

Shot Peening Nozzles Come in Several Shapes and Sizes

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As most managers and technicians have discovered, every new application for shot peening comes complete with its own set of unique obstacles. Just when you perfect the process for one part, your customer (or your boss) brings in new parts, made from unusual materials and manufactured in bizarre shapes that seem to defy effective shot peening.

Don't panic, just yet. Over the years, I've seen people create tools and techniques that range from the obvious to the ingenious, all in the service of the twin gods of peening—coverage and intensity.

Nozzle makers offer many shapes and sizes and most will create special nozzles for you, at a cost. Having an array of nozzles on hand can go a long way toward making your job easier.

Given a little ingenuity, you can usually get the desired results using one of the following standard nozzles. We begin with pressure blast nozzles.

Venturi Nozzles (Short and Long)

These are the two workhorse nozzles of shot peening. Venturi nozzles have a uniform pattern of high-velocity shot, making them the most efficient choice for covering large parts: castings, turbine blades and disks, and many automotive parts. In general, the longer the venturi barrel, the greater the stand-off distance and the larger the pattern.

Straight Bore Nozzle (Short and Long)

A straight bore nozzle has a hot spot in the center of the blast pattern that's perfect for high-intensity peening on a small part, or a small area of a larger part. With good aim, you can peen small cavities, such as bolt holes, without much effect outside the ID of the hole. As with venturi nozzles, select the barrel length that maximizes shot velocity with a pattern that covers the desired area.

Side Angle Nozzles

Side angle nozzles are short, stubby, and closed at the end. They have one or more angled openings along the barrel. Mounted at the end of a lance, an angle nozzle can peen the inside of a box channel. Rotating the lance lets the angle nozzle cover the inside of a pipe or cavity.

Side Angle Extension Nozzles

A side angle extension nozzle is a long, thin tube made from tool steel, with a small abrasive-resistant deflector tip. Extension nozzles fit into narrow cracks and holes where other nozzles fear to tread. Getting the extension nozzle into tight places, without damaging the part or the nozzle, requires precise



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controls for part placement and nozzle movement. Where coverage is critical, specialized holders can rotate the nozzle without having to rotate the lance or fixed mounting. Other opt to rotate the part around a fixed nozzle.

360-Degree Nozzles (a.k.a. Hollo-Blast Nozzles)

As the name implies, the 360-degree nozzle distributes a uniform fan of shot. Essentially a straight-bore nozzle with a centered deflector tip, the 360-degree nozzle is perfect for peening inside tubes and pipes without having to rotate the lance. Different sizes and centering carriages let you use this nozzle in tubes from 3/4 to 12 inches.

Suction Blast Nozzles

For suction blast systems, the basic gun stays the same, but you attach special adaptors to the nozzle to enhance functionality.

Regular or Straight Bore Nozzles

The standard for most manual and automatic applications, the straight nozzle delivers a tight pattern of high-velocity shot. Its comparatively small pattern usually results in a bank of multiple straight nozzle guns to ensure complete part coverage.

Venturi or Wide-Spray Nozzles

The wide-spray nozzle has a substantially larger pattern. It covers a large area more quickly, and so, requires fewer guns.

Side Angle Extension Nozzle

Adapted from the pressure blast version, the suction blast side angle extension nozzle is a long, thin tube made from tool steel with a small abrasive-resistant deflector tip. It fits into narrow cracks and holes and requires precise controls for part placement and nozzle movement. Because side angle nozzles actually deflect media, they sometimes deliver significantly lower peening intensity.

Straight Extension Nozzles

The straight extension nozzle is similar to the angled extension nozzle, but without the deflector tip. It sends a concentrated blast of shot into small openings, and requires no rotation to get thorough coverage.

Custom Nozzles

If nothing off the shelf will work, most shot peening equipment manufacturers will design and build unique nozzles just for you. Be prepared to write a big check, and you will probably have to assume all the liability if it doesn't work.

Some shops turn their machinists loose to create nozzles and adaptors. Remember that nozzles are subject to constant wear and frequent replacement. If your next batch of custom nozzles isn't identical to the last batch, you will not get the same peening results. But that's a topic for another article. ○