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Economic Polishing of Stainless Steel Utensils

Mr. C. Manimaran¹, K. Vignesh Kumar²

¹Professor, ²Student, Department of mechanical engineering, IFET College of engineering, Villupuram.

Abstract: Steel is very essential metal in the world .It has various applications such automobile industries, construction industries, production and in houses also. Steels are different types depending upon the carbon content i.e. in percentage. It classified as nickel steel, stainless steel and so on. Stainless steel mainly used because it is corrosion free. It is polished and used in homes. Here in this project abrasive jet machine is used for polishing stainless steel utensils in an economic way. In this abrasive jet machining process, instead of using abrasives like aluminium oxide, silicon carbide, glass powder and dolomite, solvent of detergent powder with sulphuric acid. Abrasive jet machining used for the removal of material from the work piece by the application of a high speed stream of solvent particles carried out in gas medium from a nozzle. The material removal process is mainly caused by brittle fracture by impingement and then by erosion. The AJM will chiefly be used to cut shapes, drill holes, de-burr and in hard and brittle materials like glass, ceramics etc. The polishing of stainless steel utensils by AJM process will ensures higher accuracy and smooth surface finish. AJM method of polishing will increase the production rate and reduce time consumption.

Keywords: Abrasive jet machining, solvents, polish, stainless steel utensils.

I. PROBLEM STATEMENT

Polishing and buffing are finishing processes for smoothing a work piece's surface using an abrasive and a work wheel or a leather strop. Technically polishing refers to processes that use an abrasive that is glued to the work wheel, while buffing uses a loose abrasive applied to the work wheel. Polishing is a more aggressive process while buffing is less harsh, which leads to a smoother, brighter finish. The polishing of stainless steel utensils is a difficult and time consuming process. So in this project, the abrasive jet machining is used to polish the stainless steel utensils. But instead of using abrasives like aluminium oxide, silicon carbide, glass powder and dolomite we use solvents like detergent powder and sulphuric acid for polishing the stainless steel utensils. This method of polishing stainless steel utensils increase life and reduce corrosion. This project is used in polish of high precision and dimensional accuracy applications. This method is very simple and polishing cost is low when compared with available methods.

II. METHODS USED FOR POLISHING

There are several methods used for polishing the stainless steel utensils mainly two;

A. Polishing By Abrasive Wheel

Stainless steel polishing and grinding is known as one of the most difficult projects. This is because most stainless steel polishing requires a mirror-like finish. It may be rejected of even the slightest of scratches or pinholes. Abrasive for stainless steel polishing, it is often pointed out that abrasive that are sticky and have a high viscosity are not appropriate for this usage. This is related to the relative hardness of the stainless steel, which is softer than glass or stone.





B. Polishing By Chemical Solutions

- 1) Polishing with vinegar.
- 2) Polishing with olive oil.
- 3) Polishing with specialized cleaners.

III. PROPOSED METHOD

In this method, the polishing of stainless steel utensils by using abrasive jet machining process. Generally in AJM process the abrasives like aluminium oxide, silicon carbide, glass powder and dolomite used.

In this process instead of using abrasives, the solvents like detergent powder and sulphuric acid is used.

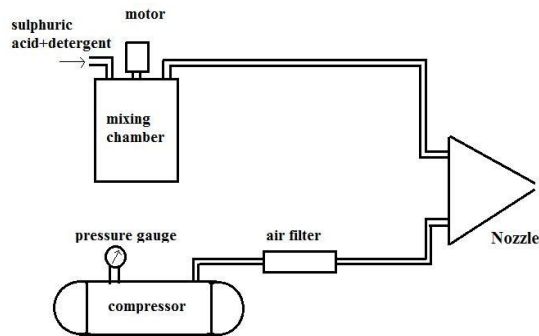
The polishing of stainless steel utensils by AJM process would ensures higher accuracy and smooth surface finish. It can be used to increase the production rate and reduce time consumption.

This method is one of the economic way of polishing the stainless steel utensils and it reduce the minor blow holes in the utensils. It leads to increase the life time of stainless steel utensils.

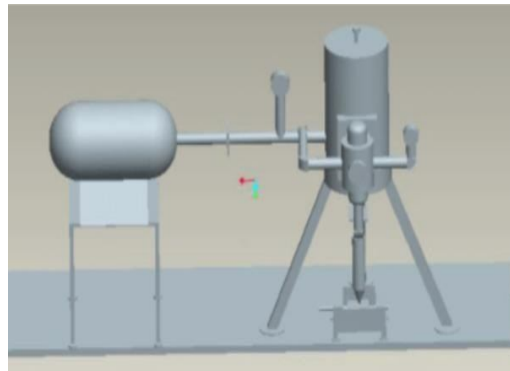
Then the cost of the detergent powder and sulphuric acid is cheap when it compared with abrasives.

In this method of polishing the stainless steel utensils improves their corrosion resistant property and it provides good surface finish for the finished product

A. Schematic Layout



B. Design Diagram



IV. WORKING PRINCIPLE

The gas or air is supplied under pressure into the chamber; the pressure of gas varies from 2-3 kg/cm². The air entered into the compressor through a filter where the pressure of air or gas is increased.

Compressed air or high pressure gas is supplied to the mixing chamber through the pipe line. The pipe line carries a pressure gauge and a regulator to control the air or gas flow and its pressure.

The fine solvent particles are collected in the hopper and fed into the mixing chamber. A regulator is incorporated in the line to control the flow of solvent particles.

The mixture of pressurized air and solvent particles from the mixing chamber flows into the nozzle at a considerable speed. Nozzle is used to increase the speed of the solvent particles and it is increased upto 300m/s.

This high speed stream of solvent particles from the nozzle, impact the work piece to be machined. Due to repeated impacts, small chips of the material get loosened and a fresh surface is exposed.

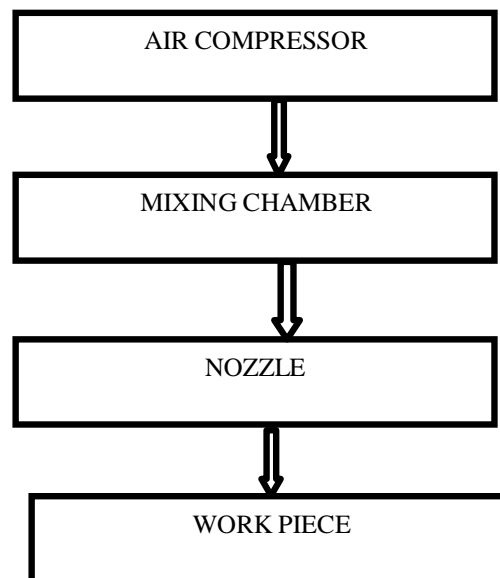
The motor is fixed at the top of the mixing chamber. The shaft is connected to the motor and it mixing the detergent powder and sulphuric acid in a complete collision.

A. Components

- 1) **AIR Compressor:** Air compressors compress the air to high pressure taking input energy from electric motor or internal combustion engine. In abrasive jet machining high pressure air jet is required so that the suspended particles in it can strike the work piece at high velocity.
- 2) **AIR Filter:** Filter regulator which is necessary for filtering the air and regulating the pressure. The common impurities suspended in the compressed air are dust particles of various sizes, moisture, and oil particles. Excess moisture present in the pipeline may result in coagulation of particles and jam the nozzle opening. Air filters have a porous membrane having various pores sizes like 5, 10, or 15 μm .
- 3) **Mixing Chamber:** Mixing chamber is used for mixing the air with the solvent particles. The solvent particles are stored in a container through which air is flown.

- 4) *Piping System*: The piping systems are required for carrying the compressed air from the compressor to the mixing chamber and from the mixing chamber to the nozzle orifice via the filter regulator.
- 5) *NOZZLE*: Nozzles are the mechanical devices which increase the velocity of fluid in exchange of pressure drop. In abrasive jet machining the high velocity jet is created by the nozzle action. As the abrasive particles strike the nozzle they may erode the nozzle surface.
- 6) *Pressure Gauge*: Pressure gauge used to measure pressures lower than the ambient atmospheric pressure, which is set as the zero point, in negative values.
- 7) *Solvents*: A solvent is a substance that dissolves a solute, resulting in a solution. A solvent is usually a liquid but can also be a solid, a gas, or a supercritical fluid. The quantity of solute that can dissolve in a specific volume of solvent varies with temperature. In this project, the polishing of stainless of stainless steel utensils by the solvents of;
 - a) Sulphuric acid.
 - b) Detergent powder.
- 8) *Motor*: An electric motor is an electric machine that converts electrical energy into mechanical energy. It operate through interaction between motor's magnetic field and winding current.

V. METHODOLOGY



VI. CONCLUSION

In this project, the polishing of stainless steel utensils by abrasive jet machining is done.

It is used for polish the stainless steel utensils by economic way when compared to other available methods.

The solvents like detergent powder and sulphuric acid is used, it is very cheap when compared to abrasives.

Using AJM method for polishing ensures good surface finish of stainless steel utensils.

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