AMPEREX TECHNOLOGY LTD.

Challenge
Retain a competitive edge by enhancing quality and reliability.

Better batteries power the world's electronics

ATL's embrace of robust analytics and Six Sigma at the enterprise level lays the foundation for increasingly reliable lithium-ion batteries

According to research and consulting firm Frost and Sullivan, between 2012 and 2016 the lithium-ion battery industry doubled in growth, reaching $22.5 billion. And with lithium-ion batteries now powering smartphones, laptops, smart watches, drones, robots, automobiles and energy grids, among others, projections show that in the next few years, it will surpass $70 billion.

In the face of fast-growing demand, China has become a global leader in the lithium-ion battery market. At the center of this growth is Hong Kong-based Amperex Technology Ltd. (ATL). In 1999, ATL's founders foresaw the demand for mobile electronic-communications accessories, including lightweight, reliable, rechargeable batteries. They resolved to enter the lithium-ion business – a decision that proved prescient. Today, ATL has emerged as a pioneer in both design innovation and product quality.

ATL's enduring reputation for quality is the result of a commitment from the company's leadership to analytics integration; to letting data guide the design of systems and processes; and to recruiting and nurturing talent. Among the talent with which the company now entrusts its product design and manufacture are Guifu Wang, Principal Reliability Engineer at ATL; and Henry Qiao, the company's Six Sigma Deployment Manager and a Six Sigma master black belt.

Wang oversees a team of experts in materials science, circuitry and electronics who apply data strategies to optimize reliability on a broad scale. Qiao is tasked with the development and fine-tuning of ATL's continuous improvement strategy for engineering capability at the enterprise level and with communicating to the company's senior management how best to implement that strategy. He leads a team of Six Sigma black belts and master black belts from across the organization.

"Each year, we set new reliability targets," Wang says. "The instructions our bosses have given us are 'accuracy … and more accuracy.'" It's demanding work. But the foundation to support it is now firmly in place, and that foundation begins and ends with analytics.

Software that bridges the information gap with customers

When analytics becomes part of any organization at the enterprise level, there is inevitably a need for robust software to support the deployment of statistical practices across multiple departments. ATL recognized this need early on, and by the time Qiao joined the company, most engineers were using Excel and Minitab.

But Qiao advocated for the introduction of JMP®, making a case for its interactivity, graphical tools, advanced design of experiments (DOE) capabilities and statistical power in areas like quality and reliability. All these features, he says, could help ATL's fast-expanding engineering teams implement statistical best practices regardless of their previous experience level.

Equally important, however, was the software's ability to harmonize with the statistical practices – and demands – of ATL's customers. "Our data is linked to our customer's database, and they are able to monitor our production line and see our data [in JMP]," Qiao explains. Thanks to the combination of its user-friendly interface and robust underlying statistical capability, most of ATL's major clients have similarly adopted JMP as an enterprisewide tool. By using the same software, ATL's engineers can more easily communicate with their clients, sharing data and working collaboratively to identify and troubleshoot problems.

"In the past, when we used Excel for the job," Wang adds, "we spent a lot of time and energy. It was a tedious and error-prone process." He estimates that, generally speaking, JMP now enables his team to perform tasks three times faster than they could with Excel. "With JMP, we let the data run overnight and see the output the next day. This saves us a lot of time, whereas with Excel, I needed two or three days to decipher it."

Six Sigma in JMP® helps reduce variance in process

With the growing digitization of ATL's facilities, the company's production line yields a vast amount of data. "We process that data with questions in mind," Qiao attests. "We are question-driven. We trawl the production line for data that are possibly relevant, then screen the data further and analyze it before reaching our conclusion."

Qiao describes a production-line issue that had once been a source of concern for one of the company's biggest customers. "They complained that the variance in our process was excessive. So we formed a team to resolve the issue using the Six Sigma method," he explains. "We first collected all the related production-line data and attempted to identify all possible causes of the problem." The team then used JMP to screen the data and identify the specific process that was causing the fluctuation, then modified that process, resolving the issue. "JMP was very useful in helping us solve this problem because of its ability to handle large amounts of data – and because of its interactivity."

He and his colleagues have met with similar success in tackling other variance issues. For example, last year, ATL launched an initiative to reduce variance in another process. "We were successful," says Qiao. "We've reduced variance by around 50 percent. Our bosses and customers were very pleased with the result."

Wang and Qiao are both devotees of JMP software's extensive DOE functionality and also regularly use the Reliability Forecast and Distribution platforms, as well as Graph Builder. "Of course, we do use other JMP tools frequently," Wang says, "but these are tools we use day to day."

Wang's primary mandate is to extend the "mileage range" of ATL batteries – that is, the duration of time over which they remain reliable. "After we identify the key influencing factors," he says, "we optimize and control those factors to create a longer shelf life." This might mean altering materials or adjusting production-line parameters. Furthermore, Wang's team uses scripting to discover and extract smart data types in the secondary development phase. "JMP (software)'s interactive graphics are very easy to understand," he says. "The entire representation is very intuitive and clear. All my colleagues agree."

Securing upper-management buy-in

Qiao emphasizes the role JMP has played in advancing a culture of continuous improvement and innovation throughout ATL. He recognizes that he's been quite fortunate in that those in senior-management positions all have rich technical backgrounds. "Our CEO was previously VP for R&D," he says, "and thus a true technical man. It is very easy for him to understand our work."

That said, Qiao acknowledges that some senior managers may not initially be on board with the Six Sigma way of thinking. "They may think it requires too much time and too many resources and that such an investment is a waste.

"So one of my responsibilities is to assist that senior manager in understanding how Six Sigma can help him or her to achieve their strategic goals in a more effective manner." It starts with addressing managers' or executives' pain points, then introducing solutions, beautifully illustrated in JMP graphics – something tangible and interactive for management to embrace.

'A critical tool for the implementation of statistical thinking'

With the encouragement of ATL's highest-level management, a solid foundation has been laid for truly cutting-edge analytics integration. Statistical training is therefore becoming first-order business for new ATL employees. JMP is introduced right away, and, Qiao notes, it's very easy for someone without a background in statistics to learn. Training is then an ongoing process. Sessions are offered each week, open to all engineers. A WeChat group offers opportunities for sharing and discussion, with questions answered by Six Sigma black belts and master black belts. Training is also provided by ATL's JMP support team.

"We hope to enhance everyone's engineering capabilities through the use of Six Sigma – with the application of JMP of course," Qiao says. "We regard JMP as a critical tool for the implementation of Six Sigma, a tool that can support our strategic implementations."

Looking ahead, Wang hopes to develop a more expansive relationship with ATL's JMP colleagues, including collaborating to create a big-data ecosystem and developing customized solutions – further honing that competitive edge.

Solution

Analytics integration via JMP® enables engineers to easily apply statistical methods like reliability analysis to optimize all stages of the product life cycle from design and development to production and usage maintenance. JMP is a one-stop shop for a range of engineering activities at ATL including data collection, malfunction classification and risk prediction.

Results

Specialty applications like deterministic and probabilistic modeling in JMP have helped the company to reduce process variation on a broad scale. A team of Six Sigma experts say that since adopting JMP, they have significantly reduced variance.

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