

Enhancing the Productivity of Lapping of Gauge by Construction of SPM

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Abstract - With changing demands, the process of manufacturing should also change, the consumer needs product that has good quality, is affordable and also need's the product is less time. Automation could be affordable, depending on the design and reliability of the machine. The project is based on somewhat similar problems. The lapping of gauge done in the company is manual process. Therefore, extremely skilled labor is required as the gauge is very important tool to maintain the Quality standards. When working on the project first we need to observe the process and understand the working. The type of gauge to be lapped is Snap Gauge IS 8023. The gauge will be held in place with the help of Clamp and the rotating lapping plate will move in and out of the Gauge gap that is to be lapped. A motor, limiting switch and other components will be used to control the various control variables.

Key Words: Lapping, SPM, IS 8023 etc.

1. INTRODUCTION

When a product or a part is factory made there are irregularities within the material structure within the type of roughness, cracks etc. this might increase the probabilities of failure of the structure and there as decrease the lifetime of the part/component. To avoid on top of problems as well as to improve the surface finish moreover because the lifetime of elements, varied processes are performed on the part. One method is lapping process. The project is relating to this method. It will correct surface irregularities and take away subterraneous harm caused by sawing or grinding, manufacturing dimensionally correct flat elements to high tolerances (Generally, but 2.5µm uniformity). Lapping is a machining process within which 2 surfaces are rubbed along with an abrasive between them, by hand movement or employing a machine. This will take 2 forms. The primary variety of lapping, involves rubbing a brittle material like glass against a surface like iron or glass itself with an abrasive like aluminum oxide, jeweler's rouge, optician's rouge, emery, carbide, diamond, etc., between them. This produces microscopic conchoidal fractures because the abrasive rolls concerning between the 2 surfaces and removes material from each. The opposite type of lapping involves a softer material like pitch or a ceramic for the lap that is "charged" with the abrasive. The

lap is then used to cut a tougher material the work piece. The abrasive embeds inside the softer material, which holds it and permits it to get across and cut the tougher material. Taken to a finer limit, this may manufacture a refined surface like with a polishing material on an automobile, or a sprucing material or sprucing pitch upon glass or steel.

2. LITERATURE SURVE

Andrea Deaconescu "Improving the standard of Surfaces Finished by lapping by the quality Parameter Design" (2014) in their temporary standing report back to deed special quality surfaces equally as higher dimensional and geometrical truth entails activity of surface smoothing processes, one altogether that's lapping. A lapping methodology is powerfully influenced by form of input parameters, the foremost necessary ones being machining speed, pressure, period of lap plate-abrasive paste-piece of work contact, mechanics of the machine-tool etc. The paper presents a study on the influence of machining speed in lapping on the roughness of metal surfaces.

Rajesh Ramadass "Process Variables Optimization in Lapping of EN8 Material Using Taguchi Method" (2018) in their report the main sight of this work is to deplete the surface roughness within the flat lapping of EN8 material. The method variables thought of for the studies were lapping time, abrasive size and abrasive carrier oil proportion. ad been understood that minimum corundum abrasive proportion in suspension provides higher surface quality in overlapping of EN8 material. The finest combination for least surface roughness were 15 minutes lapping time, eighty µm abrasive size and 1:3 abrasive carrier oil proportion in slurry.

Pravin R Parate "Conditioning Parameters for Maintaining Plate Flatness Prior to Lapping" (2014) in their report Imbrication could be a method, usually performed on hard metal plate employ in conjunction with abrasive suspensions like diamond, carbide, aluminum oxide or element inorganic compound, etc. Selection of the metal imbrication plate depends upon the identified material removal rate, the surface roughness required on the finished job, the kind and hardness of the fabric being lapped and conjointly on some extent on the ability of the employee for hand lapping. During this paper, totally different flatness error caused on the imbrication plate owing to the excessive wears.

DS Guevarraa "Design and Experimental Study of an Automatic Lapping Machine with in-process torque monitoring system" (2002) by their brief report the focus of this study is to regulate an effect matter on the automated imbrication machine for top exactness ball screw in each activity and finishing method. A prototyped plane imbrication machine with in-process torsion observing system has been designed, built, and tries out. This is often to see the link among lapping torsion, effective diameter, and error on visit establish the measuring system to regulate the finishing operations expeditiously and eventually improve and eliminate the assorted styles of error elements in an exceedingly ball screw. The experimental results showed that the new imbrication technique may adequately predict the effective diameter and error on surpass perceptive the imbrication torsion.

Yoomin Ahn "Surface Roughness and Material Removal Rate of Lapping Process on Ceramics" (1997) as per the mention in report lapping may be a large used surface finishing technique for ceramics. Equate degree experimental examination is conducted into the imbrication of aluminum oxide, Ni-Zn primary solution and water glass glass pattern set abrasive to see the results of technique parameters, like abrasive particle size, overlapping pressure, and abrasive concentration, on the surface roughness and material removal rate all round overlapping. A simple model is developed supported the depression fracture and abrasive particle assigning inside the suspension to elucidate varied aspects of the lapping technique. The model provides predictions for the surface roughness, R_a and R_t , on the machined surface and rough estimation for the material removal rate throughout overlapping. Comparison of the projections with the experimental measurements declares same order of magnitude accuracy.

3. Problem statement

Present 'Lapping' process used in the company is manual lapping, according the industrial requirements and changing scenario in the market it is required to make manufacturing of gauges in less amount of time and without neglecting the 'Quality' of the Gauge.

- The company is a Component based Manufacturer. Hence we need to focused on the process of each assignment.
- Existing lapping process consumes more time.
- It requires more attentiveness.
- Skilled & Experiences worker required.
- Uniformity will not achieve.

4. Objective

To Design and Manufacture the Machine to improve the process of lapping of Snap Gauge IS 8023. The design aims at the following targets,

1. Increase production rate
2. Increase and maintain quality.
3. Improve working condition for the operators.

5. Discussion

The method used in the workshop to lapp the gauge is manual method. This takes the lapper around 25-30 minutes per job (Gauge). The company needed to make this process less time consuming and Hence, the company decided to automate the process. This significantly reducing the time required per job (Gauge).

6. Scope

- a) Use in Lapping of different size of gauges by changing the fixtures.
- b) High volume production at low investment.
- c) By developing this concept, in future we can make more conceptual automation.
- d) While using this machine for production, time cycle of production can be reduce.

7. Methodology

The design planning involves the following steps;

- a) Collection of Data related to snap gauge
- b) Material Selection
- c) Calculation
- d) Manufacturing & Assembling

7.1 Data Collected

The company manufactures gauges ranging from 3mm to 250 mm. The machine is to be designed is for a specific range of gauges. The dimensions of gauges are collected. As per the company record, company requires in more quantity gauges ranging between 6mm to 70mm.

Different components required:

1. Lapping disc
2. Slurry or Paste
3. Pneumatic cylinder

4. Clamp
5. Holding Brackets
6. Pressure Gauge
7. Limiting switch
8. Shaft
9. Base Plate
10. Motor

7.2 Material Selection

EN31

| C | Si | MN | S | P | Cr |
|------------|------------|------------|---------------|---------------|------------|
| 0.90-1.20% | 0.10-0.35% | 0.30-0.75% | 0.050% Max | 0.050% max | 1.00-1.60% |

OHNS

| C | Si | MN | S | V | Cr |
|-------|-------|------|--------|-------|-------|
| 0.94% | 0.30% | 1.2% | 0.050% | 0.15% | 0.50% |

7.3 Working

1. Loading the workpieces on the Clamp which is specially design for some type of Snap Gauges.
2. The Lapping wheel is lowered gently to rest on the inner side of the workpieces.
3. The wheel starts rotating slowly, automatically and also controlled by the operator.
4. The abrasive slurry is fed automatically through the arrangement during the cycle in order to provide the necessary abrasive action on inner side of the workpieces.
5. The pressure of the workpiece on the wheel is initially light (as the high points are machined away). Then the pressure is gradually increased until the optimum pressure, best suited for the job, is reached.
6. The cycle continues until the desired size is obtained, the time at which the rotation stops, the top wheel lifts and swings to the side for unloading the finished workpieces.

8. Conclusion

As the project is based on semi-automatic inner lapping. We have analyzed the problem for the manufacture of snap gauge in less time of the cycle to do, so we had decided to

automate the process. After studying the parameters, we design the SPM and then did the FEA analysis in which we found no stress / deformation is generated and the design is safe, after that we manufacture the SPM and took readings of cycle time and found that the cycle time for each job is reduced by 5 minutes.

We can reduce the time of the cycle further by making improvements in the design the current parameters are set according to the need of manufacturer.

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