



## Improving Food and Beverage Production Quality and Accelerating Digitalization

Laura Stridiron, Senior Product Marketing Manager, Aspen Technology, Inc.

Regardless of the catalyst, the need for continual change is the ironic constant for most global industries. This is certainly true for the food and beverage processing and engineering industry, which as of late 2019, was estimated to grow to \$4.1 trillion by 2024.<sup>1</sup> With the world's population expected to balloon to 9.3 billion by 2050<sup>2</sup> and agricultural production needing to grow by at least 70%<sup>3</sup> in order to feed all these people, it's easy to see why companies throughout the industry might be feeling immense pressure. As the population surge directly impacts the amount of food needed and consumed, shifting economic conditions and the need for manufacturers to keep up with changing consumer demands are driving big changes in the types of products being produced.

What's being manufactured is also partially impacted by an increased desire to eat 'cleaner and healthier' items. For example, plant-based protein sales increased by 24% in 2017, which most likely shifted the focus of some developers.<sup>4</sup> But this must also be balanced against other data, such as one study that found that Asian protein consumption will grow by 128% by 2050.<sup>5</sup> Considering the

rise in food allergies, changes to regulatory requirements, and an increased focus on food safety, food manufacturers have a complex set of challenges to navigate when it comes to what they produce and how they compete for the attention and wallets of customers.

## Digitalization in Food and Beverage Processing

Digitalization is a buzz word in many industries. With the success of food and beverage companies hinging on customer tastes, evolving preferences and speed to market, the ability to leverage digital technologies and create efficiencies enables new competitive advantages for businesses implementing innovative strategies, especially those related to the "autonomous plant." Specific gains in the areas of improved supply chain processes, streamlined production and simplification of compliance tracking are the most frequent examples cited on the benefits of an accelerated digital strategy.

For many companies, it can be complicated, even overwhelming to know which steps to take first, the technology to have in place



and how digitalization will actually impact the bottom line. Some businesses may be uncertain which products could best align with a comprehensive digitalization strategy. Automation of data collection for compliance, lean manufacturing and asset optimization are common efficiency examples. There are also successful instances of digitalization that enable new services to improve the customer experience on the delivery side. But what role can digitalization play in overall product quality as a competitive advantage for the food and beverage industry?

Food processing on a large scale is particularly complex. While quality control has defined processing parameters of variables, including time, temperature and good manufacturing practices (GMPs), there are stricter regulatory requirements resulting from sources like the

Food Safety Modernization Act (FSMA) and a new trend toward ingredient traceability as a key component to building consumer trust. To better understand digitalization's role, we also need to examine the factors impacting quality.

## Hidden Factors Impacting Quality

Even with specifications defined within a product formulation, minor variations in processing may still arise. These differences can steer production unknowingly off course. Despite traditional means of recording process data, quality compromises might arise from:

- discrepancies in raw material properties
- variations in procedures
- changing environmental conditions

Without understanding the exact variances (not always visible to humans), production cannot easily forecast the outcome or effectively compensate, potentially resulting in an expensive defective batch.

## Let Your Existing Data Improve Your Confidence in Quality

Particularly in the food and beverage industry, mountains of data exist to comply with food safety tracking requirements. However, information such as maintenance work orders and compliance reports typically resides elsewhere in an organization, potentially separated from related material.



This division of data means that past efforts to mine it may not have yielded notable results. As digital transformation efforts increase, some companies are looking to this historical information to tell a story about how they can improve quality in the future.

What is the first step in utilizing past production data to provide insight? With traditional data analytic methods, many businesses would be advised to hire statisticians and data scientists to perform complex analyses. However, in addition to being unrealistic for most organizations, this approach neglects the other subsets of data in companies' hands: the "hidden factories" or inherent knowledge of their site operators and others who are intimately familiar with the ins and outs of the process itself. While they may not have been the creator of the product itself, they are intimately familiar with how to execute on the product formulation given the surrounding circumstances.

Even with sophisticated tools gathering and organizing key data, a challenging task remains: Analyze the data to determine how best to adjust the batch process for each variable and accomplish an improved

outcome. With many data visualization and analysis techniques, it may still be a daunting challenge for operators, engineers and analysts to sift through all the data patterns and identify how best to adjust processes.

## Extracting Meaningful Data Increases Quality of Production Supply

The more quickly you can turn raw data into actionable insights, the better – especially if you can do it without teams of new resources. Multivariate analytics software can help solve your process and product quality issues, which could likely result in greater customer satisfaction. These tools can help optimize production by:

- reducing off-spec product
- minimizing product rework needs
- enabling more proactive schedule changes
- decreasing lead time for customer orders





Aspen Technology offers a comprehensive suite of tools to effectively collect, organize and analyze batch and continuous process data, empowering a step change in your organization's ability to take hold of the promises of Industry 4.0.

## Three Use Cases: Taking on Big Data Challenges with Confidence with Aspen ProMV™

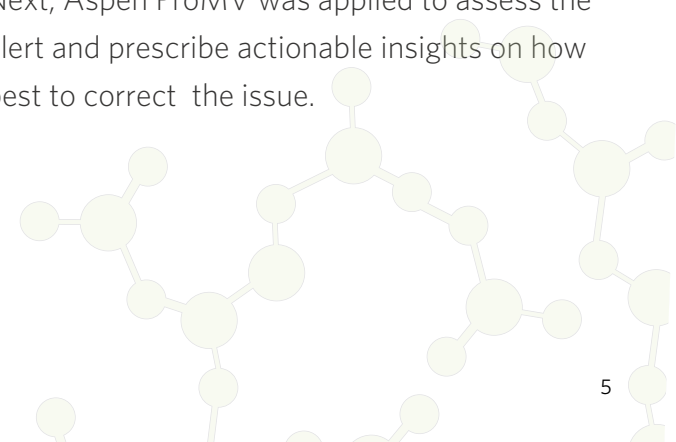
Here are examples of food and beverage companies, and organizations experiencing similar challenges, taking advantage of Aspen ProMV to improve quality in real time and optimize production.

### **1. Predicting Quality in Real Time**

The process engineers at a global food processing and commodities trading corporation had an issue on their hands. While quality challenges were not always persistent, there often was no clear solution to root cause them when they did occur. Lab tests utilized for final product quality often lagged production by two to three days, making it difficult to trace or correct the causes of bad quality in real time.

The customer's first attempt at reducing reliance on lab testing involved instituting an intermediate, mid-process test. This test required less time to complete and was done more often, but results did not correlate to final product quality. Because the test did not ultimately act as a good predictor to yield 100% product quality, this process was stopped.

Because of a lack of success utilizing traditional methods, a digitalization solution was adopted applying Aspen ProMV to the process data from the plant historian over a four-week period. The customer was able to assess roughly 150 different variables to model 'good' process conditions. With this model complete, Aspen ProMV Online was utilized to continually monitor behaviors in process variables that indicated the process might produce off-spec product process variability was detected, a real-time alert was received. Next, Aspen ProMV was applied to assess the alert and prescribe actionable insights on how best to correct the issue.





Adopting Aspen ProMV as a predictor of quality-armed operators, plant management now had the ability to rapidly determine the location of a root cause by predicting lab testing results in real time. As a result, the customer saved more than \$250k per year (USD) in off-spec product.

## 2. What If the Needle Is in a Different Haystack?

An international agricultural products company with three production lines running in parallel was experiencing random variances in quality on a dedicated production line. Operators noticed a key quality parameter randomly changing over time — contributing to final product quality on production line #3. As a result, the company had over \$400k per year in unusable product over the course of several years. All investigation efforts attempted over the years were unsuccessful.

The customer decided to adopt Aspen ProMV to help determine the root cause of the quality variance. Approximately eight months of data and 1,100 data points were analyzed in two days. These data points included information about the entire facility, and were not limited to the production line that was experiencing the issue.

Over a three-day period, results were reviewed and the Aspen ProMV model fine-tuned to determine the quality variance root cause. Once all contributing factors were assessed in Aspen ProMV, results showed process conditions on *an entirely different production line* (production line #2) were the biggest contributors to the quality variance. Although it was known that the two production lines shared a cooling water source, no linkage between quality output of the two lines was

ever noted or assessed. Installing a dedicated cooling water line on production line #2 resolved the issue and eliminated the root cause contributing to the quality variance, saving the site over \$400k in operating costs per year.

## 3. Maintaining Quality While Increasing Supply Chain Flexibility

An international food manufacturer traditionally tested incoming raw materials as its primary method for predicting overall product quality. This methodology was resulting in unreliable outcomes and an unacceptable level of off-spec product.

Having multiple raw material suppliers for each ingredient of a specific product, the customer was faced with a dilemma on how to best pre-determine the outcome of final product quality.

With the availability of historical data of the product's raw material lots and variable processing conditions, Aspen ProMV was utilized to develop a comprehensive data model that correlated these two factors. The data associated with the model revealed two raw materials had no significant impact on final quality while three others did. Therefore, the manufacturer was able to determine where to focus their raw material specification efforts to eliminate future off-spec product and adjust their manufacturing process to improve overall quality.

By using Aspen ProMV, the customer was able to scale the same modeling technique across their entire product line. This helped them avoid raw material combinations that would have led to future poor final quality — ultimately contributing to increased product shelf stability while avoiding product recall potential.

## Identify Quality Improvement Opportunities in Your Current Data

For food and beverage companies, utilizing Aspen ProMV as part of a digitalization strategy to gain increased visibility into raw materials and process conditions presents a fast track to improved overall product quality. Additionally, by simply analyzing historical or real-time data to uncover root cause variances of raw materials and process variables, businesses can significantly reduce their capital costs, increase production uptime and accelerate time to market while continually satisfying evolving customer demands.

<sup>1</sup> "Global Food Processing Market Opportunity, Trends, Forecast and Competitive Analysis Report 2019 with Profiles of Nestle, PepsiCo, Archer Daniels Midland, Unilever, Anheuser Busch Cision PR Newswire, 7 October 2019

<sup>2</sup> <https://www.rentokil.com/blog/food-processing-trends/#.XgYoz-hKg2w>

<sup>3</sup> "7 Global Trends Impacting Food Processing." Jack Lyons, Rentokil, 16 August 2019.

<sup>4</sup> "3 Trends in the Food Processing Industry." Acuity Insurance, 31 July 2019

<sup>5</sup> <https://www.rentokil.com/blog/food-processing-trends/#.XgYoz-hKg2w>



## 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. Visit [AspenTech.com](https://www.aspentech.com) to find out more.

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