

MANAGED SERVICES FOR THE OIL AND GAS SECTOR

The oil and gas industry has facilities that typically spread across various remote locations, and are not usually connected to an enterprise network. It includes the global processes of exploration, extraction, refining, transporting (by oil tankers and pipelines), and marketing petroleum-based products. The largest volume products of the industry are fuel oil and gasoline (petrol). Petroleum is also the raw material for many chemical products, including pharmaceuticals, solvents, fertilizers, pesticides and plastics.





Managed Services for oil and gas process assets

The industry has been responsible for a number of high-profile environmental incidents, including oil spills, and leaks from refineries and pipelines that have resulted in a great deal of negative media coverage. Most countries now impose strict regulations about safety and environmental controls. The oil and gas industry has worked hard over recent years to meet the challenge of providing energy and related products while, at the same time, protecting the environment. Much has already been achieved, but the industry recognises that even more can be accomplished. Therefore, it is crucial that operatives within the oil and gas industries can control and monitor the plant during every part of every process, including times when staff are not present on site.

M2M Benefits for the Oil and Gas Industry

Connecting oil and gas industry equipment to the Internet of Things and automating processes using sophisticated wireless M2M solutions delivers immense process improvements and provides clear and up-to-the-minute data on operations.

Some examples of areas where M2M delivers benefits for process control are:

- Controlling processes and plant optimisation. Using M2M process control technology enables manufacturers to keep their operations running within specified limits, including load scheduling and the monitoring of equipment performance. This allows more precise limits to be set in order to maximise profitability and also to ensure quality and safety.
- Lowering and containing costs for process control and equipment management, without compromising quality or customer satisfaction.
- Closer management of equipment such as pumps:
- Failure of offshore pumps can lead to operational inconvenience and unscheduled production shut down. Online monitoring can allow operators to pre-empt such problems.
- Effective flow management based on real-time data enables oil and gas companies to improve operating conditions.



- Managing fluid parameters more closely will maintain stability and increase productivity in operations, as well as limiting environmental damage caused by the discharge of the drilling fluids.
- Alarm management by collating alarm information centrally, assigning alarm trip points and priorities and ensuring that they reach the right people as fast as possible.
- M2M-controlled device security provides secure remote access to devices as well as data communications between devices.

Real time information from the M2M managed services improves decision making and increases business agility by:

- Providing the flexibility to deal with uncertainty in the market. Government regulations are constantly evolving and the international nature of the industry complicates matters further. The constant fluctuation of prices also demands a level of agility that most companies do not have; thereby making it extremely difficult for oil and gas executives to forecast sales numbers and manage profitability targets. Most organisations struggle to be flexible enough to adapt to new business processes and conform to new standards at any time. Manual or outdated processes, lack of documentation and process repeatability, as well as an overall lack of agility when it comes to making operational changes, retard change and the cost of failure to adapt can be very high.
- Helping to capture the knowledge of the best people in the company and to make the most of human capital. This is made even more essential by the continual emergence of new technology in the oil and gas industries and using M2M-enabled devices can help companies to keep up-to-date with technological advances.

M2M also helps meet environmental targets and reduce water and air pollution. Using real-time M2M solutions can:

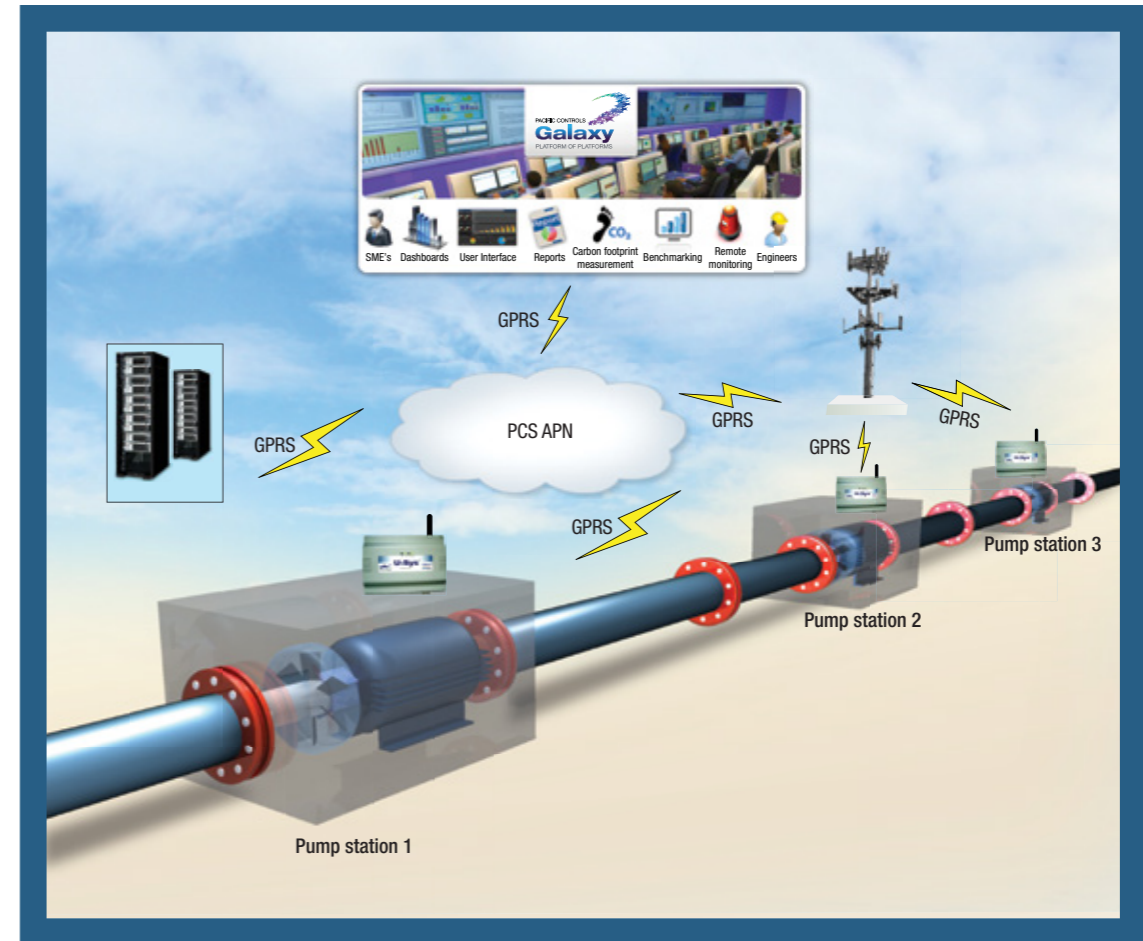
- Monitor ageing oil and gas infrastructure, including maintaining cathodic protection. Keeping up with demand and meeting environmental regulations is becoming more difficult as physical infrastructure ages and breaks down. Oil and gas companies have large amounts of physical

capital in the form of refineries, drilling rigs, pipeline, IT systems and other equipment. In order to satisfy regulators and to provide a safe environment for workers and the local community and ecosystem, this equipment needs to be maintained and upgraded over time, which requires a huge and continuous financial commitment by the company.

- Reduce oil leaks from pipes, which are a common cause of damaging oil spills, by introducing predictive maintenance and alerting staff immediately if there is a leak. Pipelines in remote locations can be monitored to protect them from theft and vandalism.
- Manage waste water and its potential environmental impacts. Water produced during oil and gas extraction operations constitutes the industry's most important waste stream by volume. M2M solutions can help to control high water content in the export oil phase, high liquid content in the gas phase and high oil content in the waste water produced. It can also be used to monitor radioactivity levels in the water produced. Levels of radium and its decay products and their concentration at each site can be monitored and the disposal process, whether the water is re-injected into deep wells or is discharged into non-potable coastal waters, can be managed more efficiently.
- Aid in introducing green technology. M2M allows oil and gas companies to employ different environmental monitoring methods which allow them to predict future conditions and to respond more rapidly. This makes it possible to halt drilling procedures, shut down production, or cease construction work during environmentally sensitive periods.

Pacific Controls Managed Services for the Oil and Gas Industry

Manufacturers of equipment for oil refineries and pipelines can use Pacific Controls ICT Enabled Managed Services For Business Process Integration to offer their customers the security of knowing that complex and expensive equipment is being continuously monitored and its performance optimised to improve operations, increase safety and keep



Example of Managed Services for pipeline monitoring

costs down. Managers can be assured that potential faults will be identified before they cause problems that could, for example, result in outages, flow control issues, spills or leaks, as well as endangering the lives of staff.

Pacific Controls provides:

- ICT enabled managed services including monitoring, feedback and optimisation tools that can be used to reduce cost and inefficiency at every stage of a plant life cycle, from design and construction through use to final demolition. The company's Galaxy platform is a complete integrated managed solution platform for connecting smart devices wirelessly to infrastructure and enterprise systems for real-time delivery of these managed services. The solution includes Gbots, software-based robots, deployed across networks to diagnose faults and control processes remotely.
- Integration of diverse equipment on a single platform. Pacific Controls Galaxy platform is the world's first enterprise platform capable of managing an entire enterprise ecosystem.
- Wireless M2M technology that can monitor and control typical equipment and processes including natural gas compressors, standby generators, electronic flow measurement (EFM), oil production, cathodic protection, fuel tank level monitoring, water resource measurement and similar installations.

- Integration with a client's existing Enterprise Resource Planning (ERP) systems. Pacific Controls Managed Services for Critical Assets Monitoring include a network comprising sensors, middleware, software and applications that help improve efficiency and quality by linking the data directly with mission critical applications such as ERP. These applications integrate internal and external management information across an entire organisation to facilitate the flow of information between business functions inside the boundaries of the organisation and manage the connections to outside stakeholders. Integrated data management provides an integrated modular environment to manage enterprise application data and optimise data-driven applications.

Pacific Controls operates a state-of-the-art GCCC that provides 24x7x365 real-time remote monitoring and control of all electro-mechanical and security services at the customer's facilities. When a customer subscribes to the service, sensors and data gathering panels are installed that include wireless transmitters that send data, including oil tank levels, pressures, temperatures and equipment statistics, to the Pacific Controls GCCC. For example, data from oil wells which used to be collected at specific times, can now be updated in real-time, all of the time. Critical alarms, such as tank pressure and tank level alarms, are sent to a list of email addresses, or as SMS messages to cell phones, and even as computerised text-to-voice messages to any phone.



This both enables maintenance personnel to attend malfunctioning wells faster and allows them to schedule product distribution with much greater efficiency, based on accurate, dynamic information. Galaxy can generate reports automatically from any of the data collated in the system and help to improve management decision making by providing access to real-time data and identifying patterns in that data.

Monitoring Cathodic Corrosion Protection

Oil and gas facilities often use cathodic protection systems to provide leading-edge corrosion control and chemical injection solutions. Corrosion is an enormous cost to these industries as measured in equipment maintenance and replacement, leaks and system failures. Pacific Controls Managed Services for Critical Assets Monitoring help to dramatically reduce this waste by offering corrosion detection and cathodic protection management services that extend equipment life.

Corrosion is natural and inevitable, but it can be minimised and delayed. A study conducted by the US Federal Highway Administration (FHWA) and the National Association of Corrosion Engineers (NACE) estimates that the annual direct cost of metallic corrosion to the U.S. economy is 3.1% of the gross domestic product (GDP) or approximately \$300 billion. Of this corrosion, around one third is avoidable through broader application of corrosion-resistant materials and following best technical practice.

How Cathodic Protection is Used

Corrosion of metals is a result of electrochemical reactions, which occur as the free energy of the metal atoms tend to reduce to a minimum. Every metal immersed in an electrolyte develops an electrochemical potential, and ground water, sea water and even concrete can act as the electrolyte. This causes a combination of chemical reactions and the exchange of electrical charges (current) between a positively charged anode and a negatively charged cathode in a process that is commonly known as an electrochemical cell. This electrochemical process has two causes:

- The variation in the natural potential between different metals and variations in the state of a single metal at different points on the surface.
- Local differences in the environment, such as variations in the supply of oxygen at the surface (oxygen rich areas become the cathode and oxygen depleted areas become the anode).

Cathodic protection (CP) is a method of corrosion control that can be applied to buried and submerged metallic structures. It is normally used in conjunction with coatings such as paint as a secondary corrosion control technique. Coatings are the first line of defence and can be between

50 and 99 % efficient depending upon age, type, method of installation, etc. A properly designed and maintained CP system will take care of the remainder resulting in a 100 % efficient corrosion protection system.

There are two types of CP:

- In one, a sacrificial anode of a more electrically active metal is attached to the structure. Electrons are lost from this anode in preference to those of the metal being protected.
- In the other, a slight DC voltage is applied to the structure causing a flow of direct current electricity to interfere with the activity of the electrochemical cell responsible for corrosion.

CP is used on a wide variety of immersed and buried structures, and on reinforced concrete. It can be applied to existing structures where coatings are damaged.

CP commonly protects :

- Pipelines
- Ships' hulls and tanks
- Storage tanks for oil and water
- Harbour structures
- Foundation pilings
- Offshore platforms, floating and sub sea structures

The main advantage of CP over other forms of anti-corrosion treatment is that it is applied simply by maintaining a low-voltage electrical circuit across the metal to be protected and its effectiveness may be monitored continuously. Its use avoids the need to provide a 'corrosion allowance' to thin sections of structures that may be costly to fabricate, and it may be used to afford security where even a small leak cannot be tolerated for safety reasons.

Monitoring Strategies for Cathodic Protection

The design and operation of CP systems is an iterative procedure. Their functioning depends upon the condition of the local environment at each point on the surface of the structure being protected, and upon the level of protective current supplied to each point of the structure. In some cases (particularly where there has been interference from previously unknown metallic structures in the vicinity of the structure being protected) modifications to the design may be required in order to achieve adequate protection.

Monitoring is crucial for the following reasons:

- The installed system will, at a minimum, require initial adjustments to balance the system and periodic adjustments to maintain that balance.

- Excessive negative potentials can, themselves, cause damage, particularly to aluminium and lead structures. In addition to being wasteful of anode material or electrical power, excess potentials can result in the generation of hydrogen gas. This can cause disbondment of protective coatings and hydrogen embrittlement of certain types of steels, especially high strength steels

CP systems may be monitored effectively by the measurement of structure-to-electrolyte potentials, using a high input impedance voltmeter and suitable half-cell. Adjustments are made to the cathodic-protection current output to ensure that protective potentials are maintained at the specified negative level.

Pacific Controls Managed Services for Monitoring Cathodic Protection

Pacific Controls ICT Enabled Managed Services For Business Process Integration offers continuous online monitoring of the protection voltage and provides anytime, anywhere access to the CP information on laptops or handheld devices for immediate response to any problems. Pacific Controls managed services solution helps to minimise the cost of monitoring and increase its frequency dramatically. By detecting corrosion problems early, asset owners and CP suppliers can take action to extend equipment and asset life.

Secure and instant access to measurement is provided using the Galaxy portal, which allows web-based monitoring of measurement ranges, configuration and alarm notification settings. Installation and system commissioning is simplified using integrated diagnostics and web-enabled configuration that significantly reduces the need for trips to remote sites.

Pacific Controls managed services will increase the life of transmission and distribution pipelines, storage tanks, oil and natural gas well casings, bridge decks, piers and other critical infrastructure by monitoring corrosion potentials and environmental data and tracking rectifier voltage and current. Pre-configured CP monitoring applications on the Galaxy platform measure volts, amps, pipe-to-soil voltage and

detect the presence of AC power. In addition, wall thickness can be measured. Power failures will be detected instantly and all alerts will trigger a rapid response and automatically be forwarded to relevant personnel.

Benefits for Oil and Gas Companies

Pacific Controls Managed Services for Critical Assets Monitoring help oil companies to optimise performance of plant and equipment, using the real-time data collected. This allows the monitoring of flow, throughput and temperature of all equipment in real time, making it easier to ensure a smooth flow of operations. The system automatically optimises scheduling of equipment use, improving availability.

Galaxy's advanced FDD framework maintains systems at their optimal performance and reliability and will improve plant integrity by providing assurance that the equipment is being operated within predefined limits and that all safeguarding systems are working properly. Using rule-based expert systems and predictive intelligence, degrading performance is identified early and preventive action taken. This will increase the life of equipment and machinery and reduce operations and maintenance costs.

Safety is improved, as critical alarms are detected and reported to the appropriate people as soon as they are raised. The service makes sure there is a fast response to alerts and provides real-time information about problems. Troubleshooting can be done remotely using intelligent Gbots to provide early fault detection, transforming oil and gas plant into real-time predictive and self-healing systems. Gbots are unobtrusive automated tools for customer support and are integrated into Pacific Controls Galaxy services delivery platform. These intelligent machines can communicate and change state automatically based on preset program criteria. The managed services increases the flexibility of response to alerts and Pacific Controls solutions for emergency management improves speed of reaction and supports better interworking between the various agencies responding to the alert, including efficient collaboration, more effective resource management and better focused deployment.

