Remote, but close

Improving operations and maintenance with remote optimization

MARC ANTOINE, GABRIELE NANI – For companies in the power and water businesses, keeping plants running, and running efficiently, is of vital importance. Effective maintenance programs and finely tuned operations are two elements that are critical in achieving this goal. That is why companies are increasingly turning to remote services as a source of cost-effective and efficient expertise. ABB provides remote services that help run many aspects of a plant's operations and maintenance. Providing these requires a very carefully thought-out and secure engineering and IT strategy.

Early diagnosis of equipment problems and optimization of maintenance and operations are elements that are essential for efficient operation of plants in the power and water industries.

Plant managers are expected to maximize output while keeping costs at a minimum. Some may be tempted to sacrifice maintenance expenditures for an immediate improvement in profitability, but this strategy can adversely affect longer-term profitability: Spending less on maintenance degrades equipment, which leads to poorer performance and, ultimately, to reduced productivity and product quality. The inverse strategy yields the inverse result: increased production and improved quality. A purely reactive approach to service should be replaced by one that properly balances reactive and proactive behavior ➔ 1.

Stepwise optimization process

Companies in the power and water industries increasingly expect remote services that supplement internal and contractor on-site support and improve the effectiveness of their operation and maintenance programs. Remote services provide expertise to the customer in a cost-effective and efficient way. Having these services available 24/7 is very beneficial to customers who are facing the dual challenge of a lack of expertise and rapidly advancing technology.

Remote service involves a three-step optimization process [1]. It usually begins with experts visiting the customer site to become familiar with the plant and
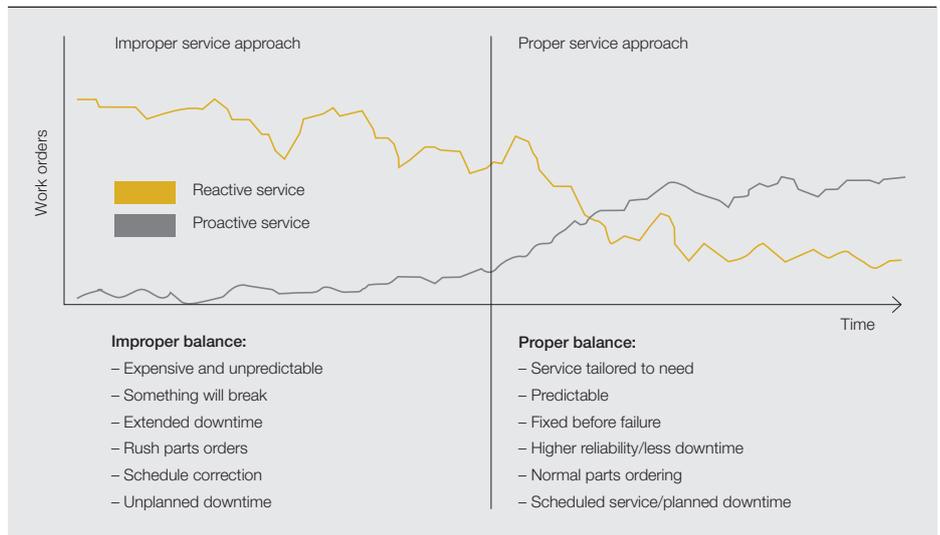
> Early diagnosis of equipment problems and optimization of maintenance and operation activities are essential.

the unique characteristics of the process. Data is collected so that an initial assessment can be performed and process problems identified. Then a root cause analysis is carried out and recommendations for corrective actions are made to the customer. Once the improvement recommendations have been implemented, subsequent periodic audits are performed to make certain that the desired results have been achieved and

Improper service approach | Proper service approach

Work orders

Reactive service
Proactive service

Time

Improper balance:
– Expensive and unpredictable
– Something will break
– Extended downtime
– Rush parts orders
– Schedule correction
– Unplanned downtime

Proper balance:
– Service tailored to need
– Predictable
– Fixed before failure
– Higher reliability/less downtime
– Normal parts ordering
– Scheduled service/planned downtime

Around the clock service availability is very beneficial to customers facing the dual challenge of a lack of expertise and rapidly advancing technology.

to ensure continuous improvement. Data for subsequent assessments is gathered automatically by data collection tools or with the assistance of field service personnel. Experts remotely analyze the data and provide status reports containing additional corrective action recommendations that will sustain the process improvements achieved and enable future improvements to be made. This process can be summarized as follows:
– Diagnose: Identify existing system reliability issues.
– Implement: Deliver identified improvement services.
– Sustain: Manage and continue the improvement process.

Remote technical support

Typically, once a new system is installed, the customer will want to fine-tune performance by reconfiguring various system and process settings. Later, he may request support in troubleshooting problems. Service engineers usually need to return to the site for these tasks. The traditional way of handling these has many disadvantages: Symptoms are often forgotten; data is sometimes collected only after an issue has occurred; and data collection can be delayed while waiting for an engineer to arrive, especially when the site is distant. With remote services, however:
– Data collection and analysis begin immediately.
– Experts are brought closer to the problems (and the solutions).
– Technical collaboration shortens time-to-resolution.
– Solutions can be deployed via remote connections.

In addition, more advanced remote services can be offered to complement the above. These include periodic life-cycle reports and health checks; 24/7 priority support with one-hour response times; support via customer-controlled remote connectivity; and consolidated reporting on support activities across a fleet. And, if customers so desire, they can request a designated support engineer – a "familiar face."

Remote FAT and training simulators

The traditional factory acceptance test (FAT) involves a customer team traveling to the factory or to a site. FATs involve high travel costs, schedule slip (if issues are discovered late on) and, because usually only limited resources are sent to a factory-based FAT, a lack of "eyes." Remote services, however, enable the customer to access and review ongoing projects that are in the FAT phase via a dedicated and secure website. This brings many benefits:
– It is cost effective (no travel required).
– Delivery schedules are shortened by early participation.
– The FAT can be adapted to the customer schedule.
– Additional stakeholder reviews are easily possible.
– Ambiguity that may result in costly changes is eliminated.
– Approval waiting time is reduced and the need for an on-site FAT may be eliminated.
– Communication between project participants is improved and costly errors caused by late, inconsistent or misinterpreted data is avoided.
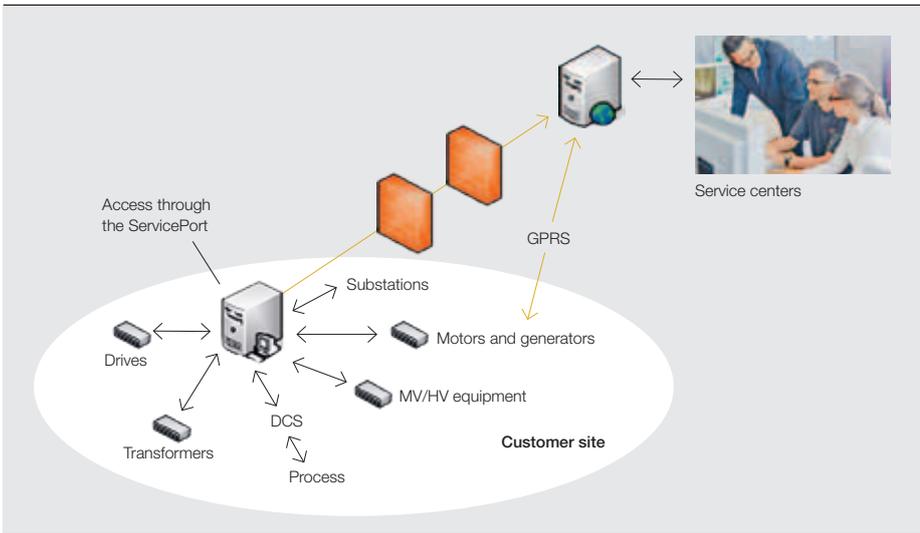
In addition, the customer has the option of using remote training simulators located at the factory instead of having to purchase and maintain these himself.

Remote secure access

The remote access platform (RAP) provides remote connection security between the service center and the customer site. RAP components, which have full redundancy and security controls, are monitored on the service center side around the clock for correct operation.

RAP enables secure, real-time remote monitoring and control of devices located at customer sites → 2. It also provides audit and security features, including audit logs to track user and application access.

Secure data transmission

The RAP and the service center perform two-way authentication prior to initiating communication. The connection is outbound from the customer site to the service center, ie, the site connects to the specific IP address(es) of its service center and always initiates the connection. This allows the customer to control and limit outbound communication.

Security and control

The customer can set granular permissions on each remote activity. Such activities include data collection, desktop sharing and file transfer.

Secure data collection

Secure data transmission begins at the source, with control over the types of data being collected for transmission. The RAP is configurable, in that data access can be enabled or disabled based on the asset owner's security policy.

Secure user access at the service center

In addition to features that ensure smooth interoperability with existing IT infrastructures at the site, the RAP solution provides a role-based access control scheme to assign permissions. Roles are assigned to users per site. Access control is granular to the level of privileges and the actual scope of privileges for any given site is restricted. User accounts are governed by strict account management procedures, so customers can be assured that the principles of least authority and separation of duties are applied. Connections from the service center to the customer sites are also regulated by the customers, who can deny or stop such connections at any time.

Audit and traceability

RAP maintains comprehensive operational and audit logs, allowing viewing of any past service event. Additionally, the desktop sharing sessions are stored in movie format on-site and at the service center and can be viewed at any time.

ServicePort as remote service coordinator

ServicePort is a remote-enabled service interface that provides process automation systems with an on-site connection to the service center [2]. It serves as the entry point to the remote site and connects to the service center using the remote secure access mechanisms described above → 2. With fully user-

Remote service involves a three-step optimization process: diagnose, implement and sustain.
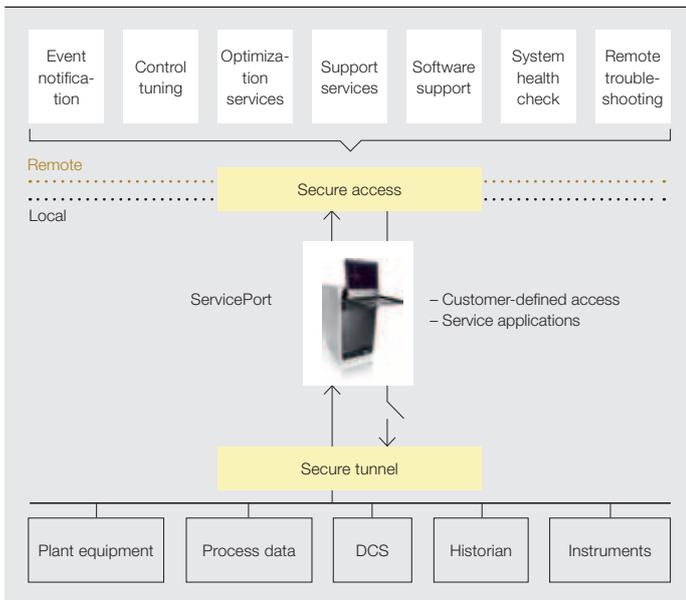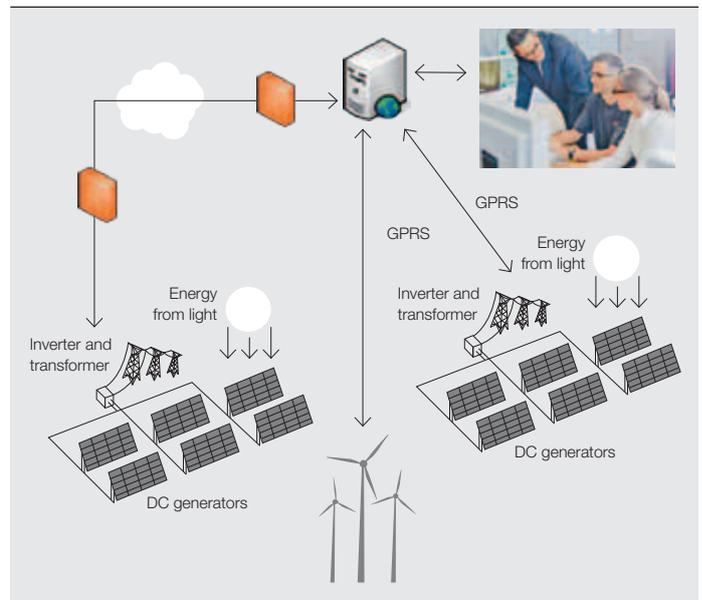
SevicePort is a remote-enabled service interface that provides process automation systems with an on-site connection to the service center.

defined security features, this on-site node acts as a service coordinator. It supports system configuration, preventive and corrective maintenance management, system diagnostics, condition monitoring, corrective implementation and service scheduling ➔ 3.

Communication between the plant network and ServicePort is through a secure tunnel and is controlled by the customer. The benefit of ServicePoint is that it enables service applications to run on-site and be readily accessible to the staff in the service center. This means no time is lost waiting for a service expert to arrive at the site.

Health checks
A fingerprint diagnostic is a fixed-scope service that identifies system performance and reliability issues through data collection and analysis. It generates both a system benchmark and an improvement plan that can be delivered either on-site or remotely, using the remote access platform. The steps in the fingerprint are those described above: diagnose, implement and sustain.

Diagnose
The initial fingerprints are used to generate performance reports that can be delivered at intervals that are based upon customer and system requirements. Fingerprints for automation systems [3, 4] include measurement and analysis of system performance, network communication and controller loading.

Implement
Based on the fingerprints, improvement recommendations are determined and scheduled for implementation.

Sustain
So that the improvement process can be achieved and continued, customers are recommended to include regular fingerprint, implementation and sustaining services in their service contract.

Asset condition monitoring
Apart from remote troubleshooting and health checks, remote services are also utilized to monitor the process and plant equipment performance on a continuous basis.

Scan-type services provide a periodic performance analysis of previously fingerprinted systems. These scans can be performed at varying intervals depending on customer and system requirements and they allow for verification of post-fingerprint corrections. In addition, they search for and analyze new or recurring issues.

Track-type services provide continuous condition monitoring of a plant system and send proactive event notifications based on key performance indicators (KPIs) to designated plant personnel or to the service center. The KPIs are based on parameters reviewed and established during the scan service. Notification triggers may be based on a single KPI or a combination of several KPIs.

Cyber security services

ABB's security services drive businesses towards regulatory-compliant solutions and integrity [5]. The services consist of regular site assessments that can be complemented by remote assessments, depending on the task, eg, configuration change management, access control and hardening, and compliance policy development. The services reduce complexity and labor costs through automation of tedious manual tasks. This, in turn, brings uniformity to security, compliance and change management.

Security fingerprints analyze computer- and network-based assets to determine deviations from accepted security standards. Such fingerprints give a comprehensive site cyber security status and identify strengths and weaknesses [6].

Remote full plant maintenance

Demand for remote monitoring and maintenance is increasing, especially for unattended or remotely located power plants, such as photovoltaic (PV) parks [7]. Here, the service collects real-time process data, handles alarm and failure detection and provides data reporting ➔ 4. Besides collecting and storing real-time and historic data on all critical plant equipment, the service continuously compares performance against KPIs. Deviation from a KPI will trigger an automatic notification to a service center engineer, who will identify the source of the problem and fix it remotely, or dispatch a service team if necessary ➔ 5.

In addition, the park operator may use the data to compare one park with another.

By combining historic weather data and next-day meteorological forecasts with the plant's configuration, the solution's self-learning algorithms can forecast energy production over the next 24 hours.

A full, and regularly tested, data backup service is also provided.

Increasingly remote

As the number of power and water plants around the world increases, remote monitoring is becoming a very attractive way of bringing the very best expert resources to bear on the challenge of keeping a plant running with maximum efficiency. Although site visits and face-to-face meetings with customers will remain an essential part of doing business, the role of the remote service center is set to take on an ever-increasing importance.

Marc Antoine

ABB Power Generation

Baden, Switzerland

marc.antoine@ch.abb.com

Gabriele Nani

ABB Power Generation

Genoa, Italy

gabriele.nani@it.abb.com

References

[1] Schroeder, J. (2008). Remote optimization. *ABB Review Special Report Process Automation Services & Capabilities, 13–16.*

[2] Starr. K. Expert access – anytime, anywhere: ServicePort delivers top process expertise to anywhere in the world. *ABB Review 3/2012, 13–17.*

[3] Harmony performance fingerprint, *ABB brochure 3BUS094565 E SM2011-027.*

[4] 800xA Advanced system fingerprint, *ABB brochure 3BUS095466 A SM2011-261.*

[5] Obermeier, S., Stoeter, S., Schierholz, R., Braendle, M. Cyber security: Protecting critical infrastructure in a changing world. *ABB Review 3/2012, 64–69.*

[6] Boo. P. Protecting control systems from cyber threats. *ABB Review 4/2012, 53–57.*

[7] Remote monitoring of PV power plants, *ABB InControl 2/2011.*