



Enabling Process Manufacturers to Leverage Resource Expertise Globally

An Industry White Paper

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||||||| About AspenTech

AspenTech is a leading supplier of software that optimizes process manufacturing—for energy, chemicals, pharmaceuticals, engineering and construction, power & utilities, food and beverage and other mill product 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.

Resource Expertise Challenges of Globalization

The process industries have changed significantly over the past decade, driven in part by a shifting geographical customer base, numerous mergers and acquisitions, and changing sources of raw materials. One result of these changes is a broader geographical distribution of manufacturing assets. When combined with the shift to operate leanly with minimal staffing levels, leveraging resource expertise across the organization becomes a substantial challenge. In simple terms, companies need timely access to the required expertise to quickly address business and production issues that can have a negative impact on profitability.

In emerging geographies such as Asia and the Middle East where process manufacturing growth is focused, required expertise may not be locally available yet. Retirement of experienced resources coupled with downsizing trends have also reduced available expertise in more established geographies like the United States and Western Europe. It is important for process manufacturers to find new ways to leverage employee expertise globally in a cost effective manner to remain competitive.

The foundation of efforts to leverage resources is to convert non-expert tasks to system applications and repeatable processes that reduce demands on resource time. A combination of Information Management Systems and Manufacturing Execution Systems (MES) provide the infrastructure and tools required to address many of these utilization challenges. For a company that wants to utilize data across the enterprise, they must determine how to deliver the appropriate granularity of data to the right resources in the right format in a timely manner. To capture the benefits of Information Management and MES layer solutions and leverage resource expertise globally, the following areas should be considered:

1. Enterprise-Wide Architecture Design
2. Usability of Data
3. Consistent and Efficient Workflow

Implementing MES solutions such as aspenONE® Production Management and Execution improves resource effectiveness by driving more efficient troubleshooting and enabling better decision making, providing greater operational consistency and increased profitability.

Design Enterprise-Wide Information Management Architecture

There is a difference between successfully collecting and managing data in a local environment and effectively handling data across an enterprise. Some Information Management Systems have designs and architectures that are more single-site friendly while others are better suited for successful enterprise-wide installations. Locally installed systems have demands at the local level for plant systems and reporting applications as well as required interactions with global applications (see Figure 1).

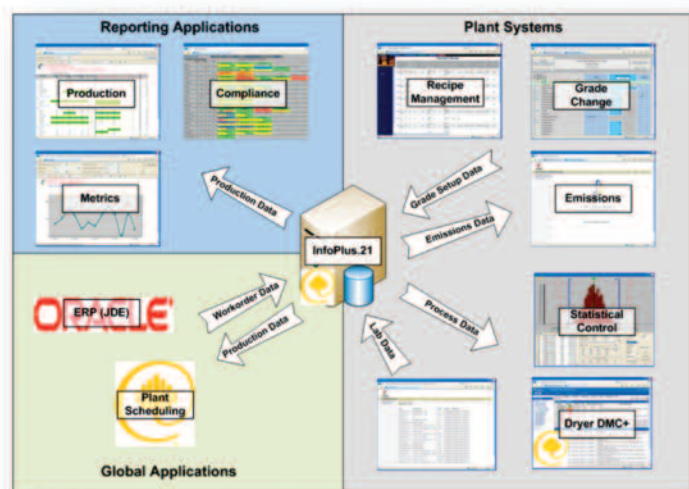


Figure 1. Example of Enterprise-Wide Architecture¹

Enterprise-wide installations are even more complex, requiring an expanded number of local and global interactions multiplied by a large quantity of sites. As a result, thorough up front architecture planning is critical to successful deployment.

Some primary considerations when designing an Enterprise-Wide Information Management System solution include:

- Ease of Deployment
- Ease of Maintainability
- Communication to Third-Party Systems
- Security
- Accessibility

For most companies, ease of deployment and maintainability are heavily influenced by factors such as use of standard hardware and software packages, practical delivery systems for patches and updates, and the ability to propagate changes within the system. Using standard protocols such as OPC for integration with or communication to third-party systems is typically a favored approach that helps reduce total cost of ownership. Companies have varied methods for addressing security and it is important that the architected solution has the flexibility to support the preferred approach.

Accessibility can be a more complex consideration because it affects how users will interact with the data. Companies must determine whether they prefer local desktop applications, web-based access or some combination. There are many choices when it comes to data access, including the use of standard Microsoft® Windows environments, a company intranet or the Internet.

AspenTech can support any of these approaches. Aspen Process Explorer™ uses the industry standard Microsoft Windows environment. The same techniques used in other Windows programs can be used in Aspen Process Explorer to help deliver real-time process data to the desktop, where managers, engineers, and operators can apply it to make better decisions and improve performance. Alternately, Aspen IP.21 Process Browser is a fully integrated web-based solution for managing real-time and historical process data on both intranet and Internet environments. It includes pre-defined web pages, web authoring components and a Java graphics publishing engine for integrating process information on standard and custom web pages for analysis and reporting. Another option is Aspen Role-Based Visualization™, a rich portal visualization solution for process industry applications which aggregates information from many sources and simplifies user access to information. By aggregating the content from multiple sources into a web-based graphical user interface, users have access at anytime and anywhere through multiple devices.

All of the various approaches have strengths and weaknesses. The decision made regarding the preferred method of accessibility significantly impacts the user experience. An upfront understanding of how users will utilize the information helps drive good implementation choices that can impact the overall architecture.

Usability of Data

Effective data collection, management, and analysis tools across an organization can increase the efficiency of expert resources, making them much more valuable to an organization. As an example, if a polymer plant in China has an extruder issue that is reducing production rate and the company's rotating equipment expert is in the United States, the troubleshooting effort may require purchasing a plane ticket and potentially taking days to get to the site. The company is burdened with significant costs in travel time and expense, but more importantly in production losses. With an effective data infrastructure and good analysis tools such as aspenONE Production Management and Execution, the expert resource

can review process and equipment data, help diagnose issues, make recommendations and monitor on-going extruder performance from anywhere in the world.

When data is made available across an enterprise, the overwhelming amount of information available can be problematic. Data collection systems, such as Aspen InfoPlus.21, can collect enormous amounts of data with detailed granularity. Valued resources with specialized expertise are not efficient when they spend their time manipulating data to get information that they value into a usable format. These inefficiencies cost companies real money. Good monitoring and analysis tools enable resources to quickly put data to use in core competency areas.

Much of the value lies in the way data is presented. If a corporate environmental engineer is assigned to monitor emissions for 15 sites around the world, and each month she gets a spreadsheet from each plant generated by local engineers with thousands of rows of data which she has to review to extract a small number of non-compliance events, this can greatly reduce her efficiency. Sorting through data does not leverage her expertise. Instead, she is spending a large part of her time looking for the needles in a haystack. If she had a mechanism such as Aspen Event.21 that could be easily configured to notify her of non-compliance events, she could eliminate much of the spreadsheet review work related to this reporting.

It would not only save significant amounts of her time but also save resource time at the local plant level. Capturing these types of efficiency gains drives better productivity and increases resource availability for more specialized and expert tasks.

When data is distributed throughout an organization, the granularity and presentation of that data is often different based on the needs of the individual user. Effective Enterprise-Wide Information Management System solutions give users options when it comes to visualization and analysis. Some common ways to view data include graphics, trends, KPIs, spreadsheets, and reports.

Process graphics and trends are most often used at the engineering and technician level with a tendency toward highly granular data. KPIs and reports tend to be summary data used at the operations and managerial level to drive decision making.

When these visualization formats are coupled with strong analysis capabilities, they provide powerful tools in the hands of the right users to leverage their expertise. For example, trends are a common part of Enterprise-Wide Information Management System solutions. Aspen Golden Batch Profiler™, shown in (Figure 3), is a tool for monitoring progress of a batch against an ideal or golden profile and provides a workflow to sustain gains from continuous improvement. Process engineers are thus provided with an environment for building simple, heuristic models representing ideal or golden profiles and viewing against current and historical batches for comparison and analysis. So rather than spending hours having to search data for ideal production runs and perform frequent manual comparisons post production with numerous trend windows, an engineer in a centralized process optimization group can have real-time evaluation capabilities in minutes to help improve and sustain batch quality and identify excursions from optimal profiles early in the manufacturing cycle.

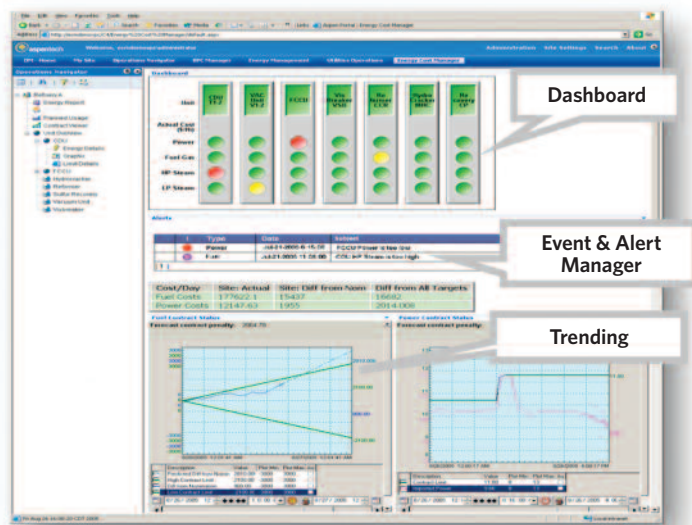


Figure 2. Leveraging Visualization Tools

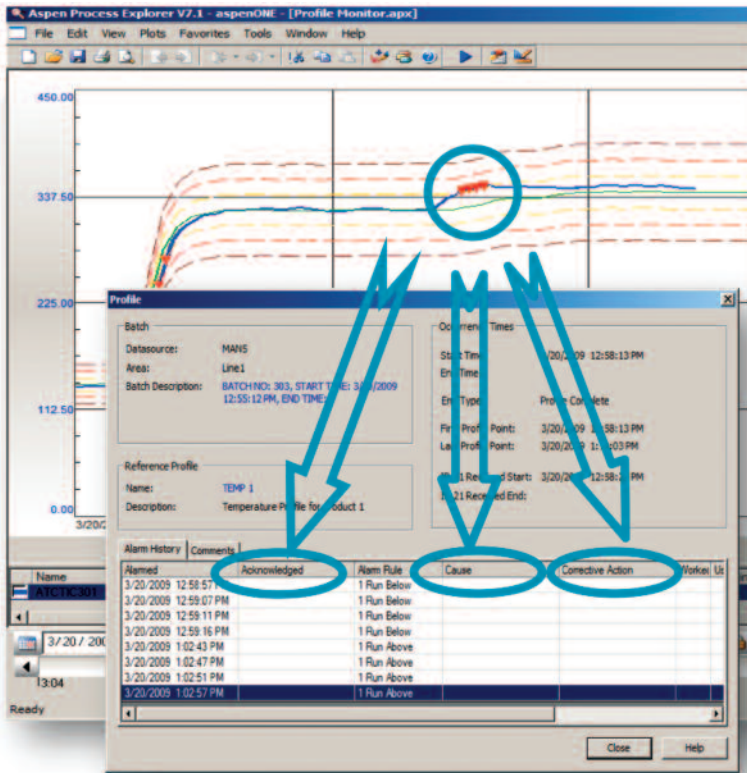


Figure 3. Utilizing Golden Batch Profiler to Improve Performance

Providing users with data that is ready for analysis as opposed to data that must be prepared for analysis drastically improves resource efficiencies. The return on investment for companies is that experts spend a much larger portion of their time leveraging their expertise to resolve issues and drive improvements.

Consistent and Efficient Workflow

When resources support multiple locations, one challenge that they encounter is variations in workflow and terminology between sites. Clearly defined workflows and consistently applied standards across sites reduce troubleshooting time and improve performance. When support resources are able to quickly understand an issue within the overall context of a workflow, they can more easily identify production impacts and root causes.

With the many variations that exist between manufacturing facilities in a company, standardization can be a challenge. The way that companies approach standardization will typically determine the degree of success that they have. Standards such as ISA-S88 or ISA-S95 are proven methodologies that can provide a common industry approach.

Standards establish a common terminology, which is extremely valuable with the global distribution of assets common in most companies. Key terms and definitions can be different depending on what part of the world a resource is located. Miscommunications due to these differences can delay or impede troubleshooting efforts. If standards such as ISA-S88 and ISA-S95 are being applied across an organization, then when a key resource in the United States is discussing a master recipe with an associate in the Middle East, they are talking about the same thing.

The MES layer can support and even facilitate the use of these standards to varying degrees. The extent to which a solution complies with these standards can determine the degree to which it aids resource effectiveness. For instance, Aspen Production Record Manager is fully ISA-S88 compliant, meaning that the data structures needed to satisfy the standard can be completely created dynamically. Any existing batch structure defined in a batch execution system can be automatically and dynamically created. The Batch Extractor also allows for online extracting of batch data from external batch execution systems into the database. These are not only time saving functions for users, but also allow companies to capture the full benefits of the standards without significant amounts of additional configuration work.

There are tools within the MES layer which also allow companies to improve the efficiency of workflow processes. Consider the product tracking activity within the ISA-S95 manufacturing operations model as an example.

Application Example: Product Tracking within ISA-S95 Model

Let's assume a process manufacturer is headquartered in the United States with a plant in Asia. Two customers call the corporate customer service group to report contamination issues which are discoloring their final products. The customer service group in the United States has access to process data from the plant historian, but the company does not have any specific product tracking tools.

To troubleshoot this issue, the customer service engineer would first try to determine what vessels, raw materials, and additives were used to produce a product before looking for any identifiable root causes. He would also need to determine which other lots or campaigns used the same equipment, materials, etc. and investigate whether those batches had similar issues. This is product tracking the hard way and can take significant amounts of resource time to fully determine the scope of the problem before getting to the root cause investigation. This approach delays the identification of other customers who could be affected by the issue. In addition, while the investigation is taking place the site is still producing products that potentially have the same contamination issues.

If this company had a production management system for marking, tracking, trending, analyzing, and reporting of production and event data such as Aspen Production Record Manager, the customer service engineer would be able to quickly and easily find specific batches, campaigns, or lots based on process data, equipment used or other production data of interest. The engineer could then proactively notify other customers who might have the impacted products. He would also immediately be able to focus on identifying the root cause of the contamination to minimize liability risks and potentially reduce or eliminate additional product quality issues.

In this example, the goal of the customer service engineer is to quickly identify the root cause of the contamination. Without the proper tools, the process of getting to the root cause can involve a significant amount of analysis work to determine basic information associated with the production campaign. The example illustrates the value of employing workflow tools that are targeted to specific functionalities because they can provide the basic correlation information up front, enabling the customer service engineer to spend his time investigating and resolving the root cause issue.

Measuring the Benefits

Resources are most valuable to a company when they are able to apply their core competencies. Companies can best leverage the specialized knowledge and expertise of key resources across company assets by designing a successful enterprise-wide architecture that makes usable data with effective workflow tools accessible to the right personnel regardless of location. The benefits of implementing MES solutions to leverage resources include faster troubleshooting, easier root cause analysis, reduced production losses, improved best practice sharing, and reduced travel costs. Companies that take advantage of solutions such as aspenONE Production Management and Execution will quickly realize these benefits and differentiate themselves from their competitors.

References

1. D. Oliveira, A. Phillips, J. Branfield, Cabot Corporation: "Building an Integrated MES Architecture Using IP21 as a Foundation", presented at the ATIMUS User Conference, Houston, TX, April 8, 2008.



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