



Use Existing Data and Resources to Speed Up New Food and Beverage Product Launches

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Urbanization and growth in disposable income is transforming the landscape of everything from housing to energy to chemicals. The food and beverage processing and engineering industry, estimated to reach a \$4.1 trillion market size by 2024, is not immune to the pressure to transform.ⁱ With a predicted world population of 9.3 billion by 2050 and the need for agricultural production to grow by 70% or more, it's easy to see why.ⁱⁱ This population increase not only impacts consumption and the amount of food needed—shifting economic powers and increased demand for on-the-go options are driving big changes in what food is produced.

What's being produced must also account for the increased desire to eat cleaner and healthier. For example, plant-based protein sales increased by 24% in 2017, which might shift the focus of some developers.ⁱⁱⁱ Other predictions suggest different priorities, such as reports that Asian protein consumption will grow by 128% by 2050.ⁱⁱ Now consider the rise in food allergies, changes to regulatory requirements and increased focus on food safety, and the range of challenges food manufacturers confront in new product development becomes daunting.

However, simply investing in research to tackle these challenges does not guarantee a competitive advantage. Even after companies establish the market need, competitive landscape and business model, speed to market and first mover advantage are critical in appealing to customers' ever-shifting tastes and desires. Therefore, some manufacturers are also rethinking how they execute R&D and new product development efforts.

In addition to partnering with suppliers, organizations are taking cues from the lessons learned in other industries. Years ago, the food industry learned from the plastics industry and began using screw extrusion in extrusion cooking. Now new product development groups are supplementing lab tests with artificial intelligence and trading expensive test batches for digital twin predictions.

Digitalization is a buzz word in many industries. With success for food and beverage companies hinging on customer tastes and evolving preferences, many of these organizations are implementing new strategies. They're looking to leverage digital technologies to create efficiencies that enable competitive advantages. The most frequent examples



cited are improved supply chain processes, streamlined production and simplified compliance tracking.

Knowing the first steps to take, the people to have in place and what exactly digitalization means to the bottom line often seems too complex to tackle. Some companies are not sure where to start or which products best suit a digitalization strategy. Automating data collection for compliance, lean manufacturing production and other efficiency examples are common, but generally only yield benefits for ongoing operations after new products are in mass production. Successful examples that refer to new product introduction generally focus on delivering new services and improving the customer experience, rather than making the development process itself more effective.

So what other role can digitalization play in new product development and increasing competitive advantage for the food and beverage industry? To answer this, we must first consider the factors influencing traditional new product development processes and speed to market.

What Determines Speed to Market?

In any industry, simply putting the best minds to work does not guarantee success. Even in agile organizations, technical development is not always the long pole in the tent—the steps before and after truly determine success. Even without considering requirements beyond an organization's control, such as designing for compliance, steps such as scheduling live test runs of an experiment can add to the overall cycle time.

Traditional new product development cycles may include total target value assessments, continual consumer testing and competitive analysis before the actual development begins. Innovation and invention may be a small piece of the puzzle compared to the other business processes that can often impact the critical path, such as:

- Incorporating non-process properties such as texture and flavor levels
- Conducting real-time experiments for new products that cost time and money and cause process disruption
- Tracking various experiments, that may show no signs of reducing iterations, to find ideal product design



Hidden Factors Influencing New Product Development

Going from first iteration to last is no easy feat. Even if there is an understanding on the direction of the desired recipe or output, variations in experiments may still occur. Even small variations can inadvertently shift new product development experiments off track. Not recognizing this could result in major delays or even a failed launch. Problems could come from:

- variations in raw material properties being used in the experiment
- small changes in procedure
- changing environmental conditions

Prevailing conditions and operating choices influence the outcome of each experiment. Small variations can steer a batch off course—but without understanding those exact variances, researchers can't easily forecast the outcome or effectively compensate, leading to an even more expensive test run.

Use Your Existing Data to Improve Speed to Market

Mountains of data exist in the food and beverage industry to comply with food safety tracking requirements. Organizations have process data on temperatures and pressures, QA data on product outputs and non-process data such as ambient conditions. In addition, maintenance work orders and compliance reports typically live elsewhere in the organization, separated from related material.

This division of data has not supported new product development. As digital transformation efforts increase, however, some companies are turning to this historical information for insight on what they could create in the future.

What is the first step in using insight on previous products to create new ones? With traditional data analytics methods, companies would hire statisticians and data scientists to guide these efforts. In addition to being unrealistic for most organizations, this approach neglects the





other subset of data companies hold: the “hidden factories” or inherent knowledge of their process engineers and others who are intimately familiar with their processes. While these workers may not have been the ‘chefs’ who developed a recipe or product, they are the ‘cooks’ who know how to execute on the recipe given the surrounding circumstances.

Even with sophisticated tools gathering and organizing key data, a challenging task remains: analysis to determine how best to adjust the batch process for each variable to accomplish the desired outcome. With many data visualization and analysis techniques, it may still be a daunting challenge for engineers and analysts to sift through all the data patterns to identify how best to adjust a new product experiment in a timeframe that surpasses an expensive real-world test run.

A New Product May Be Just a Process Change Away

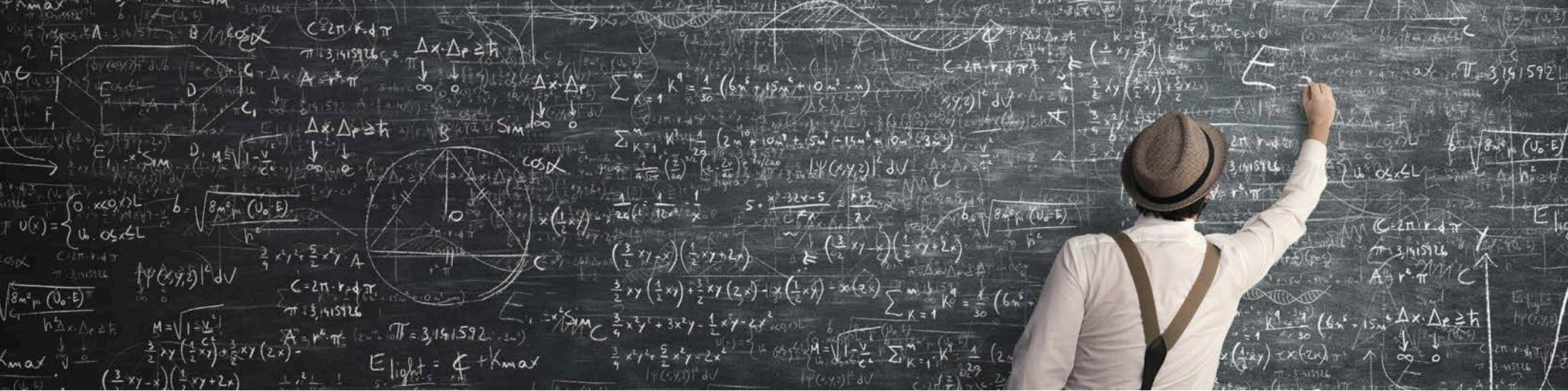
A simple process change could help your company create its newest product—but how would you know which portion of the process to adjust? This is where Aspen ProMV’s Model Optimizer and Batch Alignment tools can help. ProMV helps make sense of the data available by the

people most familiar with the process and inputs—meaning no new resources required. Using the capabilities of Aspen ProMV Optimizer, food and beverage manufacturers can determine the most critical ingredients and factors in developing a new product. They can also test it virtually with the given constraints of a particular process, reducing the number of iterations required virtually, as well as the number of real-life test runs.

Extract Meaningful Data to Increase Speed to Market

The more quickly you can turn raw data into actionable insights, the better—especially without the need for teams of new resources. Optimizing new product development for the food and beverage industry with multivariate analytics offers tremendous value. Whether increasing speed to market or producing fewer, higher-value batches, software that quickly diagnoses batch deviation to enable informed and timely action pays for itself many times over.

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.



Here are examples of food and beverage companies, and organizations experiencing similar challenges, taking advantage of ProMV to speed new product development and shorten time to market.

Finding the Formula for Success

A large global food and beverage manufacturer wanted to investigate the specific attributes of 26 different muffin flavors to identify the primary factors contributing to a quality attribute of interest (AOI). The customer wanted to avoid introducing new ingredients and maintain the other sensory quality attributes of the existing products. With 60

different variables at play, traditional statistics methods had proven unreliable. Traditional methods led to a number of experiments that quickly became untraceable.

While the company hadn't completely quantified all sensory attributes of its existing products, Aspen ProMV is equipped to start with less-than-perfect data sets. The muffin maker had already quantified AOI for all recipes in production. Using the available data, including baking parameters, Aspen ProMV identified which ingredients and baking parameters correlated most closely with the AOI.

Next, the muffin maker used Aspen ProMV Optimizer to augment the recipes digitally to determine which combinations would

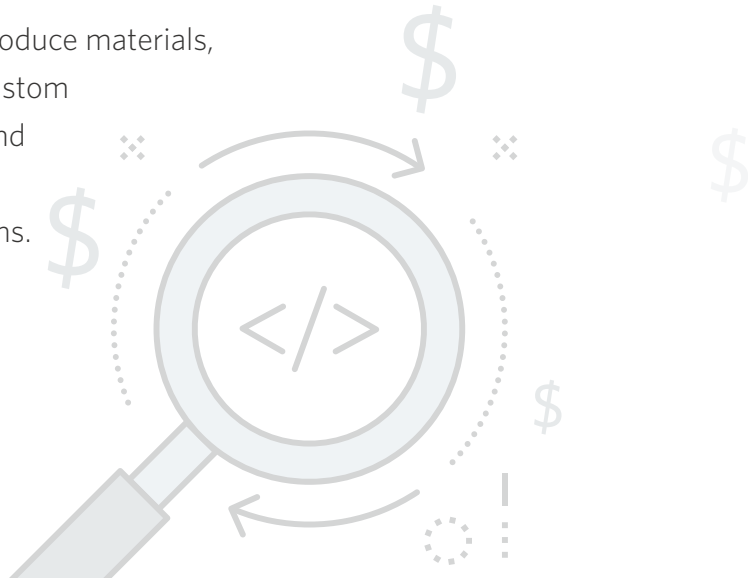
reduce the AOI to the desired levels. For the experiment, the manufacturer developed recipe alternatives for four target products. When baked and evaluated in a laboratory, the recipes resulted in AOI reductions ranging from 47%-55%! Incorporating these results into the Aspen ProMV model allowed the muffin maker to further refine the output for the remaining products. Additionally, with the model completed, the company could incorporate characteristics for raw materials they had never used before, allowing for future experimentation using new ingredients with a higher confidence in potential lab results.

Reducing the Risk of Entering the Customer Order Market

Entering new markets may require minor changes to existing products for food and beverage manufacturers. While this can create faster solutions to logistically fulfilling a new geographic need, it presents a risk to interrupting existing operations. Similarly, **a large manufacturer of silicone antifoams** began seeing an uptick in requests for custom specialty products. While many requests were indeed feasible, the company didn't always know this at the time of the request. Responding to customers in a timely manner put the manufacturer in a risky position: say yes to orders that ultimately were not technically feasible or say no and lose future business. Other business considerations beyond feasibility needed to factor into the decision to accept or reject a request as well, such as whether the plant can logistically meet the timeline of the requests given current orders, production scheduling and raw material availability.

This customer wanted to more quickly execute complex, dynamic business decisions on requests for custom specialty products. Armed with their historical production process and end product data, the manufacturer used Aspen ProMV to simultaneously examine historical raw material properties, formulation ratios and operating conditions during mixing in the past. This allowed them to not only build a database to reference as future requests came in, but to use the Aspen ProMV Optimizer to determine if they were technically capable of producing newly requested custom products.

By more quickly assessing the ability to produce materials, the company could focus on deciding if custom product orders were logistically feasible and strategic, allowing for timely customer responses and profitable business decisions.



Harnessing Process Engineers' Knowledge in New Product Development

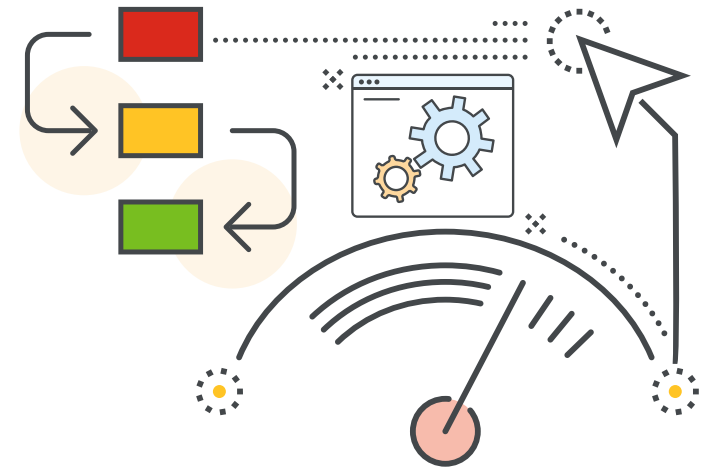
The process engineers at a global food processing and commodities trading corporation initially used Aspen ProMV to determine the root causes for several quality issues that had gone undiagnosed for a long time. The cost of quality losses was approaching \$500,000 USD per year; attempts to troubleshoot using traditional methods did not resolve the problem.

Additionally, the company could not catch and remedy off-spec product in a timely manner due to lag time for lab results after batch completion. One particular production line was costing the customer roughly \$250,000 USD a year. Aspen ProMV distilled over 150 process variables across 3 production lines to

demonstrate that the off-spec product was due to an unrelated production line, a condition the engineers had never considered. Using ProMV Online, this customer can predict in real time whether an end product will be off-spec. With this knowledge, process personnel can intervene and not rely 100% on lab testing.

After successfully using Aspen ProMV to resolve quality issues, the company saw another benefit. Running Aspen ProMV with existing process data and the engineers familiar with the process as part of new product development resulted in a faster R&D turnaround. By better defining which process areas were most critical to the final product

output, the customer could then predict, offline, total mash flows for a given feed. This meant fewer live experiments for new feeds, reducing the cost of developing a new product.





Solving a Tough Design Challenge

Not unlike designing food products with a desired texture, a Canadian research university was challenged to design a polymer whose properties change with both temperature and light. Liquid at room temperature, the polymer needed to form a gel upon injection into the eye, without suffering from exposure to UV light.

Prior to using Aspen ProMV, 23 trial-and-error formulations failed to meet one or more of the design goals. Using data from existing products as well as the previously failed iterations, the company used Aspen ProMV Optimizer to create iterations offline, without live experiments, varying formulations of new sets of ingredients and reaction conditions. Even a failed formulation wasn't bad news though. As iterations of polymer formulations failed to meet all the objectives, the new data was added to a database and the model was updated.

Adding different formulations made for a "smarter" model, with more combinations of ingredients and process conditions to test.

The company didn't need many more tests, though—the second iteration of the Aspen ProMV Optimizer framework identified a successful formulation.

Uncover New Product Opportunities in Your Current Data

For food and beverage companies, understanding how different variations to raw materials, recipes and operating conditions influence product outcomes presents a fast track to new product development. Organizations can drastically reduce R&D time with analysis of past product and process data, insight from current employees with deep process knowledge and the ability to quickly model various formulations. Spending less time and money on experiments to develop new products increases agility and provides a competitive advantage for food and beverage companies seeking ways to better meet their customers' changing needs.



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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- ⁱ ["Global Food Processing Market Opportunity, Trends, Forecast and Competitive Analysis Report 2019 with Profiles of Nestle, PepsiCo, Archer Daniels Midland, Unilever, Anheuser Busch."](#) PR Newswire, 7 October 2019.
- ⁱⁱ ["7 Global Trends Impacting Food Processing."](#) Jack Lyons, Rentokil, 16 August 2019.
- ⁱⁱⁱ ["3 Trends in the Food Processing Industry."](#) Acuity Insurance, 31 July 2019

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