Data Historians vs. DCS, SCADA, and PLC Systems

See why all of these solutions play a distinct role in a manufacturing facility—and together help optimize process performance.

As manufacturing environments become more complex, it's important to understand the functions of different technologies and how they interact with each other. DCS/SCADA systems, PLCs, and Data Historians all seemingly collect and display data in various formats, but each solution has a distinct role in the plant. Learn how together they bring greater value to process manufacturing.

Plant-Level Control Systems

As shown in Figure 1, the International Society of Automation (ISA) classifies the different systems used across a manufacturing organization—from the enterprise level down to the plant level. It is in the plant where you'll find DCS, SCADA, and PLC systems, which are primarily focused on controlling manufacturing equipment. Typically, DCS/SCADA systems use PID loops to control performance, while PLCs use ladder logic. All three systems are equipped with human machine interfaces (HMI) that allow the operator to monitor the process and intervene when abnormal conditions occur.

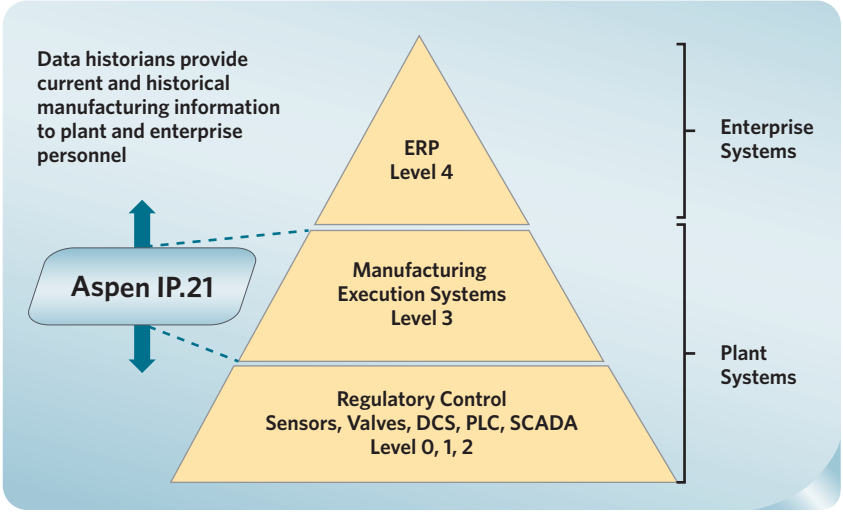

Figure 1

Data Historians and the Bigger Picture

Whereas DCS, SCADA and PLC systems reside at Levels 0 – 2, data historians are found at Level 3 (see Figure 1). Unlike DCS, SCADA, and PLC systems that only provide a view of information from within their own system, historians are architected to pull data from a variety of systems—across multiple levels—to quickly form a complete context of the manufacturing environment. In addition, the advanced analytical capabilities of a data historian allow operators to gain a deep understanding of the process, its variability, and how it can be improved.

Historians are often deployed as a single plant system, but can also be easily configured as "enterprise historians" that pull information from individual plant historians or serve as the lead historian obtaining information directly from each plant. Either of these configurations enables enterprise-wide benchmarking to further optimize process manufacturing.

	DCS - Distributed Control System	SCADA - Supervisory Control and Data Acquisition System	PLC - Programmable Logic Controller	Data Historian
Fundamental Purpose	Primarily designed for process control. Makes adjustments to control valves and actuators. Contains HMI for graphics, trends, and alarms that allows operators to supervise the process.	Like a DCS, it is primarily geared for process control, though often is a cheaper alternative to a DCS. Many SCADA systems are in remote locations with communication via telemetry.	PLCs usually control various types of mechanical equipment.	Geared toward plant management – primarily the analysis of plant operation and root cause analysis.
Architecture	Geared toward process control. Systems are 'distributed'. That is, actual controllers are physically located close to the instruments.	Geared toward process control, though not in a distributed fashion. Usually smaller applications.	Usually based on Ladder Logic.	Architected to rapidly and efficiently gather and disseminate plant data (typically temperature, pressure, level, flows) from a variety of plant systems (DCS, PLC, SCADA, LIMS, instruments) to form a complete context of manufacturing situation.
Time Horizon	DCS systems are execution systems that are primarily concerned with managing the plant at a given moment in time.	SCADA systems are execution systems that are primarily concerned with managing the plant at a given moment in time.	PLCs are execution systems that are primarily focused on managing equipment at a given time.	Due to their excellent analytical capability, historians can be used for the short term, but excel at managing over a longer time horizon.
Analytical Capabilities	Limited to trending variables within DCS itself – primarily for short-term purposes.	Limited to trending variables within SCADA itself – primarily for short-term purposes.	Usually has limited analytical capability.	Wide range of capabilities including finding patterns in the data for root cause analysis. Can easily download information into spreadsheets for further analysis.
Trending Capabilities	Can trend variables contained in the DCS system. However, trends are more orientated toward shorter term.	Can trend variables contained in the DCS system. However, trends are more orientated toward shorter term.	Usually has limited or no trending capability.	Trending capabilities are a significant strength. Can load many variables from a number of different systems over a long time horizon efficiently and effectively.
Enterprise-Wide Systems	Due to their execution nature, DCS systems are primarily intended as individual plant systems.	Due to their execution nature, SCADA systems are primarily intended as individual plant systems.	PLCs are usually intended to control individual pieces of equipment.	Historians can be used as a standalone plant system or function across the entire company to easily enable enterprise-wide benchmarking.

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Contact AspenTech SME Sales for Fast Response!

North America
phone: +1-855-882-7736

Europe
phone: +44-(0)-1189-226400

Asia Pacific
phone: +65-6395-3900

Or email esales@aspentech.com

Worldwide Headquarters

Aspen Technology, Inc.
200 Wheeler Road
Burlington, MA 01803
United States

phone: +1-781-221-6400
fax: +1-781-221-6410
info@aspentech.com

For a complete list of offices, please visit
www.aspentech.com/locations

11-4504-1113