

INNOVATION

Maintaining the bottom line

Hindustan Petroleum Corporation Limited, Mumbai

By improving the real-time reliability of its assets and operations, one of India's largest refineries is starting up its profit engine.

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EcoStruxure™ for Oil & Gas connects all major applications across the O&G value chain, from upstream to midstream and downstream markets. EcoStruxure enables Oil & Gas organizations to be more agile in their response to market dynamics. By providing a collaborative workspace which connects applications and analytics to the field systems/devices, and to the business systems, teams can view combined intelligent dashboards in real time. It brings together functions such as operations and maintenance to facilitate the best overall decisions for the business.

Maintenance matters

The objective of any refinery—from plant operations to maintenance—is to optimize operational profitability, safely. This is critically important as the speed of industrial business continues to increase.

Today, market prices for feedstock, energy, and other commodities can change by the minute. Trying to manage the financial performance of the refinery's operations using monthly data coming from ERP reports is no longer feasible. Operational profitability must be controlled, in real time, which is directly linked to controlling and measuring the reliability of the plant's assets.

For more than a century, manufacturing and plant personnel have focused on improving the efficiency of industrial operations to increase production. As process control technology has advanced, plant assets have been driven to the threshold of their reliability, increasing downtime and safety risks. In short, today's assets are under continuous strain, which is degrading their reliability and affecting the overall performance of the operation.

However, with more robust Industrial Internet of Things (IIoT) technology available, the industrial workforce is more equipped than ever to control and improve the reliability and profitability of their assets and operations in real time.

The maintenance of assets has a critical role in improving the reliability of the operation. Inefficient maintenance programs and poorly maintained assets are a needless burden, leading to increased operational costs and unexpected business disruptions. Once a motor, pump, valve, drive, fan, or any other industrial asset is installed, its availability and the efficiency with which it uses resources is affected significantly by how well it is maintained.

In older refineries, most motors, transformers, drives, starters, and other electrical assets in use today are stranded or non-instrumented, which renders data gathering to a manual process. Technicians make rounds from one asset to the next, clipboard in hand, checking on its status and reporting on anomalies. This is time consuming and tedious for the technician, subject to error and omission. It also introduces safety risk and makes it all but impossible to conduct advanced trending or analysis to optimize performance.

To improve their ability to monitor and report the health of assets, vendors are increasingly embedding them with predictive intelligence. These intelligent devices can detect abnormal conditions and automatically deliver health status to plant networks for trending, analysis, and planning. But their proliferation has presented another challenge: First-generation intelligent devices used proprietary technology that did not communicate

Goal

Ascertain the health from both connected and stranded (or non-instrumented) assets in an intuitive, easy-to-understand way, including the actionable information that enables smarter decisions. First generation intelligent devices used proprietary technology that did not communicate well with other third-party and competitor products which created islands of information.

Story

HPCL needed a methodology to improve their ability to monitor and report the health of assets to detect abnormal conditions and automatically deliver health status to plant networks for trending, analysis, and planning.

Solution

- EcoStruxure™ Maintenance Advisor
- EcoStruxure Condition Advisor
- AVEVA's Condition Management
- AVEVA's IntelaTrac Mobile Operator Rounds
- AVEVA's Process Historian

Results

Predictive maintenance can reduce costs by more than 12%.

well with other third party and competing offers, which created islands of information. While companies were getting better data on some of their equipment, they were limited in what they could do with that data.

Such was the case at Hindustan Petroleum Corporation Limited (HPCL), a national refinery company headquartered in Mumbai, India. HPCL also owns and operates the largest lube refinery in the country. With the help of Schneider Electric, HPCL installed a pilot and evaluated a new solution and methodology that provided a unified workspace, with alerts and analytics from both connected and stranded or non-instrumented assets presented in an intuitive, easy-to-understand way, including the actionable information that enables smarter decisions. The solution will result in early insight into emerging abnormal asset conditions in real time. Additionally, mobility and workflow options enabled better proactive actions and responses to address abnormal operating conditions. The solution promised to meet HPCL's strategy to move to predictive maintenance, resulting in measurable improvements to the real-time reliability of their operations, profitably and safely.

The need for integration

In 2017, 43 years after commissioning, HPCL's Mahul substation had accumulated a mix of more than 2,000 electrical devices, including multiple models of products from at least six different vendors. These assets distributed medium and low voltage to operate the plant and provide circuit breakers, fuses, and other equipment to control electrical loads and protect their plants from dangerous surges. Some of the assets were intelligent and some were non-instrumented. Figure 1 shows the distribution architecture to third party devices.

Continuously monitoring the health of such a variety of assets was becoming a challenge; and it was increasing the risk to the efficiency, safety, and profitability of HPCL's operations. Plant engineers had two major concerns: the manual maintenance checks on non-instrumented assets were incomplete and potentially less accurate than they could be, and record-keeping and trending of data collected manually was also causing problems with Oil Industry Safety Directorate (OISD) compliance audits. A third problem was that the intelligence in the connected assets was under-utilized.

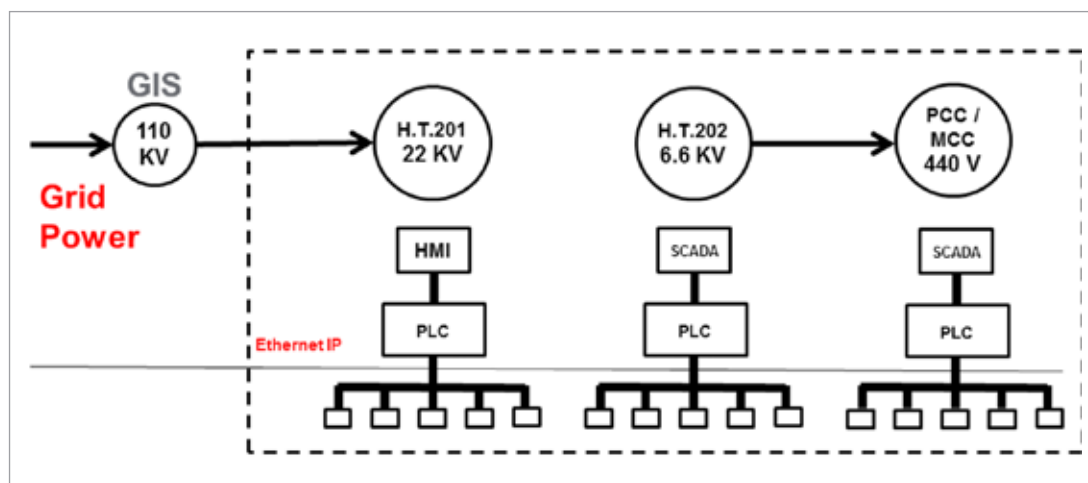
HPCL determined that achieving the close, strategic monitoring of plant assets they sought would require a system that had the following characteristics:

- Real-time alerting, which signals the severity and impact of abnormalities and reports on first-level diagnostics
- Integration of condition monitoring data and reporting
- Elimination of slow, paper-based data collection with more accurate mobile devices
- Digitization of manual data collection to enable trending, record-keeping, and advanced analytics
- A centralized, common, and vendor-agnostic repository for data from intelligent and non-intelligent assets
- Full mobility support
- Integrated work order requests with Maximo® Enterprise Asset Management system
- Support for OISD safety audits
- Scalability to accommodate other asset classes, such as process transmitters and other production automation devices
- Access control to provide the right information in the right context to the right person at the right time while ensuring stronger cybersecurity

“The reliability of our assets is critical to both cost control and revenue generation; and maintaining them properly is critical to reliability. Recognizing that, we are constantly searching for new state-of-the-art technologies that add value to our operations by making them safer and more reliable, especially when the technology can help us reduce safety incidents, disruptions, and downtime.”

— Mr. Vijay Katne,
general maintenance
manager for HPCL

Figure 1



Enter Schneider Electric

HPCL requested Schneider Electric to engineer, install, and run a pilot project to prove the concept and assure the required characteristics listed above could be met. After one month of successful operation, the pilot was decommissioned. But the results have provided HPCL with the documented expertise needed to generate an open Request for Proposal for the future installation of an electrical substation asset management solution.

As illustrated in Figure 2, the fulcrum of the solution is Schneider Electric's EcoStruxure™ Maintenance Advisor solution, which synchronizes data from intelligent connected and non-instrumented assets alike.

When the system detects and reports abnormalities in the assets, it empowers the maintenance organization to trigger work order requests and schedule processes necessary to orchestrate collaboration between maintenance technicians and relevant stakeholders.

By providing early, actionable data and insight into abnormal operating and asset conditions, the solutions activate the workforce to make smarter, more targeted, and more proactive maintenance and operating decisions that improve operational reliability and ultimately profitability.

Reining in stranded, non-instrumented assets

For non-instrumented assets, field inspections are essential to catch problems early, before they adversely affect refinery production or worker safety. AVEVA's IntelaTrac Mobile Operator Rounds allows experienced field personnel to create routine rounds, inspections, surveys,

etc., to gather important operating data on non-instrumented equipment. IntelaTrac proved to be the ideal tool to digitize field inspections such as:

- Critical and auxiliary equipment inspections, including compressors, heat exchangers, motors, turbines, gearboxes, pumps, valves, fans, tanks, seals, and high-voltage electrical equipment.
- Safety inspections/audits, including fire safety equipment and safety audit checklists
- Environmental inspections/audits, including leak detection and repair, wastewater checks
- Energy usage inspection/audits, including electrical power and steam

As technicians complete each round, they update a database with details on whatever has been done to the asset or its general operating status. They enter the information from pick-lists, default text statements or free text, using either the device or virtual keyboard.

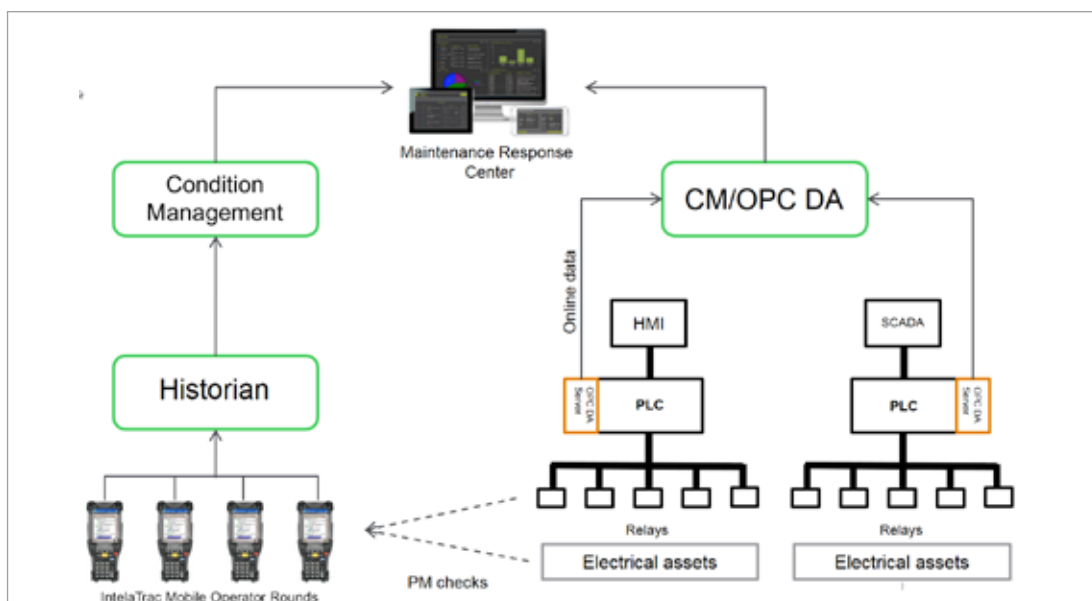
As the data makes its way to Maintenance Advisor, they go to the IntelaTrac historian, where it is accessible by AVEVA's Condition Management condition-monitoring software. Condition Management runs detection and diagnostic queries that help identify and implement further maintenance requirements, replacement needs, or other maintenance optimization activity.

Empowered by the condition monitoring reports from Condition Management, maintenance supervisors use Maintenance Advisor to execute the required changes.

When the system detects asset abnormalities, it automatically triggers workflows and schedules the necessary processes, driving new levels of collaboration between maintenance technicians and other relevant stakeholders.

- Predictive maintenance can reduce costs by more than 12%
- Eliminating abnormal events can prevent lost production value between 3 and 7%*
- Minimizing unscheduled downtime on the plant floor improves ROI on CAPEX and return on assets

Figure 2



Integrating intelligent assets

Maintenance Advisor receives information about the plant's intelligent assets from the plant network via Schneider Electric's EcoStruxure™ Condition Advisor software.

Most of modern-day devices have a built-in OPC data acquisition (DA) server, which converts all their operational and asset health data into a standard format, so their condition can be monitored in the same way, regardless of vendor or asset type.

Condition Advisor collects relevant data from OPC DA server, analyzes and contextualizes it and makes it available to Maintenance Advisor in real time, which, just as with the standalone assets, schedules the workflow necessary to keep the assets in optimal health.

Because Maintenance Advisor brings together connected and standalone assets from multiple vendors, it improves both decision support and workflow management. The software provides supervisors and operators with better analytics and contextualized information about the severity of the incident, empowering them to make better operating and business decisions based on a clearer picture of the assets' operational life.

High-performing maintenance supervisors, supported by quantitative and qualitative data provided by Maintenance Advisor, are empowered to:

1. Optimize planned downtime executing only the intervention strictly required by the wearing of assets
2. Collaborate with operations to create a culture of shared responsibility
3. Consistently learn from measurable and tracked events with the end goal to improve equipment reliability

When an asset fails or when it is at risk of failure, which can cause a major disruption or even bring production to a stop, an alarm will be triggered. The system then proactively creates a work order, assigns maintenance tasks, and monitors the work order loop from creation to completion.

Open architecture and mobility capabilities of Maintenance Advisor enable stakeholders to access complete maintenance information, from multiple locations, as well as facilitate potential integration of other parts of the company and asset classes other than electrical.

Driving profitable reliability, safely

Maintenance Advisor receives information about the plant's intelligent assets from the plant network via Schneider Electric's EcoStruxure™ Condition Advisor software.

Although more time will be required to quantify what the solution might do for HPCL's bottom line, growing evidence indicates that improving maintenance can have a tremendous, positive impact on the profitability of the operation.

Maintenance Advisor software, with built-in Condition Advisors, bridges the gap between operations and maintenance, providing predictive maintenance and decision support for plant-wide assets, including the DCS, intelligent field devices, drives, and other wide-ranging automation assets. With mobile capability and embedded workflow options, it allows plant personnel to respond quickly to emerging conditions from anywhere in the plant.

In short, Maintenance Advisor enables a plant to shift from traditional preventive maintenance, which is estimated to reduce maintenance costs by 8 to 12 percent, to predictive maintenance, which can reduce costs by much more than that.

But cost is only one factor in the profitability equation; revenue is another. According to ARC Advisory Group, on average, up to 5 percent of production is lost annually due to unscheduled downtime and poor quality; 80 percent of that downtime is preventable. *

Estimates also indicate that abnormal events can reduce production value between 3 and 7 percent each year. Protecting even 3 percent of production value is more than enough to justify investing in reducing abnormal events.

By providing early, actionable data and insight into abnormal operating and asset conditions, a solution like the Schneider Electric pilot should allow HPCL to enact preventive maintenance programs that improve the real-time reliability of their assets and operations.

For example, if the HPCL workforce can see that a transformer is likely to fail within an identified timeframe, i.e., the risk is high, they can immediately respond to reduce the load, thus extending the reliability threshold and avoiding a short-term failure. This gives the organization the time it needs to optimally and more permanently respond to the condition, which has a natural impact on the profitability of the operation, safely.

“To remain successful in a fast-paced, increasingly competitive market, we need to ensure we are getting as much value—that is, profit—from our operations as we possibly can; and asset reliability is critical to achieving that goal. This means we are always looking for and need smarter tools, more advanced analytics, and better decision-making to deliver measurable ROI, safely.”

— Mr. Vijay Katne,
general maintenance
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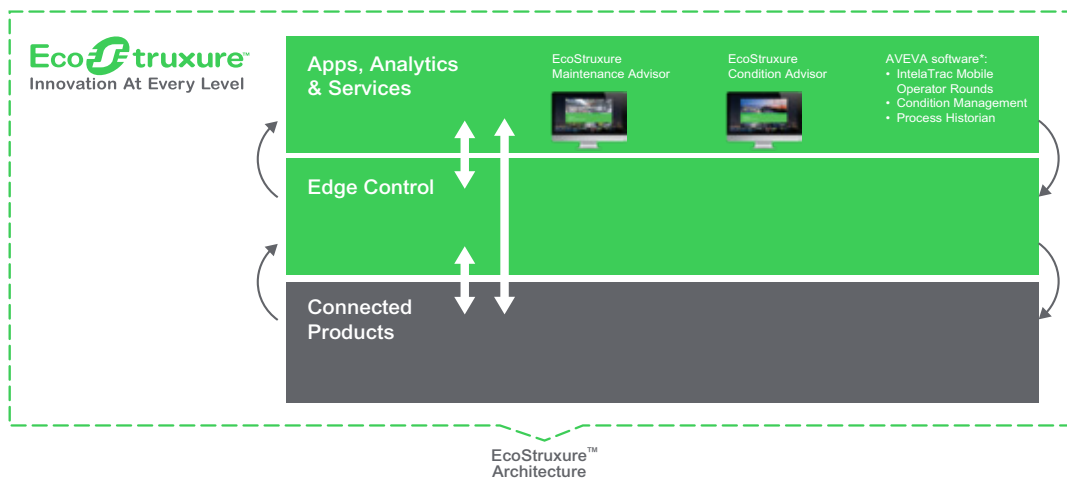
Emerging IIoT technology stacks, like Schneider Electric's EcoStruxure™ Plant platform and tools, are driving a digital transformation; and they are enabling forward-thinking companies like HPCL to seek and find value across its production processes. Maintenance Advisor, Condition Advisor, and other Schneider Electric offerings represent the next generation of technology. By activating the workforce to predict asset health and performance conditions, facilities are better able to control and optimize their operations and deliver better operational profitability, safely, even though, because of many years of service, dispersed and disparate asset base is ageing.

HPCL intends to move to predictive maintenance which will result in measurement improvements to the real-time reliability of their operations, profitably and safely. Continual monitoring of the assets will prevent manual maintenance checks on non-instrumented assets and increase utilization of the connected assets.

Notes:

*Woll D., Hill D. & Polsonetti C. (2002).

Collaborative Process Automation Drives Return on Assets. ARC Advisory Group



*The Schneider Electric industrial software business and AVEVA have merged to trade as AVEVA Group plc, a UK listed company. The Schneider Electric and Life is On trademarks are owned by Schneider Electric and are being licensed to AVEVA by Schneider Electric.

EcoStruxure™

Innovation At Every Level

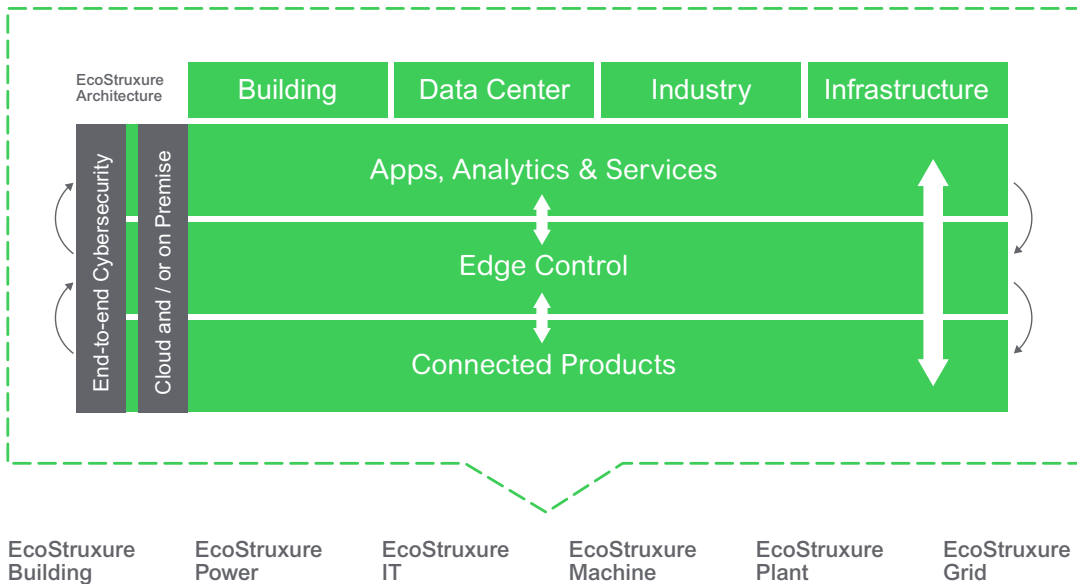
IoT-enabled solutions that drive operational and energy efficiency

EcoStruxure is Schneider Electric’s open, interoperable, IoT-enabled system architecture and platform.

EcoStruxure delivers enhanced value around safety, reliability, efficiency, sustainability, and connectivity for our customers.

EcoStruxure leverages advancements in IoT, mobility, sensing, cloud, analytics, and cybersecurity to deliver Innovation at Every Level including Connected Products, Edge Control, and Apps, Analytics & Services. EcoStruxure™ has been deployed in 480,000+ sites, with the support of 20,000+ system integrators and developers, connecting over 1.6 million assets under management through 40+ digital services.

One EcoStruxure architecture, serving 4 End Markets with 6 Domains of Expertise



Connected Products

The Internet of Things starts with the best things. Our IoT-enabled best-in-class connected products include breakers, drives, UPSs, relays, sensors, and more. Devices with embedded intelligence drive better decision-making throughout operations.

Edge Control

Mission-critical scenarios can be unpredictable, so control of devices at the edge of the IoT network is a must. This essential capability provides real-time solutions that enable local control at the edge, protecting safety and uptime.

Apps, Analytics & Services

Interoperability is imperative to supporting the diverse hardware and systems in building, data center, industry, and grid environments. EcoStruxure enables a breadth of agnostic Applications, Analytics, & Services for seamless enterprise integration.

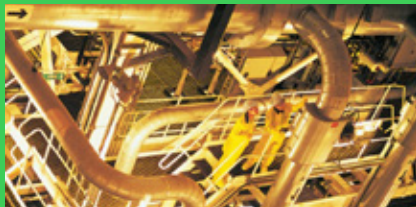
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Ignite your profit engine



Discover EcoStruxure automation & control solutions



AVEVA Condition Management



Profitable safety



Contact us to start your journey

Schneider Electric

Boston ONE Campus
800 Federal Street
Andover, MA 01810 USA
Phone: + 1 978 794 0800

www.schneider-electric.com

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