CHALLENGE

Reduce scrap related to a high-production thrust-bearing assembly.

SOLUTION

The variability analyses of JMP® helped identify the problem, and JMP's Custom Designer validated that the settings the team identified could eliminate the defect.

RESULTS

The Timken team reduced the defect rate and improved the process for the high-yield production assembly, and the team initiated a project to determine whether the improvements could be applied to other parts in the assembly family.

MORE INFORMATION

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The Surest Path to Problem Resolution at Timken: Take 5 Steps and JMP®

Lean Sigma project reduces scrap on high-volume thrust-bearing assembly

To say that Tom Putnam is not someone who leaves things to chance would be putting it mildly. Putnam is a man of design. As a Six Sigma Master Black Belt and Manager of Lean Six Sigma at The Timken Company, Putnam is a committed practitioner of DMAIC, the five-step Six Sigma process of Define, Measure, Analyze, Improve and Control.

The underlying principle of Six Sigma is that practices can be developed to systematically improve production by eliminating defects. Six Sigma holds that reducing variation in the production process is critical to business success.

Timken had a production-line issue, and it came up with a plan to address it. Lean Six Sigma was the approach, DMAIC was the method, and JMP statistical discovery software from SAS was an indispensable tool in resolving the issue.

Nothing was left to chance, and today the problem's solved.

Define

Timken has been in business for more than 100 years, providing innovative friction management and power transmission products and services that enable its customers' products to perform faster and more efficiently. Timken operates in 26 countries and employs some 25,000 people.

Timken had an issue with an assembly used within thrust bearings that are built by snap-fitting a component into a subassembly. The defect was occurring, Putnam explains, because of a bending of the subassembly.

"We were experiencing a higher scrap rate than we wanted," Putnam says, "so we saw this as an opportunity to use a DMAIC approach and Lean Six Sigma tools."

Having defined the problem, Putnam and his team next needed to decide which product among those that included this assembly to select for testing.

STATISTICAL DISCOVERY.™ FROM SAS.

"We'll continue to use JMP for our Lean Six Sigma training, and we're also introducing it to others for data validation and visualization in their daily jobs."

Tom Putnam
Lean Six Sigma Manager
The Timken Company

The highest scrap-rate part was relatively low-volume with infrequent orders, allowing minimal opportunity for realizing savings. "So we chose a part that had a fairly high scrap rate," says Putnam, "and one that had high-production volumes and frequent orders so that we could do some quick testing and save money."

Putnam and his colleagues determined that the defect was occurring as the result of a design that had been in practice for quite some time and that changing to a new design would be expensive. As such, they decided to work within this particular design to fix the problem.

Measure

"Next, we wanted to ensure that we could discern the problem–that we could measure it," says Putnam. "So we did some analysis on measurement systems and determined that we could consistently differentiate good parts from bad parts."

They then began to sort–or to carry out what's called a "scrap marketplace." This term, used in Lean manufacturing, Putnam explains, "is simply a visual control where parts that are identified as scrap or that could be suspect parts are categorized by the type of defect found."

Analyze

With samples now available to inspect, the team made use of JMP's process-mapping capabilities to better understand the steps in the production process.

"There were quite a few steps in the production process," Putnam says. "Some work had already been done to improve the processes and to reduce variation. A lot of variation already had been taken out.

"Using JMP," says Putnam, "we began doing some variability analyses. Looking at how parts were still varying in the process, we were able to identify the problem."

Improve

"Having now identified the opportunity," Putnam continues, "we then wanted to validate that what we thought would be appropriate settings could work."

Here is where the utility of JMP kicked into high gear. The team opted to pursue a design of experiments (DOE) approach. "Virtually anytime you want to get a fundamental understanding of a manufacturing process, DOE is the answer. It's the most efficient and reliable way of understanding how input factors interact on the output, or the response."

JMP offers powerful, elegant and cost-effective DOE tools centered on factors, responses and runs. JMP assists in determining whether and how a factor affects a response–to which Putnam and his colleagues will attest.

"We used the design generated using JMP's Custom Designer, did some testing and felt pretty comfortable with what we were able to see with that test. We ran some additional production samples and again verified that the change was working and actually improved the process. We did some functional testing to verify that there was no negative impact on performance of the product, and at that point we looked at other parts in that family and started to see if we could take this across all parts in the family."

While most DOE software limits the number of runs that can be carried out, JMP's Custom Designer tool allows users to specify the number of runs desired and then generates a design to meet those specs. "JMP let us fit the design to the problem," says Putnam.

Control

Ultimately, the team determined that the issue Timken was experiencing could be resolved without expensive retooling.

"All parts in the family have been converted to the new process," Putnam reports, "and the defect rate is essentially zero."

Moreover, the inspectors who had been enlisted to observe this production process have now been freed to move to another task. A considerable amount of scrap that was resulting from the defective products has been eliminated–which not only nets out into overall cost savings but is good news for the environment because the landfill is spared the excess.

The company estimates savings in manpower and scrap to be approximately US$60,000.

"What we're talking about here is cost avoidance," Putnam asserts, "and allowing us to stay focused on our core business."

Why JMP®?

The Six Sigma approach has become enormously popular, and not just with industrial companies. Financial firms, service and retail corporations, and healthcare organizations are among other institutions realizing Six Sigma benefits.

Why JMP for Six Sigma? First and foremost, because of its superior capacities to visualize and uncover data patterns that affect research, product development and production activities. JMP is the only analytic tool that offers exploratory data mining, customized DOE with total flexibility on resource allocation and the ability to specify the way a variable should be analyzed and displayed.

"Since 2001," Putnam says, "at the initiation of our Lean Six Sigma efforts, we've used JMP for our Green Belt–we call them Expert 1–and Black Belt –or Expert 2–training. We have continued to use JMP because of its ability to visualize data and interface with other applications such as spreadsheets."

One of the beauties of JMP is that it's sophisticated enough for the advanced user while easily accessible to the novice. In regards to DOE, in fact, JMP offers the uninitiated the ability to very easily design experiments that meet the most complex conditions.

Timken continues to leverage the company's investment in JMP. "We'll continue to use JMP for our Lean Six Sigma training," he says, "and we're also introducing it to others for data validation and visualization in their daily jobs even before they come to Six Sigma training."

Timken also keeps up with the latest versions of JMP. "The latest release gives us new, effective data manipulation techniques, a robust DOE platform, great script editing and the file referencing function that saves a lot of time."

For Putnam and this Timken Lean Six Sigma Team, what really matters is the end results–defects eliminated, customers happy and costs saved.

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