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Maintenance Tips

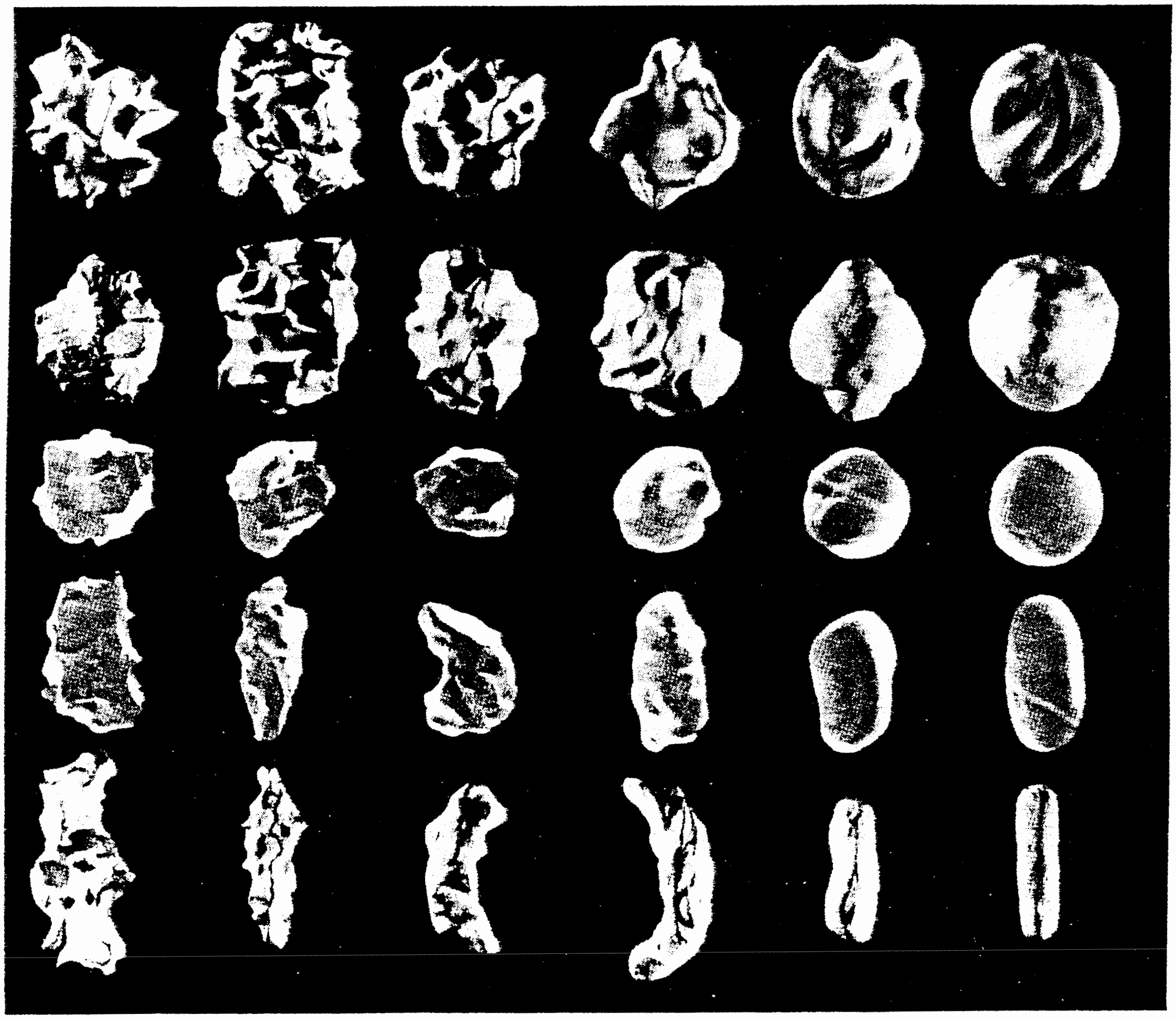
Understanding the Grain Shape of Abrasive

By James Hansink, Barton Mines Corporation

The abrasive blast cleaning industry borrows heavily from the terminology of the geological sciences. For instance, the "sand" in "sandblasting" is most often quartz or slag grains in a range of sizes that geologists define as "sand." Similarly, the concept of relative hardness adopted by the abrasive industry is taken from a term from mineralogy called the "Mohs number," developed by Friedrich Mohs, a nineteenth century German mineralogist. His scale of hardness for 10 (some scales show 15) common minerals is widely used to set minimum limits on this property. The U.S. Navy's specifi-

Roundness

Very Angular	Angular	Sub Angular	Sub Rounded	Rounded	Well Rounded
0.5	1.5	2.5	3.5	4.5	5.5



cation for hull blasting media (MIL-A-22262SH) requires that abrasives have a hardness greater than 6.0 "on the Mohs scale." Quartz sand has a hardness of 7.0, and Almandite garnet has a Mohs number of 7.5. Diamond is arbitrarily set at 10.

Understanding the terminology can help specifiers select the best abrasive for a job. This article describes another common geological notation used in the abrasive business, "grain shape."

Blasters know that "well-rounded" grains have a peening effect on the steel. Slag producers often describe their media as "angular" and therefore more effective for "cutting." "Angular" and "rounded" are derived from descriptions geologists developed for grain shapes in nature.

The American Geological Institute (AGI) has published a convenient reference to grain shapes, which is reproduced in modified form in Fig. 1.[1]

Specifiers may wish to refer to the AGI standards when calling for "angular" or "rounded" blast media. Most common media—silica sand, slags, garnet, or other natural minerals—fall naturally into the sub-angular to sub-rounded range (Fig. 2). A few media fall into the extreme ends of the definitions—well-rounded or very angular.

The figures also show that the overall shape of the grain, its length-to-width ratio, can be encompassed within the AGI definitions.

The shape of the abrasive grain affects the performance of the media. Very angular grains may tend to break down more readily than sub-rounded grains, forming greater amounts of dust. More rounded grains may present a larger surface area for contact with the steel, resulting in surface profiles that are deeper than expected.

This effect can also be understood by analogy. Suppose, for example, that a 16-pound (7-kilogram) bowling ball and a sixteen-pound (seven-kilogram) javelin are dropped from the top of a tall building to the roof of the car below. The round bowling ball makes a broader "profile" on the car's roof than the "angular" javelin.

Like the size and hardness of an abrasive, grain shape can influence materials consumption, waste minimization, dust generation, environmental compliance, and surface profile. All of these items significantly affect total project cost.

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■ Fig. 1 (left)
AGI reference to grain shapes (modified).

Courtesy of the American Geological Institute

■ Fig. 2 (top and bottom)
Photomicrographs of 2 common types of abrasive blast media. Angular coal boiler slag; sub-angular to angular Almandite garnet.

Photos courtesy of James Hansink

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Reference

1. Data Sheet 30.1, AGI Data Sheets, 3rd ed., compiled by J.T. Dutro, Jr., R.V. Dietrich, and R.M. Foose, 1989. Photo has been modified. Courtesy of the American Geological Institute, Alexandria, VA.

Tips on Sizing Dehumidification Equipment

By Charles H. Wyatt, Enviro-Air Control Corporation

High humidity can hamper blasting and lining application operations, causing flash rusting on freshly blasted steel and incomplete cure of coatings and linings. Dehumidification, the removal of moisture from the air, can help prevent flash rusting as well as premature lining failure resulting from application over moisture or improper cure. This Maintenance Tip briefly describes the types of dehumidification equipment suitable for blasting and coating operations, and it explains the basic formula for sizing dehumidification equipment based on the size of the enclosure in which the project will take place. "Enclosure," as used in the present article, includes tank and vessel interiors as well as plastic or canvas containment structures attached to tank exteriors for operations such as lead-based paint removal, unless the air flow is mandated by either federal or state regulations.

Types of Dehumidification

As described in NACE Publication 6A192, *Dehumidification Equipment in Lining Application*,[1] 4 types of dehumidification are available.

- Condensation-based (refrigerant). This method has the incoming air cross over evaporator coils to reduce the absolute amount of moisture in the air through condensation. The air then passes over both condenser coils and a series of reheat coils to increase the temperature of the incoming air and reduce the relative humidity of this air.
- Solid sorption (desiccant). This method uses a chemical to directly absorb moisture from the air while it is a vapor. Specifically, a moist air stream is passed over a desiccant that absorbs the moisture. The desiccant is then heated, forcing it to give up the absorbed moisture and regenerating the desiccant for continuous use. The heat of regeneration causes the air entering the enclosure to be substantially higher than the ambient air.
- Compression of the air. This method reduces the absolute moisture content of the air but will generally produce a saturated condition at the elevated pressure.
- Liquid sorption. In this method, the air is passed through sprays of a liquid sorbent, which then absorbs the moisture from the air. The sorbent must be

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