EXECUTIVE INSIGHT

Preventive Maintenance for Automation

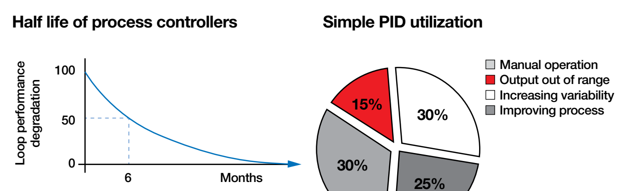
By Kevin Starr, Global Program Manager, Advanced Services, ABB Oil, Gas and Chemical business

As automation improves and industrial plants become more information intensive, there is a need to update how automation systems and process applications are maintained. Previously, maintenance could only happen when a service person was physically present.

Today, secure network connections and the technical sophistication of automation systems have established a new world of remote-enabled or remote capable services. To be effective in this environment, service requires advanced solutions based on the latest digital technology, coupled with proven methods to ensure the optimal distribution of service effort.

Automation maintenance issues

In the early days of automation, collecting data to perform maintenance was very difficult, which meant that troubleshooting was time-consuming and manual. Additionally, monitoring control loops requires a sophisticated skill set, including the fundamentals of control, knowledge of electrical and process equipment, and detailed process understanding. As great as modern automation systems are, they typically don't run and repair themselves. Human intervention is still needed. Automation systems are made up of hard drives, controllers, monitors, jumpers, firmware, software, and hardware. If a fan is ignored, a controller can overheat and result in a portion of a plant being shut down. In many organizations there are fewer trained personnel to perform maintenance.



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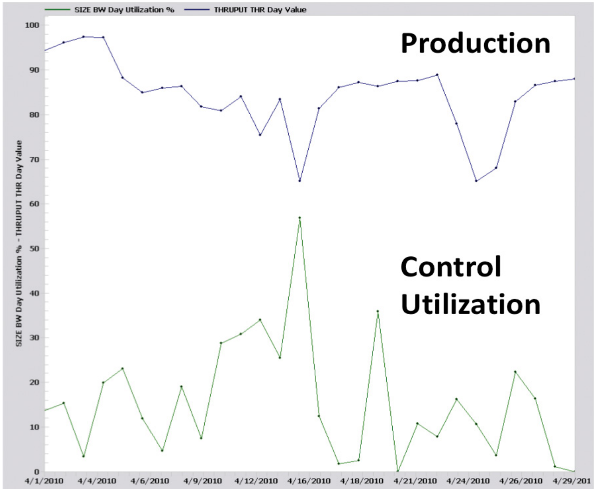
01 If 100 PID loops are all tuned at the same time and not re-tuned, then in six months' time, 50 of the loops will have degraded in performance.

Control loop issues

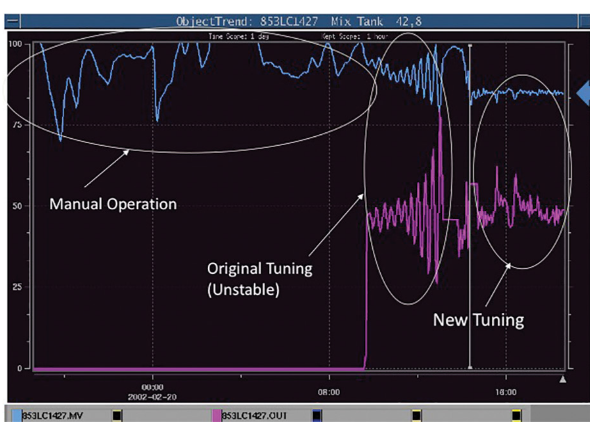
In a similar fashion as described for the control platform, control application software needs to be maintained regularly. For instance, it could become outdated and result in insufficient update times for operations. Automatic control should regulate the process; reduce process instability; and improve operations. What often happens instead is that PID (proportional–integral–derivative) control loops are not maintained, and loops have degraded so much they impede production and performance. What typically is seen when control loops are analyzed is that producers often aren't getting value from their control systems.

We recently worked with an industrial producer who was concerned his automation system was not providing the expected levels of production and quality. The reason became apparent when engineers performed digital data analysis.



The findings were disturbing. The very control system that was designed to improve production was actually decreasing production! Trends generated by the digital data analytics showed a dip in production (top trend) that occurred at exactly the same time the control system was turned on (bottom trend). As a result, the producer had reverted to running the plant in manual mode, rendering useless the significant investment his company had made in the control system. **Further investigation showed that this producer had never performed any service on his automation system.**

Another industrial producer had an automation system but typically ran the plant in manual operation. When engineers tried to turn on the automation system, they found that production became unstable. Engineers adjusted actuators, recalibrated instrumentation, updated the application, improved user interfaces, and updated tuning parameters. The result was a series of successes that provided the customer more than $10 million in value, including productivity improvement and cost savings.



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Long term solutions

Today's leaner workforce requires easier access to data, faster troubleshooting, fixing, recording and tracking of control system maintenance. To meet this need we have developed automated data gathering tools and applications that automatically analyze control systems to quickly identify, categorize and prioritize issues. These technologies can identify and send predictive notifications to users for immediate action.

Sound maintenance principles still apply

Maintenance is required to ensure that an automation system provides ongoing benefits. In general terms, there are two classes of maintenance activities: corrective and preventive. Unscheduled corrective maintenance is usually initiated after a failure has resulted in decreased production, and therefore can be expensive. Well-designed preventive maintenance reduces the risk of failures and therefore is usually more cost effective.

The fundamental difference is that the first is reactive and the second proactive. Reactive maintenance waits for a problem to occur before initiating a correction. Preventive maintenance reduces the risk of an occurrence by regularly performing proactive activities. Figure 3 (next page) shows a trend of work order tasks for a producer who moved from a corrective to a preventive maintenance strategy.

The reason many producers avoid deploying an automation service program is that they fear it will add cost with little value. This simply is not the case when preventive maintenance is properly planned, scheduled, and tracked. Notice in the diagram curve that as the amount of work shifted from reactive to proactive, the number of unscheduled reactive corrections went down. This has a direct impact on overall equipment effectiveness and results in increased production due to less unscheduled down time. Proactive maintenance adds weeks of production to the year with no additional cost.

02 These are the results automation systems are designed to deliver. However, with no automation service, systems become unproductive. The financial improvement to both plants brought about by proper service attention resulted in both producers engaging with an automation service solution that would accomplish two objectives: first, ensure results do not erode over time; and second, ensure high utilization of a significant capital investment.

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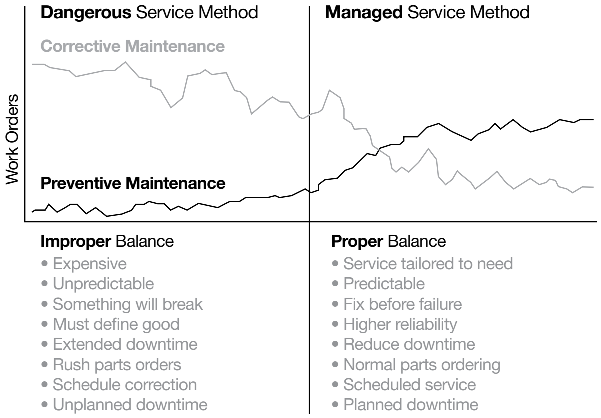
03 Work order tasks trend lines for a producer who made the shift from corrective service methods to preventive service methods. As preventive maintenance activities increased, the corrective maintenance incidents decreased.



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Service engineers use one of many commercially available Computerized Maintenance Management Systems (CMMS) to collect, manage, and apply best practices for servicing equipment. The best CMMS links factories, subject matter experts, and users to ensure that maintenance that is performed is maintenance that is useful. Aligning maintenance with best practices is the goal. Properly managing maintenance results in increased equipment efficiency, higher process reliability, extended equipment life cycles, and reduced total cost of ownership.

These maintenance principles apply to control loops in an automation system. If you are not regularly performing preventive maintenance activities on your PID control loops, then you are risking a control failure that will be much more costly than regular preventive maintenance on your control loops would be. For control loops, preventive maintenance will include regular assessments of how well the control loops are performing to meet your production needs, and if degradations are detected, it is time to tune the controls. By applying a systematic approach of preventive maintenance and controllers that have been tuned using automation systems, producers can use the latest technology, coupled with proven methods to improve quality and ensure excellent results from their service effort.

Conclusion

In the past, on-site visits were required for performing asset assessment and repair. Now, today's digital technology provides opportunities for remote monitoring and evaluation, enabling users to be more efficient, identify incidents in record time, and provide the building blocks to establish predictive notification. Digital technologies are highly effective, but they are only as good as one's understanding of sound maintenance principles, such as knowing how to move from a corrective to a preventive maintenance approach. Today, digital technologies combined with proper understanding of sound maintenance principles, ensures the best return on your service investment.

Author Information

Kevin Starr's career with ABB spans nearly three decades in roles that delivered optimization services globally and trained people on advanced services. Starr's experience working closely with industrial producers led to the development and implementation of globally accepted service offerings, 12 patents, and several software tools. Starr holds a Master's degree in electrical engineering from Ohio State University, and a Bachelor of Science degree in electrical engineering from Ohio University, both with an emphasis in process control.

To make the complicated subject of process control more easily understandable, Starr authored a book titled **Single Loop Control Methods**, in which he presents a practical, non-theoretical explanation of process control. The book outlines a non-mathematical explanation for control terms and tuning that simplifies academic process control theory and links it to industrial process control applications in a practical way. To order a copy of the book, please click here or visit http://new.abb.com/process-automation/process-automation-service/reference-pages/single-loop-control-methods/order-book.

You can find a Single Loop Control Methods video series by Kevin on youtube.com/abbservicenew. Formal training on single loop control methods is also available from ABB. Visit www.abb.com/AbbUniversity/Courses.aspx and search for "single loop control methods."

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