



Reduce Nonconformances With Automated Inspection

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Are you tired of receiving phone calls from your customers requiring you to have a third-party sort? Perhaps you're finally tired of having to deal with thousands of parts returned to you for sorting because of one or two nonconforming parts that made it through your system. You've made up your mind to eliminate this nonsense once and for all—but how?

One possible solution is an automated inspection system. Such systems can help you send only the conforming parts, as well as help you identify areas for improvement in your manufacturing process. However, these systems must be correctly specified, purchased and installed, or else they will provide you with many headaches, a false sense of security and those inevitable calls from your customers.

In-process or off-line inspection? There are two main ways of performing 100-percent inspection: in-process and off-line. There are sensors and other devices that can be mounted directly to your machine that can verify specific characteristics in-process. There are also off-line machines that can verify dimensions (at a very high rate of speed) after all processes have been completed. Do you want to inspect your parts in-process (within the machine) or after all processing has been completed prior to shipping?

Each case has its advantages. Inspection of the parts within the machine will identify the problem immediately. Response to an out-of-tolerance condition can be dealt with prior to making thousands of nonconforming parts. Inspection of the parts as the last operation of the process reduces your risk of contaminating your shipment. Parts are verified right into shipping containers and sealed, thus eliminating the risk of mixing

parts. Your company's experience with nonconformances shipped to your customer will give you important clues as to which approach you should use.

For a quality manager, the first preference would be to go with the in-process inspection. This would eliminate the need to rely on periodic operator inspections and could identify machine problems before they start. Kill the problem as early as possible.

Remember that the main goal is to protect your customer, so a post-processing inspection might be better for you. This inspection must be the last operation performed prior to shipping. Parts should be coming out of the inspection machine, counted for the proper number of parts per container, and seal the package immediately after passing the inspection.

You should begin by learning about the different technologies, how they work and what their limitations are. Some of the sources available are trade associations, magazines and journals, trade shows and the Internet. They can give you a basic understanding of what you will be looking for, along with a knowledge base for listening to suppliers' sales pitches.

Develop an inspection checklist. Before you approach suppliers, make a checklist of what you would like to inspect. Some suggestions are part numbers, type of characteristic (i.e., length, diameter, thread; external or internal; through hole or blind), nominal measurement, tolerance, percent of false negatives, target throughput per hour and annual volumes.

The term "false negatives" describes how many good parts the machine will reject as failures. The tighter the tolerance, the more critical this specification becomes. It is not practical

to say that the machine will make no mistakes. Every process, including automated inspection systems, will have variability.

Take the time to investigate different suppliers to ensure they have the capability to do what you need. Ask about their means of detection—visual or mechanical probes, eddy-current, sonic or magnetic. What makes that technology the best choice for finding your particular nonconformances? What makes their machines the best way to exploit that means of detection?

Another great source of insight is to discuss your needs with others who have used the technologies. If you are a PMPA member, the Technical and Quality Listserve is a fantastic resource to network with others who have dealt with similar issues. Advertisements in trade publications, as well as exhibits at technical conferences and machine tool shows are also great ways to learn about available technologies.

Once you have completed your checklist, review it again. Have you included all of the characteristics you need? Are there more parts that may need to be reviewed in the future? It is much easier to design flexibility before the machine is designed and built than after it is already in your facility.

Now that you have your checklist, develop a specification package that includes that checklist, along with a copy of all associated part drawings, acceptance criteria, runoff process, training and service/warranty expectations. Send this package to multiple suppliers.

Evaluate and visit potential suppliers. After receiving the suppliers' responses, evaluate the quotations and narrow your choices down to a few.



Automated Inspection...continued.....

Plan to visit these suppliers. Before your visit, ask for references to find out what their customers like and don't like about their systems. Ask what they would change if they were to do it again. Use the feedback to avoid repeating their mistakes.

When you visit the suppliers, take sample parts (both conforming and nonconforming) to see how well their equipment can image the parts and detect the nonconforming condition. Look for a tight distribution of measurement data. The system must be repeatable. You can calibrate accuracy only if you have repeatability. A system that provides different answers on the same parts is useless.

One key consideration is that almost all systems require parts to be consistently oriented for inspection. This will probably involve the use of a vibratory bowl specially designed to orient the parts. If your inspection requires multiple parts with different configurations, you'll need to ensure that the feeding mechanism is not only trouble-free for your parts, but also is a manageable change-over.

Once you have visited the suppliers, it's time to perform the final evaluation. Price is only one of several factors in the decision. You must have confidence in the supplier's ability to meet and support your requirements. Assessment of long-term maintainability by your staff is just as important. Requirements for spares (and their availability) for key components are often overlooked. What good is a system that needs a special coil or circuit board that's 8 weeks out?

After you have decided on a supplier, issue your purchase order with detailed requirements and acceptance criteria clearly spelled out. This should be a reiteration of the criteria stated in your quote specifications that were confirmed as acceptable at the time of your visit.

Meet with your chosen suppliers again. Review the purchase order and all of the associated criteria. Make sure that the runoff criteria include

at least one full day of running your most complex part. In addition, make sure a change-over is performed for both the system checking the parts and the feeding mechanism.

When the machine is ready, perform your runoff. Take along the employees who will be operating this as part of their jobs. Do not accept the machine unless it meets all of your requirements. The process will never get any better. Make sure it does what you need right now.

This may sound superfluous, but many times you are under the gun to get the machine installed. You might hear the phrase, "We'll take a look at it again when we get it on your shop floor." Don't get caught in that trap. This is like a first-piece inspection at your shop. If it passes the agreed-upon runoff, congratulations. You've done a fine job so far, but you're not done yet.

Finally, after all of the pre-work, the machine installation should be the easiest part. Have all of the personnel that will be working with the equipment involved in the installation. Use all of the time that the supplier has at your facility for training. Go over the change-over and setup processes as much as possible. Create an orderly place for spares and auxiliary parts. And start drafting those setup instructions, work instructions and procedures. Digital photos can be life-savers here. Color-code the setups. Use your team's collective experience to make this your best implementation to date.

Remember, an inspection system is a major capital investment that will bring no money into the business. Its focus is to protect your customers, keep you from losing business, and decrease sorting and shipping costs. All expectations must be clearly defined, understood and agreed upon by both you and your supplier. If they are not, get ready to dig into the pockets for sorting costs. The phone call from a disappointed customer is only one nonconforming shipment away.

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PMPA Management Update Conference
March 1-3, 2007
Disney's Contemporary Resort
Lake Buena Vista, Florida

PMPA 2007 National Technical Conference
April 22-24, 2007
Greater Columbus Convention Center
Columbus, Ohio

PMTS - Precision Machining Technology Show
April 24-26, 2007
Greater Columbus Convention Center
Columbus, Ohio

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