THE BENEFITS OF STEEL GRIT BLASTING AND RECYCLING

Mark Stewart, President; Nichole DeSantis & James Quesenberry, Marketing Analysis
ARS Recycling Systems, LLC
Lowellville, OH, USA

Abstract: Few things in life improve quality, decrease costs and reduce the environmental impact. With the proper technology, using steel grit to prepare steel structures for coating can accomplish this.

INTRODUCTION

Traditionally, single use abrasives were the least expensive method of surface preparation on steel structures; now though, with new containment laws in effect and abrasive recycling technology, steel grit blasting/recycling has become the most cost effective abrasive blasting method. With steel grits 98% recyclability rate and its non-fracturing, dustless media properties, it is easy to see how this allows contractors to increase profits and win more competitive bids. By using multi-use steel grit along with proper vacuum retrieval and recycling technology, significant cost savings such as abrasive cost reduction, disposal savings, productivity increases, and labor cost savings, along with less employee exposure to toxins, make steel grit the most cost-effective blast media on the market.

OBJECTIVE 1: COST SAVINGS ASSOCIATED WITH THE USE OF STEEL GRIT

There are many forms of blast media that can be used to clean a surface, remove rust, create profile, and prepare a surface for coating. The blasting performed on steel structures such as ships, bridges and tanks is an investment that a company needs to effectively execute. Determinants for companies deciding which media to use on a project can be contingent on the job specifications, environment, worker health and cost.

Few processes significantly reduce overall cost, let alone also improve quality and reduce health and the impact on the environment. With a recycling process, steel grit blasting can accomplish all the mentioned benefits. Pictured below is a worker blasting with steel grit. Clean air surrounds the worker; just one of the many advantages of steel grit recycling.

Unlike traditional abrasive medias, steel grit is reusable with an efficient recycling process; making it much more cost effective than other medias such as slag, garnet, silica and other mineral abrasives. Steel grit can be used multiple times across many jobs. Also, minimal grit loss in the process reduces waste. For example, a contractor may initially use twenty barrels of steel grit for a tank project that is 20,000 square feet. After 130 tons of abrasive is blasted, there is approximately five tons of grit to dispose of. Approximately fifteen barrels of grit is able to be reused and taken to the next job site. In

contrary, if a single use abrasive is used in this situation, after 130 tons of abrasive blasted, the contractor would have approximately 130 tons of waste to dispose of and no remaining grit at the end of the job. See appendix A for calculations and details.

When using single use abrasives, the material removed from the structure (paint rust) and the abrasive, result in waste. Steel grit recycling removes only the debris and grit fines, thereby reducing waste from many containers to a few drums. Steel grit may initially cost more, but the overall annual abrasive cost is dramatically decreased with the proper recycling methods.

As the grit breaks down, the particles too small to be useful anymore are deposited in the waste drum. With proper containment, the lesser amount of waste generated, compared to traditional abrasive is easier to manage logistically, which also reduces disposal costs.

OBJECTIVE 2: HOW RECYCLING OF STEEL GRIT CAN REDUCE COSTS AND IMPROVE BLASTING PERFORMANCE

The angular edges of the steel grit remove paint and rust more efficiently, resulting in a greater productivity increase than single use media abrasives.

Productivity gains of 10-20% are common because the edges of steel grit increase hourly productivity. Also, with steel grit being a dustless media, it allows better visibility so workers do not double pass and blast the same surface area twice. Low dust levels also allow for a faster clean up. Steel grit breaks down significantly less on impact compared to traditional blast media. This in turn results in less dust and waste generated during the process.

The better suited size, shape, density, hardness and friability of steel grit helps effectively clean a surface on its first pass. This increases overall productivity and decreases the need for re-blasting. The size of the media being blasted is of extreme importance for a consistent blast pattern. With proper technology steel grit is able to be blasted and put back into a cleaning/recycling system. New grit in the system may be size G40 but as it breaks down, a sufficient cleaning/recycling process can hold G80. G40/G80 is put back into a cleaning/recycling process after being blasted, mixing it with new grit size G40 – this creates the work mix. The proper working mix allows for successful removal of layers of paint and helps the contractor reach the desired blast profile quicker and more successfully. The clean consistent working mix also helps the contractor maintain a consistent profile throughout the project.

Steel grit holds an irregular shape, with granular surfaces and angular edges, which allows removal for heavy layers of paint and corrosion. Steel grit has a mass of 250lbs per cubic foot, which allows for more kinetic energy to be delivered to the surface (1). The hardness of steel grit is included in the Rockwell “C” scale; which allows for a good performance on difficult jobs (1). Friability should be considered when choosing media type because it determines how many times it can be reused and how much dust is created. For example, sand is extremely friable because of its quartz composition, which means it is not applicable for reuse (1). Many mineral abrasives are able to be recycled a limited number of times, but fortunately steel grit resist breaking and can be recycled many times.

Although steel grit recycling enhances productivity rates, it is essential to have the proper recycling equipment and an effective blasting training program available. Instruction on how to be more productive with recycling equipment will allow a company to gain the most benefits.

OBJECTIVE 3: THE REDUCED LOGISTICS, ENVIORNMENT AND HEALTH IMPACT OF USING STEEL GRIT

Logistics

When using steel grit, there is overall less waste generated, thus there will be less transportation cost to remove the waste. Also, there will be less permits/fees, resulting in landfill cost reductions. When it comes to logistics, there is less labor to manage on site, in result saving money.

In a typical scenario, the total equipment for single-use mineral abrasive is between 12-20 pieces, whereas, all-in-one recycling exits to reduce the total as low as three pieces. The picture in appendix B compares the number of equipment needed for multi-use media versus one-use mineral abrasive, and it describes the equipment pieces. This represents additional logistic cost savings and less time on a project.

Environment

Steel grit recycling has a minimal environmental impact, whereas most traditional medias have potential to cause increased environmental harm. Blasting may present environmental concerns if the right equipment and materials are not being used. Pollutants and waste being generated from abrasive mineral include: particulate air emissions of blasting abrasives and paint chips: and large quantities of spent abrasives mixed with paint chips that can enter waterways if not contained properly (2).

The Federal Hazardous and Solid Waste Amendments- are the 1984 amendments that focus on waste minimization and phasing out land disposal of hazardous waste as well as corrective action for release (3). It is required by law that the recycled work mix meets specific requirements. These requirements include, complying with all federal, state and local regulations. The recycling of steel grit must also meet SSPC-AB2 standards of <0.2% lead content (3). Steel grit recycling reduces the impact and liability of many regulations.

Health

Worker safety is of extreme importance when performing a blasting job, and although many employers know the health consequences of single use abrasives, they choose to use mineral abrasives like silica sand, coal slag, garnet sand, nickel slag and copper slag. Some abrasives and their health concerns include (4);

- *Silica sand:* Can cause silicosis, lung cancer, kidney disease and breathing problems
    - On March 24, 2016 OSHA issued a silica standard for the construction industry. Sec. 191.1053(I) and Sec. 1926.1153(k).
- *Copper slag, nickel slag and glass:* Lung damage
- *Slags in general:* Contains trace amounts of toxic metals such as beryllium, arsenic and cadmium

Steel grit recycling significantly reduces dust generation during blasting, thus employee exposure to contaminates is reduced, which increases productivity from improved visibility and helps maintain a consistent blast profile. Also, with a steel grit recycling process, the noise level can be extremely reduced when using steel grit (4).

OBJECTIVE 4: PROVING THAT HIGHER CONSUMABLE GRIT COST WILL RESULT IN SIGNICANTLY LESS OVERALL PROJECT COSTS

Steel grit blasting and recycling techniques have been perfected over the past 30 years. In the 1970's changes in Federal Environment Regulations were needed to develop friendlier solution, thus the use of steel grit started to be used by factories. In 1980 states began requiring the use of containment to collect spent abrasives and waste, and in 1990, on Federally funded projects, a recyclable abrasive was mandatory. This transition to Steel Grit and the use of Dust Collectors improved internal containment conditions, reducing costs and improving health and productivity. Today, steel grit along with recycling has allowed for the most cost savings possible.

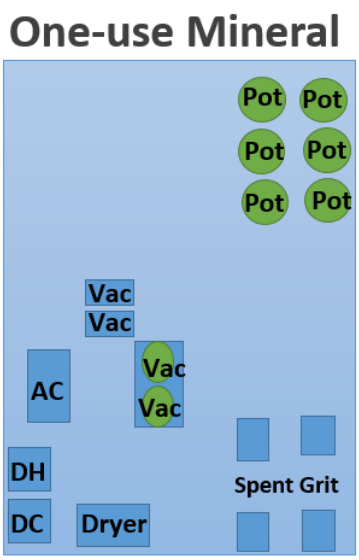
In the long run, using steel grit as a blast media is much more cost effective than using any other form of media. Appendix C represents quantitative data that examines why steel grit recycling is the most cost-effective blasting choice. The project detailed is 20,000 square feet with a crew size of four. The total cost for the project after using single use abrasive is $47,899, whereas with the right recycling technology, the total cost for the project is $8,952. This is a savings of approximately 81% or $38,947. Proven successful in Eastern Bridge and North Western Marine projects, steel grit will significantly increase savings for the contractor.

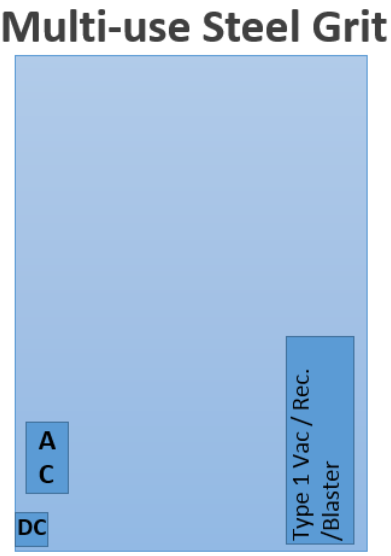
Appendix A

Inputs of Grit Cost and Waste Disposal	**Steel Grit**	**Single Use**	**Calculation**
Estimated sq. ft.	20,000	20,000	
Number of tons of abrasive to be blasted	130	130	20,000 X 13 (amount of abrasive blasted per square foot : based on contractor estimate of lbs of grit used per sq. ft.) / 2000
Total tons to dispose of	5	130	(20,000 X 0.266 (estimated waste generation rate : one 800 lb drum of waste generated per 3000 sq. ft. blasted) / 2000) + tons of grit consumed
Tons of grit consumed	3	130	Bin storage X number of total recycle passes X (1-recycle rate (98%))
Number of total recycle passes	7	1	Number of tons of abrasive to be blasted / number of tons to initally fill the system (20 vs 130)

Appendix B

(1) 28 ton blast pot – 6 nozzles
(1) 32 ton Hopper
(2-4) 50/100 hp vacuums
(2-4) 9 cu. Yd. tanks
(4-8) 10 cu. Yd. dumpsters
(24) tons sand – bulk truck
(1) 2000 cfm compressor
(1) 45k cfm Dust Collector



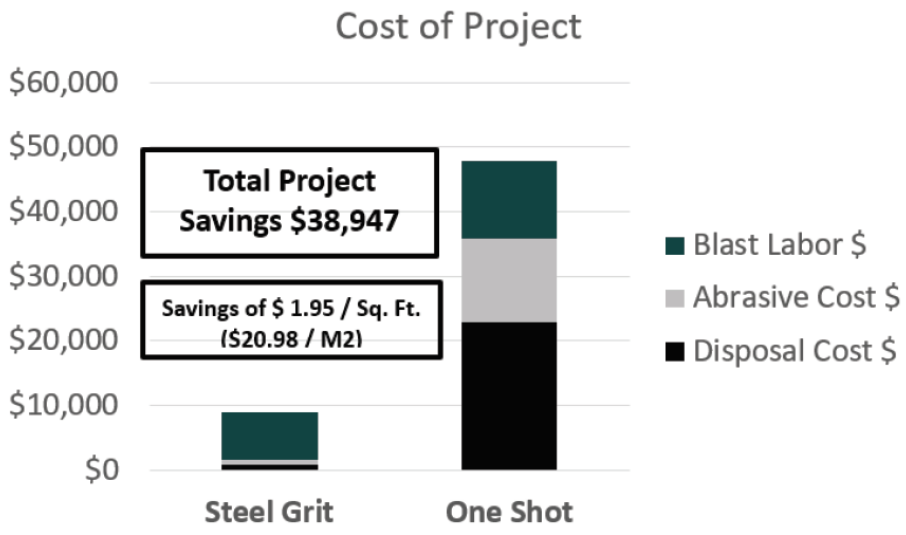


Above acronyms:

AC- Air Compressor
DH- Dehumidifier
DC- Dust Collector

Appendix C

Results of Actual Tank Scenario	Steel Grit	Single Use Abrasive
Total Job Abrasive Cost	$845	$13,000
Total Cost to Dispose	$822	$22,899
Total Blast Labor	$7,286	$12,000
Total Costs	$8,952	$47,899



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