Abrasive Blasting

Abrasive blasting or blast finishing, with all its variations, can provide enough power to remove heavy surface materials, or can be gentle enough to take print off paper without penetration. Typically, blasting is commonly used for three general purposes – as a surface finishing, preparation, or modification process.

As a finishing process, it is routinely used to:

- Remove surface contamination.
- Create a specific finish on a desired surface.

As a preparation process, it is routinely used to:

- Roughen surfaces for the application of paint.
- Remove surface irregularities.

As a modification process, it is used to increase compressive stresses on the surface to:

- Provide increased fatigue life.
- Decrease susceptibility to stress corrosion.
- Correct distortion.
- Form structural steel and plate.

Regardless of its uses, there are only two basic methods of blasting – wet or dry. The major focus of this summary will be on the dry blasting method. Wet blasting is a precision finishing operation. It normally consists of an air-blasted slurry of fine abrasive suspended in a chemically treated water. Wet blasting can be controlled to avoid metal removal and hold dimensional tolerance to within 0.0001-inch. It is also used to hone multi-tooth hobs, and finish fragile items such as hypodermic needles. Wet blasting equipment is usually cabinet style, and reserved for small, delicate workpieces.

Common Applications / Equipment

Manual Cabinet, Rotary Basket, Rotary Table, Automated Feed Booths, Tumblers, Barrels, Oscillation Units, and Blast Rooms (Open and Closed type) *(See figures in back)*

Feed Materials

- **Media** used in dry blasting processes can vary from facility to facility or from day to day within one facility, depending on the specific needs of the customer. Regardless, the media used can range in size from 20 to 6000 mesh. The style of dry blasting will determine the size of the particulate to be collected. *(See Table 1 for a list of common blast media)*
- **Particulate** from the blasted material must also be considered when selecting dust collection equipment. This material can make up as much as 95% of the collected contaminate in the dust collector. Fire, explosion, corrosive, or toxic considerations may also be required depending on the specific application.

- **Style** of dry blasting, as well as use, will determine the loading conditions of the dust collector.
  - **Direct pressure** style provides a more uniform finish in a shorter period of time, and offers more precise system controls, making the machines more appropriate for heavy finishing jobs. This style is commonly used to remove heavy mill scale or paint, hard to reach recessed areas, odd shapes, large workpieces, and high-speed production. Consequently this style can produce heavy grain loading conditions.
  - **Induction (suction)** style is usually used in light to medium production, limited space, and moderate budget requirements. In this style, some pressure is lost to the media suction requirement; therefore it is less efficient than the direct pressure style. Usually reserved for cabinet type blasting units, this style typically does not generate high grain loading. However, if multiple cabinets are exhausted, grain loading can increase significantly.
  - The **Airless or Blast Wheel** style is usually used in heavy production requirements where the need for automated systems are necessary and human interface is minimal. Parts may be conveyed to the blasting machine, or multiple parts can be loaded into the machine at one time. Due to the amount of blast media used, these machines can also produce heavy grain loading conditions.

Collection Strategy

- **Hooding** should be kept as far from the actual blasting process as possible, but still maintain proper removal of the contaminant. There are two advantages to keeping the collection hood distant – 1) reducing the possibility of clean or good blast media from entering the dust collector, and 2) reducing the effects of abrasion. Only the dust should be collected.
- **Inlets** to the dust collector should be accomplished through one or more of the following types. Remember that the blast media is designed to remove unwanted material or alter a surface, and it will do the same thing to the dust collector and filter elements.
  - **Abrasion Resistant (A/R) Inlet**
  - **Drop-out box**
  - **Abrasion Resistant Liner**
  - **Cyclone Prefilter**
  - **Air Management Module (AMM)**
  - **Extended Dirty Air Plenum (EDA)**
  - **Duct tapered to full inlet dimensions**
- **Loading** conditions to the dust collector play a large part in how well the collector will perform. Even if the media is not the most abrasive, a large enough volume of it can prove fatal to the filter elements. Again, inlet considerations should be taken into account to reduce the loading to the collector.
- **Air Volume** has not been enforced. No legislative body has set volumetric flow rates for blasting process, only suggestions that the process must be ventilated. Each applications' volume will be determined by the equipment used, material being blasted, and any specific customer requirements. Typical requests are for visible clarity, dust containment, or draft velocity.

- **Visible clarity** requests are typically based on the frequency of systematic air exchanges within a given volume. These requests are usually associated with the time it takes for the blasting environment to become visually impaired. Blast room recommendations are 60-100 cfm/ft^2 of floor or ceiling, and 100 cfm/ft^2 of wall space for side draft. Typical cabinet blasting recommendation is 20 air changes per minute.
- **Dust containment** requests are usually associated with cabinet or automated blasting processes. Air volume is based on the velocity necessary through the open areas in order to prevent dust from escaping the enclosure. Cabinet recommendation is 500 fpm inward velocity through the open areas without curtains. For rotary tables, use 200 cfm/ft^2 of opening.
- **Draft velocity** requirements are generally associated with blast rooms, and volume is based on a given feet per minutes across a given area. Common recommendation is 150-200 fpm through the room, across the workpiece, away from the worker(s).

- **Special Considerations** should be taken regarding the material being blasted. Blasting on explosive, flammable, corrosive, or toxic material means that these precautions should be applied to the dust collector.

Application Matrix (Cartridge)

Blast Media	Collector	AMR in cfm/ft^2	Filter Media	Comments
Black Beauty (carbonized slag) Automated	DFO DFT SDF TD	1.6:1 1.1:1 1.1:1 1.0:1	Ultra Web® II Ultra Web II Ultra Web II Ultra Web II	Look at properties of the material being blasted
Black Beauty (carbonized slag) Manual	DFO DFT SDF TD	2.1:1 1.3:1 1.3:1 1.1:1	Ultra Web II Ultra Web II Ultra Web II Ultra Web II	Look at properties of the material being blasted
Blasting (NOC*) Automated	DFO DFT SDF TD	2.4:1 1.4:1 1.3:1 1.1:1	Ultra Web II Ultra Web II Ultra Web II Ultra Web II	Look at properties of the material being blasted
Blasting (NOC*) Manual	DFO DFT SDF TD	3.0:1 1.8:1 1.8:1 1.6:1	Ultra Web II Ultra Web II Ultra Web II Ultra Web II	Look at properties of the material being blasted

* NOC – not otherwise classified

Application Matrix (Baghouse)

Blast Media	Collector	AMR in cfm/ft^2 (MAX CAN VELOCITY)	Filter Media	Comments
Black Beauty (carbonized slag) Automated	PJD HPT & W HPH RF MB	2.5:1 5.0:1 4.5:1 4.0:1 4.0:1	Polyester, Untr. Polyester, Untr. Polyester, Untr. Polyester, Untr.	Look at properties of the material blasted
Black Beauty (carbonized slag) Manual	PJD HPT & W HPH RF MB	3.0:1 6.0:1 5.0:1 5.0:1 5.0:1	Polyester, Untr. Polyester, Untr. Polyester, Untr. Polyester, Untr.	Look at properties of the material blasted
Blasting (NOC*) Automated	PJD HPT & W HPH RF MB	5.5:1 *(350 fpm) Cont. Tech. Svcs.* 11.5:1 *Cont. Tech. Svcs*. 9.5:1 *Cont. Tech. Svcs*. 7.5:1 *(400 fpm) Cont. Tech. Svcs*. 5.5:1 *(350 fpm) Cont. Tech. Svcs*.	Polyester, Untr. Polyester, Untr. Polyester, Untr. Polyester, Untr.	Look at properties of the material blasted
Blasting (NOC*) Manual	PJD HPT & W HPH RF MB	6.0:1 *(350 fpm) Cont. Tech. Svcs.* 12.0:1 *Cont. Tech. Svcs*. 10.0:1 *Cont. Tech. Svcs*. 8.0:1 *(400 fpm) Cont. Tech. Svcs*. 6.0:1 *(350 fpm) Cont. Tech. Svcs*.	Polyester, Untr. Polyester, Untr. Polyester, Untr. Polyester, Untr.	Look at properties of the material blasted

* NOC – not otherwise classified

Notes

Almost all blast media is reusable several times over. Typically only 5% - 8% of the media is spent during a single blast sequence. Consider the material being blasted with every application. Do not mix ferrous and non-ferrous metals in the same collection system. All blast media is considered abrasive, and abrasion-reducing equipment should be applied with each collection system. Due to the extremely wide variety of material to be blasted, the media available, and the style of blasting used, not all applications are addressed in this report.

Legislation

NIOSH (1974b)
OSHA (29 CFR 1910.94 & 29 CFR 1910.1000)
WAC (296-24-67507)
PEL – Aluminum Metal Dust = 10 mg/m^3
PEL – Crystalline Silica (Quartz) 100 $\mu g/m^3$

Attachments

Definition of common Blasting Terms
Blasting equipment illustrations

References

- *Industrial Ventilation Manual*

Definitions:

1. ***Media*** – Substance used in an abrasive blasting operation. Media may be in granular, powder, pellet, or shard form depending upon specific customer requirements.

2. ***Abrasive Blasting*** – The forcible application of an abrasive media to a surface by pneumatic pressure, liquid pressure, or centrifugal force.

3. ***Blast cleaning barrel*** – A complete enclosure which rotates on an axis, or which has an internal moving tread to rumble the parts, in order to expose various surfaces of the part to the action of the blast spray.

4. ***Blast cleaning room*** – A complete enclosure in which blasting operations are performed and where the operator works inside of the room to operate the blasting nozzle and direct the flow of the abrasive material.

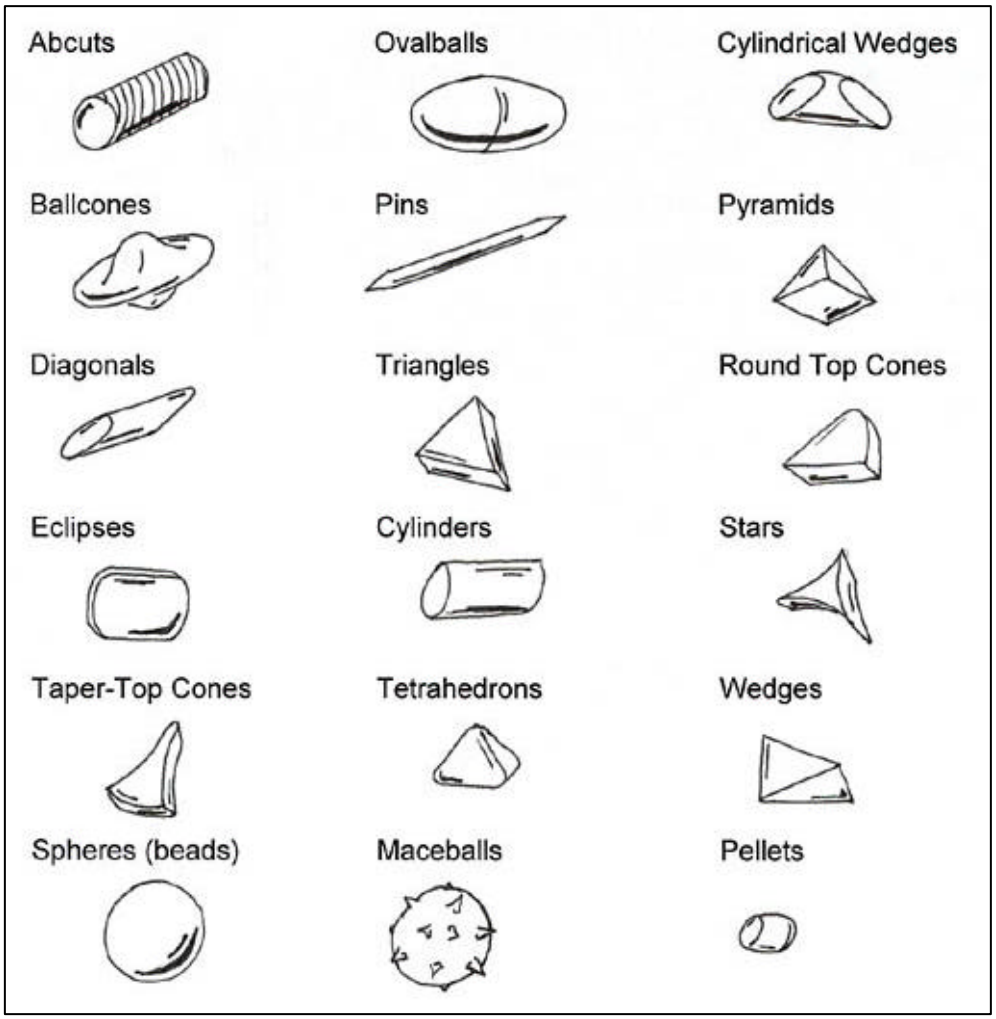
5. ***Blasting cabinet*** – An enclosure where the operator stands outside and operates the blasting nozzle through an opening or openings in the enclosure.

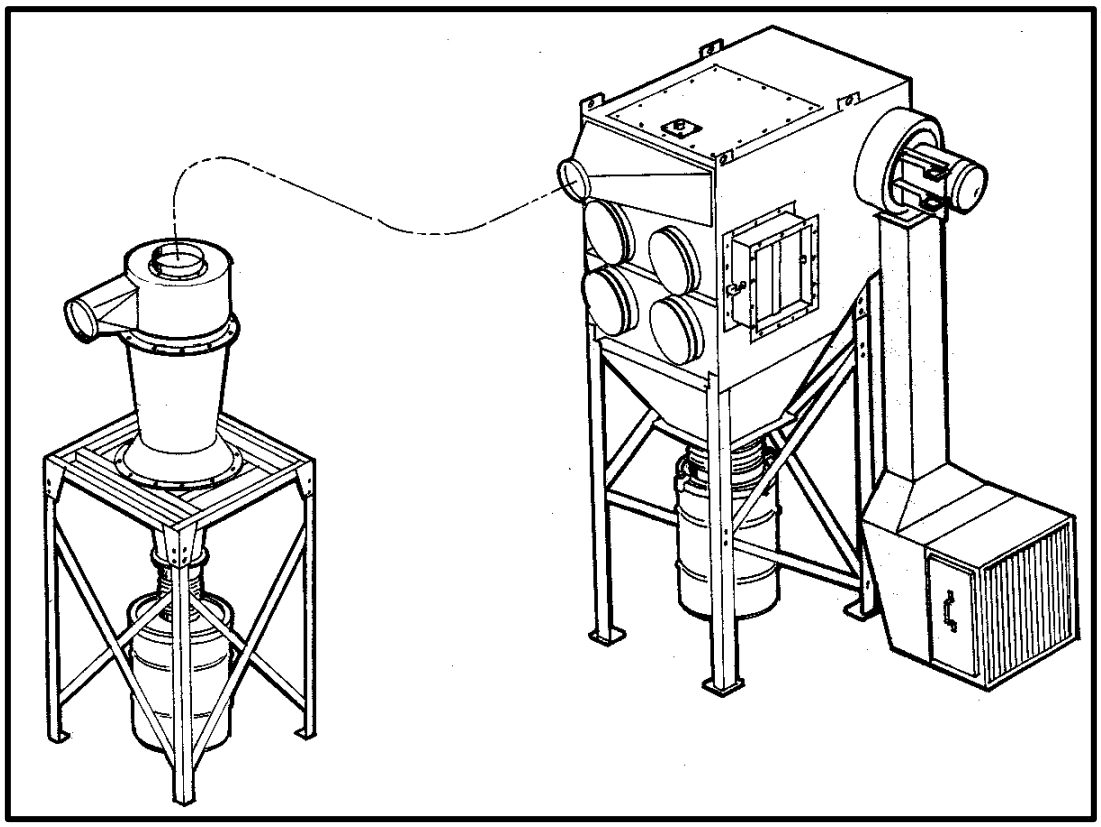
6. ***Rotary blast cleaning table*** – An enclosure where the pieces to be cleaned are positioned on a rotating table and are passed automatically through a series of blast sprays.

Table 1 – Specific Blasting Media

Sand	Walnut Shells	Carbon Steel Shot
Glass Bead	Aluminum Oxide	Pecan Shells
Apricot Pits	Corn Cob Meal	Dry Ice Pellets
Ceramic	Plastic	Stainless Steel Shot
Black Beauty (carbonized slag)	Rare Earth Minerals	Sodium BiCarbonate (Baking Soda)
Grand Blast Mix (combination glass bead and aluminum oxide)		

Table 2 – Blast Media Shapes

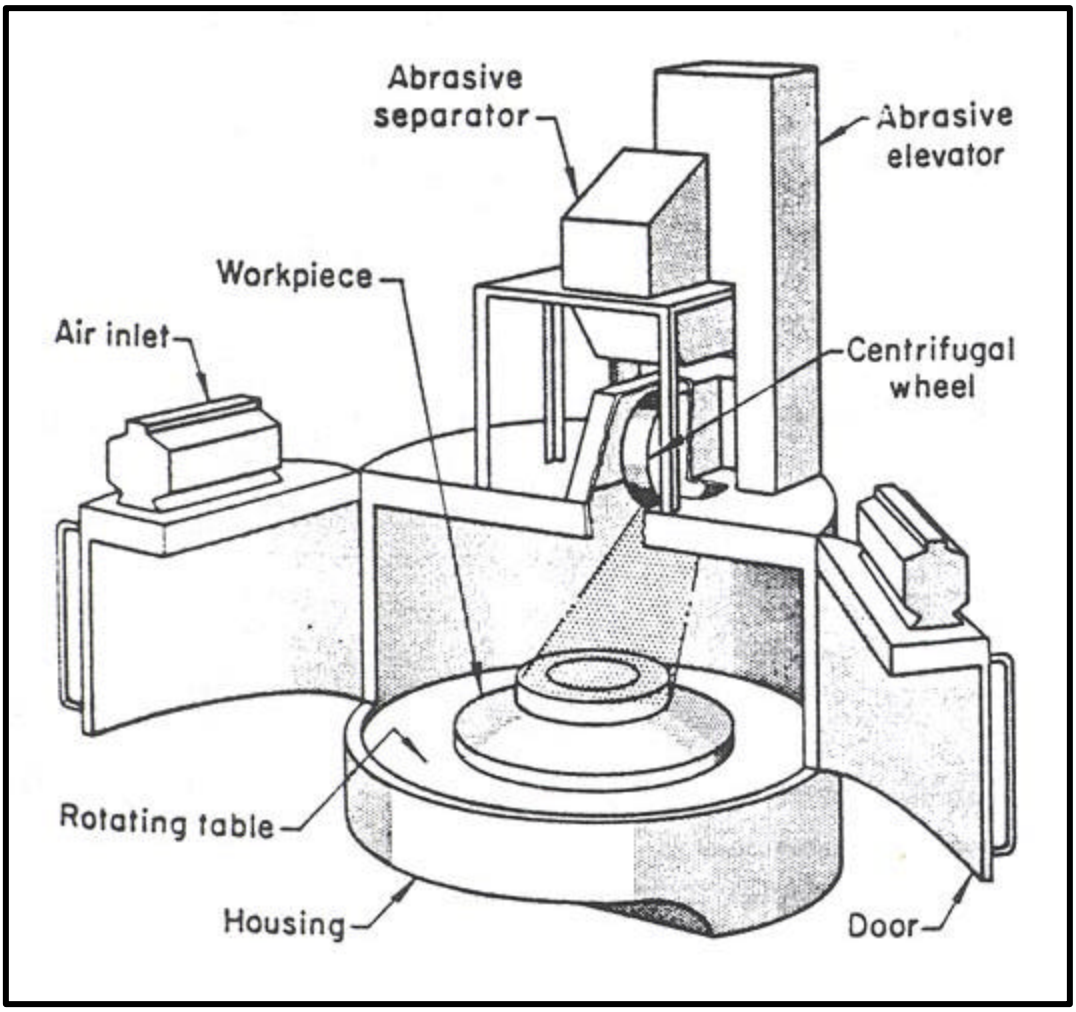




DFT 2 – 8 with unpowered KD Cyclone precleaner / load reducer

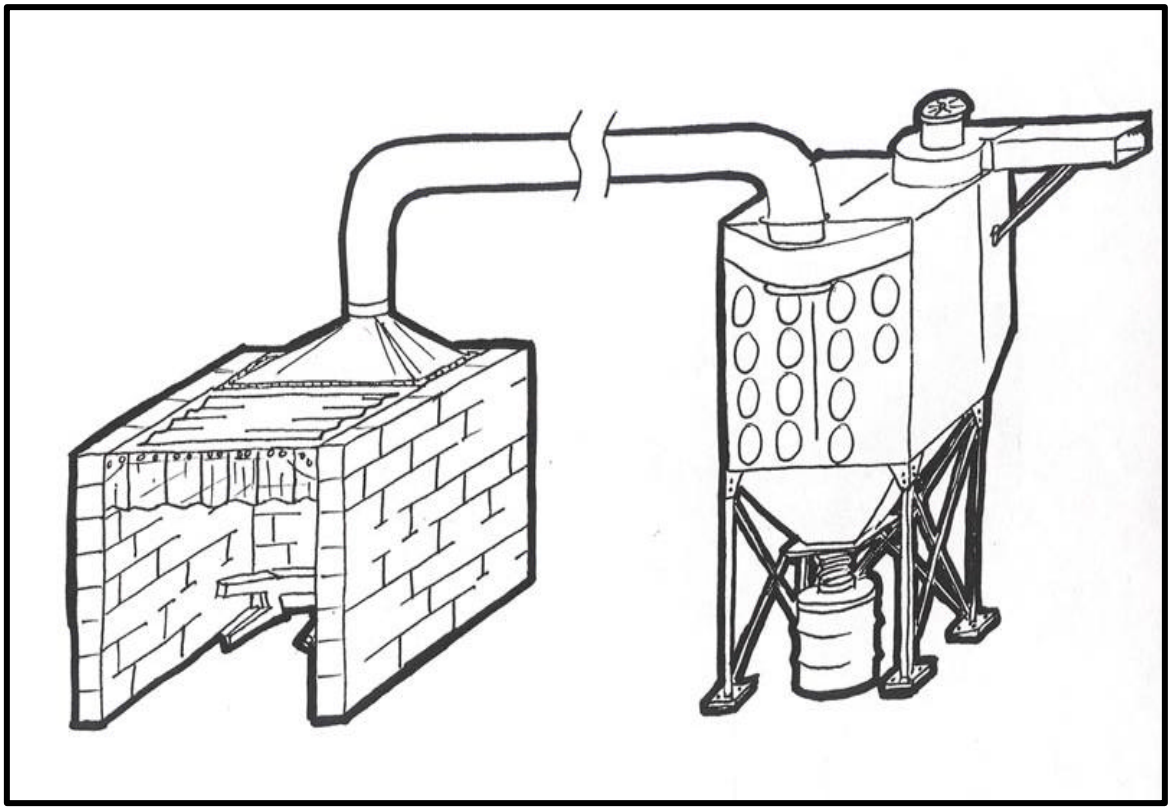
A Cyclone becomes the weak link in the collection chain. Abrasion will eventually wear out the cone. Because a KD version is used, the cone can be easily removed and replaced with very little effort and cost. Without the Cyclone, the DFT filter elements would suffer severe abrasion.

*Note – BIBO, explosion vent, and HEPA options indicating a possibly toxic contaminant

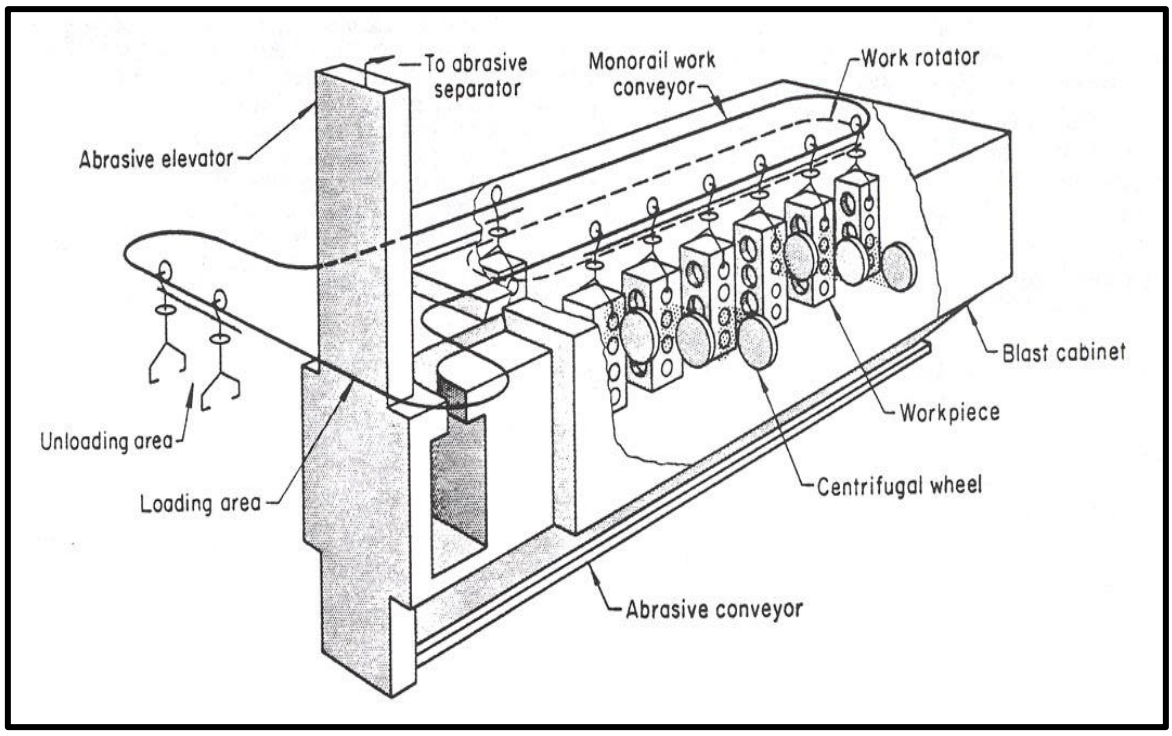


Rotary Table type blasting machine

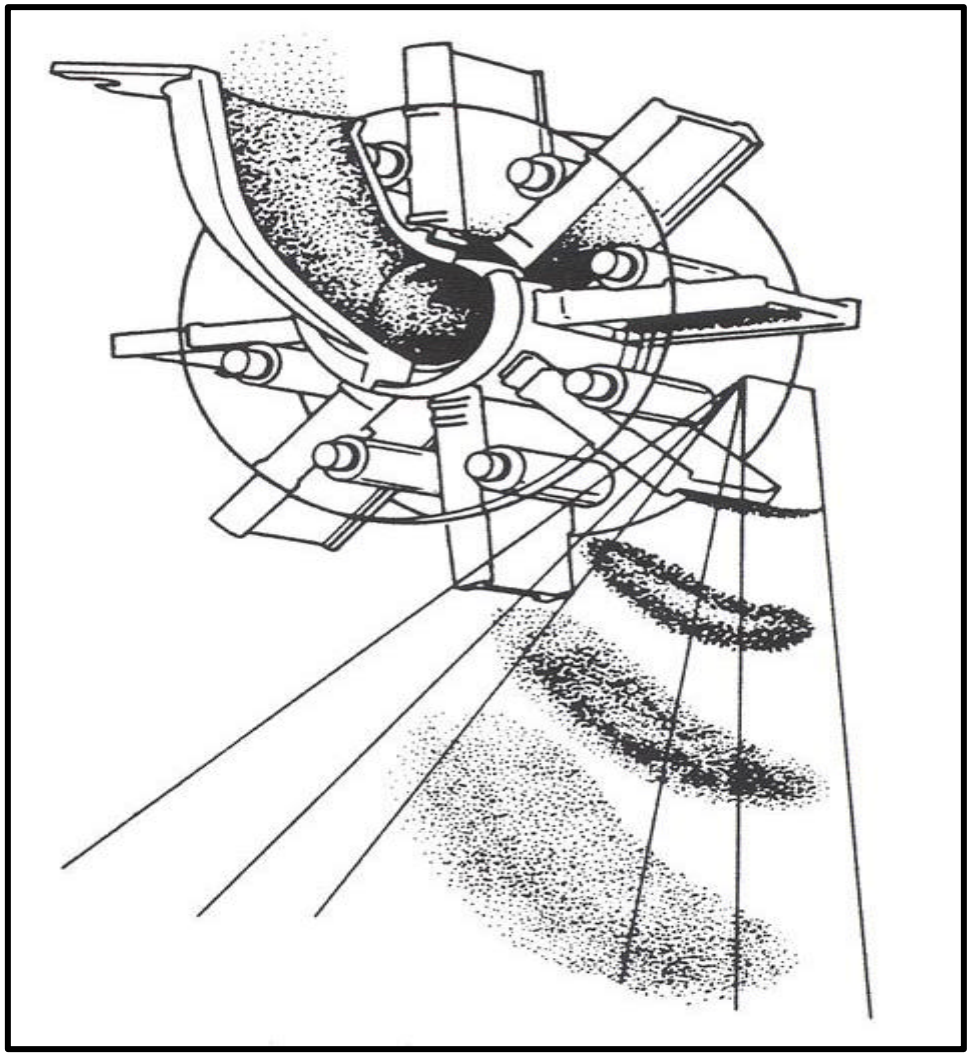
The centrifugal blast wheel propels the abrasive particles against the workpiece, as it is rotated in the chamber.



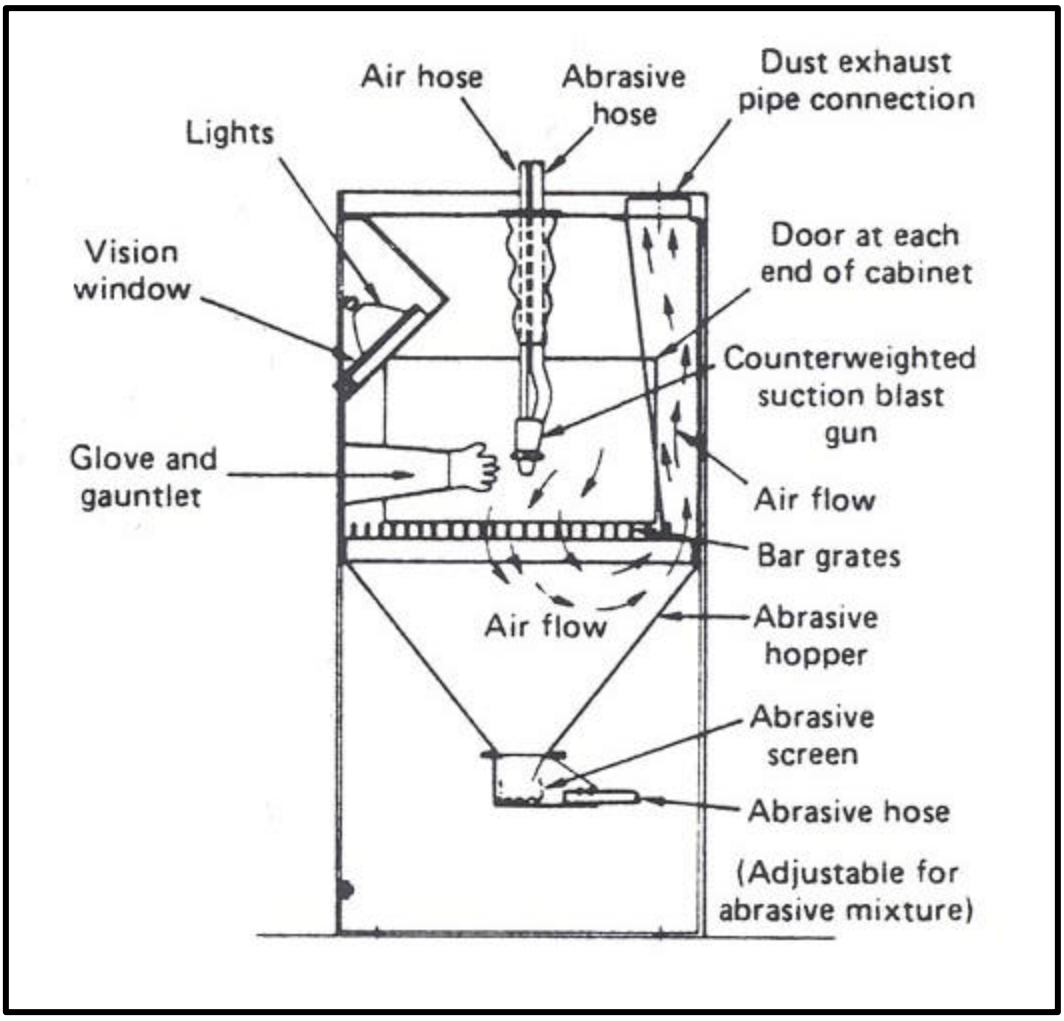
Simple open type blast room, DFT 4-32 with Abrasion Resistant (A/R) Inlet



Automated, continuous centrifugal blast wheel type cleaning machine, commonly used in high production applications



Centrifugal Blast Wheel (slider type)



Typical blast cabinet. Dual hose into the cabinet top indicates an induction (suction) style of blasting