Control Loop Performance Monitoring (CLPM)

Seeq

PROCESS MANUFACTURING

Data Sources

• Process historian

Data Cleansing

Seeq can create conditions based upon different modes of operation or recipes that a process may run. Often, facilities use the same controller for different recipes, and controller performance varies from one recipe to the next. The ability to add this context to the data within Seeq and create condition-based metric limits is very useful in these cases. Other off-the-shelf CLPM packages do not currently have this capability.

Reporting & Collaboration

Results can be summarized in an organizer topic. An organizer topic can also be used as a dashboard for continuous monitoring of controllers.

Challenge

Manufacturing sites have many automatic controllers (typically in the hundreds or even thousands for large facilities). These controllers are designed to run in automatic mode without operator intervention. Most sites don't have insight into how these controllers are actually performing. Potential unknowns include:

• Is the controller running in automatic as designed, or is an operator running the controller in manual?

• Is the controller stable?

• Is the controller effectively maintaining setpoint?

Poor control may result in an increased risk of safety incidents, harmful environmental impact, failure to meet product specifications, lower throughput, waste of energy and raw materials, increased maintenance costs, and increased operator intervention.

Off-the-shelf Control Loop Performance Monitoring (CLPM) applications are currently available but do not have a method to calculate metrics based upon different recipes, grades, operating conditions, etc. These applications are also unable to incorporate additional process data tags, such as overall production, and provide limited metrics available to users.

Solution

Seeq enables engineers to calculate and monitor key controller performance metrics. These metrics are calculated based upon values from the controller mode, output, setpoint, and process variable. While there are many metrics that may be calculated, a few examples include controller error, output travel, percent time in the correct mode, setpoint changes, and more.
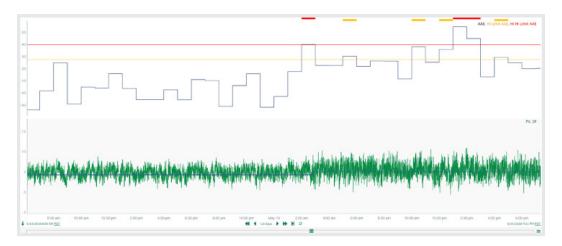
Seeq offers a flexible CLPM solution that can easily create conditions based upon different recipes, grades or operating conditions. Users have the flexibility to tie in additional process data and tags from the historian to investigate how controller performance is impacting overall unit and plant performance. Additionally, the metrics calculated for each controller are flexible and configurable by the end-user.
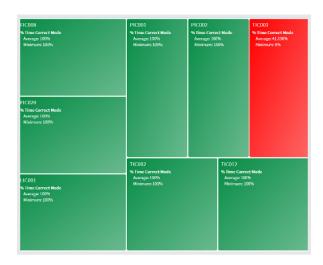
Results

Using Seeq to monitor controller performance may reveal issues related to lack of operator training, mechanical issues, poor controller tuning, ineffective control strategy, and/or change in operating conditions. With this insight into how controllers are performing, engineers and operators can troubleshoot the issue to optimize process performance.

Calculations & Conditions

- Periodic condition – Create a condition for how frequently the CLPM metrics are calculated

- Signal from condition – Calculate controller metrics

- Formula – Establish metric benchmark limits based upon historic performance

- Scorecard – Visualize metric calculations in tabular form

- Value search – Identify when metric performance is outside of its limits. Create conditions for different operating conditions or recipes, which can be used to calculate condition-based metrics

- Treemap – High-level overview of how each controller is performing relative to its metric limits

The bottom lane shows a controller's process variable and setpoint. Looking at the trend, it may not be immediately obvious that anything has changed in the controller's performance; however, the top trend shows the calculated Average Absolute Error (AAE) of the controller, which is clearly increasing over time. This increase in AAE may be due to a change in operating level.

This image shows a treemap that includes several controllers. The treemap is colored based upon which controllers are running in their correct mode. This is a helpful tool in giving a quick, high-level overview of how the assets (controllers) are performing.