



Making Profitable Digital Strides in Batch Processing: How to See ROI in Months When the Future is Unpredictable

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Regardless of what our plans were in January 2020, nothing is the same in 2021 or the future. While predictions are that the chemicals and refining industries revenues will bounce back 10 percent over 2020 numbers, surpassing their pre-decline levels (BCG), and the **International Monetary Fund with projecting 6 percent global growth¹**, many are hesitant as to what investments need to be in place to both capture this potential and gain a competitive advantage. Key ongoing changes in batch process manufacturing include:

- Changes to feedstocks due to supply chain issues
- Significant shifts in product mix due to irregular demand
- Manpower strategy changes due to increased remote work conditions
- Increased downtime due to batch-to-batch setup changes

Tackling these challenges is not straightforward. In complicated processes, turning one proverbial knob never has a singular impact.

Unintended consequences are common and include:

- Increased degradation of operational performance such as reactor fouling
- Reduced amount of useful life of consumables such as catalyst
- Increased waste emissions due to process degradation
- Increased batch cycle time when issues arise due to reduced visibility of remote workers

Digital solutions can provide key insight during these unusual times; in particular, advanced multivariate analytics such as Aspen ProMV™ can help batch process manufacturers mitigate these issues while building a solid foundation for digitalization growth, all while using existing data and providing solid near-term ROI.

Advanced analytics untangles behavior patterns amongst dozens, if not hundreds of variables, removing uncertainty from decision-making now and providing guidance for the future.



Aspen ProMV™ can help batch process manufacturers mitigate supply chain and workforce issues while building a solid foundation for expanding digital transformation.

Additionally, technology advancements such as Batch Alignment remove the guesswork from the significant differences from batch-to-batch which has historically made it difficult to draw conclusions from historical data.

Interpreting these patterns can provide such insights as:

- Identifying potential issues, such as fouling so that proactive action can be taken to mitigate
- Defining on- and off-spec product, reducing reliance on manual lab tests
- Signs of impending process and critical equipment failure, as well as “smaller” issues that create big problems such as sensor drift

Where to Start to Maximize Benefits?

Current progress in an organization’s digital maturity journey can help determine the best starting point. While it’s admirable to shoot for the moon and land on the stars, change management and cultural inertia cannot be ignored, especially when it comes to technology adoption.

Digital Maturity and Journeys

ARC Advisory Group’s “The State of APM in Industry” **2021 report** says that less than a quarter of organizations polled have implemented their Asset Performance Management strategies and about four in 10 respondents say their strategy is still under development. One reason cited is often the feeling of ‘not being ready.’

Whether this is due to lack of system integration, the right skill sets or the right data, these entities are more ready than they realize. According to a 2020 survey by **PwC**², “Forty-two percent of chemical company CEOs said they would be investing in digital operations and related technologies in the coming 12 months,” but not all investments take companies down the same path, as it depends where they started.

For purposes of simplification, digital maturity has been broken down into three categories when examining next steps to maximize benefits.





1. **Digitalization for Improvement:** Organizations that fall into this category often find investments in segmented implementations, benefiting one, maybe two, functional groups at a time. They're often in the infancy of realizing step change results from their efforts, despite what may seem like a heavy use of digitalization. For batch organizations, this may mean they can more quickly adopt a new product or perhaps reduce setup times for their existing product mix, resulting in faster time to value. Using multivariate analytics like Aspen ProMV as a first step is very beneficial for groups who feel they are poorly instrumented and worry that embarking further on digitalization will require significant CAPEX. These solutions enable use of existing data and often require no CAPEX to see significant results.

2. **Digitalization for Optimization:** Optimization comes when it's perceived that the "low-hanging fruit" has been tackled and it's time to refine further. These organizations are typically well on their way to digital maturity but still have room to grow. There are likely extensive monitoring solutions in place that provide threshold alerts and also enable consistent decision-making across multiple functions. One example of this might include a multi-level dashboard used to not only share information but also diagnose and correct issues.

The most beneficial next step for these organizations is embarking on a step change in order to understand processes and gain a competitive edge. Ideally, this would be done using advanced methods such as multivariate analytics. One example of this could be optimizing raw material yield and ensuring that manufacturers can do so regardless of their supplier—ultimately resulting in increased profits and supply chain flexibility. Taking this step will first help to hone in on where step change opportunity might exist that was not apparent before, as well as provide optimization and analysis capabilities more powerful than many traditional techniques. Lastly, multivariate monitoring enables organizations to keep track of optimizations to build the continuous improvement path.



3. **Digitalization for Transformation:** For organizations that have reached a maturity level in optimization, they look next to transform how they can do business through digitalization.

This can mean very different things to different customers, but digitalization efforts that span multiple functions and always include significant business process changes, and even redefinition of roles and responsibilities throughout the organization. One example of this may be moving to an outcome-based sales model or introducing a new services offering.

The digital strategy is no longer limited to a subset of impacted functions, but touches everyone's goals organization-wide in some way, shape or form.

With a firm understanding of their process already in place, these organizations can now begin taking advantage of open-loop monitoring and closed-loop control options to enable this transformation.

Aspen Batch APC™ is a closed-loop, model-predictive batch control system that improves product quality and yield, and reduces cycle times.

Benefits of Using Open-loop Monitoring and Closed-loop Control Simultaneously

Aspen Batch APC™ (Advanced Process Control) is a closed-loop, model-predictive batch control system that enables users to improve product quality and yield, and reduce cycle times. It features a built-in optimization engine that predicts end-of-batch quality attributes at key decision points throughout the process. While Advanced Process Control may be the ultimate goal for some organizations in order to address issues like quality, for best results, this closed-loop control should exist in parallel with open-loop monitoring like Aspen ProMV offers.

Additionally, predictive analytics that monitor and aid engineers in managing process behaviors which impact batch quality in an open-loop fashion, can be an ideal starting point. This is especially true for those seeking to quickly gain value and reduce costs through digitalization though not digitally mature enough to make the APC leap.

Open-loop Batch Monitoring	Closed-loop Batch Control
<ul style="list-style-type: none">Monitor process behaviors for anomalies.	<ul style="list-style-type: none">Closed-loop, automatic optimized course corrections to batch recipe, at key decision points based on predictions of final outcomes.
<ul style="list-style-type: none">Gain insights on root causes of process upsets, such as sensor drift.	<ul style="list-style-type: none">Automatically reoptimize control for future batches based on feedback from prior batches and push the process to the limits of performance.
<ul style="list-style-type: none">Run offline analysis and troubleshooting to recommend optimization opportunities, on demand.	<ul style="list-style-type: none">Reduce the need for human oversight with a closed-loop system that automatically optimizes the batch process.
<ul style="list-style-type: none">Continually predicts final quality to hot ship in advance of lab results.	



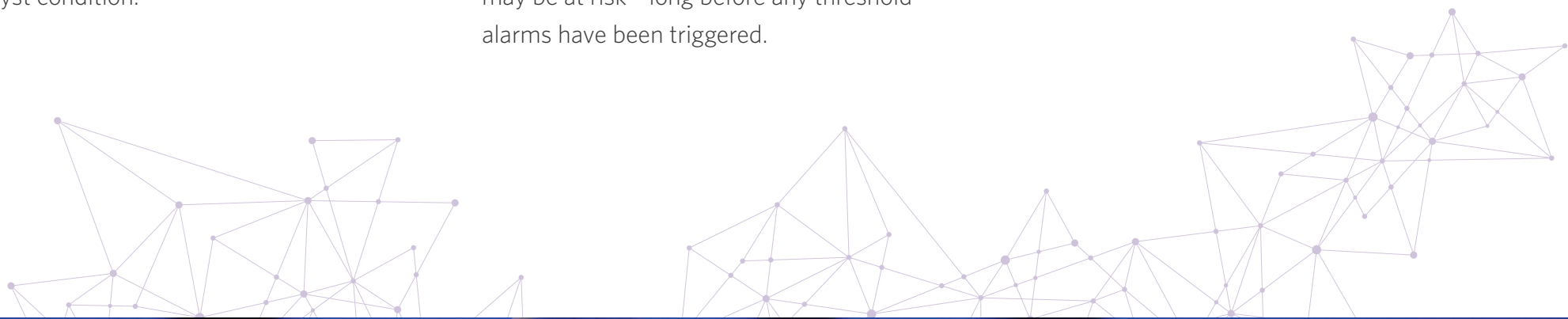
Aspen Batch APC is a powerful solution that works to control what is observed and *can* be operationally controlled. However, you cannot control what you do not observe.

Issues that are creeping into quality or process stability may be due to variables that aren't either associated with quality or the product in question, and possibly not being monitored. Common examples are sensor drift or how process operations should be adjusted for catalyst condition.

With multivariate analytics technology like Aspen ProMV, customers can more quickly identify the factors most critical to quality, giving more insight to the efforts of plant support or APC engineers.

This monitoring could be examined across hundreds of process variables. Aspen ProMV monitors behavior changes among these variables to alert when quality, or another measured outcome such as loss to flare, may be at risk—long before any threshold alarms have been triggered.

Another capability of note is the ability to find areas of opportunity to optimize processes, such as increasing yield or throughput, with process changes. This analysis is done offline and on an ongoing basis, allowing facilities to continually push the limits of their capacity to increase the production of a more sellable product.



Conclusion

Wherever your company is in its digital maturity, there are solutions available to create impactful results with very near-term ROI and help pave the way for your longer-term digital optimization and transformation journeys. For batch process industries looking to progress in that journey, the time to get started or keep moving is now. Aspen ProMV and Batch APC are powerful tools that can shorten your time to value from years to months, even weeks.

¹ <https://www.marketplace.org/2021/04/06>

² <https://www.pwc.com/gx/en/ceo-agenda/ceosurvey/2020/trends/chemicals.html>





About Aspen Technology

Aspen Technology (AspenTech) is a leading software supplier for optimizing asset performance. Our products thrive in complex, industrial environments where it is critical to optimize the asset design, operation and maintenance lifecycle. AspenTech uniquely combines decades of process modeling expertise with machine learning. Our purpose-built software platform automates knowledge work and builds sustainable competitive advantage by delivering high returns over the entire asset lifecycle. As a result, companies in capital-intensive industries can maximize uptime and push the limits of performance, running their assets safer, greener, longer and faster.

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