Using Glass as a Blasting Abrasive

Material: Recycled Glass

Issue: *Processed recycled glass has been sold as an abrasive blasting medium under several brand names in different parts of the United States. However, limited public information is available regarding the performance of finely sized crushed glass in abrasive applications because manufacturers have developed their own proprietary data. Historically, the predominant material used for abrasive blasting was silica sand, hence the common reference to "sandblasting." Other media include garnet, staurolite and industrial by-products such as coal slag, copper slag, nickel slag and steel grit. Even walnut shells and plastic beads have been used for abrasive blasting. Individual abrasive media performance depends on hardness, shape, size, weight, and other characteristics. Health- considerations are sometimes significant in evaluating blasting abrasives. For example, concerns about silicosis due to the presence of crystalline silica have resulted in very little silica sand now being used in abrasive blasting.*

Best Practice: While silica sand is a raw material used in the production of glass (see *Chemical Composition of Container Glass* Best Practice), the manufacturing process converts the crystalline structure to an amorphous state. Tests have shown that recycled container glass contains less than 1% crystalline silica (see *Analysis of Glass Dusts* Best Practice). Lower health risk represents a potential competitive market advantage for recycled glass, which can be processed to physical characteristics similar to silica sand for use as an abrasive. Crushed, graded glass described in this Best Practice should be distinguished from glass beads, which have been used for abrasive blasting for many years. Beads are spherical in shape and are often made from post-industrial recycled glass. Glass beads have been used especially in applications where fine surface finishing is important. Finely-sized crushed glass is the same raw material, but has an angular grain shape, meaning that it does not leave as fine a surface finish, but removes paint and scale more quickly.

Recycled glass has been successfully substituted for silica sand and other blasting media in shipyard trials conducted by Glass Recycling Inc. of Marietta, GA, and in other construction projects and equipment cleaning. Glass must compete with common abrasive alternatives as well as niche materials such as plastic pellets used on sensitive surfaces. Generally, coarser blasting abrasive is used when heavy surface build-up removal is required, while finer sizes are used more for industrial cleaning applications.

Because of the tight gradation requirements, and the need for clean, dry, dust-free products, most glass processing facilities are not capable of generating crushed glass blasting abrasive. Blasting abrasive is typically packaged in 50 and 100 lb. bags or in bulk supersacks weighing 2,000 lbs. or more. Recycled glass can be used in the same blasting equipment used for any of the common slag, with consideration to blasting pressure, feed orifice, and nozzle sizing. While not considered hazardous, glass dust is an abrasive nuisance dust and every consideration should be given to minimizing dust generation in blasting.

Tests have shown that various sizes (12 mesh and finer) of recycled glass media perform well in preparing steel to a "white metal" condition. Glass can be used as a dry blasting media or combined with water for use in slurry blasting. While some equipment can recover used media, tests conducted by KTA Tator, Inc. found medium breakdown rates during use at a level that would not be suitable for more than one use. Performance results of post-consumer glass and post-industrial glass as a blasting abrasive in this same evaluation are illustrated in the table below. The results show that cullet performs favorably when compared with 16x35 silica sand. Testing showed that, for blast cleaning of tight mill scale bearing steel at 100 psi, the cleaning rate of the post-consumer and post-industrial products was higher than that of the silica sand cleaning rate data. Also, the consumption rate of the post-consumer products is lower than that of silica sand, while the post-industrial product tested comparable to the referenced silica sand in consumption rate per square foot of blasted surface.

Performance of Recycled Glass as Blasting Abrasive
Summary Table (Averages)

Size:	20 X 30 mesh		30 X 50 mesh	
Test: Type:	Post Consumer	Post Industrial	Post Consumer	Post Industrial
Breakdown Rate (ASTM C136)	59.1%	65.4%	55.5%	57.4%
Dust Generation	11.1%	14.8%	13.8%	20.8%
Cleaning Rate	1.340 ft^2/min	1.137 ft^2/min	1.408 ft^2/min	1.128 ft^2/min
Consumption Rate	7.375 lbs/ft^2	10.666 lbs/ft^2	8.000 lbs/ft^2	9.917 lbs/ft^2
Surface Profile (ASTM D4417, M	3.2 mils	2.8 mils	2.1 mils	1.9 mils
Embedment	0.40%	1.27%	0.00%	0.07%
Micro Hardness (ASTM E384)	542 HK	540 HK	not tested	not tested
Conductivity (ASTM D4940)	630 micro mho/cm	114 micro mho/cm	230 micro mho/cm	200 micro mho/cm
Rust Back (ASTM D610)	0.01% (10)	0.03% (9)	0.03% (9)	0.03% (9)

Source: KTA Tator and Imtek, Inc., 1995.

Implementation: The increased use of recycled glass in abrasive blasting will require improvements in both the quantity and quality of public information on its use.

Benefits: The beneficial health implications of using recycled glass instead of silica sand may be significant. Recycled glass may also offer economic advantages over other abrasives, when efficiently processed, due to the abundant supplies of recovered glass in many parts of the country. While screening contaminants and fine-sizing glass to appropriate specifications for blasting media is not inexpensive, costs of color-sorting post-consumer container glass can be avoided since this application is not color sensitive. By offering an opportunity for mixed color post-consumer glass as well as other types of post-industrial glass, this is an application that may improve the economic viability of glass recycling.

Application Sites: Blasting shops, shipyards, aerospace maintenance facilities, and construction sites.

Contact: For more information about this Best Practice, contact CWC, (206) 443-7746, e-mail info@cwc.org.

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