Integrated Monitoring Solution Helps Major Energy Company Increase Safety and Profitability

Capgemini architects a new platform for reduced downtime, improved maintenance efficiency, and environmental protection

The oil and gas industry faces consistent pressure to meet the demands for safely generated fuel. At the same time, organizations seek to minimize the environmental impact that oil extraction and refinement can create. Like any company in a competitive global market, energy companies also explore ways to reduce fuel production costs and maintain continuous operations. This balancing act means that modern oil and gas producing corporations must embrace new approaches and new technologies to remain at the forefront of their industry.

One leading energy company, based in Europe, has done just that. The organization uses the latest hardware, software, and Internet of Things (IoT) devices in a comprehensive solution architected by Capgemini to monitor oil refining systems.

Success Story Overview

Customer: Leading European energy company

Industry: Oil and gas

Location: Europe

Client Challenges / Business Need:

- Needed to reduce fuel production costs while optimizing continuous operations

Results:

- Real-time loss detection and asset monitoring system finds leaks faster
- Wireless connectivity eases deployment of new services
- Predictive maintenance and improved employee safety minimize overall risk
- Increased uptime creates strong ROI

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Finding needles in the haystack

Oil refining systems involve a complicated and extensive combination of physical infrastructure and chemical technologies. The endeavor converts crude oil using a process called fractional distillation into constituent elements like gasoline and natural gas. A typical refinery, therefore, involves a vast network of plumbing, large tanks, cooling, and control systems.

Monitoring every element of the infrastructure for potential anomalies creates significant challenges. Visual inspection of refining systems can reveal apparent issues that need maintenance. However, should leaks occur, they are tough to find. During typical operation, refinery torches generally maintain a small flame that acts as a supplemental safety measure. The torches serve two purposes: First, they can relieve overpressures related to the refining process. Secondly, they can eliminate fossil fuel byproducts from a pipe in preparation for maintenance. Torch valves usually remain shut. In the event of overpressure, though, the system opens the relevant valves to relieve it. Also, should unexpected leaks occur, piping directs wayward gases to the torch for consumption.

Finding the exact location of that leak in a vast network of piping is difficult. Without advanced monitoring in place, diagnosing, finding, and remedying the problem can require days. In addition to the potential workplace hazards which escaped gases can pose, the loss of fuel products – and the possible revenue loss associated with it – create a supplemental business challenge.

The energy company wanted to lead the industry in efforts to reduce the risk of carbon-based atmospheric fuel leaks. To accomplish that, it needed much better monitoring approaches so maintenance personnel could address issues more rapidly and prevent unexpected and costly downtime. The corporation turned to Capgemini to architect an innovative solution which addressed all its requirements and aspirations.

Designing an integrated monitoring system

Capgemini engineered a real-time loss detection and asset monitoring system which supplements the client's existing solution. The Capgemini solution adds IoT devices, backend systems, monitoring software, and cloud-based services, for more in-depth insights.

Temperature sensors assist in detecting leaks. Other IoT devices were added like pressure sensors and vibration-detecting accelerometers to provide more monitoring data for comprehensive analysis. The combination allows the system to scrutinize refinery infrastructure for any deviations from normal operations which might indicate a future problem and a need for preventive maintenance.

The use of wireless connectivity among devices eases deployment of new services and reduces solution costs. Because the solution hosts multiple IoT types, new sensors deploy quickly in a "plug and play" fashion.

The solution also enables comprehensive reporting via a unified dashboard accessed from desktop computers or handheld devices. It features the ability to record and maintain accurate historical data. In turn, that information can feed into machine learning algorithms to improve process development over time.

Simplifying risk management

Protecting the refinery against both internal and external threats represents another vital consideration for the new monitoring system design.

An environment involving combustible fuels under pressure always poses the potential for safety risk. The IoT network instantaneously determines where leaks occur and ensures appropriate actions for needed repairs and adjustments. It also helps maintain employee safety. In an oil and gas environment, meeting certifications, regulations, and compliance is critical.

External security represents another mandatory element of the broader solution. Should a malicious party identify vulnerabilities in the refinery's infrastructure, sensitive machinery or software could theoretically face exploitation. Therefore, Capgemini implemented security layers at all levels of the monitoring solution to protect critical systems and meet ANSSI-certification requirements.

Substantial returns on investment

The refinery's capital expenditure for the Capgemini solution offers long-term ROI. Since the monitoring system helps increase uptime and avoid operational delays, it pays for itself by maximizing gas output and minimizing customer service interruptions. Identified leaks are addressed more rapidly than ever before, so the company also avoids revenue losses – and environmental impact -- associated with escaped fuel.

A future-ready, open solution

When designing the monitoring system, Capgemini sought to make the solution as "future-proof" as possible to maximize its client's investment. The solution involves industry-standard devices alongside open-source APIs and software. The "agnostic" system can, therefore, tap cloud-hosted Software as a Service (SaaS) from a variety of providers including Amazon Web Services, Microsoft Azure, or Google Cloud.

While Capgemini's solution thrilled the energy company since it addresses their mission-critical needs today, the company also anticipates longer-term benefits. The system's extensibility offers the refining company new capabilities to deploy new services, extending the value of their customer-centric operations, and creating new revenue streams.

A team effort

Developing the IoT-based analytics and monitoring system included Capgemini's work with Intel to develop an end-to-end solution for tracking the asset lifecycle. Intel's proven hardware, software, and security ecosystem, including Intel gateways and XIoT framework, enable the system's underlying architecture.

These Intel ingredients, in combination with Capgemini's industry experience, XIoT middleware, and analytics capabilities, create a fully integrated system. The result is a customizable, secure end-to-end IoT platform solution, available "as-a-service" and ready for deployment.

An XIoT solution with multiple industry applications

The proven solution provides an excellent option for companies facing similar challenges in other industries too. With the aid of internet-connected devices, business intelligence across the asset network encourages further innovation and greater operational efficiency.

Sectors like manufacturing, utilities, construction, transportation, and aerospace often involve diverse and complex assets spread over large areas. Maintaining those assets, and identifying potential issues before business-critical failures, creates significant challenges. Downtime of critical assets leads to delayed operations, monetary losses, and poor customer service.

With a rich set of built-in capabilities and its future-proof architecture, Capgemini's in-depth Intelligent Asset Monitoring solution offers an adaptable, turnkey solution.

Find out more

To learn more about the ways Capgemini solutions can increase your mission-critical infrastructure's reliability, operational efficiency, and performance, please contact your region's Capgemini representatives and visit: https://www.capgemini.com/service/energy-internet-of-things/

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