PRECISION PEENING OR SPRAY AND PRAY?

IN MY FIFTEEN years as a shot peening machine manufacturer, I have seen machines with multiple nozzles installed in facilities around the world. Many of these machines were purchased with extra nozzles so they could peen a wide range of parts. A few of these machine probably have operators that are guilty of the "spray and pray" approach to shot peening: Spray a lot of shot at the part and hope that it's peened to the proper intensity.

In a typical multi-nozzle machine setup, the part moves through the peening zone and is peened from many different angles. There can be several problems with this approach, including:

- Lack of intensity verification
- Inadequate intensity
- Wasted shot, energy consumption and operator time
- Unnecessary wear and tear on machine due to excessive shot blast
- Troubleshooting difficulties

MULTIPLE NOZZLES = MULTIPLE INTENSITY ISSUES

The angle of the nozzle is critical to the intensity value and therefore it makes sense to provide a saturation curve for every nozzle. If the movement of the nozzle is changed, more intensity verification (and coverage inspection) are required.* Establishing and maintaining proper intensity for each nozzle in these cases is a great deal of work.

WASTE, WASTE, WASTE

Consider the cost of operating an eight-nozzle machine. One 3/8-inch nozzle at 60 pounds of air pressure requires 125 cfm of air. 125 cfm of air requires a 25 hp air compressor. Now consider how much air it takes to run this eight-nozzle machine: Over 1000 cfm and 200 hp! That's a lot of power and set-up time.

If a smaller part is placed in the machine and the nozzles' parameters weren't changed, some of the shot may not even hit the part because they were pointed at a larger part. When you add the expense of wasted shot to the additional wear on the equipment's cabinetry, the cost can be substantial over the normal lifespan of a machine.

COMPOUNDED TROUBLE

Another problem with multiple nozzle machines is the complexity of the shot delivery system. If the machine isn't peening properly, where is the problem? In an eight-nozzle machine, the problem could be in any one of the 32 valves needed to run the system. Troubleshooting time needs to be added to the machine's operating expense.

THE SOLUTION IS PRECISION PEENING

So what can be done? Let's consider replacing all of this cost in consumables, power and labor with an automated single-nozzle machine.

The initial cost of a robotic shot peen machine can be high but it's generally a one-time cost. When compared to large air compressor equipment and the continual labor costs associated with machine setup times, it can pay for itself very fast. Plus, the price of electronics continues to go down, making automation affordable even for small companies.

My approach is to take a single nozzle, automate the movement of the nozzle with a coordinated axis movement so the nozzle follows the contour of the area to be peened. This approach allows the shot peening technician to hit only the areas required. A part-motion recipe is developed and saved for each part, thus eliminating costly setup time.

Only one saturation curve is needed for the single nozzle. In an accurate motion program, all of the shot will strike the part at the proper angle allowing for proper intensity and coverage. Another benefit to automation is the ability to peen at the highest specification level thus providing a more valuable service to customers.

When purchasing single-nozzle automated machinery, consider how many axes are needed to move the nozzle and part(s) to achieve the proper angle to peen all surfaces. The controller is another key purchasing decision. Buying a name brand is a wise choice. Custom PC-based programs may be inexpensive but they can be hard to understand and troubleshoot by anyone but the software developer—and a small software developer may not be available when you need them. The whole point of going to a single nozzle system is to obtain a precise, yet simplified, peening process.

*For an in-depth explanation of how the nozzle's angle affects intensity, see Dr. David Kirk's article, "Variability of a Shot Stream's Measured Intensity," in the Summer 2012 issue of *The Shot Peener*.