Every day, plant managers focus on achieving the best possible productivity and efficiency, and rely on their control systems to help them do that. But just because a process industries company has made an automation investment doesn’t mean they can sit back and watch production go along automatically forever. Many plants neglect taking actions, such as control tuning, to ensure the control system operates at maximum potential.

When systems do not perform as they should, plant personnel will not obtain positive results, and may even give up using their control systems entirely. If managers really want to increase productivity and efficiency, they must ensure that they use control systems effectively. The best way to do this is to ensure that automatic control is turned on and tightly tuned.

Out of tune
ABB conducted an analysis of control systems used by customers in multiple industries that revealed a stunning finding: up to 75% of a typical plant’s automation investment is not providing benefits. Instead of solving process problems, the systems are not operating as they were designed, due to the lack of comprehensive tuning.

In the same way a car would operate suboptimally (even dangerously) if the owner didn’t change the oil, check the tires or pay attention to warning lights, a control system will operate sub-optimally if it doesn’t receive the attention it needs.

The right service will ensure that customers obtain optimal use of their automation, so they can use less raw material, improve energy consumption, have a wider operating window, increase production, enhance product quality and troubleshoot more rapidly.

Control loop performance is one of the keys to a smoothly running process controlled by an automation system. It is crucial that control loops are tuned regularly through a well-planned, advanced service program delivered by qualified process control engineers.

In tune with the times
Whether it’s cement, chemical, gas, metals, mining, oil, paper or utilities, industrial processes have one thing in common: they all process some form of raw material into more finished products that go on to other uses. Process industries companies have always understood the importance of their equipment to their process, and hardware service has long been a priority at industrial plants. However, service is now becoming more sophisticated in the way it is delivered, and the way it delivers value.
Regular tune-ups

Automation service has evolved considerably since its beginnings. In the early days of automation, data collection was difficult, control was limited, the number of controllers in a plant was often determined by available space, and troubleshooting was a lengthy, hands-on process.

Today, data is easily accessible, the range of controllers is extensive, sites can add as many controllers as will fit on hard drives, and digital troubleshooting tools abound. If plants continue to rely on the same service methods they used in the past to solve issues presented in today’s globally competitive economy, they will be less successful.

Out of tune, out of commission

Modern plant control systems integrate tightly with industrial equipment. As a result, a control system includes far more elements than ever before. If any area falls short or fails, a site will experience production or quality variability that has a direct impact on plant performance. This makes it even more critical that automation control loops are checked and calibrated regularly.

As stated earlier, many plants purchase automation and, once in place, believe it can run indefinitely, without intervention. But control systems don’t run themselves. They are made up of computers, controllers, monitors, firmware, software and hardware. If, for example, an engineer ignores a fan, a controller can overheat and result in an entire portion of a plant being shut down.

Recently, a plant became concerned that their automation system was not providing the levels of production and product quality expected. When ABB specialists used the latest data gathering and analysis tools to get to the root of the problem, they discovered some disturbing facts: the very control system that had been designed to improve production was actually impeding production.

When a system’s automatic controls don’t work, operators will turn them off and perform functions manually, which negatively affects production and quality. That’s exactly what the operators did at this plant.

Digging deeper, ABB discovered that the reason why this plant’s control system was failing, and personnel were turning to manual operation, was because no service had ever been performed on the system.

Performance Distribution Chart

Recent ABB analysis has found that in many process industries plants, control performance distribution is 30% manual operation, 30% increasing variation, 25% improving production and 15% output out of actuation range. This indicates that many control system owners are under-utilizing their automation investments.
Keeping in tune

ABB has discovered that at many plants, control performance distribution is 30 percent manual operation, 15 percent out of actuation range, 30 percent increasing variation and 25 percent improving process.

With this distribution in mind, an important question for plant managers is: “When was the last time you checked your control loop tuning?” ABB is finding that the answer too frequently is “Not very often” or “When we installed it.”

After an industrial plant began to lose money on their operation, they asked ABB to examine their automation system and find out why. The customer’s control performance distribution generally followed the pattern described above, and the plant frequently ran in manual mode.

When ABB turned on the plant’s control system, plant production became unstable. After investigating the underlying issues, ABB fixed the actuation, recalibrated the instrumentation, upgraded the application, made the user interface easier to navigate, and updated the tuning parameters. As a result of these improvements, the customer achieved a series of successes that added up to more than 10 MUSD a year in financial improvements.

This improvement is not uncommon. The results experienced by this plant accurately reflect what automation systems are designed to do. Without service, a system becomes unstable and unusable. Recognizing the positive financial impact, this customer implemented a service program that ensured their results would not erode over time, and would make the benefit of well-tuned controllers sustainable.

Keeping in tune

Service activities break down into two basic types: preventive and corrective. Unscheduled corrective maintenance occurs after equipment fails. Because it’s unplanned, it can mean lost production, lost time and inconvenience. Preventive service is designed to reduce these risks through planned maintenance.

Plant managers often worry that preventive maintenance will add cost without value, but this has proven to be untrue when preventive maintenance is effectively distributed and tracked. When well-considered preventive maintenance on an automation system increases, unscheduled reactive (i.e. expensive) maintenance usually decreases.

Process industries get the most value from their automation assets by finding and applying the best tuning parameters for PID controllers. As shown in these charts, which display data obtained by ServicePort at an actual customer site, after tuning the customer’s stock flow basis weight experienced a 22% reduction in standard deviation of control error.

The result: adding proactive service is like adding weeks of production time.
Preventive maintenance has a direct impact on overall equipment effectiveness. With preventive maintenance, unscheduled downtime is reduced, resulting in increased production.

For a successful proactive service program, plants should address three important service areas: service distribution, service skills and service tools.

**Service distribution:** in service distribution, the trick is knowing the right distribution of service activity and managing for that activity. Service should include preventive, support, administrative, scheduled corrective, optimization and unscheduled corrective.

**Service skills:** in service skill mapping, ABB has found that the employees of plants that practice proactive service have on average more than three times the training of people in plants that practice reactive service. Well-trained personnel are equipped to provide service when and how it’s needed.

**Service tools:** these can be software or hardware components designed to improve the efficiency of proactive service. The volume of information processed in today’s automation systems requires high-power technical tools to manage data and quickly drive to conclusions.

**ABB tuning tools**

ABB offers advanced control loop tuning service tools built upon extensive service experience. The ABB Loop Performance Suite of service tools includes:

− Data Logger
− Loop Analyzer
− LoopTune
− Signal Analyzer

These tools provide: data collection, loop setup and calibration; data analysis, standard reports, tuning and simulation, and identification. These tools help industrial companies maximize use of their control systems by ensuring the control loops are optimized for the production situation.

For maximum availability and flexibility, these tools are designed for both on-site and remote use. A production facility can quickly gain access to the benefit of these service tools, as well as eliminate travel time and significantly reduce troubleshooting time by using these tools through the secure, remote-enabled ABB ServicePort™ Service Delivery Platform.

The ABB ServicePro Service Management System uses built-in and continuously updated best practices for ABB automation and ABB-automated processes to help customers move to proactive from reactive service. This chart, which is actual data from an ABB metals customer, shows that the more planned preventive maintenance work orders are completed, the more both unplanned and planned repair hours go down, both reducing maintenance costs and improving system and process availability.

To assist with important preventive maintenance activities such as control loop tuning, ABB offers the ServicePro Service Management Platform. ServicePro enables planning and scheduling of all maintenance, as well as analysis and reporting of completed work to ensure maximum manpower utilization, parts availability, and analysis of equipment and process problems for operational and capital planning. With ServicePro, plants have the tools needed to keep maintenance on track and on budget by facilitating proactive service activities such as control loop tuning.

**Fine-tune**

Quick identification of emerging PID control loop issues, before they can have a negative impact on system usage, is an ongoing challenge for most plants. ABB’s Loop Tuning Accelerator Service, an enhancement to ABB’s Loop Performance Monitoring Service delivered through ServicePort, is designed to reduce the time between diagnosing potential PID control loop problems and the necessary corrective tuning.

The Loop Tuning Accelerator Service provides process engineers with control information that has already been gathered, analyzed and stored by the ABB Loop Performance Monitoring Service, to be used as a basis for creating accurate process models that can be used for testing tuning parameters.
without affecting the process. This shortens process modeling time, which usually requires time-consuming and disruptive bump tests, thus speeding identification and correction of control loop issues.

The service uses site data that has already been automatically gathered and classified based on specific Key Performance Indicators (KPIs) specified by plant personnel for use in the ABB Loop Performance Monitoring Service. This data helps identify and isolate issues, such as dead time, inverse response and outliers. Data is then analyzed to find the root cause of problems, and to more accurately trend performance history. The resulting information can be used by plant or ABB engineers to improve control loop tuning.

Services such as the ServicePro Service Management System, and the ABB Loop Performance Monitoring Service with Loop Tuning Accelerator, powered by ServicePort, can become key contributors to successfully maximizing control system utilization. Today’s industrial automation systems require advanced services, based on the latest technology and proven methodologies, to ensure optimal system and process availability. With a proactive and well-balanced service program in place, plants can achieve significant financial gains.

Control loop performance can be monitored at the customer site or remotely through the ABB ServicePort Service Delivery Platform, through which customers and ABB service personnel can access Key Performance Indicators to tell if control loops need to be tuned. ABB service personnel can then help the customer tune their control loops to ensure maximum control utilization, which leads to higher plant productivity.
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