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DESIGN OF JIG & FIXTURE FOR SURFACE FINISHING OF INTAKE MANIFOLD

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Abstract : The scope of this project is to give surface finishing to Intake manifold. On Lathe Machine by using Jig & fixture. Jig is device which is used to hold the work piece or fix the work piece and guide the cutting tool. The purpose of the jigs is to provide strength, holding, accuracy and interchangeability in the manufacturing of product. The objective of this project is to design and development of jig & fixture. Productivity & quality are the major factor for growth of our Indian manufacturing sector. The total machining time is reduced by 7 min per component which improves the productivity. In various industries the verity of job is less and high quantity of job produced. Because of high productivity mass production up to the increment of 32760 job per year occurs, this is possible when reducing total cost and saving time.so mass production is achieved by use of fixtures. In this project the design of fixture for drilling operation and facing operation from the both sides. Such fixture are made accurate and precise drilled hole and also individual positioning, marking, frequent checking are eliminated. Fixtures are the tool used to locate and hold the work piece in position during the manufacturing process. So we design the fixture 3D model by using design software's (Creo, Catia, cad) etc.

IndexTerms –Introduction, Theory Of Manufacturing, Analytical Design Calculations, Design based on Creo parametric, *etc.*

I. INTRODUCTION

Fixtures are the tool used to locate and hold the work piece in position during the manufacturing process. Fixtures are used to hold the parts firmly which are to be machined, it is used to produce the duplicate parts accurately. In order to produce parts with required accuracy and dimensions the parts must be firmly and accurately fixed to the fixtures. To do this, a fixture is designed and built to hold, support and locate the work piece to ensure that each work piece is machined within the specified limits. Set blocks, feeler or thickness gauges are used in the fixture to refer the work piece with the cutter tool.

The fixture is a special tool for holding a work piece in proper position during manufacturing for supporting and clamping the work piece, device is provided. Frequent checking, positioning, individual marking and non-uniform quality in manufacturing process is eliminated by fixture. This increase productivity and reduce operation time. Fixture is widely used in the industry practical production because of feature and advantages. To locate and immobilize workpieces for machining, inspection, assembly and other operations fixtures are used. A fixture consists of a set of locators and clamps. Locators are used to determine the position and orientation of a workpiece, whereas clamps exert clamping forces so that the workpiece is pressed firmly against locators. Clamping has to be appropriately planned at the stage of machining fixture design.

II. STATEMENT

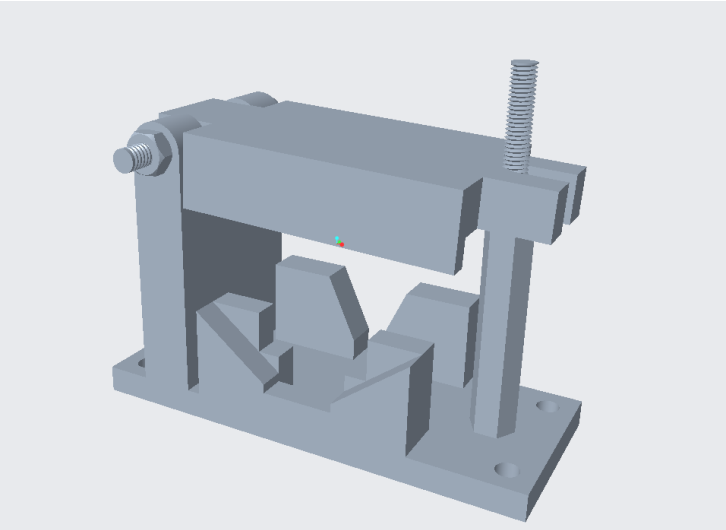
After discussion with current industry ,the component which have taken for our project study , they have drilling and surface finishing operation. But currently they are using fixture for single side operation , due to which very less productivity and also it is a time consumable , so we have taken the project for study .We will try to design a fixture such way that , increase the productivity and reduce the time.

III. OBJECTIVE

- Reduce the cycle time for operation more than 60 %.
- Increase productivity more than 50%.

• Reduce the damage % of the component because of less material handling.

IV. DIAGRAM



V. SCOPE

Reduces the cycle time, due to this increase productivity and also less material handling reduces the percentage of damage.

VI. MATERIAL COST ESTIMATION

Material Cost Finding Calculation:

1) Clamp

Area = W * L
= 12.2 * 220
= 2684 cm^2

Specific gravity per kg of clamp is 7.86

Total weight = Area * Specific gravity
= 2684 * 7.86
= 21.09 kg

Cost = Weight * 60 Rupees/ Kg *1
= 21.09 * 60
= 1265.4 Rs

2) Side Support

Area = l*b*h
= 12*70*70
= 58800 cm^3

Specific Gravity Per kg of side support = 7.86

Total Weight = Area * Specific gravity
= 58800 * 7.86
= 462.16 kg

Cost = Weight * 40 Rs/ Kg * 1
= 46.2116 * 40
= 1848.4 Rupees.

3) Base Plate

Area = l * b
= 270 * 15
= 4050 cm^2

Specific gravity per Kg of Base plate = 7.86

Total weight = Area * Specific gravity
= 4050 * 7.86
= 31.83 kg

Cost = Weight * 40 Rupees / kg * 1
= 31.83 * 40
= 1273 Rs.

4) V- Block

Area = $\frac{a+b}{2}$ h
= $\frac{24+48}{2}$ * 15 = 540.

Specific gravity per kg of V- Block = 8.92

Total weight = Area * Specific gravity
= 540 * 8.92
= 48.16 kg
Cost = Weight * 60 Rupees / Kg * 1
= 46.16 * 60 * 1
Cost = 2889.6 rupees.

5) Bolt

Area = $\pi/4$ * (dn – 0.9743 / n)^2
= $\pi/4$ (17 – ($\frac{0.9743}{0.5}$))^2
= 177.92 mm^2

Specific gravity of Bolt is = 7.5

Total Weight = Area * Specific gravity
= 177.92 * 7.5
= 1.23 kg

Cost = weight * 20 Rupees / Kg * Quantity
= 1.33 * 20* 10
Cost = 266 Rupees.

Sr. No	Element Name	Cost/Kg	Total Cost (Rs)
1	Clamp	60	1265.46
2	Side support	40	1848.40
3	Base Plate	40	1273
4	V- Block	60	2889.60
5	Nut and Bolt	20	266
		Total	7542.46

Table No :1 Cost Estimation

VI. RESULT AND DISCUSSION

From above overall study. And results of fixtures the old machine SPM has high machining cost per component because its time required per component is high as compared to VMC used.
So we design the fixture for the Lathe machine and time, cost decreases in high extent. Previous machine has required 10(Ten) minutes for job for drilling from one side. But by using fixture for lathe machine the time required is 3(Three) minutes from the both sides. So production rate is increases. That's why company profit obviously increases.

SPM	JOB	LATHE	JOB
10min	1	3min	1
1hr	6	1hr	20
1day	45	1day	150
1week	270	1week	900
1month	1170	1month	3900
1year	14040	1year	46800

Table No.2:Production Rate

The production rate increased 3.33 times of SPM production by using fixture on Lathe.

VII. CONCLUSION

The efficiency and reliability of the product manufacturing has enhanced by the system and the result of the fixture design has made more reasonable. To reduce cycle time required for loading and unloading of part, this fixture approach is useful. If modern CAE. CAD are used in designing the systems then significant improvement can be assured. To fulfill the and high-performance fixturing requirements optimum design approach can be used to provide comprehensive analyses and determine an overall optimal design.

From this project, we can do our component drilling operations on stub axle a component very easy without any errors. By these new Drill fixture components are clamped in the desired location, and reducing deflection from clamping force. So that set-up time reduced, productivity increased, minimize material handling, reduced cost per component.

VIII. REFERANCE

1. Guohun Qin, Weihong. Zhang Min Wan "Analysis and Optimal Design of Fixture Clamping Sequence ASME for publication in the JOURNAL OF MANUFACTURING SCIENCE AND ENGINEERING, 2006
2. Michael Stampfer "Automated setup and fixture planning system for box-shaped Parts" International Journal of Advance Manufacturing Technology 45:540-552 DOI 10.1007/s00170-009-1983-1, 2008.
3. Djordje Vukelic, Uros Zuperl & Janko Hodolic "Complex system for fixture selection, modification, and design" Int J Adv Manuf Technol 45:731-748 DOI 10.1007/s00170 009-2014-y, 2009.
4. Weifang Chen Lijun Ni & Jianbin Xue "Deformation control through fixture layout design and clamping force optimization" Int J Adv Manuf Technol 38:860-867 DOI 10.1007/s00170-007-1153-2.2008.
5. . J. Cecil "A Clamping Design Approach for Automated Fixture Design" Int J AdvManuf Technol 18:784-789,2008