Process Control Optimization Tools

Background

High quality process data with an adequate sample rate and signal resolution is required to evaluate control loop health and optimize controller tuning; such data is normally only available by directly sampling the analog voltage signals directly from the field instrumentation I/O using standalone ***Data Acquisition Equipment***. As many as a dozen bump tests may be required to properly evaluate the control valve performance and assess the variation in the process model parameters, making analysis without special ***Bump Test Analysis and Tuning Software*** very time consuming. Process data collected for process and control system evaluation should be analyzed with Time Series Analysis tools, particularly the Power Spectrum, to reveal the nature of the process variability which provides clues to the possible sources of excess variability.

To facilitate these common process control evaluation and optimization tasks, Lambda Controls distributes a *package of process control tools* made up of the following components:

- **Bump Test Analysis and Tuning Software**, consisting of the ***Control Loop Assistant*** (CLA) software developed by Lambda Controls, which is used to evaluate control loop health, identify a dynamic process model and calculate controller tuning.
- **Data Acquisition Equipment**, consisting of the ***Data Logger Model CVF2*** from Innovention Industries Inc., which enables collection of process data directly from the field instrumentation analog signal I/O.
- **Time Series Analysis Software**, consisting of the ***Analyse-Plus Plotting and Analysis Software*** from Innovention Industries Inc., which is used to plot process data and analyse the nature of the variability with Time Series Analysis tools such as the Power Spectrum, Auto Correlation, Cross-Correlation, etc.

Lambda Controls also provides training in the use of these tools.

Control Loop Assistant (CLA) features:

- Software runs on any personal computer using any of the Microsoft® Win32 operating systems, namely Windows 95/98/ME and Windows NT4/2000/XP.
- Interactively identifies and marks for analysis all bump tests in a data file
- Facilitates viewing of bump tests for evaluation of control valve performance and determination of control loop nonlinearities such as backlash and stiction
- Interactively identifies a dynamic model for each bump test
- Currently the CLA software supports two process models:
  - First Order with Deadtime and
  - Integrator with Deadtime
- Generates a summary table of bump test results
- Calculates controller tuning constants using Lambda Tuning

- Tuning constants can be generated for the commonly occurring forms of PI controller (Parallel, Classical or Standard form) and tuning parameter options such as: reset time in seconds per repeat, reset rate in repeats per minute, etc.
- Generates a report documenting the bump test results, process model parameters and controller tuning parameters.

A detailed description of the CLA software and a Demo version are available at the Lambda Controls website: www.lambdacontrols.com.

Data Logger Model CVF2 features:

- Input signals are isolated to 1500 VDC
- Over-voltage protection is 300 VDC
- Portability: unit (5 lb/2.5 Kg) plugs into parallel port; no plug-in card required
- 16 bit A/D; microprocessor based with built-in memory
- Sampling as fast as 1000 samples/sec.
- 8 differential analog input channels, 1 frequency channel
- 9 analog input ranges include: 0 to 20 mA, 0 to 10 V, 0 to 2 V, 0 to 500mV, 0 to 100mV, -5 to 5 V, -1 to 1 V, -250 to 250 mV, -50 to 50 mV
- 0 to 30 KHz frequency channel range with 2 trigger levels
- All analog signal ranges and frequency trigger levels are software selectable
- Stand-alone collection mode: after data collection is initiated from your computer, collection will continue with or without your computer connected.

Analyse-Plus Plotting and Analysis Software features:

- Software runs on any PC with a Pentium 200 MHz processor or higher, under Microsoft Windows™ XP, 2000, NT4, ME, 98 or 95.
- Plots data using overlay, panning and zooming features

  Data import and export capability
- Time Series Analysis tools including: Power Spectrum, Auto Correlation and Cross-Correlation
- Library of functions to manipulate data, e.g. data editing, filtering, equation processing

Further details of the Data Logger data acquisition hardware and Analyse-Plus software including a Demo version are available at the Innovention website: www.innovin.com.

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