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For Bosch, Red X marks spot for quality gains

Problem-solving system saves time, money for supplier

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ANDERSON, S.C. — Scrap was piling up here at Robert Bosch Corp.'s automotive electronics factory.

Components that depend on delicacy to function were coming out scratched, contaminated or cracked. With the plant's contracts and reputation on the line, management sent in three quality control teams to find the problems.

Within a week, all of the teams converged on the same machine. Ceramic circuit boards were jamming as they entered the machine. So Bosch engineers adjusted the machine and solved the problem — or so they thought.

About a month later, another team working on a different project discovered some circuit boards were entering production warped from the start. When they fixed the problem, quality got better everywhere, recalls Doug

Carson, statistical engineering manager at the Anderson plant.

"As we looked back at it, we realized that scratches, contamination and cracks — they're just the way problems look to us, and we come up with those classifications," Carson says. "Because they looked different, we split the same problem into three different problems."

Traditional pitfall

It's a common — and costly — pitfall for organizations that take the traditional approach to problem-solving, says Craig Hysong, executive vice president of Shainin LLC.

The Anacortes, Wash., consulting firm has worked with Bosch's Anderson plant since 2000, when management began using Shainin's system for identifying and solving quality problems.

The system, called Red X (the letter, not the Roman numeral), uses a proprietary series of multiple matrices and like events to determine the source of a problem.

In essence, Red X helps engineers or managers rule out what the problem is *not*, until they can zero in on what the problem is. Often, the problem isn't what management thought it was (see story on page 2).

"We like to think of it as we're talking to the parts, rather than the experts," Hysong says. "For the very difficult problems that have been around a long time, if the experts were right initially, it wouldn't have become a big problem."

Tackling quality problems quickly and with minimal expense is crucial for manufacturers. Nowhere is this more evident than in automotive electronics.

As electronic components become more complex, they account for an increasingly greater portion of a vehicle's cost. Reducing scrap, rework, overtime and other costs associated with quality problems helps suppliers offer products at a lower price.

Faster is better

Carson is one of two Bosch engineers at the Anderson plant to achieve master status in the Shainin certification hierarchy. He says quali-



STEVE FINCHER

Inspector Katina McDowell examines an electronic throttle body at Robert Bosch's Anderson, S.C., factory. The plant used a problem-solving technique from the consulting firm Shainin to find the cause of a preproduction quality issue with the part.

ty problems that once plagued managers for weeks or months now take days or hours to solve using Red X.

Case in point: Two years ago, the Anderson plant was preparing to launch production of an electronic throttle body. Like an old-fashioned carburetor, the device controls the flow of air to the engine.

During testing, engineers discovered that some of the valves on the throttle body manifold were taking too long to close at low temperatures. Just milliseconds of delay could raise emissions and degrade the engine's cold start.

Traditional problem-solving called for a battery of tests. But the parts had to be heated to high temperatures, then cooled completely before being measured. Each test would take hours, putting the project in jeopardy.

By using a Shainin technique that eliminates all factors that can't be causing a problem, engineers zeroed in on the source within a week. Tiny differences in the bearing pocket of

the motor flange were preventing some valves from closing properly.

Says Carson: "Now that I know exactly what's wrong, I don't mess up my preproduction approval process. I make the start of production, and the customer has never even seen an issue."

That first year, the Anderson plant completed four projects using Red X. The plant reaped a return on investment equal to 3.8 times the amount it spent carrying out the Shainin system.

In 2005, the Anderson plant completed 35 projects, generating savings of 19.5 times the amount spent with Shainin. The figures, calculated by Bosch, do not include money saved on cost avoidance.

The cost of putting the Shainin system in place is hard to calculate. Most companies seek out Shainin when they have a crisis, says Dick Shainin, executive vice president and a partner in the company founded by his father, Dorian.

Shainin snapshot

Shainin LLC's proprietary methods for identifying and solving quality problems are widely used in the automotive industry. A quick look at the consulting firm

History: Founded by Dorian Shainin, an aeronautical engineer who began his career as a quality guru while working at an aircraft propeller blade factory during World War II. Sons Peter and Dick are still active in the business, as is grandson Patrick.

Headquarters: Anacortes, Wash.

Offices: Suburban Detroit; Munich, Germany; Shanghai

Employees: 50

Major customers: Chrysler, General Motors, Delphi, Mercedes Car Group, Robert Bosch, Yazaki North America, Detroit Diesel

Source: Shainin LLC

Creating a culture

Depending on the nature of the crisis, the consulting firm's fee can run between \$10,000 and \$40,000, Dick Shainin says. Expanded programs are customized to a client's needs and the expected return on investment.

Some clients pay by the class or coaching visit. Shainin also has fixed-price arrangements where it agrees to help a client achieve a set of goals, he says.

In the case of Bosch, Carson brought Shainin to the Anderson plant. Carson had been certified on the system while working at Bosch's Charleston, S.C., plant. He continued his training after he transferred to Anderson, where he helped coach others.

Shainin encourages certified masters such as Carson to attend class with the people they will be coaching, to stay current on advances in Shainin techniques.

Shainin also provides an online forum for certified masters through its Web site and an annual symposium with presentations by clients and Shainin consultants.

"An effective program involves a regular cadence of Shainin technical and leadership coaching to create a disciplined problem-solving and prevention culture," Dick Shainin says.

To help build that culture, in late 2005 Bosch introduced another layer of the Shainin system at the Anderson plant: Rolling Top 5.

Rolling Top 5 takes problem-solving to the executive level by helping management identify the operation's top five business problems — hence

Playing the Red X quality game

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ANDERSON, S.C. — Ask Craig Hysong how Shainin LLC's proprietary system for identifying and solving quality problems works, and he'll borrow a page from Webster's dictionary.

Make that one word on one page, and it's your job to guess what it is.

Sound impossible? Not if you use the right strategy, says Hysong, executive vice president of the Anacortes, Wash., consulting firm.

"The most efficient way is to look at the total number of pages in the dictionary — this one has 1,374 — and ask: Does the secret word live between pages 1 and 687?" he explains. If you get that right, you've cut in half the realm you have to search.

Taken exponentially, every time a

problem-solver asks a similar question, he or she cuts the realm of possibilities in half. Two to the 17th, meaning 17 questions, is 131,072 — just more than the number of words in a standard, unabridged dictionary.

"So, no matter what word I pick, my strategy is guaranteed to get me there in 17 questions," Hysong says.

It's a simple analogy for Shainin Red X, the problem-solving system that German supplier Robert Bosch Corp. began using at its electronics plant here in 2000.

Doug Carson, statistical engineering manager at the Anderson plant, says he often uses the "dictionary game" to explain how Red X works to new Shainin trainees.

Start with a problem. Either the problem exists or the measurement system that says there's a problem is

lying. Once that has been established, the next question is whether the problem is in the parts or how the parts are put together.

"I just start making splits all the way down until *this* is the only thing I have left. *This* is what it has to be," Carson says.

Seven years into the Shainin system, it takes the Anderson plant an average of six "splits" to determine the root cause of a problem, Carson says. "So the game becomes, how fast can I make six splits?" he says.

Hysong says it's not unusual for people trained in Red X to refer to problem-solving as a game.

"The thought process is not, 'Am I going to be able to solve the problem?'" he says. "They know they're going to solve it. The real game is, 'How quickly can I solve it?'" **AN**

the name — and convert them into technical projects.

"A lot of times, if you give a technical person a business problem, to them it looks like 'I have to solve world hunger. Where do I start?'" Hysong says. Rolling Top 5 "takes that business problem and converges on a technical project, so that the technical team leader is focused right away on what they need to do."

With Rolling Top 5 in place, the Anderson plant had completed 41 projects as of early December 2007, the same number as in all of 2006. Yet the return on investment almost tripled, from 23.4 times the amount spent in 2006 to 66.5 times the amount spent as of early December.

What do the Anderson plant's customers think of the Shainin system? Carson says it has an "unbelievable calming effect." That's because many of the plant's largest customers, including General Motors, are also Shainin followers.

Says Carson: "They understand the language. They know the strategies. When we come to the table working a problem with this methodology, they have confidence in us that we can get to the root cause and solve it."

Right tool for the job

Rolling Top 5 and Red X are not the only problem-solving tools at the Anderson plant's disposal. Like all Bosch plants worldwide, Anderson employs the Bosch Production System, a standard lean production system similar to Toyota Motor Corp.'s system.

There's also Six Sigma, the oft-adapted quality program that Motorola Inc. is credited with developing in the mid-1980s using methods gathered from numerous sources.

Carson says the Bosch Production System helps identify deviations in day-to-day operations, while Six Sigma might help improve reliability during the launch of a new product.

Rolling Top 5 is best at identifying projects that have the greatest impact on the overall business and thus the greatest payoff, he says.

"Some folks tend to fight between the different methodologies, and it gets into the PC-versus-Mac fight," Carson says. "What we've found is not all problems are the same, and there are different tools available depending on the complexity."

Tim Hudgens, another Shainin master and a senior quality engineer at the Anderson plant, was at first skeptical that a single quality program could work at a plant with such

complex and diverse processes and products as Anderson's.

As Bosch's North American center of competence for electronics and sensors, the plant produces electronic throttle bodies, integrated air fuel modules, oxygen sensors, electronic control units for antilock brakes and transmission control units. Anderson is also the worldwide production site for low-temperature, coal-fired ceramics.

Hudgens says the breakthrough came when the Anderson plant began tailoring Rolling Top 5 to fit its needs. Now the Shainin system has become part of the plant's culture, he says. Even the personnel department speaks in Shainin lingo.

"This brings structure to something we know we should be doing anyway," Hudgens says. "Problems are always going to be there, but if we can apply a structure to them, then we can step through them very quickly." **AN**



Statistical Engineering Manager Doug Carson brought the Shainin system to Bosch's Anderson plant. The quality control system has an "unbelievable calming effect" on customers, he says.

Tool box

The Robert Bosch factory in Anderson, S.C., uses a range of methods to improve quality and solve problems. A sampling from the factory's troubleshooting tool chest

SYSTEM	PURPOSE
Bosch Production System	Identify, fix day-to-day problems
Red X	Identify a problem's root cause
Rolling Top 5	Identify problems whose solutions offer the greatest potential payoff
Six Sigma	Improve reliability during a new product's launch

Source: Robert Bosch