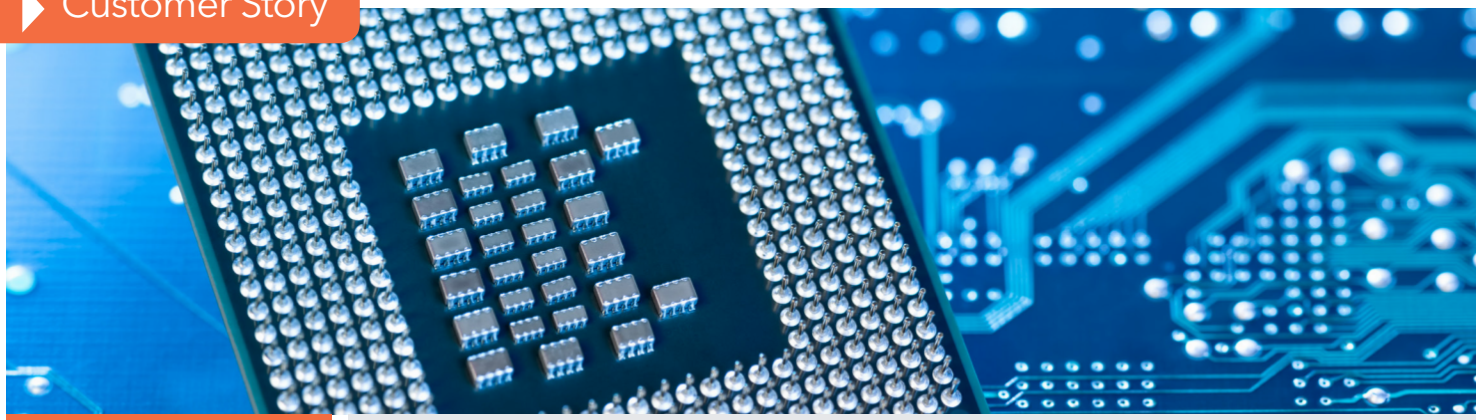
Customer Story



ASM International

Challenge

Enable customers to meet market demand for ever-shrinking, higher-performance device structures at a competitive price.

Statistical methods, vital for an 'engineering world'

ASM utilizes statistical methods companywide to be more effective and efficient

Integrated circuit transistor count is said to follow Moore's law. That is, the number of transistors that can be installed on a circuit doubles about every two years. The demand for this level of growth in complexity presents evolving challenges for the entire semiconductor supply chain.

ASM International, a leading global manufacturer of wafer processing technologies, is working tirelessly to advance what is possible in integrated circuit manufacturing. Thanks to ASM's innovations over its nearly 50-year history, semiconductor manufacturers worldwide have been able to shrink and innovate transistors for computer, smartphone and home electronic devices that are smaller, faster and more powerful than ever before.

With such a robust R&D backbone, it's no surprise that ASM is an organization dominated by engineers. "We live in an engineering world," says Paul Deen, Statistical Methods Program Manager at ASM. "We start with the skills people learn in university for doing our process and hardware development." To be competitive in their development, ASM continuously adopts new techniques and standardizes these globally. "To be most effective, efficient and complete in our experimentation and process understanding we need people with a background in chemistry, physics or engineering who also fully use the power of statistical methods."

Deen, a mechanical engineer by education, serves as the program manager and quantitative consultant for a broad array of internal clients and projects. By taking a proactive interest in data-driven product development and process control across the company, Deen helps the entire operation elevate its capabilities and performance.

'Make us more effective and efficient – that's my mandate'

"When I joined this key ASM program, I saw an opportunity to truly impact the way we work," Deen says. "Our program improves all areas of our company; examples include the way we do product and chemistry development, hardware tolerancing, product reliability improvement, test plan optimization, supply chain development and ongoing services and operational performance optimization. As we touch more areas of the company, the need for data grows with it. We flow from one part of the organization to another and take away barriers to gain a more holistic understanding of what is happening in our products. That allows us to improve those systems and better meet our customers' requirements."

The ASM team seeks to identify areas where improvements make the most impact. "I'm driven to do things smarter, more effectively and in a more risk-aware way," Deen says. "Make us more effective and efficient – that's my mandate. The goal is to utilize statistical methods wherever we work with data, which is essentially everywhere in our business. If I do my job right, people should wonder why we would ever do it any other way. To enable standardized analysis we make use of JMP

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>
> Paul Deen, Statistical Methods Program Manager

(software)'s add in functionality. We've developed and standardized a set of automated analyses that are packaged and distributed globally.

"It usually starts with statistical methods trainings, but it doesn't stop there. Training, using real ASM examples and challenges, helps build skills with the engineers and scientists, but this seed needs to fall on fertile soil… I need to constantly switch between on-the-ground working with the employees and working with their management to develop the framework.

"I've witnessed countless people change their attitude towards data analysis and statistics. We are equipping people with the right tool, and suddenly it becomes easier for them to do their work. What used to take hours can now be done in minutes, and the results are more complete and more risk-aware. It allows them new insights into their data and therefore their product; things they could not get to before."

Accuracy that flows from component to processing technology to wafer

"What I really like is that JMP not only gives you a mathematical model, it allows you to take that model and use it for many more things," Deen says. "For example, we can do simulations of our product's performance and use that to evaluate the specifications and performance of the underlying hardware, software and chemistries. With properly constructed experimentation, leveraging JMP (software)'s simulators, we don't need to run as many wafer experiments to evaluate tool performance. We can ask questions like: What would happen if we had a less variable temperature controller? Or what is the most cost-effective parameter to improve chamber matching? The way JMP enables us to examine 'what if' scenarios is really powerful."

JMP® allows ASM's engineers to "dig into the problem, see something happening, click on it, subset it, make another graph, and figure out what's going on," Deen says. "And in just five steps, they'll probably be at the root cause or powerful new understanding. It is the data-driven (and graphical) equivalent of five whys."

Do much more complete development in less time

To illustrate the benefits of ASM's quantitative development, Deen cites new chemistry development for process nodes that is required in order for ASM to stay ahead of the semiconductor industry's needs. Traditionally, chemists might use a "follow your nose" approach, experimenting with combinations until a workable domain is found. Such attempts, however, do not yield sufficient understanding of what makes it good. Instead, Deen says, "We use a process flow that gives a deeper understanding and is more efficient at the same time. One technique we apply is the use of Custom Design in setting up experiments. We then use Fit Model to model the process and the profilers with Simulator to test our understanding. Every question we can answer this way saves us tremendous amounts of time experimenting in our labs."

And, Deen says, "with quantifiable time savings across the organization, a clear strategy and support from the senior management team, we are pushing for even more benefits in terms of time to market and enabling new technology for our customers. We need to do the cost/benefit evaluation on everything from experimentation to process and hardware development, we want to make sure we do enough but not more. Be effective and efficient; JMP allows us to find that sweet spot."

Solution

Further develop and improve data gathering and analysis techniques, processes and frameworks to better understand both product and processes across all facets of a dynamic high-tech semiconductor manufacturing supplier.

Results

ASM sees great results in regard to efficiency and effectiveness: "We have a much deeper understanding and are able to work much faster thanks to JMP (software)'s visual approach to statistically backed data analysis."

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