



IJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** IV **Month of publication:** April 2022

DOI: <https://doi.org/10.22214/ijraset.2022.41649>

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Design of Sand Blasting Machine

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Abstract: When a metal is exposed to atmosphere, it gets corroded by atmospheric air. To overcome this sand blasting process are used. When machining leaves the sharp burrs or edges on an object, sandblasters can smooth it until it is safe to handle. Sand blasting is a method used to clean, polish or strengthen metal with the help of abrasive material. Sand blasting is used in almost every industry that uses metal, including aerospace, automotive, construction, shipbuilding, rail, and many others. Sand blasting machines uses abrasive material like steel grit, glass bead, sand. The blast media is pneumatically accelerated by compressed air and projected by nozzles onto the component to roughen a smooth surface, shape a surface or remove surface contaminants. For the application of sand blasting process on a big component, which may require secondary surface treatment, which is carried out in a confined space, so many times we have to shift jobs to confined room. Due to this material handling cost increases. To avoid this, there is need of design of portable type of sand blasting machine.

Keywords: Sand Blasting, Abrasive Material, Surface Treatment Process, Material Handling Cost, Portable.

I. INTRODUCTION

Sand Blasting is a surface treatment process using high velocity steel abrasive. Sand blasting is used to obtain excellent cleaning and surface preparation for secondary finishing operations.

- 1) The cleaning of iron, steel, non-cast parts, forgings, etc.
- 2) Mechanical cleaning of sheets, rods, coils, wire, etc.
- 3) Shot peening to alter mechanical properties (increasing resistance to fatigue for springs, gears, etc.)

Sandblasting is also known as abrasive blasting. Basically, it is the process of bombarding a stream of abrasive material to the surface which we want to clean. The sandblasting operation is done with high pressure to smooth a rough surface. There are several types of sandblasting process like Soda blasting, Shot blasting and Bead blasting. Sandblasting is an extremely useful procedure in a welding applications and industries for removing excess weldments as well as for cleaning the surface. Whether a material needs to be cleaned, deburred, prepped for powder-coating, de-rusted, shot-peened or otherwise just have its paint removed, sandblasting is the process for the job. These machines are mainly useful in the auto industry, in ship and rail yards and in a range of industrial applications. Certain degrees of skill and safety training are required to use the sandblaster as abrasive material may cause some injuries. The sand blasting machine which was used in the industry are big in size and cannot be mobile so our main objective of our project is to make the machine mobile and less space occupying machine with reduction in weight, also reducing the cost of machine to make it budget friendly for small scale industries too.

II. LITERATURE REVIEW

Rupesh Narkhede et.al. (2019) [1], The study shows that the portable sand blasting machine is very economical & useful for heavy fabrication company. Big size products require sand blasting process before painting. The sand blasting machine are generally immovable and used in confined space, so every time we need to shift such big products in confined space of blasting after welding small components, this increases the material handling cost. After using portable sand blasting machine, we can do blasting on small components which we welded after first blasting process; this can be done on same location where we can manufacture, therefore we do not need to shift same again to confined space of blasting room. In this way we can save handling time as well as handling cost also. It helps to reduce human fatigue by considering handling process.

D Dudek et.al. (2018) [2], The study shows that the surface roughness after the abrasive blasting process is undetermined that is random. As a result of the treatment with low granulation grains, an even distribution of roughness on the work surface is obtained. The using larger sizes of abrasive grains may affect smoothness of surface. The surface after blasting is more susceptible to corrosion, hence the abrasive slurry should contain corrosion inhibitors.

Chuanli Yu et.al. (2022) [3], The study shows that under ultrasonic fatigue test, the effect of sand blasting and hot isostatic pressing (HIP) on VHCF performance on IN718 fabricated by selective laser melting (SLM), X Ray Computed tomography (CT) and 3D optical profiler are used to characterize the defects, including size and location

Meike stiesch1 et.al (2020) [4], The study shows that the within the limitations of this study, it was shown that the residual stress correlates with the mean surface roughness Rz after sandblasting. The highest residual stress and surface roughness was found after sandblasting perpendicular to the surface. Among the parameters blasting angle, the blasting pressure showed the greatest effect on surface roughness and residual stress with the parameter range tested in this work. Further research is needed to evaluate the effect of these different surface treatment regimens on the adhesive bond strength after veneering with feldspar ceramic.

Kubilay Barutcgil DDS et.al (2015) [5], The study shows that Surface treatments of hybrid ceramic resin blocks could enhance the bond strength to resin cement; however, using Single Bond Universal without surface treatment showed a higher bond strength value.

III. PROBLEM STATEMENT

- 1) Eliminate the oil and scale present on a superficial level, the projection of the abrasives eliminates consumption from the surface also, giving a particularly surface condition which has simple bond to the paint.
- 2) We realize that around 80% of the surface disappointments happen when the pre-treatment of the surfaces isn't finished appropriately.
- 3) Consequently, this progression of sandblasting the surface, earlier to painting, galvanization or such a covering should not be neglected as it is considered as the most basic stage for a great pre-treatment of surface.
- 4) It is one of the most straight forward and the quickest approach to eliminate old paint and rust from the metal surface.

IV. OBJECTIVE

- 1) To reduce the cost of the machine so that these machines can also be used in the small industry and it does not occupy more space.
- 2) These machines are used to reduce the weight and reduce the time by manually removing the rust from the object.
- 3) The main aim of our project is to make it compactable by reducing the size of the tank and make it movable.

V. RESEARCH AND METHODOLOGY

Fabrication of Sand blasting machine is consisting of the Following components to full fill the requirements of Complete operation of the machine.

1. LPG Tank
2. Ball Valve
3. Hose Pipe
4. Blast Pot
5. Pressure Gauge
6. Nozzle
7. T Joint
8. Coupling
9. Wheels
10. Stand

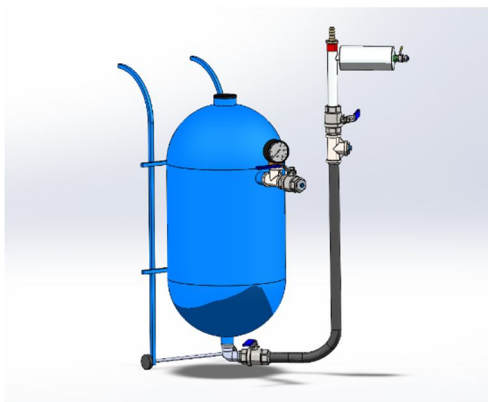


Fig. Solid works Design

Sandblasting can be defined as a surface treatment process using high velocity of abrasive material to remove the rust paints and other surface impurities. Stationary sandblasting is done in cabinets and portable sand blasting can be done anywhere, thus; it is also known as a portable sand blasting machine. It can be related to garnet sandpaper for their similar effects. After sand blasting, the material receives a completely new look and a better finish. This method involves blasting of air on very small surface of work piece at very high pressure in order to etch or clean or to smooth surface. Air + selected abrasive material + portable sandblasting machine + appropriate sandblasting nozzle + on/off control + blast surface = high-speed erosion (removal of rust particles from the blast surface). Sandblasting is also called as Abrasive blasting.

It is the operation of forcibly propelling a stream of abrasive material against a surface under high pressure to smooth a rough surface, to remove the surface contaminants. There are several variants of its process, such as bead blasting, sandblasting, shot blasting and soda blasting etc.

- 1) The height of the tank is 630 mm and the diameter of the tank will be 317 mm.
- 2) The materials used for the air receiver will be cast iron. The tank can hold the pressure of 2000 psi.
- 3) There will be two Ports of ½ Inch in LPG tank one for inlet of compressed air which is connected with T-Joint and ball valve and at the other end the Pneumatic male connector of ½×8 mm is fitted. The other end is used for the outlet of compressed air which is connected to hose pipe by means of ½ Inch nut joint and ½ Inch ball valve.
- 4) There will be two T-Joint, one at the inlet side to fitting the Pressure Gauge and another one for fitting of pneumatic male connector to the blast pot.
- 5) The blast pot is basically the reservoir for media and maintains the pressure necessary for blasting. The blast pot contains fabrication of barrel nipple of ½ inch diameter and 6-inch length to sand storage tank is of 2-inch diameter and 6 inch in length welded at right angle triangle. At the top of sand storage tank, a coupling is welded for joining of ¼ inch ball valve.
- 6) While the diameter of the hose will be for 20x1500mm.
- 7) The size of pneumatic tube will be 8mm.
- 8) The pressure for the compressed air will be nearly 7 to 8 bars.
- 9) Nozzles permit media to be sprayed at variable speeds depending on type of nozzle is used.
- 10) Inlet and Outlet valves monitor the inflow and outflow of air and confirm whether or not the blast pot is pressurized.
- 11) The pop-up or inlet valve responds to pressure place into the system and pops up to pressurize the system.
- 12) The Sandblasting Media valve regulates the flow of abrasive from the blast pot.
- 13) The abrasive lure prevents abrasive from traveling through the outlet valve.
- 14) After media is loaded into the machine, variety of events should occur to start blasting.
- 15) The jet flow valve is used to force the mixture of abrasive material and air towards to nozzle which increases the velocity of jet.
- 16) A mixture of air and abrasive can spray through the nozzle.

VI. CONCLUSION

The portable sand blasting machine is very economical & useful for heavy fabrication company. There are such big products in size and it requires sand blasting process before painting, so every time we need to re-shift such big products in confined space of blasting after welding small components or some rework on small attachments, this increase material handling cost. After manufacturing portable sand blasting machine, we can do local blasting on small components which we welded after first blasting process; this can be done on same location where we can manufacture, in this way we need not to shift same again to confined space of blasting room. On same place we can do blasting with the help portable sand blasting machine & same time we can release to painting. In this way we can save handling time as well as handling cost also. It helps to reduce human fatigue by considering handling process.

VII. FUTURE SCOPE

For some more Improvement in Portable Sand Blasting Machine using LPG cylinder, we can use some following points.

- 1) We can use nozzle of tungsten carbide which will have higher life than stainless steel nozzle.
- 2) As in sand blasting machine we store the air pressure in air receiver, so for safety and security purpose we can use the Pressure Relief Valve and set it at 10 bar pressure.
- 3) As compressed air contains moisture in it, we can use the moisture separator at the inlet of compressed air to remove the moisture contaminants

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