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# DESIGN FOR AUTOMATION OF SAND BLASTING

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## ABSTRACT

Sandblasting, sometimes known as abrasive blasting, is the operation of forcibly propelling a stream of abrasive material against a surface under high pressure to smooth a rough surface, roughen a smooth surface, shape a surface, or remove surface contaminants. The sand media used in the process is of very small size and travels at a higher pressure, which when done manually causes health hazards and lower productivity than that of machine labour. As a result, an automated sandblasting machine will eliminate operator interference with the process and cycle time, resulting in cost savings for the industry. An automated sandblasting machine is developed that sandblasts the tools in the industry and improves the existing process.

**Keywords:** Automation, Sandblasting, Bead Blasting, 3D Modelling.

## 1. INTRODUCTION

A sandblasting machine uses glass beads to achieve a good surface finish on the cutting tools in our industry. This is achieved by propelling the glass particles at high velocities. The glass beads are first heated to a temperature of 170o C for smooth travel through the hopper and mixer. Then the hot glass bead is poured into the hopper, and then it enters the mixer, where it is mixed with compressed air. A mixture of compressed air and sand comes out of the mixer. Because the process's sand media is so small and moves through the air under such high pressure, working by hand poses health risks and is less productive than using a machine. As a result, an automated sandblasting machine will reduce cycle time and remove operator interference from the process, saving the industry money. An automated sandblasting device is created to sandblast industry tools and enhance the current procedure.

## 2. LITERATURE REVIEW

Sandblasting was used to smooth up the surfaces of SUS316L specimens using alumina grinding particles with average particle sizes of 14.0 or 3.0 m, respectively. Additionally, the 14.0 m particles and then the 3.0 m ones were used in a doubled sandblasting process (DSP). The 3.0 m particles were provided to increase the surface roughness and the surface area of the specimen in comparison to the case of the 14.0 m particles. Furthermore, in the case of the DSP, these values were raised even more. These samples were heated by electromagnetic induction while submerged in simulated bodily fluid (SBF) at a pH of 8.4 and 25 degrees Celsius. Cap formation was elicited on each specimen by this treatment. These materials demonstrated a significant capacity for HA formation. [1]

Surface factors like topography and roughness (Ra) have a significant impact on how MCrAlY coatings react to isothermal oxidation. This study investigated how sandblasting affected the oxidation behavior of MCrAlY coatings that were thermally sprayed using an HVOF. Oxidation tests were carried out for varying lengths of time at 1050 C in isothermal circumstances. The bond coat had a Ra of almost 12 lm. The content and morphology of the thermally grown scales were examined using a scanning electron microscope (SEM/EDX) and X-ray diffraction before and after oxidation. The findings demonstrated that the oxide scale that developed on the coatings as they were sprayed was primarily made of Al2O3, but the oxide that developed on the coatings after being sandblasted was mostly made of spinel. Additionally, the oxidation rate gradually decreased as the bond coat's Ra rose. and compared to the sprayed coating, the amount of Al2O3 increased. Analysis using a scanning electron microscope revealed that the thickness of the scale layer on the CoNiCrAlY coating after being sandblasted at 1050 C was significantly smaller than that on the coating after being sprayed. [2]

Verification and calibration methods utilizing precision artefacts as reference elements are important to verify that measurements can be made using non-contact metrology technology. In this situation, there is a strong desire in industry for calibration artefacts that are both more accurate and more economical. The purpose of this work is to show that it is possible to calibrate and verify non-contact metrological equipment utilizing low-cost precision spheres as reference artefacts. As reference objects, low-cost precision stainless steel spheres are utilized specifically. It goes without saying that such spheres need to have their optical behavior altered by having their high brightness removed to be utilized as standard artefacts. The spheres are manually blasted with sand for this purpose, which is also a very inexpensive method. process. Using a laser triangulation sensor mounted on a Coordinate Measuring Machine (CMM), the experiment was validated. The impact of sandblasting on the spheres will be assessed using the CMM touch probe, which is significantly more accurate. The impact of this post-processing is then further examined using the laser triangulation sensor. Ultimately, after reducing the brightness, which distorts and diminishes the quantity of points as well as the quality of the point clouds, the improvement in the quality of the point clouds acquired by the laser sensor will be put to the test. The parameters utilized to investigate the impact of sandblasting on each sphere, both in touch probing and laser scanning, in addition to the number of points obtained, are the measured diameter, the form error, and the point cloud's standard deviation in relation to the sphere with the best fit. [3]

The goal of this study is to examine the surface properties of low carbon steel JISG3101SS400 that has been sandblasted with steel grit G25. The nozzle pressure is fixed at 5 bars, the pressure angle is 90 degrees, the nozzle-to-surface distances range from 15, 25, and 30 cm, and the blasting times range from 25, 45, and 120 s. The initial step in surface characterization is to use a scanning electron microscope (SEM) to observe the surface's shape and an energy dispersive X-ray spectrometer (EDS) to determine its chemical composition. Then, visual inspection, measurement of surface roughness, and identification of the hardness profile using Rockwell and micro-Vickers hardness tests are carried out. To examine the surface features associated with the coating procedure, an ASTMD7091 paint thickness test was conducted. The SEM study discovered valleys, granules, micro cracks, and grits imbedded on the surface because of the result. According to a visual inspection, the roughness, with values between Ra18.1 and Ra21.4 m, falls within the parameters of ISO8501. A maximum hardness value of 332HV and a depth of more than 50 m are displayed by the hardened layer while sandblasting with parameters of 15 cm distance and 120 s time. It is confirmed that both roughness and hardness profiles rise with decreasing nozzle-to-surface distance and increasing blast time. It is found that sandblasting low carbon steel SS400 employing steel grit G25 is beneficial in enhancing the mechanical strength and surface hardness. The paint covering of machinery such as pumps, tanks, ships, and pipelines depends on these mechanical qualities. [4]

In dentistry and orthopedics, metal surfaces are cleaned, made rougher, and activated using the sandblasting technique with corundum. The displacement of particles in the surface is caused by the substantial local energy transfer at the impact location. Sandblasting can be utilized with this technique to coat surfaces. In this paper, we report a recently discovered method that enables the sandblasting of titanium dioxide (TiO2) and hydroxyapatite (HA) onto metal surfaces. The blasting medium is a porous composite ceramic made of titanium dioxide or hydroxyapatite with an alumina core serving as the carrier material. The method is used on titanium substrates, and the samples' composition, morphology, and surface roughness are all examined. [5]

As technology in the world and in the sphere of industry advances, industry is moving more and more to computer-based automation; these industries demand very intricate and accurate components having specific special criteria. Even though glass is still primarily produced by manual labor on a small-scale basis, demand for it is growing. To prevent child labor and because the manual sandblasting procedure is dangerous and produces dust, it is necessary to automate the glass frosting technique. As a result, we are recommending computer assisted glass frosting equipment. Glass frosting is the process of adding an acidic or abrasive substance to a glass surface to create a design. The glass is stationary in the concept that is being offered, the nozzle is filled with sand, shot blasting is carried out with its assistance, and the nozzle moves appropriately to carve a stencil on the glass. [6]

Metal is corroded by atmospheric air when it is exposed to the atmosphere. Sand blasting is employed as a solution. Sandblasters can smooth an object after machine removes any sharp edges or burrs, making it safe to handle. With the aid of abrasive material, sand blasting is a technique used to clean, polish, or reinforce metal. Almost all industries that use metal, such as aerospace, automotive, construction, shipbuilding, rail, and many others, use sand blasting. Abrasive materials including steel grit, glass beads, and sand are used by sand blasting equipment. To roughen a smooth surface, shape a surface, or remove surface impurities, the blast medium is pneumatically accelerated by compressed air and projected onto the component by nozzles. [7]

By maximizing the replaceable nozzle diameter, cleaning costs in quartz sand abrasive blasting were minimized in this study. The lowest cost was determined by an examination of cleaning costs. The cost research revealed that there is an ideal replaceable nozzle diameter at which the cleaning cost is lowest for each sandblasting situation. Additionally, a screening experiment was used to investigate the effects of the parameters initial nozzle diameter, nozzle wear rate per hour, time required to change a nozzle, compressor power, machine cost per hour, nozzle cost per piece, and cost of sand on the ideal replaced nozzle diameter. The research's findings indicate that the starting nozzle diameter has the greatest impact on the ideal substituted nozzle diameter. [8]

Metal can be cleaned, strengthened (peened), or polished using the shot blasting technique. Almost all industries that employ metal, such as aerospace, automotive, construction, foundries, shipbuilding, rail, and many more, require shot blasting. A few techniques, including the hook shot blast machine and roller conveyor shot blast machine, have been detailed, along with the general classification of the entire process. Finally, the limitations and drawbacks have been discussed. [9]

The chemo mechanical bonding of titanium is enhanced by silica coating. To prepare surfaces for thermal silica coating (Sili coater MD) or tribochemical silica coating (Rocatec), sandblasting is advised. The volume loss, surface shape, and composition changes in pure titanium were examined in this work in relation to the effects of sandblasting and coating procedures. Titanium volume loss was comparable to values for base metals and does not appear to be a problem for the clinical fit of restorations. After sandblasting, embedded alumina particles were discovered in the titanium, and EDS measurements showed that the alumina content rose to a range of 27.5-39.3 wt%. Small silica particles continued to accumulate on the surface after tribochemical coating, raising the silica content to a range of 17.9–19.5 wt%. Loose alumina or silica particles were removed from the surface using ultrasound. resulting in only small reductions in the alumina or silica concentration, indicating that most of the materials are firmly attached to the titanium surface. Silica concentration increased only marginally from the sandblasted specimen to 1.4 wt% after thermal silica coating treatment. These silica coating techniques use silica layers that vary greatly in shape and thickness. These findings serve as a foundation for explaining adhesive failure modes in bond strength testing and for formulating strategies to enhance resin bonding. Titanium that has been sandblasted and coated with silica using ultrasound in a clinical setting. [10]

**3. DOUBLE ACTING CYLINDER**

A double-acting pneumatic cylinder is one where the thrust, or output force, is developed in both extending and retracting directions. A double acting cylinder alternates cycles of pressurized fluid to both sides of the piston and creates extend and retract forces to move the piston rod, permitting more control over the movement. Double acting pneumatic cylinders are mostly used in industrial and robotics industries. They perform tasks such as opening/closing doors and lifting and moving merchandise off conveyor belts. Other uses include medical applications, earth-moving equipment and space programs.

The pressure inside the cylinder rises as air enters on one side of the cylinder. The rise in internal pressure causes the piston to move in a specific direction. The piston rod transmits the developed force to the object to be moved. The working fluid in pneumatic cylinders is compressed air. Another advantage of pneumatic systems is that they rely on air and noble gases to power them, rather than potentially combustible hydraulic fluid or mechanics. Regular air is less likely to lead to explosions, or danger to the operator while the latter deals with hazardous materials.

**4. A/C MOTOR**

An AC motor is a motor that converts alternating current into mechanical power. The stator and the rotor are important parts of AC motors. The stator is the stationary part of the motor, and the rotor is the rotating part of the motor.

**5. RESULT AND CONCLUSION**

The developed automated sandblasting machine provides reduced and standardized cycle time which increases productivity reduces the skill level required by the operator and isolates human interference with the process which reduces the level of exposure of labour to the process thus eliminating occupational health hazards. Since the process is automated, the quality of the sandblasted tools remains the same and all these advantages result in cost savings for the industry.


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