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Increased the Productivity of Casting by Re-Design of the Shot Blasting Hanger.

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Abstract: - *Shot Blasting machine use a various hanger during machining of various process, in this work its essential to increase production rate in RVM industry. For this its required to increase hanger capacity for the various castings used in the industry. To increase hanger capacity for number of casting its required to re-designed the hanger such a way that its capacity is maximum up to 300Kg of short blasting machine. With the study of shot blasting machine and its hanger we should have to design hanger as requirement*

Keywords: - *Shot Blasting Machine, Shot Blasting Hanger Cost Reduction, Productivity Improvement,*

I. INTRODUCTION

Castings are removed from mould box placed on hanger .Due to automatic feed mechanism then Castings are travels in to the shot blasting machine. Before the blasting program begins, the machine door is manually closed and locked. As the casting hanger rotate, they are blasted at two different blasting stations according to -the pre-set blasting times. The blasting abrasive is continuously cleaned, recalculated and reused. An abrasive metering device feeds the cleaned abrasive from the abrasive storage bunker to the high-performance turbines. Upon completion of the blasting cycle and after the turbines have come to a complete stop, the machine door opens manually and the suspended castings return to their initial position by manually.

II. PROBLEM STATEMENT

Existing system of short blasting machine hanger carrying 16 Number of casting for the operation having 14 minutes of machining time. The problem is that, number of components per operation is less, so required to increase the production rate at the same machining time. After discussion with industry and important of above problem we have taken this problem for our project work. After doing study of current short blasting machine, hangers and its process there may be possibility to increases the production.

Fig 1. Existing Hanger with castings use in short blasting machine.

III. AIM & OBJECTIVE

Present design of Hanger is carrying maximum 16 No of casting due to this productivity is very low of current industry, so we will redesign the current shot blasting hanger and achieve the following objectives on the new design of the hanger for the shot blasting machine.

1. To increase no. of casting more than 16 within the existing hanger capacity. (300kg).
2. To reduce the cycle time of operation.
3. Redesign of hanger.
4. Material selection for hanger.
5. Bending Stress and Diameter of hanger Rods by using Analytically Method.

IV. RE-DESIGN OF EXISTING HANGER

4.1. Selection of material for New Hanger

We can use stainless steel for hanger material and it is the best alternative for existing hanger material (Mild Steel). But we cannot use it for re-design because of its Cost and availability. So, we select the same material for re-design of short blasting hanger i.e. Mild Steel (Grade-C20).

Calculation for Diameter of steel rod.

Weight of Casting	: -	4.5 /Kg.
Number of Casting on Hanger	: -	36 Nos
Number of branches of hanger	: -	12 Nos
Number of casting per branch	: -	3 Nos

300 kg Short Blasting machine door is 1000*1000. So, we Assume all the lengths of hanger as shown in fig below, so it can move in and out easily between the door.

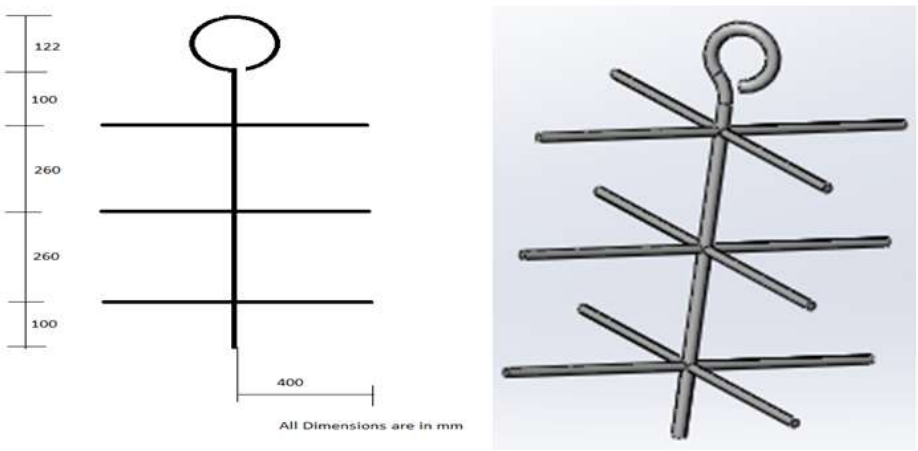

Fig.2. Dimensions and Proposed model of Re-Designed Hanger

4.2.1 Load of castings acting per branch: -

Load of single Casting = 4.5 * 9.81 = 44.145 N

Assumptions: -

Considering one branch of hanger for calculation

Let,

One branch of hanger is fixed to one end and another end is free like as cantilever beam.

Three casting per branches

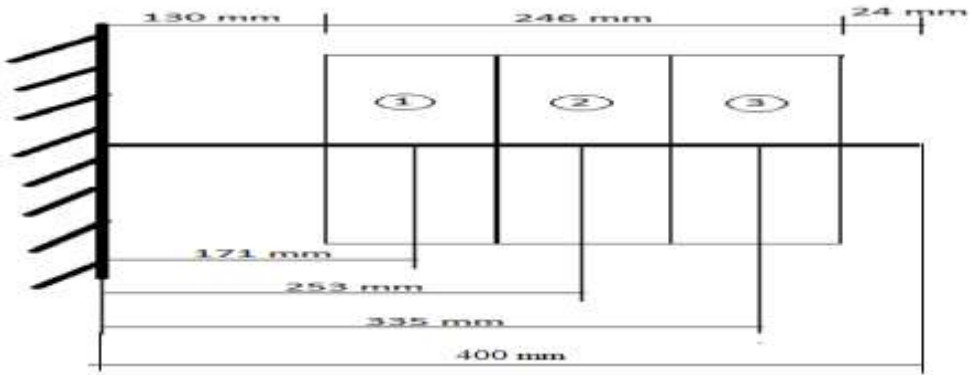

Fig.3. No of casting per branch

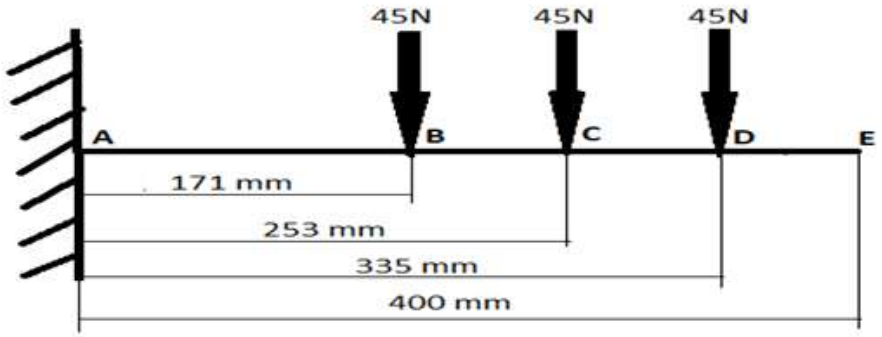

Fig .4. Load Distribution Diagram

4.3. Bending Moment: -

Mb = (45*171) + (45*253) + (45*335)
Mb = 34155 N-mm
FOS: - 1.5
Syt:- 260 N/mm2
Working Stress = Syt / FOS
= 260 / 1.5 = 173.33 N/mm2
Bending Stress (σb)
σb = 32 Mb / π d3
173.33 = (32 * 34155) / π d3
d = 12.61 mm
d = 14 mm
d = 18 mm
In Shot blasting machine, shots of abrasives hitting on the casting as well as hanger also due to this hanger wears, therefore Additional increased diameter is use because of this increase diameter life of hanger increases.

4.4. Calculation of Middle Rod Diameter

Ultimate tensile strength = 540 N/mm2
Factor of Safety = 1.5
Working Stress = Sut / FOS = 540 / 1.5 = 360 N/mm2
Stresses Acting on middle Rod i.e. Direct Stress and Bending Stress.
Load on Single Casting = 45 N
Total load of Casting on Hanger = 45 * 36 = 1620 N
Direct Stress (σd) = F/A = (1620 * 4) / π d2 = 2062.648 / d2
Bending Moment on Single Branch = 34155 N-mm
Total Bending Moment = 34155 * 12 = 409860 N
Bending Stress (σb) = (32 * Mb) / π d3 = (32 * 409860) / π d3= 4174799.678 / d3
Working Stress = σd+ σb
360 = (2062.648 / d2) + (4174799.678 / d3)
d3 = (2062.648 * d) / 360 + (4174799.678 / 360)
d3 = 5.73 d + 11596.67

d3 – 5.73 d – 11596.67 = 0
d = 22.72 mm
d = 25 mm
4.3 Weight of New Hanger

4.5.Weight of single branch
W = Volume * Density
Where,
Density = 7850 Kg / m3
Radius (r) = 9 mm = 0.009 m
Length (l) = 400 mm = 0.4 m
W = π r2 l * 7850 = π * 0.0092 * 0.4 * 7850 = 0.8 Kg
Total Weight of Branches = 12 * 0.8 = 9.6 Kg
Weight of Vertical Bar
Radius (r) = 12.5 mm = 0.0125 m
Length (l) = 720 mm = 0.72 m
Length of Hook = π * d = 3.14 * 0.025 = 0.07853 m
Total Length of Hanger = 0.72 + 0.07853 = 0.7985 m
W = Volume * Density
W = π r2 l * 7850
Weight (W) = 3.14 * 0.01252 * 0.7985 * 7850 = 3.1 Kg
Total Weight of Hanger = 9.6 + 3.1 = 12.7 Kg

4.6. Ansys of Newly Design Hanger.

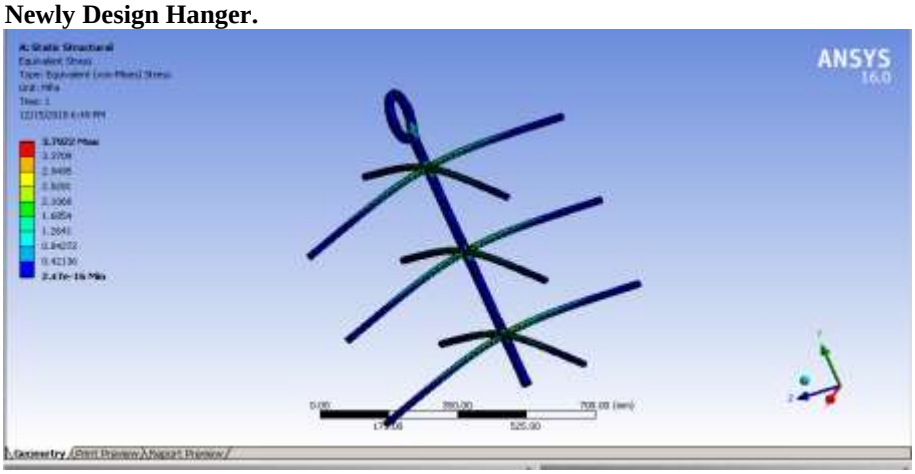

Fig .5. Equivalent (von-Mises) Stress

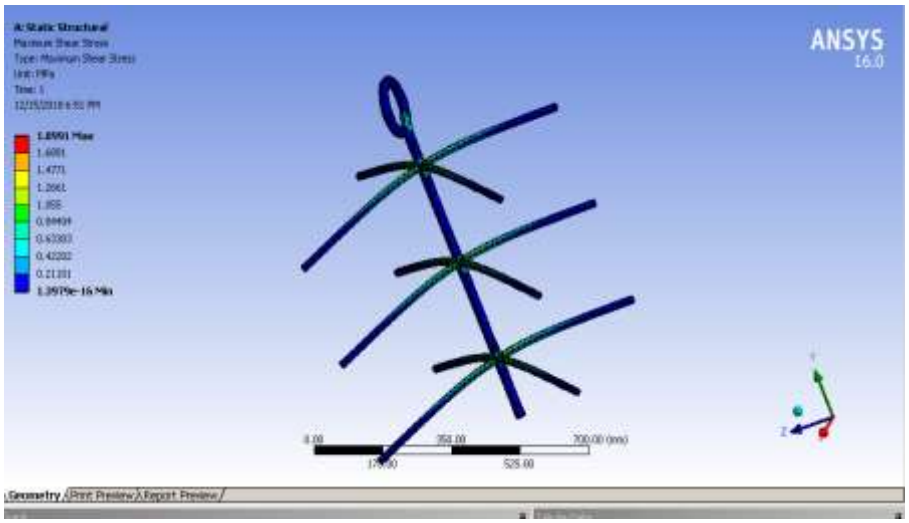

Fig.6. Maximum Shear Stress

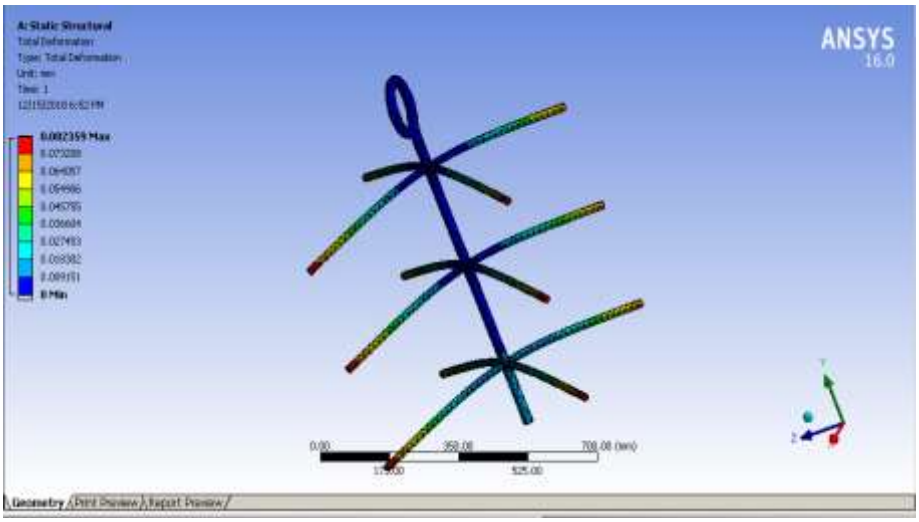

Fig .7.Total Deformation

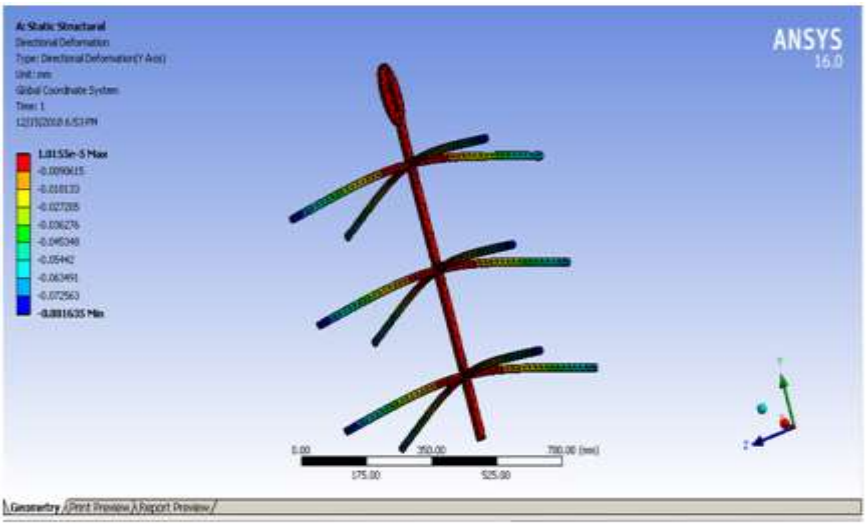

Fig .8. Directional Deformation (Y-axis)

V. CONCLUSION

Table 1. Comparison between Existing and Re-design hanger.

Sr. No.	Parameters	Existing Hanger	Re-Design Hanger
1	No. of Branches	8	12
2	No. of castings per branch	2	3
3	Total No. of Castings on hanger	16	36
4	No. of operation cycles	2	2
5	Weight of hanger	8.29 kg	12.7 kg
6	Total Time required per Batch	14 min.	14 min.

After performing trial test on re-design hanger, it seems that surface finish of casting is same that of existing one and operation cycles required is same (i.e. Two cycles).Production rate increased but surface finish issue still not solved in one operation cycle. Still another operation cycle is required as that of existing one. Our problem still A remains unsolved so, we have to design such hanger which will solve above problems and also increase production rate.

In this project work, castings carrying capacity of hanger is increase hence production rate increases by using newly design hanger as compare to existing hanger using in shot blasting machine. After implementation of new designed hanger, we increased casting range 16 Nos to 48 Nos hence we increased production rate thrice. Total Benefit annually for industry Rs 8, 00,638 /-

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