

Ovation™ Process Historian

Features

- Designed to meet the needs of precision, performance, scalability, and historical data management for the Ovation control system
- Collects histories of Ovation process values, messages and status changes
- Creates a chronological record of operator actions and process alarms
- Demonstrates scalable operation for 1,000 to 200,000 point values
- Provides flexible deployment options for a variety of system configuration needs
- Hardware and software options for multiple levels of fault tolerance
- Offers online and removable long-term archive solutions
- Connectivity features and client applications for external data access, analysis, trending and reporting
- Operates in the Microsoft® Windows computing environment



Introduction

Emerson's Ovation™ Process Historian provides mass storage and retrieval of process data, alarms, sequence-of-events (SOE) and operator actions for the Ovation control system. The speed, power and flexibility of the historian allow it to organize vast amounts of real-time process data and present meaningful information to all users of process information, including operators, engineers and maintenance personnel. Integrated tools provide viewing, sorting and data analysis at the Ovation control system without the need for additional software and separate applications bring similar capability to users' desktop computers.

Historian Architecture

Data Collection Supports Flexible Deployment

To meet various system application needs, the historian collection function (known as a "scanner") can be deployed either on the historian server or remotely on one or more operator stations located throughout the Ovation system.

By distributing the collection of process values and messages, this data is processed locally and forwarded to the historian server for long-term storage. Therefore, an outage by the server will not interrupt data collection, as this data is buffered until communication with the server resumes. A second

redundant scanner can execute on another station to provide additional protection of data loss due to a failure of the primary scanner host computer.

Centralized Deployment Option Serves Multiple Systems

The Ovation process historian's distributed data scanner architecture also supports data collection from multiple Ovation systems. This allows a centrally deployed historian server to collect and store data, service requests for process values and messages from multiple plant units and provide this information to historical client applications. These applications are capable of displaying, printing or saving files that contain information combined from the individual Ovation systems.

Rich Client Applications for Data Users

The historian and the Ovation process data retrieval applications (e.g. trending, reporting functions) operate in a client/server fashion for requesting, serving and presenting historical data. The user interacts with these applications to specify the time period and type of data desired, along with any filter criteria for analysis or review. The historian server then responds to these retrieval requests by recalling this information from its historical data archives.

The Ovation client application programs typically run on an operator or engineer workstation. These applications provide the functions to display, print or save pre-formatted reports of the data retrieved from the historian server. The historian's optional desktop application package provides special versions of the Ovation historical reviewing and trending programs for use on desktop PCs that have network access to the historian server.

Historical Sampling & Collecting

The Ovation historian software scans / collects the following types of historical process information:

- Real-time point values and statuses
- Point attributes

- Laboratory data
- Alarm messages
- Operator action messages
- Sequence of event messages

The recording of process messages complements the tracking of process point values and statuses by allowing users to cross-reference and compare control actions, alarms and events with the process point samples obtained during a period in question.

By maintaining such a comprehensive set of historical records, Ovation process historian users are able to better understand their processes' typical and abnormal behavior to identify common trends, explore anomalies, and diagnose process flaws and failures. The detail contained within the Ovation historical data can lead the user to identify conditions that could be missed by generic historian systems; the frequency and precision of device and sensor readings prove beneficial when accuracy is of utmost importance.

The following paragraphs describe these data collection subsystems in more detail.

Process Value History

Point history continuously reads process points and collects exception values and their corresponding status and time-stamp indication. In other words, a data sample collection is based on point status or value changes that occur outside a user-selectable deadband. This method of collection minimizes disk storage consumption while providing an accurate record of process activity. Most scan frequencies are based on user defined increments of one second; however, a small subset of points can be configured to be scanned every 0.1 seconds.

In addition to sampling analog and digital point types, the historian can also store time-stamped readings of packed digitals, node records and drop status points.

The status conditions that are monitored and saved are numerous and include:

- High (or low) limited exceeded
- Hardware error
- Alarm acknowledgement

- Cutout from alarm checking
- Value quality
- Operator entered value
- Scan removed
- Alarm / limit checking disabled
- Timed out point

Although typical historian configurations will collect process point data for 5,000 or 10,000 points, the Ovation historian is designed to support up to 200,000 data points in some configurations.

Point attributes such as units or descriptions are also stored for later use in displays and reporting applications.

Point history also processes user requests to retrieve previously stored process point information, providing data for operator trending and reporting functions.

Laboratory Data

Laboratory data is a special data collection method for storing point data that is not acquired in real-time (such as laboratory test results). These points may be collected via manual entry or by import of files generated by external devices. The resulting data files are stored into the historical archive for use in trends, reports and other retrieval functions.

Message History

In addition to point values and attributes, the historian also collects process messages from the Ovation system including alarm messages, operator event messages and sequence-of-events messages.

Alarm History

The historian receives alarms sent by a designated alarm logging drop, typically an operator or engineer station, to an alarm message scanner which packages and sends them to the historian server for storage into an alarm history subsystem.

Once stored, alarm history allows users to use client applications to request a list of alarms for display, print or saving to a file. It also provides the capability

to filter the alarm list based on factors such as point name, time period and/or unit or drop of origin.

Operator Event History

Operator event history records operator actions initiated by users at an Ovation operator workstation. Actions, such as auto/manual transfers, raise/lower commands, on/off commands, set point changes, alarm limit changes, point scan status changes, or manual entry of values are clearly identified, time tagged and stored chronologically.

Upon request from a client application, operator event history will retrieve the data and filter this chronological list by time period, originating unit / drop or event type. The list can be displayed, printed or saved as a file.

Sequence of Events (SOE) History

The Ovation controller has the ability to produce sequence-of-events messages which allow tracking and comparison of process events to a millisecond resolution. These messages are directed to an Ovation process historian scanner for packing and delivery to the historian server for storage.

SOE history supports the retrieval of this data into a chronologically ordered list in response to queries from Ovation client applications for the purpose of post event analysis of critical plant situations.

The historian report system can automatically generate reports of SOE data with the messages output in chronological sequence.

It is a requirement that the Ovation controller be equipped with the appropriate sequence of events I/O modules to perform this function.

Historical Data Storage

Once the historical data has been scanned / collected, it is stored for future retrievals. The historian manages: primary storage and extended storage area.

Primary Storage

The most recently collected data is kept online in primary storage. Primary storage maintains a history of data for as long as the historian server's internal disk capacity will support. An internal RAID 5 disk array is available for primary storage in most historian hardware configurations.

Extended Storage

In addition to primary storage, the Ovation process historian also supports extended storage options that provide access to a historical archive that may include years of valuable process data. Two options exist: a set of 1 - 16 external RAID storage units or an unlimited series of removable DVD-RAM storage media.

The advantage of the external RAID devices is that the historical data is always available online. However, removable media gives the user the ability to physically move the data to an off-site location.

Data copied to extended storage is eventually erased from the primary storage area when space needs to become available for storage of the next time period of data.

When the removable media storage option is used, a portion of the internal storage area may be made available for restoring selected time periods of data for the purposes of planned historical data analysis. Tools for media management facilitate the identification of media volumes that are required to service historical data for the desired time periods.

Reporting System

Features

- Uses SAP® Crystal Reports® to build the templates used by the report manager.
- Includes a library of predefined report templates that provide layout, fonts, graphics and other presentation definitions that can be easily applied for quick and simple report creation.
- Existing formats may be modified to extend their capabilities; custom report layouts can be created by scratch.

- Includes specialized formulas to link to Ovation point values and descriptions.
- The Ovation report manager is used for the scheduling of reports, programming of event trigger conditions and assigning of process point names to build a "report definition".
- Message-based report formats provide logging of alarms, operation events and SOE data.
- Prints or saves reports as a file in a variety of formats (e.g. Microsoft® Word and Excel, HTML, CSV, text).

Plant operations typically require some form of hard copy record of plant activity. The Ovation process historian includes a reporting system that allows users to easily acquire relevant historical data and present this information in various formats. Predefined templates may be selected for common reporting tasks or custom reports may be created for more complex data analyses.

The report system provides the framework for defining and generating various types of system reports including:

- **Scheduled Reports** — Report execution scheduled in periodic intervals
- **Event Triggered Reports** — Summarizes activity of user defined data occurring during an event triggered by one or more process conditions.
- **Trip Reports** — Provides information prior to and following a trip event
- **Manually Initiated Reports** — Generates reports based on a user's request
- **SOE Reports** — Automatically creates a chronological printout of recent SOE activity

Report Design

The report designer is used to create or revise an existing format template of a report. This program creates the physical layout of the titles, rows and/or columns of data, graphs, and charts, as well as the fonts and colors to be used.

It also allows the insertion of historian elements from the report designer's field explorer, such as point values/status, attributes, summary values and formula fields, to simplify the creation of common historical reports.

The report templates are subsequently used by the report manager where the user can specify data query criteria such as point names, or query selection parameters that can be programmed and saved along with the report format file.

Custom reports may be designed to present process values, process messages (alarms, etc.) or a combination of historian data types. The report designer provides the ability to specify report and page headers and footers, as well as grouping sections for producing hourly and daily summaries of the data values that are returned from the historical data query.

Report Management

Features of the report manager include:

- Configuration of report definitions
- Scheduling of report execution
- Automatic SOE reporting
- Configuration export and import
- Monitoring and reporting of execution status

The report system packages tools to configure, schedule, and generate the various reports required by the user.

Report definitions are configured by assigning run-time parameters to be applied to a pre-built report format template. Specific point names, titles and the time interval to be covered are assigned to the selected format template. Additional report definitions may be created using that same format template, but with different points and titles to allow quick and easy creation of multiple reports that will have a consistent appearance.

Users may also specify the destination of the resultant report. The output may be printed, displayed within a report viewer window or exported to a file. Report output files may also be configured to be sent to users via email by interfacing with an external email server.

Report definitions may then be assigned to time-based or conditionally triggered execution events. Timed events are user-specified and are typically set up to be hourly, daily, weekly and monthly periods. Shift events are also available to be used. Triggered

events are initiated by satisfying the logical point value conditions when they occur in the real-time Ovation process database.

The report scheduler initiates report generation when specified via an operator request, conditional trigger or timed event. The embedded Crystal Reports generation engine processes the report format with the data requested from the Ovation process historian and generates the final report output.

User Applications

Ovation Dynamic Trends

The dynamic trend at the Ovation operator workstation maintains a local buffer of historical data for points recently requested for live trending. When a point is initially assigned, the buffer is pre-filled with data retrieved from the Ovation process historian.

Historical Trends

Historical trends utilize information collected in point histories. Several user-definable points can be contained within one trend. The time period, also determined by the user, can be defined in any interval divisible by one second. Time periods can be defined in one of three ways:

- Start and end times
- End time with a specified interval
- Start time with a specified interval

Additional Trending Features

Historical trends can utilize mathematically processed data results, such as interpolated data values, average data values, standard deviation values, maximum values and minimum values, etc. A zoom feature is available for focusing in on a particular time period. The page function provides the user with the ability to scroll forward or backward through a trend in either full page or half page increments.

Various features are available to facilitate visual analysis. Users have a choice of presenting the trend in tabular, graphic or radar views. Colors are used to distinguish between different trending points, as well as to show a point's status. A selection cursor is

available in the trend window for choosing an area of the trend to view detailed information for that plotted value. Once the area is selected, a window appears on the screen with additional point data relative to the selected time such as the point name, value, status and the plotted time in hours, minutes and seconds.

Historical Review

Historical review is a valuable tool for ad hoc interrogation of Ovation historical data. It offers point-and-click selection of time ranges and data filters and view, print and save-to-file capabilities. It also enables access to individual and combined views of Ovation data, including:

- Point values and statuses
- Alarm messages
- Operator events messages
- Sequence-of-events Messages.

This application provides users with a powerful tool for investigating and diagnosing detailed process records that correspond to the time period of a plant condition or event. It is available on an Ovation operator workstation or optionally available on a desktop PC.

The descriptions of this application's sub-function tabs are listed below.

Historical Point Review

Historical point review is a method for querying and displaying historical process values and related status information.

The main review window displays a point's value at the time that it was collected (i.e. when its deadband was exceeded or when its status had changed). The display is provided in a row and column format, listing the time, date, point name and value for each delta. The historical point review properties window offers data filters for point values and status-related conditions (e.g. point quality, limit / alarm violations, cutout status and scan removal status). It accepts a user-specified time range in absolute or relative times. It also offers a point browser for building lists of points to query, by searching for valid historian points.

Historical Data Edit

For circumstances where erroneous data was captured or data collection was missing, the historical data edit application provides authorized users with a tool to easily replace the flawed date with more accurate values. The window can be invoked stand-alone or in time range context from the Ovation point review or trend applications.

Changes to the values (and statuses) are recorded without destroying the original data collections, allowing users the choice to view the modified or the original record. Changes and other pertinent tracking information for every data editing session are stored in a separate, reviewable audit log.

Historical data editing is an optional feature and is activated via license management to prohibit accidental use in installations that do not desire this capability.

Historical Alarm Review

Another tab within the historical review application allows the user to display, print or save to a file a user-filtered list of alarm messages stored within the Ovation process historian's alarm history. Its properties selection window specifies filters for alarms by a number of categories, including alarm type, point type and single point. It also runs with a user-specified time range, in absolute or relative times.

Historical Operator Event Review

The operator event review function filters the chronological list of operator event messages by user-specified time period, originating drop or event type. This allows users to zero in on actions taken during the time period of interest and help to draw conclusions as to whether human interaction preceded a particular plant event.

Historical SOE Review

SOE review, running on the operator or engineer client, allows the user to view the SOE messages generated throughout the Ovation system and stored by the historian. With millisecond time resolution, users can identify high-speed digital state changes

that may have initiated or resulted from an interesting process incident. Users can refine their search based on a particular point name or originating unit or controller.

Desktop Application Tools Option

Versions of the historical trend and historical review applications described above are also available for desktop deployment to provide data to users with access to the Ovation historian server without requiring them to be on the control system itself.

In addition, the process historian tools suite includes an add-in for Microsoft Excel which provides users with easy-to-use menus and entry forms to build historical data requests. These requests may be

driven by parameters contained within spreadsheet cells and once configured, will be embedded within the spreadsheet for re-execution at a later date. This tool provides the user with powerful data analysis and reporting capabilities within the familiar spreadsheet environment.

SQL Query Support

The process historian provides support for SQL data queries for historical data. This interface services queries from external, OLE-DB -compliant desktop applications and extracts the data in tabular form to satisfy SQL requests for historical messages (alarms, SOE and operator events), and exception-based process point data samples.

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