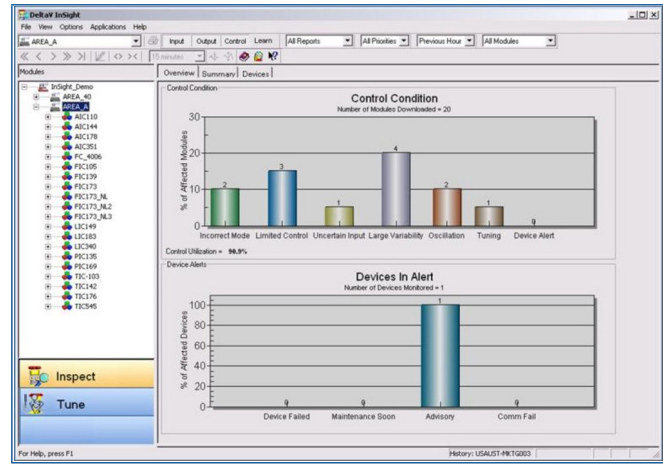# DeltaV™ InSight

- Gain new process insight from embedded process learning

- Easily identify underperforming control loops

- Quickly tune loops for improved control

- Test tuning with simulation

- Generate reports to track control performance

- Easy to Use

DeltaV™ InSight—a control performance suite.

Introduction

Process manufacturers lose millions of dollars each year due to process variability and poor control performance, often unaware they even have a problem. Control engineers and instrument technicians are typically overworked and illequipped to monitor and maintain the hundreds of control loops and instruments for which they are responsible. And contributing to the problem, traditional control systems don't provide a systematic way to monitor, diagnose and improve process control performance.

DeltaV™ InSight enables process manufacturers to improve process control by monitoring and reporting control performance; identifying and diagnosing problem loops; recommending tuning and maintenance improvements; and continuously adapting to changing process conditions. DeltaV InSight is used to improve control at existing plants and to reduce startup time for new control system installations.

Benefits

Gain new process insight from embedded process learning. DeltaV InSight automatically learns your process by continuously evaluating your plant performance and calculating process models based on normal day-to-day operations. These models provide valuable insight into your process and may be applied in a wide range of applications to precisely benchmark control performance, diagnose problems, calculate controller tuning parameters, test control configurations, train operators, and minimize process variability through adaptive tuning and model based control.

Easily identify underperforming control loops. Do you know how well your control loops are performing? Why fly blind when you can continuously monitor control performance and identify the best areas to focus resources for maximum plant efficiency? With DeltaV InSight, you can quickly identify abnormal control conditions such as wrong control mode, limited output, and high variability; identify malfunctioning devices that may cause control problems; and accurately pinpoint loops that need retuning with a model-based tuning index.

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Quickly tune loops for improved control. Properly tuned loops can decrease process variability and increase profits through improved product quality, throughput, and equipment availability. DeltaV InSight continuously monitors control performance and provides adaptive tuning recommendations for every PID loop in the system based on normal day-to-day operations. No disruptive plant tests are required. You may also initiate on-demand tuning to automatically step the process and calculate tuning for PID and Fuzzy logic control loops.

Test tuning with simulation. For the advanced user, DeltaV InSight provides sophisticated but easy-to-use loop simulation and analysis tools. This allows predicted control loop performance to be analyzed before the new tuning parameters are updated in the controller.

Generate reports to track control performance. DeltaV InSight Performance Reports provide operations, maintenance and control personnel the ability to easily track key control performance indicators; from a single loop to an entire plant area. Standard reports are included with Insight, with the ability to create custom reports to include KPI's specific to your facility. All reports may be created on-demand or generated automatically for periodic distribution.

Easy to Use. As an embedded application in the DeltaV system, InSight requires no software installation, integration, or configuration. Using DeltaV software's common configuration database, InSight automatically recognizes input, output and control blocks as they are added to or deleted from the system. This means faster startups and less maintenance.

Product Description

DeltaV InSight is an integrated application to monitor, analyze, diagnose, report, and improve control loop performance. DeltaV Insight includes monitoring and tuning capabilities plus advanced diagnostics and adaptive tuning capabilities made possible with embedded learning algorithms. A single-user interface provides seamless transition between loop diagnostics and tuning.

Embedded Process Learning

DeltaV InSight uses learning algorithms embedded in the controller to calculate process models and diagnostics for every control loop in the system. These models and diagnostics are used for intelligent performance monitoring and adaptive tuning to accurately identify problems and

recommend tuning improvements. Process learning is easily enabled from DeltaV Explorer or DeltaV InSight for individual control modules or entire controller nodes.

DeltaV InSight calculates process models based on process changes made by the operator or automated procedures such as batch control sequences. Whenever there is a change in the setpoint (or output when controller is in manual), InSight automatically captures the process input and output data and performs an efficient calculation to identify process dynamics. These process models are stored in a database for users to evaluate performance over time and to identify potential process nonlinearities and degradations, such as the fouling of catalysts, heat transfer surfaces, and sensors.

A unique aspect of DeltaV InSight is that it is an embedded part of every DeltaV system. Calculations for control performance, diagnostics, and adaptive tuning are performed directly in the controller. Historical data analysis and reporting are performed on a PC workstation with user access from any DeltaV PC on the system network. DeltaV InSight's architecture can be seen below.

Embedding DeltaV InSight into the automation system improves both ease of use and calculation performance. InSight is easy to use because there is no additional configuration required. InSight configuration is automatic: every time a control loop is added, deleted, or modified in the control system, InSight configuration is automatically updated with the latest configuration. DeltaV InSight also performs better because the control calculations are embedded directly in the controller. Calculations for control performance, diagnostics, and tuning require a lot of information, which can significantly add to system communications loading. Embedded calculations greatly reduce the system communications as compared with traditional OPC data access. Furthermore, for fast loops, it's virtually impossible to scan the control loop via OPC fast enough for accurate calculations.
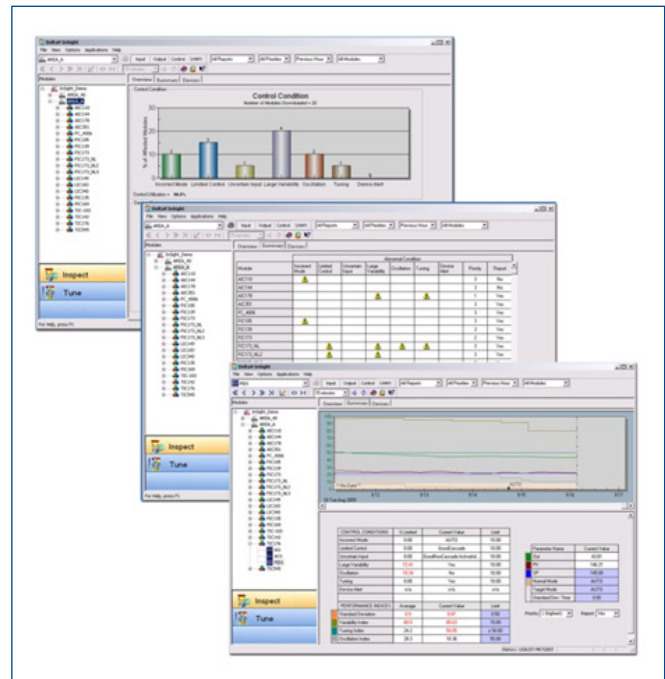
Control Performance Monitoring

DeltaV InSight provides continuous control performance monitoring for every loop in your system, 24 hours a day, 7 days a week. Quickly assess control conditions across your entire system with overview displays that identify abnormal control conditions for the selected system, area and module level. Once an abnormal condition is detected, you may easily drill down to get detailed performance metrics and historical information on specific control blocks.
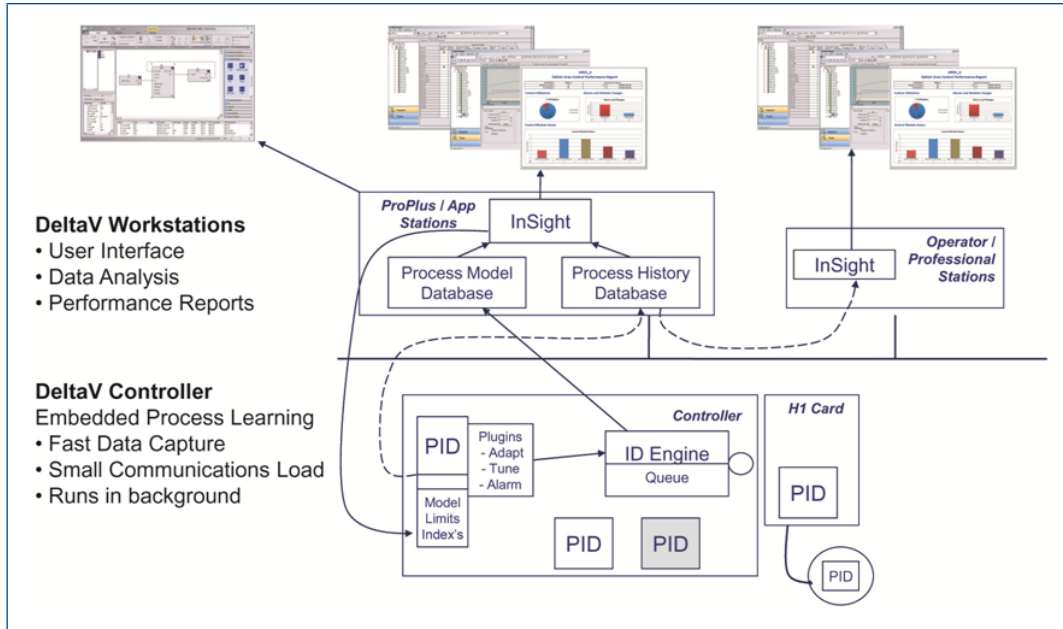
DeltaV InSight Architecture.

The Control Conditions monitored for every control loop and reported in the Overview and Summary displays include:

- **Uncertain Input.** A block's process variable is bad, uncertain, or limited.

- **Limited Control.** A downstream condition is limiting the control block action; for example, the output is at a maximum limit.

- **Incorrect Mode.** The actual mode of a block does not match the normal mode configured for the block.

- **Large Variability.** A block's standard deviation and variability index are exceeding their maximum limits.

- **Process Oscillation.** A block's process variable has oscillatory behavior.

- **Recommended Tuning.** A tuning recommendation has been calculated that significantly improves control.

- **Device Alerts.** Indicates when a control module has one or more devices that have had active device alerts.

DeltaV InSight calculates the percent time that these control conditions exist and reports them as an abnormal condition if the percent time exceeds a defined global limit. Abnormal control conditions are indicated in overview graphs and summary tables from which the user may drill down on specific blocks for more detailed control performance indices and historical trends.

InSight Control Performance Monitoring.

The Control Performance Indices provided on a block basis include:

- **Standard Deviation** is calculated for each AI, AO, and control block.

- **Variability Index** (or modified Harris Index) is calculated for each control block and indicates the control performance as compared to minimum variance control.

- **Tuning Index** is a model-based performance index that provides an easy-to-understand benchmark comparing current tuning with the desired tuning based on calculated process dynamics. The Tuning Index is the predicted % change in control variability for the new tuning recommendation.

- **Oscillation Index** is calculated for each control block process variable and provides an indication of oscillatory behavior.

- **% Time Limited** provides an indication of how often any of the control conditions listed above are active.

DeltaV InSight performance monitoring is easy to use because it automatically configures itself as control strategies are added to or deleted from the system. No communications interface or mapping of tags is required. Default performance limits for control conditions and performance indices are provided and may be easily changed based on your specific knowledge of your process.

Asset Alert Monitoring

DeltaV InSight also provides overview displays with summary status information for all devices (Fieldbus and HART) that are monitored for maintenance state. Four asset alert levels are reported including: Asset Failed, Maintenance Soon, Advisory, and Communications Failed. Detailed asset information is also easily available by launching AMS Device Manager from DeltaV InSight for any device in question.

Control Loop Tuning

DeltaV InSight provides two approaches to loop tuning:

- On-demand tuning—Uses on-demand testing of the process to automatically provide tuning recommendations.

- Adaptive tuning—Uses past changes in setpoint or output to automatically provide tuning recommendations. No additional plant tests are required.

DeltaV InSight's On-Demand Tuning is available for PID and Fuzzy Logic control blocks in the DeltaV controller or Emerson FOUNDATION Fieldbus devices. Tuning recommendations are available on demand by initiating automatic testing of the process. During the tests, the loop remains under control to prevent large disturbances to the process. The on-demand tuning method is based on the Åström-Hägglund algorithm referred to as the relay-oscillation method. Users may easily adjust the desired speed of response for the control loop to speed up or slow down the closed loop response. Advanced users may also specify optional tuning rules for modified Ziegler-Nichols, Lambda, or Internal Model Control.
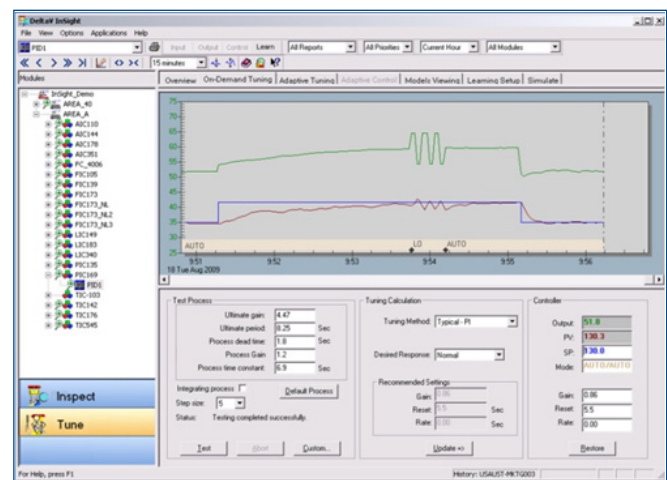
InSight On-demand Tuning.

DeltaV InSight's Adaptive Tuning is available for all PID blocks that have embedded process learning enabled, either in the controller or in Emerson FOUNDATION Fieldbus devices. Adaptive tuning is based on process models that are continuously calculated based on changes the operator makes during normal day-to-day operation. The process models used for tuning are validated using quality parameters for model identification and model variability. Tuning recommendations are automatically provided for validated models based on Lambda or IMC tuning rules.
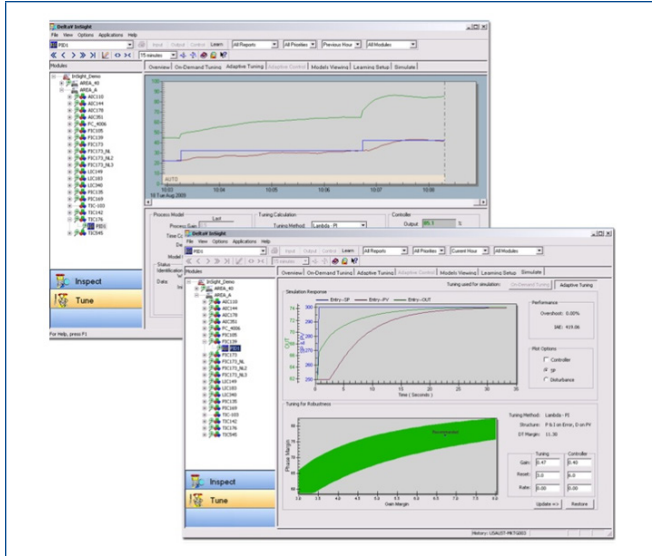
InSight Adaptive Tuning and Simulation.

The unique value of DeltaV InSight's adaptive tuning comes not only from providing optimal tuning recommendations, but from proactively identifying loops that need to be re-tuned. For each PID block, a tuning index provides a quantitative metric for the predicted % change in variability for the new tuning recommendation. With a tuning index it is possible to identify and rank control loops that need tuning, before operational or variability problems are reported.

For the advanced user, DeltaV InSight also provides sophisticated but easy-to-use loop simulation and model analysis tools. The simulation allows control loop performance to be predicted before the new tuning is used. The user can view a simulated loop response based on the recommended tuning parameters and compare the response with the current tuning parameters. You can also assess loop stability for different tuning parameters with a robustness plot. The model analysis tool provides insight into process characteristics and can be used to validate model consistency, identify non-linearities, or process changes over time.

DeltaV Adapt

Closed loop adaptive control is also available using Delta Adapt, an add-on product that utilizes DeltaV InSight process models and adaptive tuning calculations. DeltaV Adapt is ideal for non-linear processes and processes that experience changing dynamics for different regions of operation. DeltaV Adapt may be used with any PID blocks

that reside in the controller and have an Adapt license assigned to the block. See the DeltaV Adapt product data sheet for more info.

Control Performance Reports

DeltaV InSight Performance Reports help operations, maintenance and control personnel track control performance and identify opportunities for improvement. Standard reports are provided for system overview, area control performance, and detailed loop analysis. These reports may be created on-demand or scheduled for automatic generation, such as for monthly or weekly reports.

InSight Control Performance Reports.

Furthermore, DeltaV InSight reports are easily customized to include additional key performance indicators such as critical alarms, energy consumption, or production rates. Based on Microsoft Excel templates, reports are easy to enhance using DeltaV Reporter—an Excel Add-in provided free with DeltaV, which lets you add process, alarm and event information to your InSight reports.

Licensing

If a subscription Insight license expires, the licensed functionality in the Insight application will no longer be available. To continue using the functionality, please renew the subscription license for a new term.

Prerequisites

- Insight Control Performance Reports require history collection for monitored loops. Control Performance Reports are only supported with history collection in the DeltaV Continuous Historian.

Related Products

- **DeltaV Adapt.** Closed loop adaptive control that can be applied to any DeltaV PID loop. Automatically changes loop tuning as process conditions change.

- **EnTech Toolkit.** A DeltaV InSight add-on option for experienced control system engineers who want advanced tools for the most difficult control loops. The EnTech Toolkit extends DeltaV InSight capabilities with a collection of applications for advanced statistical analysis, dynamic modeling, and tuning optimization.

Ordering Information

Perpetual License - v14 and Earlier Systems or Systems with Existing Perpetual Licenses

Description	Model Number
DeltaV InSight, System-wide unlimited client connections. License size based on total AO DSTs configured on the system.	
DeltaV InSight; up to 100 Analog Output DST	VE9140S00100
DeltaV InSight; up to 250 Analog Output DST	VE9140S00250
DeltaV InSight; up to 500 Analog Output DST	VE9140S00500
DeltaV InSight; up to 1000 Analog Output DST	VE9140S01000
DeltaV InSight; up to 2000 Analog Output DST	VE9140S02000
DeltaV InSight; up to 3000 Analog Output DST	VE9140S03000
DeltaV InSight; up to 4000 Analog Output DST	VE9140S04000
DeltaV InSight; up to 30000 Analog Output DST	VE9140S30000
DeltaV InSight Scale-up, System-wide scale up. License size based on configured AO DSTs.	
DeltaV InSight Scaleup; 25 Analog Output DST	VE21UPS059
DeltaV InSight Scaleup; 100 Analog Output DST	VE21UPS060
DeltaV InSight Scaleup; 500 Analog Output DST	VE21UPS061
DeltaV InSight Basic, Single Client for ProPlus or other DeltaV workstation. Provides base functionality. Does not include Performance Reports, Tuning Recommendations, Adaptive Tuning or other capabilities enabled by embedded process learning.	VE2134BASIC

Ordering Information

Subscription License - DeltaV v15.LTS and Later Systems*

Description	Model Number
DeltaV InSight Subscription License; up to xxxx Analog Outputs	VE9140SwS0xxxx_YyFYzz
DeltaV InSight Scaleup Subscription License; sss Analog Output DST	VE21SwS0uu_YyFYzz

The model numbers above are for initial subscription term lengths only; renewal model numbers are available with a "-R" at the end of the model number string.

*w = represents the length of the subscription term in years (1, 3, or 5)

*$xxxx$ = represents the license capacity (0100, 0250, 0500, 1000, 2000, 3000, or 4000 Analog Output DSTs)

*y = represents the specific year of the subscription term (1, 2, 3, 4, or 5)

*zz = represents a two-digit indicator of the year of purchase (e.g. 23)

*sss = represents the license capacity (25, 100, or 500 Analog Output DSTs)

*uu = represents the scaleup part identifier (59 for 25 Analog Output DSTs, 60 for 100 Analog Output DSTs, and 61 for 500 Analog Output DSTs)

*Beginning with DeltaV v15.FP1, the total AO DSTs configured on the system is equal to the sum of perpetually-licensed AO DSTs and AO DSTs configured as subscription FLEX DSTs. For more information on FLEX DSTs please refer to the DeltaV PK FLEX Controller product data sheet.

Description	Model Number
DeltaV InSight Basic, Single Client for ProPlus or other DeltaV workstation. Provides base functionality. Does not include Performance Reports, Tuning Recommendations, Adaptive Tuning or other capabilities enabled by embedded process learning. Perpetual license.	VE2134BASIC

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