So you want to be an automotive supplier- Automotive Quality Requirements?

by Laurence Claus

So you want to supply fasteners to the automotive industry? This is a great market segment to be in, but like most paths that one decides to take, there are certain philosophies or ways of doing things that one must be prepared for. Perhaps one of the most distinguishing attributes of the automotive industry is the way that they approach quality.

When I started in the fastener industry over thirty years ago the company I worked for had a roving band of inspectors whose sole task everyday was to go from machine center to machine center, randomly grabbing parts out of tubs and inspecting them. If they got lucky, they discovered a problem before it made it further along in the process or, worst case, to the customer.

This was a common practice in those days and basically was the practical implementation of a "detection strategy". In such a strategy one assumes that there may be problems but that through vigilance and inspection the problems can be detected and removed. Although this isn't necessarily a bad philosophy when volumes are low, it becomes a very weak strategy when volumes are high, such as is typical in the automotive fastener segment.

In contrast, automotive parts makers were one of the first to use prevention strategies instead of detection ones. A company that employs such a quality strategy will seek to discover a pending problem before it occurs and becomes a problem for both the manufacturer and their customer.

Quality Philosophy

What is quality? Although a seemingly innocent and simple question, it generates a potentially complex and multi-layered answer. In essence, however, we might answer that when speaking about a manufactured product it is "a measure of excellence or state of being free from defects, deficiencies and significant variations (*Reference from www.businessdictionary.com*)" ISO 8402-1986 adds to this idea the notion that a product or service provides an answer to a need and, therefore, defines quality as "the totality of features and characteristics of a product or service that bears its ability to satisfy stated or implied needs".

Traditionally companies approach meeting this concept of quality by comparing their products against a set of customer or engineer specified requirements. In this way quality is defined by whether the part is "in specification" or not. In other words, a part is high quality provided that all of its characteristics are within specification. It does not matter where in the specification they are manufactured or whether they actually work well, only that they fall within the established boundaries. This is known as a "Goal Post" philosophy.

When extending such a philosophy, the user assumes that the part is equally good in whatever condition it has been made. Some people, however, have problems with this type of philosophy. As an example, when I teach on this subject I often throw out the question to my students, would you buy a new car if you knew that every part on the car had been manufactured to the low specification limit? Not surprisingly I rarely have any takers. I inquire why no one would want to buy such a car for its "in specification." The class will explain something to the effect that instinctively, and probably rightfully so, a car assembled under such conditions might be prone to more future problems. Therefore, even the staunchest proponent of a Goal Post philosophy may harbor some reservations.

For many years this was the prevailing quality philosophy in automotive circles and the automotive OEMs devised complicated programs and certificate programs for suppliers that could provide high levels of quality. So how does one implement a system to execute such a philosophy? If you adopt this as your philosophy you expect that your processes will occasionally create parts out of specification, so that you must continually employ detection methods to determine when this has happened. Simply put, you implement a lot of inspection.

In the middle 1960s, quality guru, Genichi Taguchi, pointed out that specifications were given by engineers and not customers. He ended up proposing his theory referred to as the "Taguchi Loss Function." Dr. Taguchi recognized that although something might be "in specification" it may still fail to please the customer. His loss function essentially stated that as you begin to deviate from the ideal (or target), the value of the product or service begins to diminish.

As an illustration, let's take a cup of soup as an example. Let's say that we have a serving temperature specification between 90°F and 150°F. At 120°F it is the perfect serving temperature, we really enjoy that bowl of soup. At 95°F it is still in specification, but not quite warm enough to be completely enjoyable and at 145°F too hot to take in without blowing on it a while. Likewise, we understand that at 75°F it is way too cold and at 165°F it badly burns the roof of our mouths. This example clearly illustrates the concept that we can have something "in specification" and yet it is not of equal value to the ideal or target condition.

So if this becomes your philosophy, how do you implement activities to execute it? In the simplest of answers, you would endeavor to find the ideal case (provides the highest customer value) and build a stable process that you can control to uniformly provide that case every time. In other words you would build a sustainable, controllable process and we can extend that thought to say "good process nets good parts".

This is exactly what the modern Quality Management Systems (QMS) like ISO9001 or the automotive version IATF 16949 intend to do. In essence these systems are about figuring out your process and then continually improving upon it so that it remains under control and is always getting better.

Automotive Quality Systems

The automotive OEMs have adopted this second philosophy and set requirements for their suppliers to adopt activities to support it. In essence there are three main activities that set automotive suppliers apart from suppliers in other industries. They are…

1. IATF 16949 (or Similar)

It all began in 1997 with QS9000. This was the first automotive only QMS, derived as a supplement to ISO9000. Over the years it evolved (along with ISO9000) from QS9000 to ISO/TS 16949 and most recently to IATF 16949. Although adding and changing requirements, it has retained its fundamental principles which place a series of requirements on those recipients who possess it to understand, monitor, and, most importantly, control their processes. Like its predecessors, IATF 16949 establishes a basic foundation from the 200+ requirements of ISO9001 and then adds another almost 300 automotive specific requirements. For companies not accustomed to a control based quality system, obtaining IATF 16949 can be a daunting task.

2. Advanced Process Quality Planning (APQP)

A second hallmark of automotive quality is the requirement to participate in APQP activities. The idea here is that once you begin developing a new part you will undertake a series of actions spanning the time you first received the part as an RFQ to the point you put it into production. These action steps are intended to help plan, develop, and implement successful processes to make the subject part you have been awarded.

APQP is multifaceted and includes a variety of planning steps. A few of the more commonly employed steps are:

- Feasibility Review
- Process Control Plan (PCP)
- Failure Modes and Effects Analysis (FMEA)
- Capability Studies
- Measuring System Analyses (MSA)
- Preproduction Part Approval Process (PPAP)
- Run-at-Rate Study

These activities are intended to work together to holistically determine success of the part before it is taken into full scale production. If the APQP is done well, it will often expose difficulties and problems well in advance of when they would become major or even catastrophic problems.

3. Pre-Production Part Approval Process (PPAP)

PPAPs are an invention of the automotive OEMs and until recent years were used only within the automotive market sector. However, in recent years many other entities outside of the automotive sector are employing PPAP (or equivalent) activities. I can recall thirty years ago when the PPAP concept was new and a PPAP submission was only several pages thick. Today, many requirements have been added and the average PPAP is maybe 100 pages or more, even for the simplest of fasteners.

PPAP is actually a part of APQP, but since it embodies many of the APQP activities and started out exclusive to automotive, it is worth singling out for additional comment. PPAPs follow the award of a part and are intended to verify the supplier can make the part as quoted. As such, PPAP involves actually making a small run of parts to verify that part and process parameters can be met. Although some of the same activities conducted during APQP are conducted during PPAP (MSA, PCP, and FMEA), the PPAP is all about demonstrating the ability to develop a process that will provide an adequate number of high quality parts.

Summary

In summary, for companies wishing to enter the automotive market, these philosophies may seem foreign and the tasks to get manufacturing processes under control overwhelming. New entrants must expect a steep upward climb. To achieve this they may have to invest in a good deal of training and put their best people on it. However, if done right, the automotive quality systems are, bar none, the best in the world. This makes companies that can implement and execute on these philosophies some of the best in the world and well worth every company, whether automotive supplier or elsewhere to strive for.