Troubleshooting your shot peening operation

by Herb Tobben

While shot peening is a highly technical and complex process, governed by societies and panels of experts, it can be, but need not be, intimidating. Because of the many variables that affect shot peening results, standards help to ensure consistent quality of output. Understanding the variables and how they impact the results simplifies the process and can make troubleshooting easier.

Most standard specifications are patterned after military or SAE engineering specifications. And it's important to understand that many manufacturers set their own process standards, either to cover shot peening in their plants or to set standards for their vendors. Critical-application shot peening, such as is done on aircraft and aerospace components, will have a set of specifications to follow. These specs provide a wealth of information and a rigid framework of guidelines to follow. The specifications will either reference the standard SAE specification or in some cases, the manufacturer will create their own specifications that incorporate the SAE spec and either add to or over-ride part of the SAE specification.

Since these specs are guidelines for intensity and coverage that must be achieved as well as the media and the size to use on your particular substrate material, it is up to you to determine how to combine the many variables. These variables include media size and hardness, nozzle size, distance, angle, and pressure; as well as how long to peen and what shot flow rate will be necessary to achieve the desired result. The manufacturer's print of the part will call out the intensity needed as well as the shot size to use and the coverage to be achieved.

When initially setting up your shot peening operation or when failures occur, here are some suggestions for determining what's going wrong and how to obtain the results you seek.

Intensity

With the intensity given on the print, the challenge is to maintain consistent conditions to obtain consistent results over the production run. When intensity is not being maintained, the variables that affect it include: media size, media hardness, blasting angle, and blasting velocity. I usually begin with the variables that are the easiest to check and work my way to the more complicated ones.

Media Size

This sounds like a no brainer; but check the working mix— it may not be right. Of course, you may have the wrong media size— someone may have ordered the wrong size. Mix-ups can also happen when there are several shot peening operations each using different media.

Media Hardness

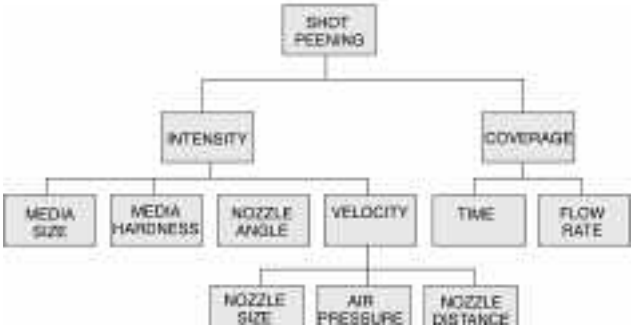
The media must always be harder than the part. Check to make sure the media hardness is correct. Shot varies in hardness and is measured on the Rockwell scale. Soft shot measures between 40 and 45 Rc; but it is available up to a 62 Rc. Hardness ranges will vary by media manufacturer.

Blasting Angle

Verify that the angle of impingement is correct. Your records will state what the angle should be. Vibration in the system can cause nozzle movement; changing the nozzles can also cause the angle to be inadvertently altered.

Blast Velocity

When blasting velocity is not being maintained, the nozzle size, air pressure, and distance from the work piece may need to be modified. Measuring blast velocity is a more complex process; so



I leave that until the other variables have been verified. Check the air to media ratio (the shot flow rate). There are numerous ways to check the blast velocity—the easiest being using an electronic instrument pointed toward the blast stream during operation.

Nozzle Size

Check the nozzle to determine if it has worn out and needs to be replaced. Check to make sure the nozzle has not suffered some kind of damage. It may have become scored or become damaged in some way.

Air Pressure

Make sure you can maintain air pressure when all the nozzles are on. Sometimes the systems get overloaded when greater demand is generated than the source is capable of providing. Make sure the air line diameter is appropriately sized.

Distance

Measure the distance from the nozzle to the work surface. Just as some of the other variables accidentally can be altered, so can the distance. Compare your measurement with your set up documentation.

Coverage

If coverage is not being achieved, blast time and media flow rate need to be checked and adjusted as necessary.

Blast Time

Check the time of the blast cycle. Someone may have changed the setting; or the timer could be defective.

Media Flow Rate

Check the metering valve for signs of tampering, or for wear. Check to make sure there are no foreign materials in the metering valve, hose, or nozzle. Replace components as needed.

Recordkeeping is perhaps drudgery, because it is a requirement. It's as much fun as reading an owner's manual; but it is indeed your friend. Making simple checks of the system and consulting your notes can save hours of frustration since with shot peening you are always working with so many variables. Of course, I hope you know that when you're stumped, you can always call me. (1-636-239-0300) ●

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