Elevating Specialty Chemical Performance to World-Class Levels

An Industry White Paper

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Introduction

Every day, in specialty chemical manufacturing plants around the world, a process begins where feedstock materials are dispatched, a batch is run, and a product is eventually produced. Then the entire process starts all over again for that same product or a different one. Over the course of this cyclical process, specialty chemical manufacturers are constantly asking themselves these types of questions:

- Was the most recent production run performed as efficiently as possible? If not, why?
- Did we use more ingredients than in previous runs? If so, why?
- Did it take more time than previous runs? If so, why?
- Did we use more energy than previous production runs? If so, why?

In order to be competitive globally, it’s not good enough just to produce products. They have to be produced efficiently and profitably. Thus, it’s essential to be able to continuously become more efficient. To maintain profitability and manufacturing flexibility, specialty chemical producers want to have predictable and stable batch/transition times for a given product that optimizes material/energy consumption while meeting all product quality specifications. To make this a reality, it’s necessary to document and track the materials used during the production run—including exact quantities—as well as the conditions they were subjected to as they traversed the process.

That’s why every specialty chemical facility should have a process historian tailored for batch processes. Historians collect data from all the appropriate underlying execution systems and instruments, document that data, calculate and display performance metrics, allow users to visualize the data in a variety of formats, and retrieve data sets for root cause analysis. In this way, data is transformed into “actionable” information—enabling better, faster decisions across the organization. Historians allow you to gain insight into your batch production process around product characteristics, transitions, and also batch production profiles, which can enable you to optimize materials used during a batch and increase product quality.

Mobility opens up new possibilities for specialty chemical manufacturers.
Data Management

The first requirement for a historian is to seamlessly collect process data from disparate sources, such as from DCS, SCADA, or PLC systems, allowing you to get a more complete view of the manufacturing context. AspenTech’s flagship product, Aspen InfoPlus.21®, uses a variety of means to achieve that goal—ODBC, web services, or supporting products such as Aspen Cim-IO, which utilizes industry-standard mechanisms such as OPC.

Data Management also extends to facilitating the initial system setup. Microsoft® Excel add-ins simplify the process of loading data tags into the historian by enabling users to create and configure historian records directly from Excel, thereby reducing installation time.

Intelligent Search

Once the historian is online, you want to be able to quickly locate data within the system. “Google-like” intelligent search capability achieves this goal with virtually no training required. Not only does it make more experienced professionals more efficient, but it also extends the use of the historian to more casual users.

Intelligent search capability within a historian operates in a similar fashion as Google. For example, if you want to find the tagname for the deethanizer reboiler hot oil outlet temperature, you simply start typing ‘Deethan Temperature’. As you are typing, it instantly starts matching what you are typing. In short order, it picks out the best match just as when you search on the web.

Intelligent search is a “Google-like” method of finding data in the historian.
Visualization/Mobility

Once historized, data in the historian can be visualized as process graphics, trends, key performance indicators, SPC charts, and more to aid in the decision-making process.

In addition to the traditional desktop and web views, new enhancements based on HTML5 technology have now made it possible to view historian data on common mobile devices—smart phones, tablets, etc. Mobile applications allow users to gain access to the same information traditionally only available in the control room—including after hours. What’s also beneficial about mobile applications is that the user can configure email and text alerts for notifications, alerting them to a significant process excursion. After receiving the alert, they can drill down to quickly find more information about a particular issue and continue drilling down until they understand the source of the problem.

Mobile solutions allow the user to drill down using the touchscreen to quickly understand the source of the process issue.
Trends

Specialty chemical operators and engineers will always want to plot variables collected in the historian, either against each other over time or in other formats such as X-Y, in order to gain an understanding of the historical process operation. The good news is that recent improvements make this easier than ever. High-performance trends allow users to display more than 80 variables over a long historical time period in mere seconds. This gives engineers the ability to connect the dots faster when diagnosing and solving process problems, and is certainly much faster than trying to switch back and forth between a series of much smaller, pre-defined plots or “creating” new trends on the fly.

What’s also ideal about these new trending capabilities is that they can be rendered on whatever device you want—web, smart phone, or tablet—since they are based on HTML5 format.

KPIs and Overall Equipment Effectiveness

Another key element of a historian is the performance metrics that allow users to determine how well the plant is achieving its business goals. Key Performance Indicators (KPIs) can be set up in different forms, such as speedometers, so that users can see at a glance how well the plant is performing.

Overall Equipment Effectiveness (OEE) is an industry-standard metric that allows specialty chemical operators to drill down to understand how well the plant is achieving its production, quality, and equipment availability targets. While the ability to measure, compare, and contrast different facilities at a high level is valuable, what’s even more important is the ability to drill down to understand the source of why one of the plants is not achieving its goals. For example, if upon investigation, you discover that availability is only 80%, then you can drill down to look at some possible causes—equipment failure, preventative maintenance, shutdown, etc.
Analyzing Batch Performance

Since the majority of specialty chemical plants are batch, tools must be provided that allow operators and engineers to quickly and easily analyze batch performance. Engineers often have learned that there is one particular production run from the past that they would like to emulate in the future. Some refer to this as their “golden” batch. Historian visualization technology easily allows engineers to visually compare and contrast their “ideal or golden” batch against a current batch or previous batches. This type of analysis allows a manufacturer to quickly understand the nuances and differences between various production runs in order to improve production. Without tools specifically designed for this type of analysis, an engineer would literally have to overlap different batches on top of one another—and consume an enormous amount of time in the process. This innovative technology enables such analysis in a matter of minutes.

In addition, the Aspen InfoPlus.21 family of products provides additional capabilities to compare and contrast batches through the use of “single” and “multiple” batch plots. “Single” plots allow users to dive into all the pertinent values associated with a given batch or portion of a batch (e.g. phase).

On the other hand, the “multiple” plot capability allows users to bring up a variable(s) from multiple batches on one plot. For example, the user might suspect that the max temperature encountered might affect the yield of a certain product during the reactant phase of a batch. Using the “multiple” plot capability, the user might choose to plot the max temperature and product yield of the 50 most recent batches to determine if a discernible pattern emerges. What’s beneficial about this analysis capability is that the user doesn’t need to look up the individual times of the batches. The system understands this through the batch context definition, so this plot can be constructed in a matter of moments.

The bottom line is that all these batch analysis tools allow users to spend their time on analyzing production issues—not on chasing data. This enables increased production and quality, while reducing energy and material costs.
Root Cause Analysis/Analytics

Plant engineers are routinely faced with having to solve complex process problems. A historian system provides Excel add-ins that allows users to download this data into Excel where they can leverage its full power for deeper analysis. Full integration with Microsoft PowerPivot and Power View makes it possible to create even more powerful analyses and reports, which can be updated automatically and distributed throughout the enterprise with SharePoint 2010.

However, Aspen InfoPlus.21 provides even more sophisticated means of analyzing performance. Using Aspen InfoPlus.21 SQLplus, users with a minimal amount of programming experience can perform sophisticated analyses. The name “SQLplus” is instructive because it is much more than a simple querying tool. Rather, it's a “scripting” language meaning that it’s much easier to use than a programming language. The “SQL” portion allows a user to download datasets, while with the “plus” portion a user can perform sophisticated logical and mathematical operations on the resulting datasets. AspenTech clients use Aspen InfoPlus.21 SQLplus heavily to perform a wide variety of analyses.

Conclusion

In order to remain competitive, historians are an essential foundational element for any specialty chemical plant. Historians collect plant and gathering system data so that operators and engineers can view and analyze data. In addition, new visualization tools based on HTML5 technology allow users to view all plant information (tags, trends, graphics, SPC charts) on their favorite mobile device (smart phone, tablet, etc.).

What’s especially important is the ability to analyze batch performance. Special tools are provided that allow a user to dive into the particulars for a specific batch or phase of the batch, compare a batch against a “golden batch”, or analyze variable(s) from multiple batches. Additional analytical tools allow users to download information to Excel for further analysis or perform mathematical/logical analysis on various result sets.

The bottom line is that a historian allows specialty chemical operators to truly increase manufacturing performance and shareholder ROI.
About AspenTech

AspenTech is a leading supplier of software that optimizes process manufacturing—for energy, chemicals, engineering and construction, and other industries that manufacture and produce products from a chemical process. With integrated aspenONE® solutions, process manufacturers can implement best practices for optimizing their engineering, manufacturing, and supply chain operations. As a result, AspenTech customers are better able to increase capacity, improve margins, reduce costs, and become more energy efficient. To see how the world’s leading process manufacturers rely on AspenTech to achieve their operational excellence goals, visit www.aspentech.com.