Industrial^IT
Loop Performance Manager

Optimize^IT

Optimize^IT Loop Performance Manager (LPM)

This maintenance application is designed to keep your plant instrumentation and control system operating at peak performance. LPM provides two main components for process improvement, a Loop Tuning tool and a Loop Monitoring tool. The loop tuning tool is used to improve control loop performance, while the auditing tool is used to monitor loops to ensure that performance does not degrade. Any industrial plant can benefit from Loop Performance Manager, which can be implemented without a large capital investment in equipment.

Improved PID controller tuning can result in reduced quality variation, reduced scrap and reduced downtime. The ability to maintain PID loops at their optimal operating conditions translates into manufacturing cost savings and higher productivity. Optimizing control loop performance, however, can be a difficult and a time consuming task, even for an experienced control systems engineer or instrument technician. Many plants forgo potential economic benefits from their distributed control systems (DCS) investments because of poorly tuned or manually operated loops.

LPM provides a powerful, yet extremely easy-to-use, collection of software tools that control engineers and process operators will find useful to start-up, diagnose and maintain control loops. The package supports a wide variety of commercial PID control block algorithms (both from ABB and our competitors), as well as various configuration options available for those PID algorithms. By combining data collection, model identification, feedback tuning, feedforward tuning and controller simulation in a single user interface, ABB delivers a complete tool and removes the barriers preventing optimization of your DCS.

Loop Tuning

Utilization of the Loop Tuning function involves the following steps:

- Data collection via OPC
- Data processing and data storage
- Process model identification
- Process model evaluation
- PID tuning parameter calculation
- Controller tuning evaluation
- Logging

The first stage of control loop tuning is data collection. With LPM you can collect open-loop data, with the controller mode in manual, or closed loop data, with the controller mode

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in automatic. The model identification algorithms are robust and can work with both types of data. LPM can determine the complexity of the model, or the user can manually select a preferred model structure. The algorithm can identify dead time, inverse response and under damped behavior in the process models.
To evaluate the model, the user may examine several plots (prediction vs. real data, step response, frequency response) and numerical metrics.

With the process dynamics quantified, the user selects a loop tuning rule. LPM supports lambda tuning, the dominant pole placement method and the Internal Model Control (IMC) method. The optimization algorithm computes the best control loop tuning parameters and presents a simulation of an input disturbance and a setpoint change as a visual evaluation method. LPM also presents performance indices such as Integral of Absolute Error and Settling Time. There are control loop performance specifications that the user can adjust. After LPM calculates the first set of tuning constants, the user may fine-tune the results by adjusting the specifications using slider bars on the user interface.

Before closing the tuning form, LPM saves the results of the tuning session to the control loop tuning log. This log is a permanent record of the tuning action and could meet operational requirements to document process changes.

Loop Auditing

The Loop Auditing function includes the following procedures:

- Periodic data collection for monitored loops
- Performance index calculations
- Archiving indices
- Problem diagnosis

In the auditing function, the user sorts loops into common categories that determine sampling frequency and duration of a data set. Loop auditing begins with daily periodic data collection that operates in the background for up to 250 loops per LPM server. Loop tuning functions are not affected by ongoing audit operations. After data collection is complete, the performance indices are computed and stored in the auditing database. The audit reporting function generates configurable reports and then outputs the data as spreadsheet (.xls) files on a weekly basis. The reports contain quantitative information in the form of performance indices and qualitative information. The qualitative information comes from the evaluation of rules involving the performance indices. The rules report on the likelihood of specific problems, like sluggish tuning, valve stiction and loop oscillation. Using the collected data, the user can create plots of indices or on-demand reports. The reports enable the maintenance team to focus on the most important process control problems.

Continuous Auditing
Benefits Your Bottom Line

Close supervision of control system performance is a cost effective way to improve process economics and prevent degradation over time. Auditing control loops delivers the following types of benefits:

- Extended equipment lifetime
- Improved energy efficiency
- Increased process capacity
- Fewer plant trips
- Higher/more consistent product quality

Plant auditing facilitates the pursuit of optimum performance and maximum return on investment. Audited plants attain stable and robust conditions necessary for higher-level optimization functions offered by model based multi-variable controllers and/or true plant optimizers.

LPM Features

Software
- MS Windows 2000
- Client server architecture

Loop configuration
- Multiple DCS types
- Multiple PID algorithm types
- Database input tool
- Feedforward variables
- OPC parameters
- Organize by loop category or plant area

Data collection
- Uses OPC
- Simultaneous data collection for multiple loops
- Data is stored for future comparison

Model identification
- Dead time
- Integrating models
- Inverse response
- Under-damped models
- Automatic or manual selection of model structure
- Closed loop or open loop identification

Model evaluation
- Step response plots
- Frequency response plots
- Plot predicted data against actual data

Tuning rules
- Lambda - PI
- Dominant pole placement - PI or PID
- Internal Model Control - PI or PID

Tuning evaluation
- Disturbance rejection
  - Output overshoot
  - Maximum deviation
  - Integral absolute error
  - Frequency response plot
  - Simulation plot
- Setpoint response
  - Overshoot
  - Rise time
  - Settling time
  - Simulation plot

Auditing
- Automatic data collection
- Calculation of performance indices
- Automated reporting
- Problem diagnoses

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