Assuring The Quality of Abrasives

When you clean steel by abrasive blasting, you need to produce a finish that will allow maximum adhesion of the coating. Thus, you need to create the specified profile and the specified degree of cleanliness, such as SSPC-SP 10.

The abrasive, itself, will affect both the profile and the cleanliness of the steel. To achieve the appropriate profile, you must use the right size abrasive, and to achieve the appropriate cleanliness, you must use abrasive that will effectively cut away rust, scale, old paint, and other contaminants that may be on the surface. In addition, you must be sure the abrasive is clean, so that it does not recontaminate the surface.

This Bulletin deals with assuring the quality of the abrasive you are using. It will explain how to check for cleanliness, size, and, if you are recycling the abrasive, the proper operating mix.

Documents from the Abrasive Supplier

Your abrasive supplier will have processed the abrasive before selling it to you. His processing normally involves cleaning the abrasive, testing it for chemical content, grading and separating it according to size, drying it, and preparing it for shipment in bags or bulk units.

When you purchase the abrasive, you will receive a material safety data sheet (MSDS) describing its chemical make-up and the precautions you need to take when using it. You can also request documents on sieve analysis and detailed chemical content from a laboratory analysis.

In addition to these assurances from the supplier that the abrasive meets your requirements,
there are some simple tests you can conduct to verify that the abrasive is acceptable for use.

**Abrasive Cleanliness**

Abrasive needs to be clean; otherwise, the contaminants on the abrasive will be transferred to the surface being blasted. The most dangerous contaminants on abrasive are water, oil, grease, and chloride- or sulfate-containing salts. Any of these contaminants, once transferred to the steel, can cause failure of the coatings applied over them.

One simple way to detect oil and grease is to place a handful of abrasive in a clean glass jar containing clean water. Place a lid on the jar and shake it vigorously. If a film of oil appears on the surface of the water, then the abrasive is not clean enough to use.

Checking for grease and oil contamination is especially important when you are recycling the abrasive. In this situation oil and grease can easily be picked up from the steel surface or from faulty equipment, so it is useful to check for oil and grease at regular intervals during the blasting-recycling process.

This test of abrasive with water in a jar will also let you see how much dust or dirt is in the abrasive. If the water gets very cloudy or if dust rises to the surface of the water, then the overall cleanliness of the abrasive should be questioned. Excessive dust or fines in the abrasive will make you spend more time cleaning the surface before painting.

Visual inspection should let you determine if the abrasive is dry. To keep it dry, make sure that your abrasive supply is stored properly, off the ground and under shelter. Avoid using abrasive that has been exposed to the elements because of torn bags, improper storage, or other reasons. Damp or wet abrasive, in addition to causing pinpoint rusting on a steel surface, will clog up your blast equipment and prevent efficient operation.

Detection of salt or other chemical contaminants on the abrasive can be done in a laboratory or with specialized equipment in the field. If you suspect chemical contamination, you can check for contaminants with litmus paper. The abrasive should be nearly neutral; that is, it should have a pH of 6-8. If the pH is higher or lower, the abrasive may be chemically contaminated, though a higher or lower reading is not a definitive indicator.

You can do a conductimetric analysis to check for salt contamination with a minimum amount of equipment in the field. The method is described in ASTM D-4940. In this test, you combine equal amounts by volume (300 ml) of pure water and abrasive, and after agitation, a waiting period, and further agitation, you filter the slurry and then check the water for conductivity with a conductivity meter (Fig. 1). This test will let you know if you have ionic contaminants (i.e., salts) on the abrasive. According to ASTM, a reading of 500 pμhos/cm indicates a high level of salt contamination, while a reading of 50 pμhos/cm indicates a low level. The use of a conductivity meter to check for salts is also mentioned in the draft SSPC standard on abrasives.

**Abrasive Size**

The size of abrasive you use will influence the speed of cleaning and profile created on the steel. The initial condition of the surface will influence the choices that must be
Fig. 3 Replica tape being measured to determine profile height

made. Larger particles are most effective for removing old paint, layers of rust, and mill scale. However, they create a deeper anchor profile. Small particles are most effective for removing oxides. They are also needed if the steel is pitted.

A typical slag abrasive mixture is a 10-40 gradation. These numbers mean that, typically, at least 90 percent or more of the abrasive will pass through a #10 sieve (10 lines per in.) and be retained on a #40 sieve (40 lines per in.). Particles will be in the range of approximately 0.1 to 0.025 in. in diameter. The larger particles provide more impact energy and the smaller particles provide optimum coverage. Steel abrasives are more dense and harder than slag abrasives. Therefore, finer particles are used in making up the gradation.

The size and hardness of abrasive are 2 factors that will determine the profile or anchor pattern on the steel. So it will be necessary to select abrasive that creates the profile range specified in contract documents.

Occasionally, the size of the abrasive will be specified for the cleaning job you are doing, but more often, only the profile size will be specified (and is the preferred method). You can check abrasive size with a sieve analysis as described in ASTM D-451. The sieve analysis is conducted

with screens readily available from industrial supply houses (Fig. 2).

You can check profile height with replica tape (Fig. 3) or visual comparators to see that it conforms with specifications. If the profile height is greater than the specified range, then you need to use smaller abrasive. If the profile height is less than specified, then you need to use larger abrasive.

Operating Mix
When you are recycling abrasive in a centrifugal blast machine or a field portable recycling system or a vacuum blaster, you have to deal with the problem of abrasive breakdown. As the abrasive is used, it breaks up and is worn down by impacts with the work surface. A separator in the recycling system should remove abrasive "fines," that is, particles that are too small to be useful for cleaning. You will need to add fresh abrasive to the system at regular intervals to account for the loss from breakdown and to maintain an operating mix of abrasive sizes that will effectively clean the steel and create a consistent profile.

Quality control
You can make sure that the abrasive you use will not have a detrimental effect on coatings performance by making a few routine checks, such as testing for cleanliness in a jar of water, measuring abrasive size with a sieve analysis, and measuring profile with replica tape.

More elaborate testing, such as conductimetric analysis or laboratory testing for salts, may be required in some instances. ATB