

PRESURFACE TREATMENT OF ALL MATERIALS BY SANDBLASTINGShikha parashar¹, Anil Kumar Parashar²¹B.Tech 3rd year (mechanical) Krishna Institute of Engineering & Technology, Ghaziabad, Uttar Pradesh, India, shikha04021993@gmail.com²M.tech final year(mechanical) Karnataka State Open University, Director DGAQA, Ministry of Defense, New Delhi, India, anilkumarparashar1@gmail.com

Abstract- Sandblasting is a general term which is used to describe the act of propelling very fine bits of material at a high velocity. This process is used for cleaning or etching the surface before the treatment of the surface. Prior to powder coating, painting or spray galvanization, metals are required to be sandblasted according to their surface conditions. The use of diverse blasting materials creates various types of surface results. Various substrate surfaces (e.g. steel, concrete, wood, glass, plastic etc.) and blasting materials create convincing effects and solutions. The aim of the present work is to analyze the performance of sandblasting as a solution for presurface treatment of materials.

Keywords- Sandblasting, Sandblaster, Abrasives, Presurface treatment

I. INTRODUCTION

Sandblasting is actually an old term for “abrasive blasting”. Sandblasting is a process of using compressed air to propel abrasive media at a very high velocity on a surface to clean (usually rust, old paint), debur or to prepare the surface for a coating of some sort. . It is also one of the easiest, quickest and convenient ways to remove impurities from surface prior to any type of coating. These typical figures compare the surfaces before and after sandblasting.

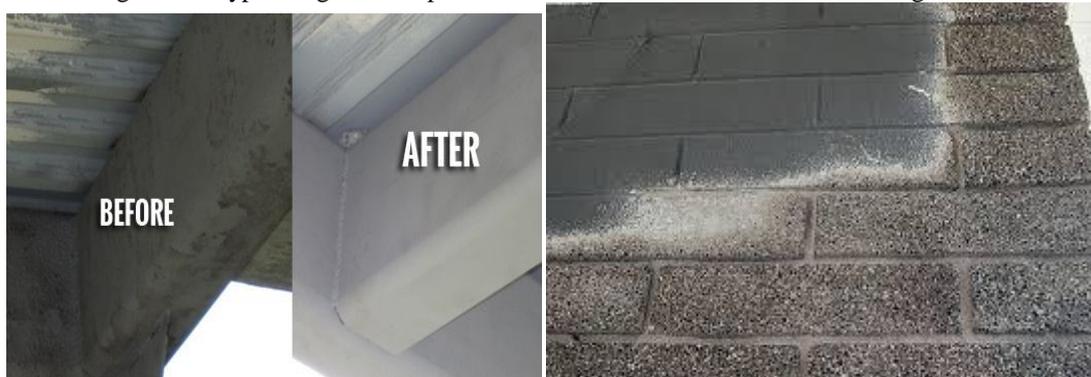


Fig (1) shoes a comparison between surfaces before and after sandblasting.

This is a delicate process which requires a controlled environment, complete with proper ventilation, independent air supply, and protective equipment.

II. NEED FOR SANDBLASTING

- To remove the oil, grease and scale present on the surface.
- Projection of the abrasives removes corrosion from the surface.
- Providing such a surface condition which has easy adhesion to the paint.
- We know that approximately 80% of the surface failures occur when the pretreatment of the surfaces is not done properly.
Therefore this step of sandblasting the surface, prior to painting, galvanization or any sort of coating must not be overlooked as it is considered as the most critical stage for a good pretreatment of surface.
- It is one of the easiest and the fastest way to remove old paint and rust from the metal surface. It is very much convenient in usage.



Fig (2) shows a person carrying out sandblasting

- This process is also useful for cleaning those surfaces which are difficult to reach.
- Smooth finish of the product is obtained by this process.

III. SANDBLASTING PROCESS

This is the process of blowing fine sand at a high pressure with the help of compressed air that is passed through the nozzle at a very high velocity. The sequences of operations in sandblasting are as follows:

- Loading of abrasives into the compressor.
- Second step is focusing of pressurized air through the nozzle on the surface to be sandblasted.
- Nozzle along with controlling the pressure and velocity also helps in creating a trajectory for the blast.

IV. SANDBLASTING EQUIPMENT

There are two kinds of sandblasters: “Suction” / “Siphon” & “Pressure” Blast Systems. Pressure blast systems are the systems which are ten times more effective and quicker than the suction blasters

4.1. Pressure blasters

Pressure blast systems are the systems which are ten times more effective and quicker than the suction blasters. They are also easier to use. They consist of large container comprising of silica sand under high pressure. A gun is joined to the upper portion of the container with the help of a hose that can bear the abrading effects of sand.

4.2. Siphon/suction blasters

These blasters are moderately cheap and are more likely to find. They consist of three main parts. A sandblasting gun with two hoses of which one hose is connected to the bottom of the handle and the other hose is connected to the lower side of the barrel. It has a repository of loose sand. Some type of container or bucket is formed by this type. As the gun is fired, the air creates a suction that pulls the sand into the gun. Now sand can be reused by collecting it and placing back into the reservoir.

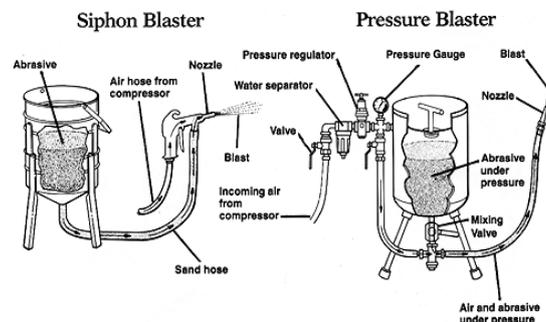


Fig (3) shows the siphon and pressure sandblasters.

The sandblaster is basically divided into three main categories;

- The abrasive medium
- The air compressor
- The nozzle

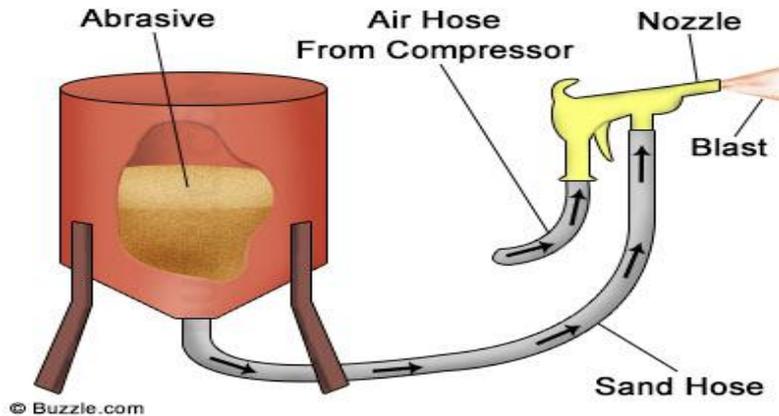


Fig (4) shows various parts of sandblaster.

1) **The abrasive medium**

Abrasive medium forms a stream which is forcibly propelled on a rough surface to smoothen the surface and to clean it.

- a. **Glass beads**- They are used for softer materials as well as they do not provide any harm or damage to the surface.
- b. **Silicon carbide**- Due to the hardness of silicon carbide they are used on heavy duty equipments.
- c. **Pick steel shot**- By leaving a smoother finish than other media, pick steel shot allows easy application of paints and adhesives.
- d. **Dry ice pellets**- one of the newest methods used in sandblasting, dry ice pellets can clean any surface sensitive to residual dust left by other media. Since they just vaporize in a few minutes, sandblasting using dry ice pellets will not harm electrical or mechanical equipment.

2) **Air compressor**

Air compressor is a mechanical device which increases the pressure of the air by decreasing its volume. This air compressor is a type of gas compressor. Air compressors are similar to pumps which increase the pressure on the fluid and can transport fluid through the pipe.



Fig (5) shows diagram of an air compressor used for sandblasting.

Nozzles- Abrasive blast cleaning nozzles are used in many surface preparation applications. Wherever a surface needs cleaning and profiling using blasting media industrial quality wear resistant carbide nozzle should be used. To maximize productivity of abrasive blast cleaning system it is important to select correct carbide nozzle for media being used.



Fig (6) shows the parts of nozzle used in sandblasting.

These nozzles are mostly of three types: Ceramic nozzles, Tungsten nozzles, and Boron carbide nozzles

- **Ceramic nozzles** –These nozzles are been a staple in blasting industry since the beginning. They perform better with soft abrasives, but wear quickly with today’s more advanced abrasives. It takes 100 ceramic nozzles to equate tool life of 7 tungsten carbide nozzles or single boron-carbide nozzles.
- **Tungsten-carbide nozzles-** tungsten nozzles are very light in weight and are very popular in today’s abrasive blasting market. They are much harder and can outlast ceramic nozzles by about 14 times. This is a great choice for harder cutting and more aggressive abrasives.
- **Boron carbide nozzles-** These are the longest wearing of common materials used in sandblasting nozzles. They are 100 times longer than ceramic and 7 times longer than tungsten carbide.

V. PRETREATMENT OF SURFACES

Prior to die casting, anodization, powder coating and painting, the surface needs some sort of pretreatment or cleaning. This step is similar to laying down the foundation. This process of cleaning of the surfaces puts a heavy impact on the post processes. Therefore, for this sandblasting is a very good surface treatment process.

5.1. Pretreatment for powder coating.

Pretreatment means preparation of surface prior to powder coating. Here this is called as metal pretreatment because the powder coating is predominantly applied to metals.

Tendency of material

Tendency of material is to have a lot of roughness, irregularities and scratches on the surface.

Need for sandblasting

The surface preparation involves mechanical cleaning. For powder coating the cleaning process includes methods like sandblasting and scratch brushing. This is carried out by the abrasive action which along with removing the impurities from the surface also not only removes the surface impurities but also disposes of the scratches and reduces the surface roughness and irregularities. Even though sandblasting process is very good, but then also a coating must be applied immediately because now the cleaned and dirt removed surface is in a highly receptive state and corrosion occurs promptly.

5.2. Pretreatment for galvanized sheets

Tendency of material-

Similar to Aluminum, the galvanized material has a strong tendency for producing a very thin coat of zinc carbonate or zinc oxide on surface by undergoing corrosion, which is commonly called as White Rust.

Need of sandblasting-

The material which is galvanized generally has a strong tendency to produce a layer of white rust on its surface which is a bad base for application of powder or any other coating on the surface. Therefore, it must be removed prior to powder coating. Besides this, there are chances of presence of oil on the material surface which may have come during the fabrication process. This layer is necessary to remove for having proper bonding of powder coating.

5.3. Pretreatment for die-casting material

Tendency of material-

Similar to the galvanized sheets, the die-casting material also has a strong tendency for undergoing corrosion, producing a very thin coating of white rust on its surface.

Need of sandblasting

Sandblasting is needed for the removal of oil and white rust, which is present on the surface of a die casting material.

5.4. Pretreatment for mild steel

Tendency of material-

Picking up the rust and dirt when the material is exposed to bare atmosphere is the tendency of material.

Need of sandblasting

Sandblasting is done to remove the oil, grease, rust and black scale formed on the surface. Mild steel material is also recognized for its tendency of undergoing rapid oxidation when exposed to bare atmosphere. Result of oxidation is formation of a layer of oxide on the surface called rust. To avoid this, material is not directly exposed to bare atmosphere. For this, we mostly make use of rust preventive oil on mild steel surface. This oil does not allow metal to contact directly with the air and thus defers oxidation.

5.5. Pretreatment of Aluminum

Tendency of material-

A very thin coating of aluminum oxide is formed on the surface by undergoing natural oxidation.

Need of sandblasting-

The need of sandblasting here is to remove the coating of aluminum oxide that is formed on the surface of material by undergoing oxidation.

5.5. Pretreatment of painting

Tendency of material

The material is prone to rust, dirt, corrosion and some sort of surface irregularities.

Need of sandblasting-

Clean metal allows the paint to comply better. Sandblasting is an effective method for removing old paint and rust from a metal object to prepare it for painting. This process is performed on virtually any metal object, from furniture to car parts, and creates a smooth surface due to the abrasive qualities of the sand.

VI. PROBLEMS CAUSED DUE TO IMPROPER TREATMENT

Pretreatment is the bottom layer for powder coating, painting, die-casting, mild steel, aluminum, and galvanized sheets etc. It is said that we cannot have proper coating with improper pretreatment. Also 80 % of the mechanical failures are due to improper pretreatment. Hence, there is a keen need to take utmost care to ensure that proper pretreatment is carried out before painting, anodization, and powder coating. Proper pretreatment includes carrying out of proper sandblasting. The various problems caused due to improper pretreatment are stated as:

- Oily patches start appearing.
- Pin holes start appearing on the surface of material.
- Rusty surface starts appearing beneath the powder coating film

VII. SAFETY GEAR IN SANDBLASTING

Safety is a one of the most important key feature in the process of sandblasting.

- Anyone who is performing sandblasting or even those in the close proximity of sandblasting process must ensure the necessary safety precautions before carrying it out.
- The thing of paramount importance is that the workers must properly be equipped with the correct safety equipments to safeguard themselves from harmful impurities that are released during sandblasting process.
- Eyeglasses must be used.
- Hearing protection must be taken.
- Eye and face must be properly protected.
- Helmet must be worn.
- Leather gloves that protect the full forearm and aprons (or coveralls) must also be worn.
- Safety shoes or boots must be worn.



Fig (7) shows the safety equipments of a worker that must be worn while performing sandblasting.

VIII. CONCLUSION

Removal of old paint, rust and dust present on the surface can be done by the help of effective equipments which tear the dirt and rust away from the surface thereby exposing the bare metal. Sandblasting, combining the effect of high-velocity air, forces enormous amount of sand against the surface of metal, thus removing the rust and breaking down some metal into fine particles which afterwards separate from the surface. Thus sandblasting is an efficacious process that removes all the impurities and corrosive materials present on the surface. Once these are removed, the surface is now all set for the application of corrosion protection, paint coatings, powder coatings etc. but takes experience and specialized equipments.

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