a better balance between price and performance compared to costly satellite communications. Bandwidth and latency both improved and more importantly, operational costs were optimized.

CAPEX and OPEX optimization

A leading National Oil Company (NOC) in central Asia, with over 120 years of experience and control of more than 90% of the oil and gas reserves in its country, identified clear benefits in implementing industrial wireless technology, to improve its onshore gas processing operations.

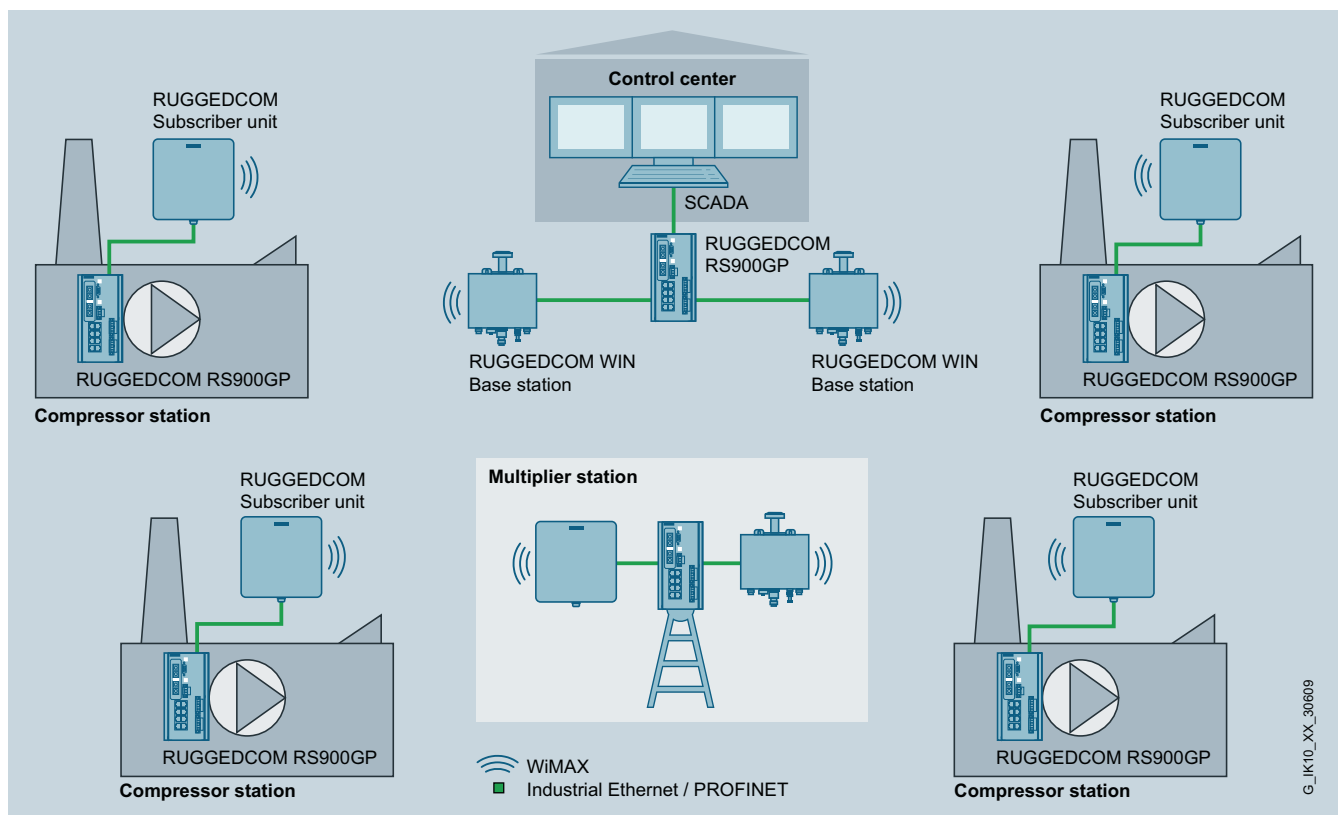
Gas processing plays a key role within the hydrocarbons value chain, since they must be extracted from a raw

mixture of gas, oil water solids and other impurities. A specialized process is required to separate these hydrocarbons from non-hydrocarbons, to produce a dry natural gas, with the highest possible calorific value and commercial pipeline quality.

In this scenario, gas compressors are necessary to ensure the reliable extraction, production and distribution of natural gas. As example, when the natural reservoir pressure declines, the compressors are used to preserve the gas pressure and continue with production. Additionally, gas compressors are used to ensure a reliable distribution of this high valuable hydrocarbon, via surface or underground pipelines.

With one of the NOC's largest oilfields, the main challenge was to increase the productivity of the gas compression systems, within the gas processing plant (GPP).

To achieve this goal, it was necessary to provide a secure backup link for connectivity at distances up to 65 km away from the GPP (Diagram 2)



Secure backup data connectivity for distances up to 65 km away from the GPP.

At the beginning of the project, there were no initial plans to incorporate wireless broadband solutions based on WiMAX. While assessing the network design with the aid of Siemens technical consultancies, clear benefits were identified making WiMAX the preferred choice.

Compared to a fully wired network design, CAPEX and OPEX were optimized, commissioning time and troubleshooting were dramatically reduced and an additional level of

redundancy was provided through the use of a wireless backup link. Since the WiMAX system supports true mobility, the NOC was additionally able to benefit with increased flexibility, brought by a mobile workforce. Their repair and monitoring team vehicles, are now able to access the network within the complete GPP, making "connectivity on the move" possible.

Security information

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions only form one element of such a concept. For more information about industrial security, please visit <http://www.siemens.com/industrialsecurity>

Siemens AG
Process Industries and Drives
Process Automation
Postfach 48 48
90026 Nürnberg
Germany

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Conclusions

- Industrial communication equipment differs from conventional devices, as they are designed to be used in harsh and industrial environments to support OT (operational technology) networks, which are the backbone of critical applications in the Oil & Gas industry
- Industrial communication is a key enabler of digitalization in the Oil & Gas industry, as it is required to ensure a reliable, secure and constant flow of information along the complete Oil & Gas value chain
- In order to define which technology is the most appropriate to rely on a reliable communication network, it is necessary to analyze the diverse operational paradigms and requirements of each application. It means, counting with a professional planning and support, to reduce the probability to run into difficulties during installation, commissioning and operation