Cast Steel Shot and Grit

The Miracle Workers of Blast Cleaning, Profiling, Peening

Part 1 of a 5 part series

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Miracle workers? Isn’t that a bit of exaggeration? Not really! The largest size shot (or grit) commonly used in blast systems is approximately this “•” size, and the smallest is about this “.” size. Now, when you consider the work cast steel particles this small are asked to do, you have to concede it truly is miraculous. How do they do it?

Substituting the word “impact” for the word “blast” helps take the mystery out of it. Then it becomes: Impact-cleaning and impact-profiling using steel shot or grit; Impact-peening using steel shot. IMPACT is the key! Cast steel shot and grit perform their miracles not by abrading or scraping, but by IMPACT!

The last thing you would ever think of doing is to blast away at your workpiece at point-blank range with a 12-gauge shotgun loaded with #3 Steel Buckshot (1/4” diameter). That would be IMPACT OVERKILL, for sure! Destroying the workpiece is certainly not the intent. Systems engineered for blast-cleaning, blast-profiling, and blast-peening want to utilize the impact-power of steel shot or grit to perform the required function, yet avoid the obvious overkill of our shotgun example. How do they accomplish this?

The formula for kinetic energy (impact-power) is ½MV squared. “M” = Mass (shot size); “V” = Velocity. Obvious options: Reduce both Mass and Velocity. For the “Mass” factor, instead of 1/4” Steel Buckshot, the blast systems use the sizes shown above—“•” largest, and “.” smallest, with as many as ten distinct sizes each of cast steel shot or grit from which to choose. “Velocity” is cut way back, to about one-quarter to one-half the velocity generated by the shotgun. Now, depending on the user’s choice of shot or grit size and velocity range, it is possible to handle jobs from the roughest and toughest to the most delicate.

Two factors contributing to the tremendous impact-cleaning-profiling power of cast steel shot and grit are:

1. All the impact-power of a given particle of shot or grit is concentrated on an almost infinitesimal point of contact, thus developing an incredibly high “pounds per square inch” of crushing power which is much, much more than the highest strength alloy steel plate can withstand;

2. The unbelievably high particle count in the abrasive blaststream — as many as one to two billion particles can be thrown each minute by some blast wheel units, depending on the size of shot or grit used. (Shot this “o” size will have approximately 14,000 pellets per pound, while shot this “.” size can have as many as 6,000,000 per pound.)

In all blast-cleaning-profiling-peening applications, control of impact-power and coverage, via proper selection of the factors of velocity and size, is essential to effective and efficient performance. However, these additional steel abrasive characteristics also play an important part in the process:

SHAPe (round shot for a “peened” finish aspect; angular grit for a sharp, angular “etch” finish aspect); HARDNESS (four ranges, use depending on the toughness/tenacity of contaminants to be removed; hardness of work profiled or peened).

Thus, the user has five basic choices to consider when seeking the combination that will best serve his particular needs:

- Velocity
- Size (for Mask Shape)
- Hardness
- Size (for blast-stream population count — “coverage”)

The purpose of this Technical Bulletin is two-fold:

1. To take the mystery out of how cast steel shot and grit perform their many “miraculous” functions, by identifying the five elements that can contribute to the most effective and efficient performance.

2. To serve as an introduction to a series of Technical Bulletins to follow, that will describe and explain the effects of choices made (from the five choices listed above) vs. the four factors involved in all blast-cleaning, blast-profiling, blast-peening systems:

- Product Finish (cleanliness and/or profile)
- Speed of Processing (productivity)
- Equipment Wear/Tear & Parts Replacement
- Abrasive Cost per Unit of Work Processed

(Example: What does increasing abrasive hardness mean with respect to finish—and, how will it affect Speed of Processing, Wear/tare and down-time of the equipment, and Abrasive usage?)

Inevitably, there will be pluses/minuses in whatever choice is made. Being made aware of these pluses/minuses most obviously is critical to the user’s decision-making process. And, that will be the goal of the series of Ervin Technical Bulletins reprinted in Abrasive Blast Cleaning News to follow—helping you arrive at the best decisions! ☑