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Attack of the Yellow Sac Spiders

When you think of a spider infestation, the fuel tank hose of Mazda Sedan probably does not come to mind. But in fact, a problem with yellow sac spiders infesting and compromising the fuel tanks caused a recall of 42,000 Mazda sedans in 2014 (Woodall 1). While this may seem to be a random occurrence, the 2014 recall was actually the second recall Mazda has issued due to a spider infestation. In 2011, Mazda also recalled 65,000 cars due to the exact same issue (Woodall 1). This not only implies that yellow sac spiders are fairly persistent creatures, but that Mazda failed to properly investigate the issue the first time it appeared. This failure may have grave implications for Mazda and is a great example of why quality management concepts such as those proposed by business gurus Phillip Crosby and W. Edwards Demming are so crucial in a competitive business environment.

The first question to be addressed is probably the most perplexing: What would possibly make spiders want to live in a gas tank? Mazda spokesman Jeremy Barnes answered this question saying that “The yellow sac spider is attracted to the hydrocarbons” (Wallace 1). In simple terms, the spiders like the smell of gasoline. This simple attraction has grave implications. “The web weaved by a spider can lead to a restriction of fuel flow, which in turn can reduce fuel tank pressure when the emission control system purges vapors from the evaporative canister. This can put stress on the fuel tank, which may crack and leak fuel, increasing the risk of a fire, a report filed with NHTSA says” (Woodall 1). Additionally, it was found that the spider problem was only present in cars made in Flat Rock, Michigan (Woodall 1). Mazda’s first solution to this bizarre but very serious problem was to add “a spring to the canister vent line to keep spiders from crawling inside.” (Woodall 1). The recall in 2011 involved placing these spring canisters in all the potentially affected sedans and sending them on their way. However, “after learning of nine cases in which tanks were damaged even though a spring was loaded, engineers determined that a change in the car's software would keep tanks from cracking even if a spider web blocks a vent.” (Woodall 1). In other words, Mazda gave up trying to eliminate the spiders and simply tried to develop an effective work-around that allowed both the fuel tank hose and the spiders to live in peace. While this “solution” seems to have prevented any cars from catching on fire in

recent years, one could argue that the Mazda engineers never really got to the root of the problem.

So what should they have done differently? Six Sigma methodology would suggest utilizing the 5 Whys technique. “The 5 Whys is a technique used in the Analyze phase of the Six Sigma DMAIC (Define, Measure, Analyze, Improve, Control) methodology” (iSixSigma 1). Specifically, “The 5-whys is a method of root cause analysis in which the learner repeatedly asks, “why?” in order to drill down from higher-level symptoms to the underlying root cause(s) of a problem.” (Gross 1). A great example of this problem solving strategy was demonstrated by Don Messermith, a professor emeritus at the University of Maryland and expert in entomology (Gross 1). When tasked with finding out why the Jefferson Memorial was deteriorating more quickly than other beloved monuments, Messermith went through the following sequence of question and answer:

Why #1 – Why is the monument deteriorating?

Because harsh chemicals are frequently used to clean the monument.

Why #2 – Why are harsh chemicals needed?

To clean off the large number of bird droppings on the monument.

Why #3 – Why are there a large number of bird droppings on the monument?

Because the large population of spiders in and around the monument are a food source to the local birds

Why #4 – Why is there a large population of spiders in and around the monument?

Because vast swarms of insects, on which the spiders feed, are drawn to the monument at dusk.

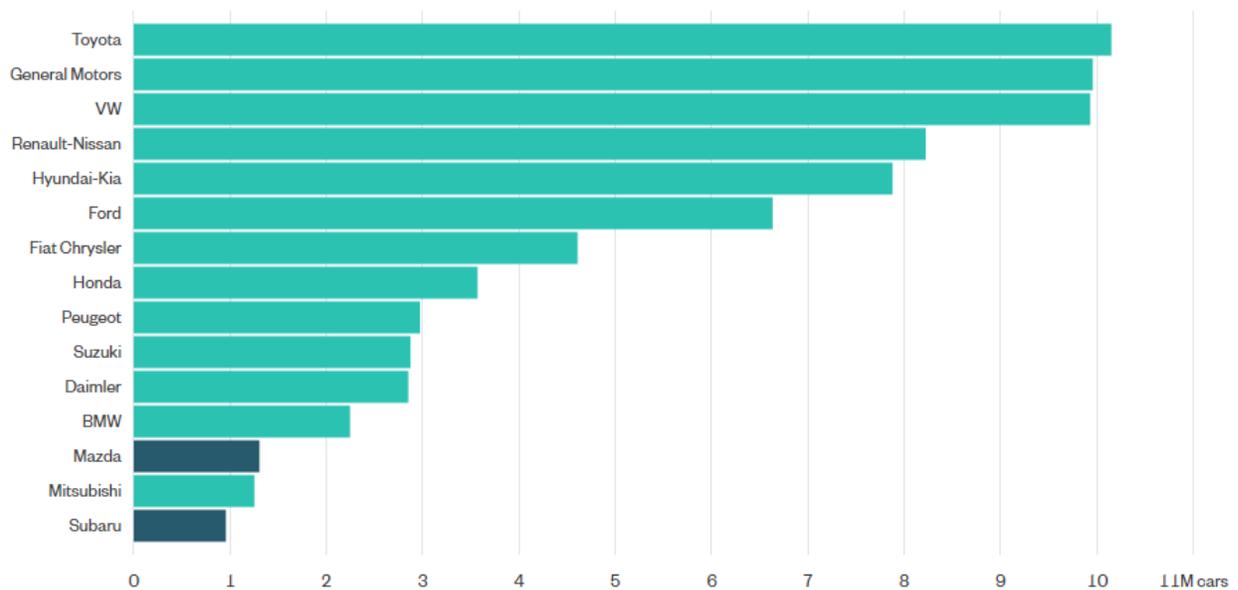
Why #5 – Why are swarms of insects drawn to the monument at dusk?

Because the lighting of the monument in the evening attracts the local insects.

Solution: Change how the monument is illuminated in the evening to prevent attraction of swarming insects. (Gross 1).

By getting to the root of the problem, Messimith was able to present a solution that not only completely addressed the issue but was also relatively cheap to implement. Applying this same methodology to Mazda’s yellow sac spider example might have allowed the company to not only completely eliminate the spiders (something they currently haven’t been able to do) but also save themselves the cost of a second recall.

One might argue that although the second Mazda spider recall was unfortunate and probably avoidable, Mazda still has one of the best recall track records in the auto industry, falling just behind Mercedes-Benz in a Forbes study of 15 car companies (Gorzelay 2). One could also argue that Mazda is not the only car to issue recalls because of spider-related uses. CNN Money reported in 2014 that “Suzuki became the fourth Japanese automaker forced to recall cars because of problems caused by spiders,” preceded by Mazda, Toyota, and Honda (Isidore 1). However, out of those four Japanese automakers, Mazda was still the only company to issue *two* recalls for the same issue. Furthermore, Mazda cannot really afford to lose any unnecessary sales as it is in the fight of its life against giants like Toyota, Volkswagen, General Motors, and Ford (Korosec 1). In October of 2016, Bloomberg magazine reported that Subaru and Mazda “will both miss targets and see declining revenue this year,” identifying that “the more enduring problem for Mazda and Subaru is they're simply too small to survive in a business that's changing as fast as it has in a century” (Fickling 1).



Source: Bloomberg Intelligence

Figure 1 Graph highlighting Mazda and Subaru sales in comparison to larger auto makers (Fickling 1).

Bloomberg goes on to predict that Mazda will have to invest significant capital into automatic driving and electric cars in order to not be left behind in the coming decades (Fickling 1). While Toyota might be able to survive a nasty recall and still invest in the future, small companies like Mazda may not. Not surviving might mean being swallowed up by a larger company like

Toyota. In fact, Fortune magazine writes in a November 2016 article that “Mazda Motor and Toyota Motor have reportedly pinpointed at least 10 business segments that are ripe for cooperation” (Korosec 1). Similar optimistic language was probably first used when Toyota first “cooperated” with Daihatsu Motor before completely taking it over in January 2016 in a \$3.2 billion stock deal (Korosec 1).

The dangerous situation of small auto companies like Mazda makes attention to quality even more important. Phillip Crosby writes that “when we were able to identify that at least 20 percent of revenue was spent doing things over, I realized that we had a tool that would focus the operating executives” (Crosby 106). His statement speaks to the objector that insists “recalls are just part of business.” If recalls are just a part of business, then so is losing 20% of your revenue. When examining the nature of Mazda’s spider recall from the perspective of quality management experts such as Crosby and Demming, we can start to identify some important characteristics about the event. Deming writes that “when product leaves the door of a supplier, it is too late to do anything about its quality.” (Demming29). This observation speaks to the difference between internal and external defects. Internal defects are ones caught before the product reaches the customer. External defects, like the ones described by Demming above, are caught by the customer. According to Six Sigma, some examples of external defect costs include: “Complaints, repairing goods and redoing services, warranties, customers’ bad will, losses due to sales reductions, environmental costs” (Buthmann 1). While internal defects may require the cost of scrapping material, the cost of external defects may include the intangible costs of losing a customer. Mazda’s spider recall was a great example of an external defect. While Mazda reports that no vehicles actually caught on fire, loss of customer good-will and consumer confidence was a probable result of the recall. How we prevent such damaging external defects (and internal defects for that matter) depends on the type of variation causing the defect.

In quality management, variation describes a product’s performance when compared to an average. Differentiating the two main types of variation, special cause and common cause, is an important step when deciding how to deal with a problem. Six Sigma defines common cause variation as “caused by unknown factors that result in a steady but random distribution of output around the average of the data” (iSixSigma 1). Simply put, common cause is the type of variation found baked into a system. Common cause typically makes up 80-90% of all variation (Rivera, Lecture). If common cause is controlled and managed, it brings improvement to the system. John

C. Wood describes common cause variation in his book, *W. Edwards Deming: Critical Evaluations in Business and Management, Volume 1*, when he writes, “Common causes affect all events in a process all the time; they are features of the system” (Wood 122). On the other hand, “special cause variation... arises from influences which are confined to a particular even or individual case” (Wood 123). Wood explains that these cases can include inadequate training of an employee, failing machine part, unnecessary adjustment of a machine, or contamination getting into a lubricant (Wood 123). Special cause variation accounts for 10-20% of all variation and causes the system to become unstable (Rivera, Lecture). Removing it does not improve the system as a whole, but simply brings the system (whether inherently good or bad) back to normal (Rivera, Lecture). When we compare these two definitions to our Mazda spider-infestation, it becomes clear that Mazda is dealing with special cause variation. The distinction between special cause and common cause variation is vital for several reasons. If one were to mistake a special cause variation for common cause, they may over adjust and try to fix the entirety of the system to eliminate the variation. In our Mazda example, this would be equivalent to changing its production procedures for all its manufacturing plants to prevent spider infestation, even though the Flat Rock, Michigan plant was the only one experiencing the problem. On the other hand, if the spider infestation was common cause and was mistakenly labeled as special cause, Mazda might increase the problem by not taking enough action. As it is, the spider infestation does indeed appear to be special cause variation, and therefore the most logical step would be to eliminate the variation in order to return the system back to normal. Once the system is stable, Mazda would be able to begin addressing common cause variation and begin improving its operations as a whole.

In summary, Mazda is a small auto company struggling for market share who allowed a special-cause variation spider infestation to compromise the stability of the Mazda system and become an external defect costing tangible material and labor costs as well as most likely incurring intangible customer dissatisfaction, yet did not properly deal with the issue using the DMAIC 5 Why’s problem solving methodology and therefore had to deal with issue for a second time a few years later. While Mazda is generally a respected car company and even has a lower recall rate than its competitors, its spider recall ordeal proves the necessity of strict understanding and adherence to quality management principles in order to prevent disaster (Gorzelany 2).

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