Co-innovating tomorrow™

YOKOGAWA

OpreX™ Asset Management and Integrity

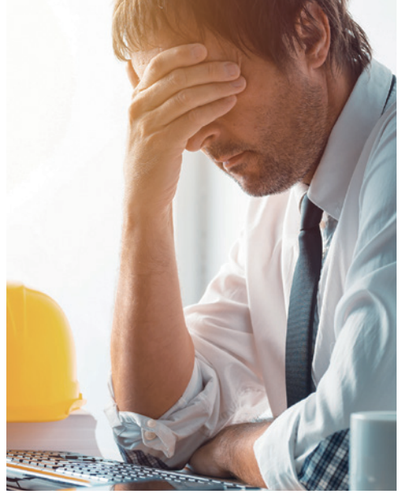
Plant Resource Manager

PRM

Bulletin 33Y05Q10-31E

Why it is important to have a proper asset management regime in place for reliable, efficient, and profitable plant operations

Damage or failure of plant equipment can have a significant impact on operation of the plant as a whole. Yokogawa's Plant Resource Manager (PRM) allows optimization, improves the fidelity of maintenance processes, and provides cost justification.



? Plant equipment maintenance challenges

Complexity of vast fleet of equipment

Accurately assessing the status of the myriad of devices and components from different vendors throughout a plant is a major issue.
Contacting an operator in a control room in order to check the status of a particular device takes time, and the fidelity of the information given may be incomplete.

Lack of maintenance resources

Cost cutting has an impact on plant operations. Plant resources tend to be allocated first to the manufacturing division, which means that maintenance division personnel are forced to perform upkeep with limited resources.
It is challenging to comprehensively monitor plant devices, equipment, and other assets while reducing downtime from machinery failures due to limited resources.

Depletion of institutional knowledge

The labor force is declining; keeping up the same level of maintenance for equipment traditionally entrusted to veteran technicians proves difficult as active technical staff leave the workforce.
In addition, maintenance work has increased due to aging equipment that deteriorates over time. High technical skills and a wealth of knowledge are required, making maintenance work more difficult.

! Yokogawa's approach to efficient facility maintenance

Centrally manage and visualize plant equipment data

PRM allows comprehensive management and reduction of maintenance costs associated with plant equipment, better utilizing these resources from the point of view of maintenance and operations. A field network remotely monitors each device and updates the user not only on its status, but also provides diagnostic functionality for the early detection of failure. This includes detecting valve and other instrumentation malfunctions such as clogged pressure pipes.

Achieve cost savings through improved maintenance efficiency

PRM leverages digital technology to the fullest extent.
For example, using a dedicated PRM plugin that supports the valve packages offered by each vendor, allows the plant to drive efficiency of valve maintenance through auto-tuning and diagnostics.
In addition, automated commissioning and periodic loop checks save time, and use self-diagnostic data when the plant is online to send data to operators in real time.

Yokogawa offers equipment maintenance solutions that provide both reliability and efficiency

Yokogawa is a trusted provider of systems that keep the plant online, as well as maintenance solutions that allow operations to stay online while achieving reliability and efficiency gains.

Yokogawa streamlines
plant management across three levels!

Select which tier to start using based on plant needs

Malfunctions of plant equipment and devices cause abnormalities and instability to manufacturing workflows, and in turn add to the time it takes to identify the cause and restore the system. As a result, overall production efficiency decreases. Anticipating equipment malfunctions before they occur and monitoring plant processes for prevention of failures and hot-swapping of equipment with limited impact to operations.

Yokogawa provides solutions across three tiers:

1 Visualize status and remotely configure equipment

- **Device templating allows for efficient propagating of shared parameters across multiple devices**
- **Device Type Manager (DTM) and other specialized calibrating tools enables equipment to be brought online quickly**
- **More efficient equipment replacement by tracking and comparison of parameter logs**
- **Reduce man-hours by checking and configuring device parameters remotely**

2 Monitor equipment and device performance

- **Device patrolling ensures periodic polling of status data for efficient assessment of equipment conditions**
- **Versatile diagnostic algorithms allow for measuring valves from multiple vendors**
- **Periodic and automatic equipment status reports (field asset KPI reports) visualize conditions and comprehensively assess the health of the plant**

3 Providing data to enhance maintenance and operations

- **Critical equipment information can be checked immediately via not only the DCS but also the entire ICSS (*1) integration for rapid response to problems**
- **Loop diagnostics allow for improving control valve performance and maintaining high productivity**
- **Work order efficiency is achieved by integrating with higher level systems (ERP/CMMS (*2), etc.)**

*1) ICSS : Integrated Control and Safety System (incl. DCS, SIS, and other subsystems)
*2) ERP : Enterprise Resource Planning, CMMS: Computerized Maintenance Management System

Resolving issues across the plant lifecycle

Plants often expend unnecessary resources on maintenance due to a lack of clear thresholds regarding what extent to perform maintenance without impeding plant operations. Yet, with plant maintenance becoming increasingly more stringent and complex, plant owners must maintain reliability while driving efficiency gains.

Before start of operation (Start-up)

After start of operation (Operations/Maintenance)

	Commissioning	Equipment configuration management	Daily maintenance	Equipment replacement	Turnaround maintenance	Facility diagnostics	
Type of work	Equipment configuration and calibration when launching a plant and during turnaround maintenance/inspections	Equipment parameter configuration and management	Confirmation of equipment status while in operation	- Parameter configuration - Loop checking	- Selection of equipment under maintenance - Selection of maintenance parameters - Equipment calibration - Commissioning	Control valve status monitoring	Pump status monitoring
? Issue	Having maintenance (field) personnel and operators (CCR) work together to check connections and loops takes time, and report creation is also time-consuming.	- Information is not centrally managed, making the tracking of parameters and change logs very difficult - Difficult to reuse past parameters	Assessing the latest conditions during inclement weather or for devices attached to towers requires going out into the field, which consumes time for preparation and transit.	Field and operator crew must compare parameters to original installation, which is inefficient.	Difficult to assess each individual device, so all devices are subject to maintenance. Maintenance workflows rely on experienced veterans.	Using valves from multiple vendors; diagnostic approach differs for each.	Relies on experienced maintenance personnel checking for vibration and pings.
Solution	Automatically perform loop checks of HART and FOUNDATION™ fieldbus (FF) protocol compatible equipment widely in use in plants today, and auto-generate reports.	Create a centralized database of equipment data, reducing time spent to find information and making it more available.	The device's self-diagnostics results can be confirmed on the PRM monitor. Multiple staff (maintenance, operations, and others) can check the same data regardless of departmental affiliation.	Reuse prior parameters saved on PRM to quickly swap and replace equipment.	PRM provides maintenance logs per-device; select which ones to maintain. Also select maintenance parameters per the conditions of the equipment in question.	Check the health of valves even when using those from multiple vendors. Diagnostics by correlation of equipment and process data, as well as long-term data retention; diagnose degradation.	Assessing slight pressure changes allows user to quantitatively detect cavitation in the early stages.
! Function/ Product	**Commissioning** CSP FM FMV **Calibration** PRM FM	**Adjust** PRM FM	**Device Viewer** PRM **Diagnostics** PRM ISAE **KPI reports** PRM **PST scheduler** PRM	**Adjust** PRM CSP	**Adjust** PRM FM **KPI reports** PRM **Commissioning** CSP FM FMV	**Valve diagnostics** ISAE	**Pump abnormality detection** CDS

Related Yokogawa products

Visualize status and remotely configure equipment

- PRM — PRM (Plant Resource Manager)
- CSP — PRM commissioning support package
- FM — FieldMate (field equipment calibration, configuration, and management)
- FMV — FieldMate Validator (IOM operation verification tool for N-IO)

Monitor equipment and device performance

- ISAE — InsightSuiteAE (Field Asset Analytics)

Providing data to enhance maintenance and operations

- CDS — Cavitation detection system

Maintenance

Visualize status and remotely configure equipment

Online monitoring and centralized management of plant equipment

Intuitively determine the status of equipment and machinery in the field.

In the event of an abnormality, the details and required action are sent through a notification.

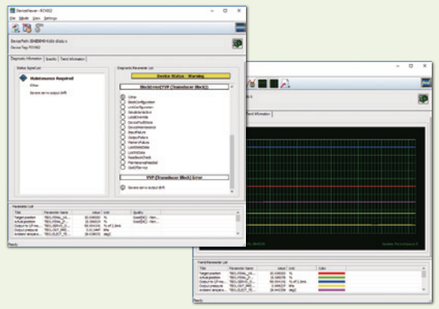
Integrates with CENTUM

Navigation functionality

Plant equipment conditions can be integrally viewed in a list/explorer format. A variety of display formats are available to suit plant needs. Monitor field equipment status online, with at-a-glance review with icons.

Device Viewer

Equipment diagnostic data is shown online in an intuitive format. Monitor equipment data trends at a glance.

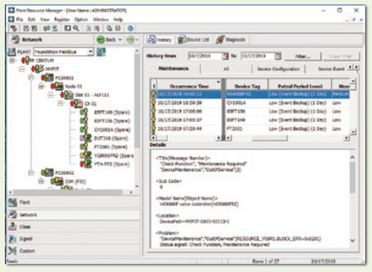


Navigation functionality

Maintenance alarm functionality takes warnings from equipment and advance diagnostics and adds relevant information for maintenance personnel before notifying them. Alarms bound for operators are conveyed via guidance messages from CENTUM HIS (Human Interface Station).

Action Guide

Check predicted causes and response actions so preparations can be done before heading into the field.



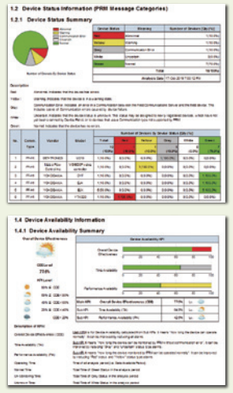
Loop checking

Engineering data from CENTUM, the integrated production control system, is used to confirm device connections, simulate output, and use valve opening data to check three inputs and five outputs. This is then generated into a report that greatly reduces time taken for data analysis.

Assess all field conditions

Report generation

Data collected from field equipment is used to generate a field asset KPI report, visualizing possible abnormal trends in equipment and peripheral processes. These reports allow for efficient maintenance tailored to the current and future conditions of the equipment.



Open technology

System is compliant with open technology and can connect to a wide range of devices.

- Supports devices offering FOUNDATION™ fieldbus, HART, ISA100 Wireless, PROFIBUS, and other digital communications protocols
- Supports international standards like FDT/DTM (Field Device Tool/Device Type Manager) and EDDL (Electronic Device Description Language)
- Supports multivendor field equipment compliant with the above

A range of connection formats for equipment.

- CENTUM VP, STARDOM, and ProSafe-RS connections
- Communication and gateway DTM
- HART multiplexers and HART modems

Data integration

Centralized management of facilities information via a database for effective use of the data.

Assess past alarm history and use this to craft inspection plans. Saved parameters, as well as those for other equipment, can be reused during inspections and calibration. They can also be sorted by specific equipment, alarm, or other parameters; overlooking alarms or forgetting to change modes after inspection will no longer be an issue.

Parameter management

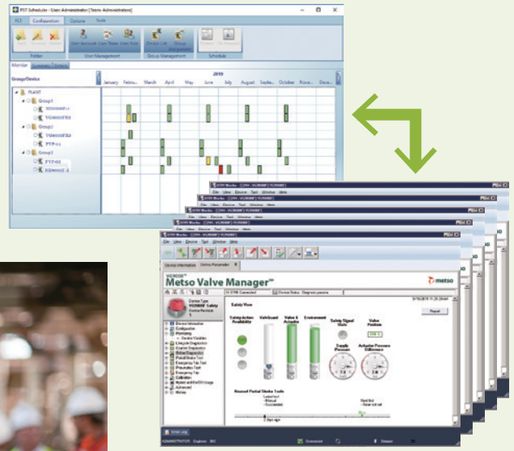
Easily check and compare parameters.

Compare parameters across multiple pieces of field equipment of the same model and check differences.
Easily obtain parameter change logs for field equipment.

PST scheduler

Perform spot checks of emergency shut-off valves in a safe and efficient manner.

Perform automatic and semi-automatic PST's (partial stroke tests) of multiple valves per preconfigured settings and log the results. A PST allows larger lengths of time between each FST (full stroke test), which normally requires taking a plant offline.



Diagnostics

Monitor equipment and device performance

Robust diagnostics support valve diagnosis tools provided by many vendors

Expand the scope of diagnosis from individual equipment to control loops and facilities.

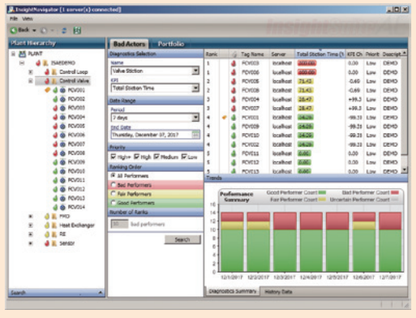
Field Asset Analytics "InsightSuiteAE" is software that identifies abnormally trending plant equipment (field devices with digital communication functions, control valves with a positioner, heat exchangers, etc.) and control loops. This software can visualize the operation status of the device online. InsightSuiteAE performs a diagnosis based on the correlation between equipment data and process data as well as a deterioration diagnosis using long term data.

Valve diagnostics

Monitoring and diagnostics of regulator valves
- KPIs for each diagnosis result
- View priority by ranking

Supports multivendor applications
- No complex configuration required

Diagnostics include:
- Stiction
- Opening deviation
- Linkage abnormalities
- Hunting
- Supplied air pressure
- Estimate seal/gasket leakage

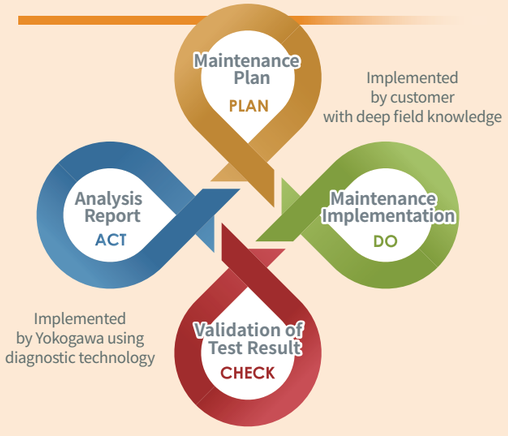


Asset performance reports (consulting service)

Three tiers of evaluation
- Level 1: Visualized assessment
- Level 2: Equipment health assessment
- Level 3: Performance assessment

Report contents
1. Analysis summary
2. List of equipment requiring maintenance
3. Detailed analysis
   - Alarm details
   - Cause
   - Risks
   - Recommended actions

Continuous support to drive improvements in plant uptime and maintenance efficiency



Predictive Detection

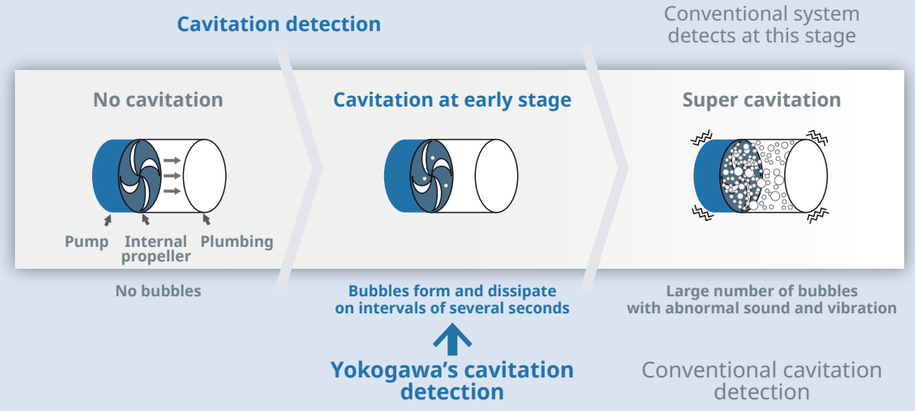
Providing data that will optimize maintenance and operations

- Integrates with detection solutions -

Early detection of equipment abnormalities allows for efficient plant maintenance

Process industries use highly complex and large pumps within operations. Failure of such process critical pumps often results in downtime costs that exceed $200,000/day. Hence, it is critical to keep a very close watch on these pumps and are looking to implement predictive maintenance solutions.
Yokogawa's cavitation detection system does not rely on detection by vibration or pings, the traditional technique used to detect cavitation after it has already progressed. Instead, our solution detects fluid pressure differentials caused by early cavitation, allowing for the quantitative determination of the extent of possible cavitation. Early detection of cavitation provides plant operators time to take proper countermeasures to prevent damage to pipes.

Detectable cavitation level



For more detailed information regarding Cavitation Detection System, please refer to the left brochure (Bulletin 30B10A10-01EN) or visit Yokogawa website.

Visit our website at:
Yokogawa Pump Cavitation
http://www.yokogawa.com/cavitation/

OpreX™ Asset Performance Monitoring

Yokogawa provides a range of lifecycle services to support monitoring, preventive maintenance, and predictive maintenance based on usage parameters. Accurate and clear understanding of the plant's conditions improves sustainable efficiency gains in OPEX.

Onsite services

Analyzing system data and proposing innovative solutions

System data is analyzed and findings presented in the form of a comprehensive asset performance report. Yokogawa offers consulting services that enable you to identify problems, resolve them, and then achieve sustained outcomes thereafter, leading to more efficient maintenance workflows.

Problem solving

Providing an environment that makes the most of the system

Alarm threshold and unobserved parameters tend to be missed over the course of a plant lifecycle. By efficiently monitoring these in an ongoing fashion, Yokogawa offers accurate diagnostics and tuning. Degradation diagnostics are performed using communication data sent from actual smart-devices (HART/HH) in the field.

Diagnostics

Customized maintenance services optimized for PRM

Yokogawa design and propose hardware/software maintenance services tailored to budget and usage conditions, allowing use of the existing system with confidence. Yokogawa provides solutions that span the entire lifecycle, including security measures and software updates.

Maintenance

Global service support

OpreX™ Yokogawa achieves operational excellence by providing products, services, and solutions based on the OpreX comprehensive brand that cover everything from business management to operations.

YOKOGAWA ELECTRIC CORPORATION
World Headquarters
9-32, Nakacho 2-chome, Musashino-shi, Tokyo 180-8750, Japan
http://www.yokogawa.com/

YOKOGAWA CORPORATION OF AMERICA
12530 West Airport Blvd, Sugar Land, Texas 77478, USA
http://www.yokogawa.com/us/

YOKOGAWA EUROPE B.V.
Euroweg 2, 3825 HD Amersfoort, The Netherlands
http://www.yokogawa.com/eu/

YOKOGAWA ENGINEERING ASIA PTE. LTD.
5 Bedok South Road, Singapore 469270, Singapore
http://www.yokogawa.com/sg/

YOKOGAWA CHINA CO., LTD.
3F TowerD Cartelo Crocodile Building,
No.568 West Tianshan Road, Shanghai 200335, China
http://www.yokogawa.com/cn/

YOKOGAWA MIDDLE EAST & AFRICA B.S.C.(c)
P.O. Box 10070, Manama,
Building 577, Road 2516, Busaiteen 225, Muharraq, Bahrain
http://www.yokogawa.com/bh/

Visit our website at:
Yokogawa Asset Management PRM
http://www.yokogawa.com/PRM/

Represented by:

Printed in Japan, 911(KP) [Ed : 15/d]

YOKOGAWA Co-innovating tomorrow™