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## STUDY OF DIFFERENT COMPONENTS OF POLISHING

### UNIT: AN OVERVIEW

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**Abstract:** In many industries smooth surfaces got increasing importance, such as food or medical, chemical, etc. The mechanical treatment of surfaces (grinding and polishing) does not fulfill desired specifications, in some of the industries. Polishing work pieces continuously in a stretch is the main purpose of developing the polishing machine. It is usually done to further improve the looks by generating good surface finish, prevent contamination of work pieces, create a reflective surface, remove oxidation or prevent corrosion. Grit size of the abrasive particle affects the surface finish. That's why polishing is a multistage process and it starts with a grit size which is rough in nature and every subsequent stage of the polishing tends to use a higher grit abrasive having a finer nature until the surface to obtained which is intended. Imperfections such as pits, lines, nicks and scratches from the workpiece using the rough grit size and finer lines that are not visible to the eyes are leaved by finer abrasives. In order to improve the surface finish polishing is mainly done on the face of the components. So it is needed to study the different components use to develop the polishing machine. In this paper, we studied the different components of polishing machine/unit.

**Keywords:** *Polishing Machine, Components, Electro, Polishing Unit, Sprocket.*

## I INTRODUCTION

### Section I

#### Introduction:

Method that uses abrasive particles to create smooth surfaces is called as polishing method [1]. After polishing, metallic surfaces get defects free and tends to be more reflective and smooth, shiny, enhancing the appearance [2]. Buffing is complementary to metal polishing, which is less harsh method that has brighter finish results. Polishing has several stages, in case the material unfinished [3]. In the stage first, imperfections from the material is removed by rougher abrasive. In subsequent stages finer abrasives leaving the material comparatively unmarked are used. Polishing and buffing compounds are generally applied along with polishing wheels and that of high speed polishers, to achieve the mirror like finish. Wax, kerosene and some other lubricants are some of the polishing materials can be used in the process. Buffing can be done with stationary polisher like

stationary polishers, die grinders, or few of the specialized automated equipment to achieve an even brighter shine [4].

. By putting polishing rod in the tube driven by motor, the rotating itself achieves a polishing. This method is used for internal polishing of pipes and tubes, generally used for stainless steel pipes [4]. Here is another polishing method used to design a polishing machine Electro polishing is also a method to achieve high purity in applications when applied to ID pipe system components. Electro polishing is a micro process .It is a little different from buffing and polishing [5] and [6].

Here, we have designed and developed a machine which gives a fine polishing to the stainless steel pipes. So, for polishing and grinding of stainless steel, which are wear, corrosion and rust resistant, polishing is a little bit difficult. But, due to these properties stainless steel has a better value in manufacturing industry. For the polishing purpose we have used metal roller, metal roller shaft, rubber roller, rubber roller shaft, Shaft For oscillating Plate, oscillating plate,

Tensioner Plate, Belt, Cylinder, Bearing, Stud, Sprocket and Frame. Using this, we can polish pipes of various sizes. The proposed method is having less cost than that of conventional method. Machine developed is a portable and not bulky. In this paper, we briefly discussed the components used for developing machine.

Rest of paper is organized as: Section II gives literature survey. In section III, Brief discussions of components are given. Conclusion and references are given in section IV and V respectively.

## Section II

### II LITERATURE SURVEY:

Some of the literature related to fabrication and design of polishing machine has been studied which are based on the above research problem.

Erinle et al. has developed and detailed studied metallographic polishing machine. To develop a machine which can polish metal to get a flat and smooth surface is the main aim of the study. Their developed machine has ability to grind and polish metal components is the final conclusion by them [7].

Avinash et al. has deeply studied and designed setup of metallographic lab. In order to achieve good surface finish they developed a laboratory equipment to polish metal. They concluded that types of machines which are available in the market which will help to obtain better surface finish [8].

Barbuto : in order to automate ceramics polishing has developed procedures. By considering Struers automatic polishing machine they studied these procedures. Very high quality product are produced by their procedure concluded by them [9].

Sagar et al. : Polishing machines performance evaluation has studied by them. Design consideration of polishing machine is discussed and also concluded as their developed polishing machine has better performance in producing shining surface of specimen [10].

Oyetunji et al. : has been developed laboratory polishing machine. In order to polish metallic materials, they develop their own indigenous technology. It is concluded that the machine developed by them used by the end users in the industry of metallography [11].

Zavid et al. : Polishing machine which operation based on parallel – kinematic system has developed by them. Hexapod held in a machine frame is also developed to drive the polishing tool. They concluded that steel material can be polished by designed hexapod with good roughness of surface [12].

Bhaskar et al. : By considering different types of emery paper during polishing, studied metal removal rate. Tested the effectiveness of the fabricated polishing machine. Concluded that to polish metal components these types of machines can be used [13].

Wang, G.L. and Wang, Y.Q. : Special polishing has been developed. By considering surface roughness they studied different process parameters and efficiency of polishing through Taguchi method with giving optimal combination of process parameters [14].

Fernandez et al. [15] For abrasive polishing process developed a innovative methodology. Feasibility of polishing method using robots is studied by them. Concluded that possibility of predicting the final quality of surface using their developed methodology.

Wu et al. [16] Considering surface quality of M300 steel during polishing has studied. Ball type abrasive tool polishing is used and considering surface roughness optimized and removal rate of material. Using confirmatory test concluded with the process of optimization.

Qu et al. [17] Design process in polishing and grinding have studied by them. Considering genetic optimization in FEA software, did optimization process. Enhanced dynamic properties from their analysis is concluded by them.

It is observed from literature review that lot of researchers put much efforts in design of polishing machine also tried to optimize the parameters so that obtain good surface finish. Considered, flat type polishing machine and attempts are made to improve belt conveyor system with replacement with chain conveyor system which results in less load on shaft. Four head wheels replaces single head wheels and so obtained continuous operation that saves time and also gives uniform polish as to increase the length of polishing. Proximity sensors and the screw jacks are the main key components used in design and the fabrication of polishing machine. To safeguard any worker going close to machine while operation, proximity sensors are used. To hold bulky workpiece while polishing, screw jack is used. In this paper we studied the different components of polishing unit/machine in detail.

## Section III

Design of a polishing machine, which should have capability of specimen polishing in a continuous sequence for the idle time reduction of machine, is the main need of this research work. It will be helpful for the rapid movement of workpiece from rough polishing to better surface finish at one continuous operation. Here we listed and explained the components those are used to develop polishing machine.

**1. List of Components of polishing unit:**

No.	Name of Components	Raw Materials
1.	Metal Rollers (3 in numbers)	MS Pipe
2.	Rubber Roller (1 in number)	Rubber
3.	Metal Roller Shaft	MS Bright
4.	Rubber Roller Shaft	MS Bright
5.	Shaft For oscillating Plate	MS Bright
6.	Oscillating plate	MS Bright
7.	Tensioner Plate	MS Bright
8.	Belt	Zircon emery paper
9.	Cylinder	-
10.	Bearing	-
11.	Stud	MS Bright
12.	Sprocket	MS Bright
13.	Frame	MS Bright

**BRIEF DESCRIPTION OF COMPONENTS**

**Metal Rollers**



Fig.1 Metal Rollers

Metal Rollers are mounting on metal roller shaft, belt is passed over through these three rollers for polishing purpose. Metal rollers provide tension on belt which gives better polishing. Metal rollers used three in numbers. Two rollers are connected with oscillating plate which is driven by 0.5 HP motor. Metal rollers at this position are fixed on shafts, they

only exerts fixed pressure on polishing belt. When contacting pressure applied by metal rollers on belt curve shape contacting area on pipe surface responsible for removal of material upto 0.5mm thickness. Third metal roller is used for tensioner plate. This roller is rotates with belt speed and supporting the tensioner plate.

**Rubber Roller**



Fig. 2 Rubber Roller

Rubber Roller is used only for one purpose that is to avoid slippage, because if all rollers are of metals then there is chance of slippage of belt. Rotating belt is mounted on three metal rollers and one rubber roller. Rubber coating is given to metal roller and due to this rubber roller coating it provides gripping between both surfaces which avoids slippage of rotating belt. Rubber roller is driven by 3 HP motor and for polishing unit.

**Metal Roller Shaft**



Fig. 3 Metal Roller Shaft

Metal Roller Shafts are used for mounting of rollers on it. They are two in numbers and having Nickel Chromium Plating over it. MS bright is used for metal shaft manufacturing using turning, facing, and grooving process. For proper alignment and absorbing stressed and bending induced in shaft ball bearing used.

**Rubber Roller Shaft**



Fig. 4 Rubber Roller Shaft



Rubber Roller shaft is used for mounting of rubber roller over it. It is placed at top and is driven by motor which is placed above it. Rubber roller is mounted on this shaft which is at driven position and

driven through 3 HP motor. MS bright is used for shaft manufacturing using turning, facing and grooving manufacturing process.

**Oscillating Plate Shaft**



Fig. 5 Oscillating Plate Shaft

Oscillating plate is mounted on oscillating Plate Shaft. That plate keeps oscillating and thus belt on it keeps on polishing a pipe. It is a short length shaft only gives oscillations to the oscillating plate mounted on this shaft which supports two fixed metal rollers for belt tensioning and polishing.

**Oscillating plate**

Oscillating plate is mounted on shaft which connected to connecting rod driven by motor. Oscillating plate applies contact pressure on belt with the help of metal rollers for better finishing. It oscillates at very low speed driven 0.5 HP motor through connecting rod which is directly engaged with oscillating plate mounted shaft.

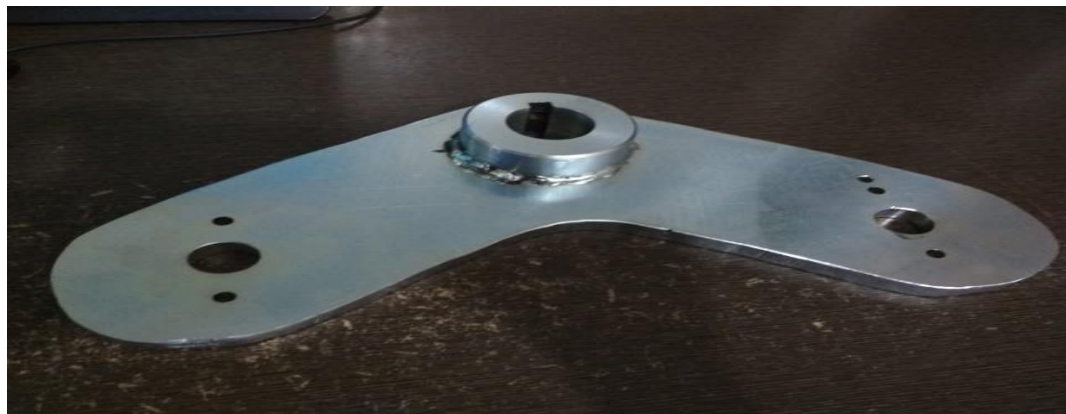


Fig. 6 Oscillating plate

Vertical movement of connecting rod induce rotation of shaft through joint. M.S. Bright is used for

oscillating plate and it manufactured using gas cutting process.

**Tensioner Plate**



Fig. 7 Tensioner plate

Tensioner plate maintains tensioning for belt with piston cylinder arrangement. Tensioner plate only supports tensioning cylinder using universal joint and at other end using metal roller. M.S. Bright is mainly used for this plate and manufactured using LPG and oxygen flame gas cutting process.

**Belt**



Fig. 8 Belt

Emery paper belt engaged with rollers for removing material from welded joint. Abrasive emery paper is used for polishing the pipe surface. Belt applies pressure on pipe surface through metal roller. Belt tensioning for obtaining proper finishing is done using pneumatic cylinder arrangement and for avoiding belt slippage one rubber roller is provided. Belt moves at rubber roller speed. Zircon material used for manufacturing of belt. Belt life is measured by its abrasive surface thickness.

**Cylinder**



Fig. 9 Cylinder

Pneumatic piston cylinder arrangement is provided for maintaining tensioning in polishing belt up to 10 bar. Pressure is given to piston at extension and at one end it is connected to tensioner plate

through universal joint at extended condition. During replacement of polishing belt, proper pressure range is maintained in cylinder and maintained in cylinder and mounting or removal of belt can be achieved.

**Bearing**

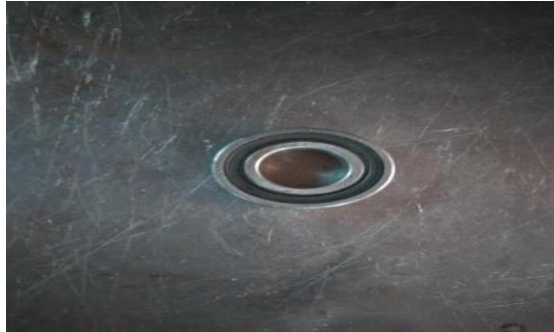


Fig. 10 Bearing

Bearing is used to sustain radial and axial loads on shaft. Bearing also gives proper fitting. For absorbing vibrational stresses and proper shaft

alignment. Ball bearing at calculated life is used for oscillating plate shaft, rubber roller shaft and for metal roller shaft.

**Stud**



Fig: 11 Studs

Studs are used to support chain and sprocket unit and for lifting of whole assembly. Studs of MS bright are manufactured by metal forming process. Four numbers of studs supports base plate on which whole assembly is mounted. In order to adjusting the

diameter of pipes base plate needs to move in vertical direction which is provided through chain and sprocket mechanism which is mounted on studs. Polishing unit becomes portable due to use of studs.

**Sprocket**



Fig. 12 Sprocket

Chain is mounted on sprocket. It allows vertical rotations of sprocket along studs. Sprocket with chains used for vertical adjustment of fixing of base plate along the studs. Due to this required

diameter of pipes is adjusted and polishing is done. Selection of sprocket is based on assembly strength, manual operating, strength of chain, studs and it manufactured by metal forming process.

**Frame**



Fig.13 Frame

Whole assembly is mounted on frame. Frame is constructed for mounting whole assembly of polishing unit. Using gas cutting process MS bright plates like base plate, topplate, two side plates,

back plate and front plate are manufactured and by welding unit frame is obtained. Main function of frame is to collect the burr which is removed from pipe surface during polishing.

**Section IV**

**Conclusion:**

To produce high quality surface finished on product the surface machining technique is used which is called as polishing. The process is a multistage process which uses a finer abrasive in each subsequent stage. Paper has a clear aim of design and fabrication of polishing machine which continuously performance polishing at each stage, it



eliminates the idle time wasted in the process of polishing. A smooth and shiny surface is generated on the workpiece by the process of polishing. In order to improve the surface finish polishing is mainly done on the face of the components. Here all the required components for development of polishing machine are studied names as metal roller, metal roller shaft, rubber roller, rubber roller shaft, Shaft For oscillating Plate, oscillating plate, Tensioner Plate, Belt, Cylinder, Bearing, Stud, Sprocket and Frame.

### Section V

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