



Challenge

To improve process efficiency by adopting a statistics-driven operational approach across all levels of the organization.

Optimizing DOE for optimal product design

Innovation reigns at Gore Japan as engineers focus on waterproof material

Anyone who has ever hiked, biked, climbed mountains, or traversed the world's wilder places knows about GORE-TEX® products, the breathable, waterproof high-performance fabrics without which outdoor activities would be a little less enjoyable.

GORE-TEX® products, a flagship of W. L. Gore & Associates, are dynamic by definition. Not only are they designed to be physically flexible – an essential component of modern active wear – but they're also adaptable to different customer specifications. Water-wicking gloves for biathletes. Tactical shelters for the military. Waterproof jackets for all-weather hikers.

Gore Japan, a subsidiary of the US-based W. L. Gore & Associates, works on the research and development, manufacture, and sales of GORE-TEX® technology. Gore Japan focuses on the expanded porous polytetrafluoroethylene (ePTFE) technology that makes this waterproof material – and Gore's other products – so innovative. The company's product lineup supplies a wide range of industries, from health care and semiconductors to aerospace, automotive and chemical. And if one thing can be said about Gore Japan's multifaceted manufacturing processes, it's that data analysis has played a vital role in all aspects of the business.

A balance of advanced analytics and ease of use

Anticipating the challenges of growing demand for ePTFE technology, the company sought to integrate a new statistical analysis tool that was simple to use and produced shareable, easy-to-understand outputs.

"There are limits to what you can do with spreadsheets," says Tatsuo Yamamoto, a statistician at Gore Japan's Polymer Science Center, "so it was difficult for us to promulgate a data-driven mindset within our corporate culture without better tools. What we needed was a best-of-both-worlds solution fusing spreadsheets, which can only do simple things, and SAS, which requires programming skill."

In 2001, Gore Japan turned to JMP, a statistical analysis tool that has been the companywide standard ever since. And the number of JMP users continues to increase because JMP is easy to use, convenient and non-programming-reliant – in addition to aligning well within the scope of Gore Japan's work.

According to Yamamoto, JMP was already in use at Gore's US headquarters. Following tests using a variety of acquired data, JMP proved able to handle a wide range of statistical methods, from basic analysis to complex multivariate analysis, without relying on programming know-how.

"Along with usability and an abundance of functions, another attractive feature was the ability to visually verify the validity of analytic results," says Yamamoto. "With excellent profiling functions, in which multivariate models can be understood visually, JMP was the right choice for us."

¹ W. L. Gore & Associates, Co., Ltd. (Gore Japan) is the Japanese subsidiary of W. L. Gore & Associates, Inc., headquartered in Newark, Delaware.

Along with usability, another attractive feature in JMP is the ability to verify the validity of results visually.

Tatsuo Yamamoto
Team Leader, Statistics,
W. L. Gore & Associates, Co., Ltd.



Nowadays, almost all of Gore Japan's engineers use JMP to plan and implement efficient design of experiments (DOE). With it, engineers can easily run experiments that yield critical insight into the optimal combination of factors affecting product quality. And as Gore Japan's use of JMP has expanded over the years, so too have the software's capabilities.

Encouraging proficiency in analytics across the organization

In 2010, Gore Japan introduced an entry-level statistics training program, aimed at new recruits in technology with little knowledge of statistical analysis. The program incorporates 10 practice exercises spanning four days – from univariate, bivariate and multivariate analysis to screening programs, response surface plans and verification tests.

Among the program's goals are to increase interest in statistics, introduce users to JMP basics and strengthen linkages between research staff and the company's statistics team.

"Achieving the balance between an experiment's reliability and efficiency is just the planning stage," says Yamamoto. "Because the reliability and reproducibility of results obtained according to advance planning varies, it is necessary to draw up designs for experiments taking a variety of factors into consideration... after specifying what it is you want to know. With the custom DOE capabilities of JMP – that allow for restrictions based on a

consideration of multiple factors – innovative experiments can be flexibly implemented.

"In experiments that focus on conditions based on past results and experiences, you won't reach true optimum conditions. You have to determine the size of the range to search, gradually narrowing down the optimum and remaining aware of an optimization approach."

Visual capabilities enable hands-on learning

The statistical training of new Gore Japan recruits involves a design optimization exercise. By the end of the program, they'll be able to meet required specs with minimal variation. With the repeated process of prototype creation, experimentation and analysis, participants follow the same steps as actual business operations. In the process, they learn the importance of DOE, how to use statistics correctly and how to use JMP in operational processes.

Today's more thorough training has produced a new work cycle. Engineers consult with the statistics team before an experiment, planning and implementing DOE based on the team's advice. In the future, Gore Japan plans to enhance the business systems database with a similar approach.

And JMP will likely be used here, too, paving the way to still newer uses of data.

Solution

The company encouraged its researchers to use JMP® to plan and implement efficient experimental design.

Results

Gore Japan transformed its experimentation processes, more effectively and efficiently testing optimal combinations of factors affecting product quality. Employees' mastery of statistics is progressing, and those business areas in which JMP is involved have expanded.

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