International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 04 Issue: 05 | May -2017 www.irjet.net p-ISSN: 2395-0072

Provision of Belt Grinding Instead of Shot Blasting For the Requirement of Small Circular Fitting Job

Prof.M.C.Ingale[1] ,Arjun S. Bichukale[2], Akshay S.Deshmukh[3], Sagar R.Fale[4], Vikee R.Kaldate[5]

[1]*Asst. Prof. Dept of Mechanical, Sppu, PVPIT, Pune, Mahrashtra, India*
[2345]*Dept of Mechanical Engg.Pursuing Bachelorette Degree,PVPIT,Pune,Maharashtra,India*

Abstract: *The best quality product is produces from various manufacturing processes. Every company aim is to produce good quality product with short time and minimum price. In foundry industry the shot blasting process plays a vital role for clean, strengthen or polish the metal, in foundries the handling of shot blasting machines having most hazards related to health, safety & Environment are involved. After heat treatment process blackish and to improve aesthetic appearance of part appearance observed on the surface of the product so that we have to remove this, by shot blasting process. The product quality will be good when the manufacturing processes like turning, facing, threading, grooving etc. are done without using the shot blasting process. After shot blasting process turning operation is look place all over the part so most of the sot blasting effect is remove during this operation. so we have decided to skip shot blasting process. So after heat treatment without shot blasting trail is taken and it is found that small blackish line is available at hex chamfer. But small blackish spot remained on the some portion of the product that is not accepted by the customers. so polishing is done only that surface only not for whole product. So shot blasting process is not economical for that type of product. Also shot blasting process is time consuming and expensive so we can use some alternative method instead of shot blasting process. so we can eliminate by using some alternative methods such as Metal tumbling, metal polishing, ultrasonic cleaning, cylindrical grinding, belt grinding or polishing belt grinding etc.*

Keywords*: Belt grinding, hazards of shot blasting, emission, depth of cut, MRR, Speed of belt grinding,*

Introduction

Belt grinding it is an abrasive machining process used on metal and other material it is typically used as finishing as well as polishing process in industry A belt coated in abrasive material is run over the surface to be processed in order to removed material or produced desired finish. The belt grinding process is variable by adjusting certain parameters such as belt speed, grinding pressure, feed speed and size of contact etc. belt can be constructed with single or multiple head. First head is used for coarse belt grinding and other for fine grinding. Among of two processes, fine belt grinding is economical for our fitting job polishing because, in case of coarse belt grinding, there is high removal heavy stock. Also fine belt grinding method gives finish from 0.01 to 0.005 mm depth with high accuracy. So fine belt grinding is beneficial for our product requirement because we need only 50 micron polishing but above belt grinding process give us polish up to 50 micron. Hence it satisfied our product aim.

Process flow chart of our industry

- **Present Process flow at shop floor :**

Heat Treatment → **Shot Blasting** → Crack Testing Polygon (Milling) → Gun drilling → CNC Set Up 2 CNC Set Up 3 → Deburring → Ultrasonic Cleaning Millipore Testing → Visual Inspection → Packing Pre → dispatch Inspection

- **Proposed Process flow at shop floor**:

Heat Treatment → **Belt Grinding** Crack → Testing → Polygon(Milling) → Gun drilling → CNC Set Up 2 → CNC Set Up 3 → Deburring → Ultrasonic Cleaning → Millipore Testing → Visual Inspection → Packing → Pre dispatch Inspection

Results observed on product by:


After Heat treatment


After shot blasting

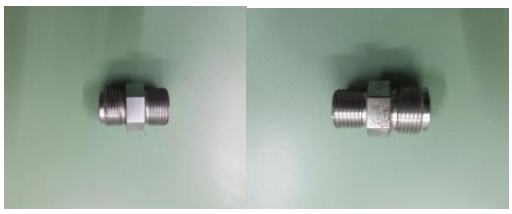
Using shot blasting without using shot Blasting

fig.1 Results observed on product

I. Challenge to Shot Blasting Process

The company uses shot blasting process to remove black appearances on the work piece. So, first of all company carries heat treatment process before shot blasting process and then conduct other manufacturing process. In company, this process takes up to 10 sec/product time for our circular fitting job. As per company requirements, this process having more time consumption. So, goal of company is to achieve product polishing within 4-5sec.Also, shot blasting is not suitable for our entire product and it having some hazardous effects on product.

These hazardous effects are as follows:

Leakage in shots: - At the time of blasting the metal, the leakage of shot is a major hazard in the shot blasting machine.

Aluminum dust emission: - It is very dangerous and explosive while it get ignited. and also made some occupational related health issues occur due to inhale the dust.

Dust inhalation: - It may cause adverse effects to the workers.

Noise: - Some workers have been shown to be exposed to levels of noise over 100 db; shot blasting machines and shell making equipment may also be sources of excessive noise.

Physical Injuries: Serious burns may result from splashes of molten metal in the melting and pouring areas of the foundries. Frequent, unprotected viewing of white hot metals in furnaces and pouring areas may cause eye cataracts. Eye injuries from molten metal or fragments of metal may occur in the pouring and dressing areas.

II. Experimentation

The selected work piece material which having diameter 22.5 mm and length 32.81 mm was used. This steel is widely used in industrial applications like engine shaft, connecting rods, studs, screws, spindles etc.The chemical composition of our work piece is given below.To hold the work piece,we make C fitting job holder. For making this holder, we uses mild steel round bar which having diameter 38 mm and length 92 mm. On lathe machine, we carry out turning operation up to 25.5 mm on the round bar also 4.5 mm facing which carried on each side of round bar.So on, for locating the workpieces,we creates a throughout hole of 22.5 mm diameter on vertical drilling machine with an suitable arrangement. To maintain direct contact with belt grinder, we cuts arc on round bar with 179^0. This helps us to ensure better contact. As we know, for achieving an better performance, we need to hold the C fitting job holder. for that purpose, we select mild steel material. from that material, we makes 2 C- shaped plates of 25.5 mm inside die with the help cutting machine and then these plates are joined by rectangular plate using strong welding.To keep the C fitting job holder in with contact C bracket, M04X10 mm Alan screw is used which holds it tightly. it contains vertical column, horizontal square bar, base plate etc. For manufacturing of vertical column, we cuts square bar of 38X38 mm by using cutting wheel. Also we take its height up to 260 mm. All assembly is supported on it; hence it should be properly supported. So we weld it to base plate which bolted to installed support of grinding machine. Also then, we produces horizontal square bar of 19X19 mm. It enhances proper contact of work piece to belt grinding. For supporting this bar, we make provision of square hole of about 19X19 mm in vertical column at 210 mm height. It slides in it smoothly due to provision of square bushes. The material used for the horizontal square bar which is as same as for the vertical column. It also cut by using cutting wheel. Then we produced a rectangular base plate of 100X80 mm by using cutting wheel machine. and then we makes a 4 drill of 10 mm dia on base plate. Finally, we mount this base plate on rigid support of machine. Also, for convenient operation of square horizontal bar, we produce a simple arrangement of handle.

Table 1 Chemical Composition of product (%)

Carbon (c)	Manganese (Mn)	Silicon (Si)	Molybdenum (M)	Chromium (Cr)	Sulphur (s)	Phosphorous (P)
0.38-0.4	0.75-1.0	0.15-0.30	0.15-0.25	0.8-1.10	0.040	0.035

Table 2 Physical properties of AISI 4140 alloy steel

Properties	Metric	Imperial
Density	7.85 g/cm^3	0.284 lb/inch^3
Melting point	1416^0c	2580^0F

Table 3 Mechanical properties of alloy steel

Tensile Stren	Yield Strength	Bulk Modulus(typical for	Shear Modulus(typical for	Elastic modu	Poisson's ratio

gth		steel)	steel)	lus	
655 Mpa	415 Mpa	140 Gpa	80 Gpa	190-210 Gpa	0.27-0.30

Meaning of 4140
4-Molybdenum steel
1-Chromium
40-0.4 % Carbon

Fig.2.1 work piece preparation

Fig.2.2 Alloy steel 4140 Belt grinding Machine

Fig.2.3 Prepared Work pieces after belt grinding.

III. Results And Discussions

Material removal rate results: Firstly the weight of the work piece is measured before the machining process with help of balance, the initial weight of the work piece is noted down. After weight measurement, the work piece is held between C-fitting job holder and belt grinder. During the machining process, the time taken for each section for grinding is measured with the help of stop watch as shown in figure. and noted down. After the machining at one section, the work piece is removed from the machine and the final weight of the work piece is measured. The experimental results are calculated for Material removal rate to optimize the effects of parameters on MRR. The results obtained using Taguchi optimization technique.

Material Removal Rate: MRR can be defined as the ratio of volume of material removed to the machining time.

MRR= (Wb-Wa)/Tm

Wb =weight of work piece material before grinding
Wa = weight of work piece material after grinding
Tm = machining times (min/sec).

Table 4 Experimental results for Material removal rate (MRR)

Belt grinding speed (rpm)	Work piece speed (rpm)	Weight(before grinding) wb	Weight (after grinding) wa	Time (sec)	MRR
1000	350	0.084	0.078	14 sec	0.00042
1000	400	0.084	0.078	13 sec	0.00046
1000	375	0.084	0.078	12 sec	0.00050

From table no 4, for Material Removal Rate (MRR) clearly indicates that the work piece speed, grinding wheel speed and feed rate is more influencing for surface MRR and depth of cut is least influencing for material removal rate.

IV. Conclusion

Based on Experimental result obtained by provision of belt grinding instead of shot blasting process for small fitting components in this study following conclusion can be drawn:

I. From this experiment, we observed that belt grinding machine requires 4sec per product as compared to shot blasting process, required 6 sec per product so less time consumption for belt grinding machine.

II. So shot blasting process is not economical for that type of product. So,it conclude that to eliminate the shot blasting process for saving the cost as well as time and thus process will be more economical.

V. References

1) C. Krishna Kumar (2016),"HSE assessment and improvement in shot blasting process",IOSR journal of mechanical and civil engineering Vol 13,pp 01-05.

2) B. Balwindersingh (2014)," Effect of process parameters on micro hardness of mild steel processed by surface grinding process", IOSR journal of mechanical and civil engineering Vol 10, pp 61-65.

3) Sandeepkumar (2015),"Review of analysis & optimization of cylindrical grinding process parameters on material removal rate of En15AM steel", IOSR journal of mechanical and civil engineering Vol 12, pp 35-43.