FINTEC
METAL FINISHING TECHNOLOGY

ABRASIVE BLAST MEDIA

SELECTING THE RIGHT ABRASIVE

A coating is only as good as the preparation of the underlying surface.

Professional wet abrasive blasters know that **choosing the right abrasive is key to achieving a coating application that lasts.** With the right abrasive, you'll maximize profits by getting the job done faster while expending the minimum volume of abrasive.

These are the factors to consider when **choosing your abrasive.**

SURFACE CHARACTERISTICS

As a general rule, the blaster should **use the finest abrasive necessary to attain the required surface preparation characteristics**. A fine abrasive will give you more impacts per volume. The more particles in the stream, the more work is accomplished in the same time. When blasting concrete or wood, you don't need a hard, expensive abrasive, or a coarse particle: **crushed glass** makes an excellent, inexpensive choice for work on relatively soft surfaces.

However, when preparing iron and steel for a protective coating system, there are additional considerations. Coatings adhere poorly to hard, flat surfaces, so the blaster is required to develop a pattern of indentations that the coating can anchor to, aka **the anchor pattern.**

THE ANCHOR PATTERN

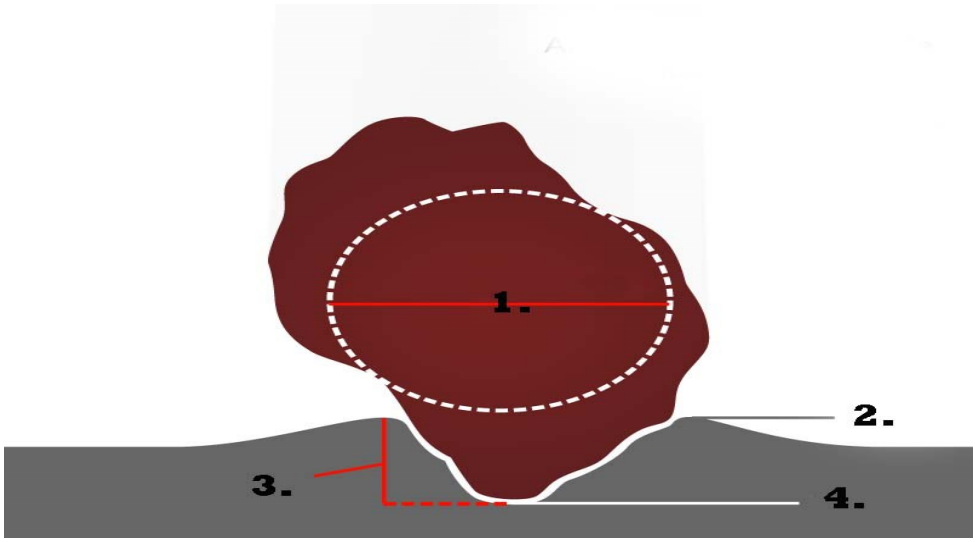
When a sufficiently hard abrasive particle strikes steel, it deforms the surface into a **valley** and pushes up **peaks.** The distance between the top of the peak and the bottom of the valley is known as **the depth profile.**

In the U.S., the depth profile is measured by **mils** – thousandths of an inch. In the metric system, the **micron**(one millionth of a meter) is used.

1 mil = 25.4 microns.

For optimal adhesion, the applied coating should **completely fill the valleys and cover the peaks**. The deeper the profile, the more anchoring occurs. However, if the profile is too deep, the peaks can protrude beyond the surface of the coating, causing pinpoint rust and premature failure of the coating. In some cases, the contractor may be required to go back over the area with a finer abrasive to reduce the surface to specified profile depth – a costly mistake.

Generally, the correct profile depth will be **25-30% of the dry film thickness** of the total coating system. For most industrial coatings, **the typical steel profile is between 2-3 mils**, not normally exceeding 5 mils.



An 80-mesh garnet particle leaves up to 3.6 mil depth profile in steel.

1. 177 microns = **7 mils**

2. Peak

3. 76.2 microns = **3 mils**

4. Valley

Before choosing your abrasive, check the data sheets from the coating manufacturer's website to obtain the optimum surface preparation conditions.

For example:

Iron & Steel – SSPC-SP6 – 2 mil profile.

ABRASIVE PROPERTIES

Knowing the surface characteristics and the profile depth you need to achieve; you are ready to select your abrasive. There are four properties of abrasives that contribute to profile depth: ***size, shape, hardness*** and ***density.***

SIZE

All things being equal, the bigger the particle, the deeper indentation it will make, but blasting large particles will give you less impacts than an equal volume of smaller particles. Small particles clean faster, provide better coverage, and result in a more uniform profile. The most efficient approach is to **use the smallest particle necessary to achieve the desired profile.**

Particle sizes are commonly classified by mesh sizes, often given a range, for example: 30/60. This indicates that 95% of the mix will fall through a 30 mesh but not pass through the 60. The *mesh size number* indicates **the number of mesh lines per square inch in a sieve**, ranging from 6 (coarse) to 327 (powder).

PARTICLES - MESH SIZES TO MICRONS

Mesh Size	Particle Size*	Microns (µm)	Common Examples
20		841	
30		595	Granulated Sugar
40		400	Coffee
50		297	Black Pepper
60		250	
70		210	
80		177	
100		149	
120		125	Table Salt
140		105	Powdered Sugar
170		88	Human Hair

SHAPES

The shape of the article effects how deeply it cuts into the coating and underlying substrate. Shapes are classified according to angularity.

Angular particles cut through soft coatings and rust, cleaning faster, and producing sharper anchor patterns. **Rounded particles** produce a more even, peened surface, good for breaking away hard brittle coatings and mill scale.

Angular

- CRUSHED GLASS
- COAL SLAG

Sub-angular

- OLIVINE
- PLASTIC
- GARNET

Sub-rounded

- STAUROLITE
- WALNUT

Rounded

- GLASS BEAD
- SILICA SAND

HARDNESS

Generally speaking, the harder the particle, the deeper the profile it will impart, except in cases where a high-velocity hard particle shatters, delivering less than optimum force.

Softer abrasives, like organic materials and plastics, are good for removing dirt, oil, grease and paint **without creating an anchor pattern** in the underlying substrate.

Abrasives by Hardness (MOHS)	
Plastic	3.0 - 4.0
Walnut	3.0 - 4.0
Glass Bead	5.5 - 6.0
Silica Sand	5 - 6
Crushed Glass	5.5 - 7
Coal Slag	6.0 - 7.5

Olivine	6.5 - 7.5
Staurolite	7.0 - 7.5
Garnet	7.0 - 7.5

DENSITY

Dense particles impact with more kinetic energy over a smaller surface area, resulting in a deeper profile. Dense particles also deform less, absorbing less energy upon impact.

Abrasives by Density (Specific Gravity (g/mL))	
Water	1.0
Walnut	1.2 - 1.35
Plastic	1.5
Glass Bead	2.5
Crushed Glass	2.5
Silica Sand	2.65
Coal Slag	2.7

Olivine	3.3
Staurolite	3.6
Garnet	3.5 - 4.3

VELOCITY

It comes as no surprise that high speed impacts cause deep profiles. Velocity is the only factor that can be easily adjusted in the field. Once you've selected the abrasive that puts you in the ballpark, you can **fine-tune the depth profile by adjusting your blast pressure.**

ABRASIVE DESCRIPTIONS

The following data is intended for orientation purposes only. These are approximations of general product categories. Specific products vary significantly. Check the manufacturer's data sheets for the most current and accurate information.

Depth profile estimates are based on mild steel at 90-100 psi, nozzle at 18" at a 110-degree angle using a Geo-blaster GB 600 wet abrasive blaster.

SILICA SAND

Silica sand is the original blasting abrasive, but is no longer recommended for blasting applications due to the occupational hazard silicosis. It is included here for comparative purposes only.

Mesh sizes: **6-270** | Hardness: **5-6 MOHS** | Density: **2.65 SG** | Shape: **Rounded** | Cost: **$**

GARNET

Garnet is a gemstone with excellent naturally abrasive properties. This hard abrasive is fast-cutting, low-dust producing and low-consuming, excellent for removing tough coatings, paint, rust and mill scale from steel. Garnet also permits precise feathering control. A good general outdoor surface preparation abrasive.

Mesh sizes: **30-120** | Hardness: **7-7.5 MOHS** | Density: **3.5-4.3 SG** | Shape: **Subangular** | Cost: **$$$**

DEPTH PROFILES FOR GARNET (for steel)

Mesh Size	Max Profile	Recommended Usage
30/60	2.4 - 4.7 mil	Steel, Concrete, Asphalt, Aluminum
80	1.5 - 3.6 mil	Steel, Concrete, Asphalt, Aluminum
120	0.5 - 2.0	Steel, Concrete, Asphalt, Aluminum, Fiberglass, Brick, Boat Bottom Paint
150	0.5 - 1.5 mil	Steel, Concrete, Asphalt, Aluminum, Fiberglass, Brick, Boat Bottom Paint

CRUSHED GLASS

Made from 100% recycled glass, this abrasive creates a sharp profile and is useful in removing a variety of coatings. It produces a whiter, cleaner finish than slags and mineral sands. Crushed glass is the abrasive of choice for preparing concrete.

Mesh sizes: **30-400** | Hardness: **5.5-7 MOHS** | Density: **2.5 SG** | Shape: **Angular** | Cost: **$**

DEPTH PROFILES FOR CRUSHED GLASS (for steel)

Mesh Size	Max Profile	Recommended Usage
20/30	2.5 - 4.5 mil	Steel, Concrete, Asphalt, Aluminum, Fiberglass, Brick
30/70	2.0 - 3.5 mil	Steel, Concrete, Asphalt, Aluminum, Fiberglass, Brick, Boat Bottom Paint
50/100	0.5 - 2.5 mil	Steel, Concrete, Asphalt, Aluminum, Fiberglass, Brick, Boat Bottom Paint

MINERAL SANDS

Mineral sands, like olivine and staurolite, are fast-cutting, low dust abrasives that contain less than 5% silica per volume. Good for removal of rust, paint, weathered coatings and mill scale.

Mesh sizes: **20-120** | Hardness: **6.5-7.5 MOHS** | Density: **3.3-3.6 SG** | Shape: **Angular to subangular** (olivine), **subangular to rounded** (staurolite) | Cost: **$$**

COAL SLAG

Coal slag is by-product of coal-burning power plants, considered a “green” abrasive because it would otherwise be disposed of as waste. It is a relatively cheap, low dusting abrasive with low free silica,

but is considered a dirty abrasive and not widely used in wet abrasive blasting because the high amount of “fines” (fine particles) mud up on the surface. Typical applications include the removal of rust, paint, weathered coatings and scale from steel and concrete.

Mesh sizes: **12-80** | Hardness: **6-7.5 MOHS** | Density: **2.7 SG** | Shape: **Angular** | Cost: **$**

GLASS BEADS

Glass beads are used for general cleaning, peening and cosmetic finishing of sensitive metal surfaces; removing automotive paint; brightening grout and removing fungus and calcium deposits from tile; polishing cast iron, stainless steel, aluminium, propellers and turbine blades.

Mesh sizes: **30-325** | Hardness: **5.5-6 MOHS** | Density: **2.5 SG** | Shape: **Rounded** | Cost: **$$$**

PLASTIC

Plastic is a soft, light abrasive that leaves no anchor pattern, good for stripping paint and mold from sensitive surfaces, deburring and deflashing aluminum, brass, plastics and fiberglass. Considered a less-hazardous alternative to chemical stripping, and faster than hand-stripping.

Mesh sizes: **12-80** | Hardness: **3-4 MOHS** | Density: **1.5 SG** | Shape: **Angular** | Cost: **$$$**

WALNUT

Nut shells and other organic materials don’t cause anchor patterns, making them useful for cleaning dirt, grease, oil, carbon, scale, burrs and paint without changing the underlying substrate. Useful for cleaning auto body panels, electric motors and aircrat engines, dies and molds, polishing watches ad jewelry, and restoring antique surfaces.

Mesh sizes: **6-100** | Hardness: **3-4 MOHS** | Density: **1.2-1.35 SG** | Shape: **Subangular** | Cost: **$$$**

SUMMARY

The right abrasive for the job is the finest grade that can impart the depth profile required by the coating system.

Before purchasing abrasive, visit the manufacturer's websites for the latest product specs, or browse our directory of abrasive manufacturers product data sheets

Abrasive Name	Mesh Size	Hardness	Density	Shape	Cost
Silica Sand	6-270	5-6	2.65	Rounded	$
Garnet	30-120	7-7.5	3.5-4.3	Subangular	$$$
Crushed Glass	30-400	5.5-7	2.5	Angular	$
Mineral Sands	20-120	6.5-7.5	3.3-3.6	Angular to Rounded	$$
Coal Slag	12-80	6-7.5	2.7	Angular	$
Glass Bead	30-325	5.5-6	2.5	Rounded	$$$
Plastic	12-80	3-4	1.5	Angular	$$$
Walnut	6-100	3-4	1.2-1.35	Subangular	$$$