

## **“Design and Fabrication of Jig and Fixture for WheelBolt Hub Assembly”**

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### **ABSTRACT**

The Objective of our project is to design a fixture which is capable of 2 different types of front axle's wheel hub having different dimensions that are currently assembled at Ashok Leyland, Ennore. The 2 axles that are produced are FA90, FA99. Of these 2 are assembled currently in the existing of same machine to improve our production efficiency, time consumption, power consumption and labour cost will be reduced of 50%. Our design aims at solving the above mentioned problems by providing a changing the fixtures. In order to overcome such problems certain modification are to be done so that the fixture can be indexed easily with very little effort. Thus making it a worker friendly fixture. We are doing the design in such a way that it consumes less time for operation and ensures good quality.

### **INTRODUCTION OF JIG AND FIXTURE:**

The jigs and fixtures are the economical means to produce repetitive type of work by incorporating special work holding and tool guiding device. Some of the advantages of employing jigs and fixtures in mass productions are: It eliminates the marking out, measuring and other setting methods before machining. It increases the machining accuracy, because the work piece is automatically located and tool is guided without making any manual adjustment. It increases the production capacity by enabling a number of work pieces to be machined in the single setup and in some cases a number of tools may be made to operate simultaneously. The handling time is also greatly reduced due to quick setting and locating of the machine. It can be increased due to high clamping rigidity of jigs and fixtures. It reaches semi-skilled operation of the tool and the works are mechanized. This saves labour cost. It reduces the overall cost of machining by fully or partially automatic process.

### **BASIC DIFFERENCE BETWEEN JIG AND FIXTURE:**

A fixture holds and positions the work but does not guide the tools, whereas a jig holds,

locate as well as guide the tool. The fixtures are generally heavier in construction and are bolted rigidly on the machine table, whereas the jig is made lighter for quicker handling and clamping with are often unnecessary the work piece. The speed, feed and depth of cut for

#### **TYPES OF FIXTURE:**

1. Plate fixtures
2. Angle plate fixtures
3. Vice-jaw fixtures
4. Multi station fixtures

#### **PROBLEM ANALYSIS:**

The main problem faced by the company was the improper fixture on the hub bolt & racer pressing machine. Improper fixture design. Effective accommodation of all the two types of fixture by the same machine. The defects in the existing system were studied. A 'Cause and Effect' diagram is drawn to highlight the problems and their causes.

#### **DESIGN A PLATE FIXTURE:**

The first step in designing a plate fixture is assembling and analyzing all relevant data concerning the part to be machined. Once a plate fixture has been determined to be the most economic and efficient fixture to use for the operation, the designer begins to analyze specific information about the part to design ideas.

- The part is a rough casting approximately.
- The approximate wall thickness.
- The part has no prior machining.
- The material is cast aluminum.

#### **FACTOR TO BE CONSIDERED WHILE DESIGNING FIXTURE:**

##### **LOCATION:**

- Locating surfaces are kept as small as possible and the location are made from the machined surfaces
- Locating pins are made accessible and visible to the operator.

### **CLAMPING:**

- Position of clamps is provided as best resistance to the cutting tool.
- Clamps are made in a position which does cause deformation to the work piece.

### **LOADING:**

- The loading and unloading processes are made as soon as possible.
- Loading and supporting surfaces are usually made of hardened material and also it's being renewable as possible.

### **STABILITY AND RIGIDITY:**

- The fixtures possess a high rigidity which withstands the cutting forces.
- The fixtures are made rigidly fixed on the machine table.

### **SAFETY:**

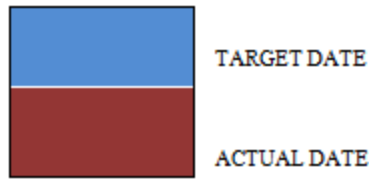
- The fixtures are designed for safety.
- All the sharp edges are removed and avoided.

### **ECONOMY:**

- The fixtures are made reduced in machining and production cost by providing easy manufacturing.

### **ACTIVITY CHART:**

- An Activity Chart was prepared considering the various processes involved in completing the project and the duration of stay at Ashok Leyland. The Chart shows the target date for the completion of a process and the actual date of completion. The Chart explains the various activities that were planned and carried out. The Chart was prepared on consulting our guide Mr. Rajan.



### **JIG:**

A jig may be defined as a device, which holds and locates and work piece and guides and controls one or more cutting tools. The holding of the work and guiding of the tools are such that they are located in the positions relative to each other. In construction, a jig comprises a plate, structure, or box made of metal or in some cases of non-metal having provisions for holding the components in identical positions one after the other, and then guiding the tool in correct position on the work in accordance with the drawing specifications, or operations layout.

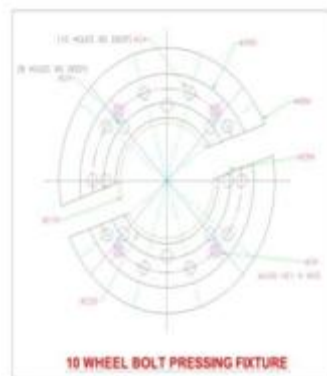
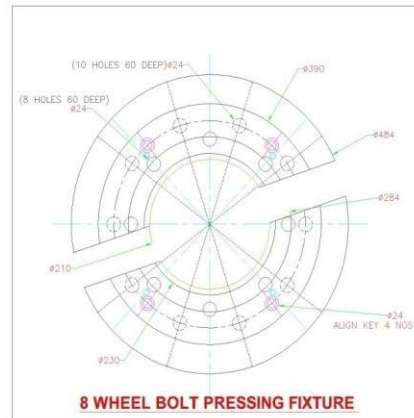
### **FIXTURE:**

A fixture may be defined as a device that holds and locates a work piece during on inspection or for a manufacturing operation. The fixture does not guide the tool. In construction the fixture comprise different standard or specially designed work holding devices, which are clamped on the machine table to hold the work in position. The tools are set at the required position on the work by using gauges or by manual adjustment. **Fixtures** are used to hold the work piece during machining operations. The name is derived from, the fact that a fixture is always fixed or fastened to a machine in the fixed position. It does not contain arrangements for guiding the tool. The use of fixture becomes essential when the components to be produced are in larger number. Some type of tooling used in positioning parts relative to each other for fabricating purposes are also commonly referred to as fixtures, welding fixtures. There are many number of fixtures used in different on the basis of their working operations in the different machine tools. In a setup using a fixture, the responsibility for accuracy depends upon the operator and the construction of the machine tool.

### **ADVANTAGES OF FIXTURE:**

- Reduce the cost of production
- Maintain consistent quality

- Speed production
- Prevent or reduce improper techniques
- Improve the overall safety to the part, operator and machine



### SPECIFICATION OF HYDRAULIC PRESSING MACHINE:

Operation	Wheel Bolt outer race pressing		
Maximum pressure	400 bar		
Capacity	800 KN		
Motor capacity	22 KN	Bearing pressing pressure	400 kg/cm <sup>2</sup> Maintain
hydraulic pressure	220 bar		

### ON RUNNING PRESSING OPERATION:

Bolt pressure	: 200 bar
Bearing pressure	: 175 kg/cm <sup>2</sup>

### MATERIAL:

Jig and fixture	: Mild steel
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Wheel bolt : Castiron

### **MATERIAL GRADE:**

Hub : FA90

Wheel bolt : M22\*2.5

### **CALCULATION:**

Pressure = 200bar

Load = 800KN

Height = 60mm

Maximum load = 40KN

Minimum load = 20KN

Diameter = 24mm

Maximum stress =  $p_{\max}/\text{Area}$

=  $40 \times 1000 / ((3.14/4) \times 24^2)$

=  $88.419 \text{ N/mm}^2$

Minimum stress =  $p_{\min}/\text{Area}$

=  $20 \times 1000 / ((3.14/4) \times 24^2)$

=  $44.20 \text{ N/mm}^2$

Maximum stress/Minimum stress =  $88.419/44.20$

=  $2.0043 \leq 4$

We are using material is cast iron, this material range is less than 4. to find out the value is 2.0043.

So, Design is safe.

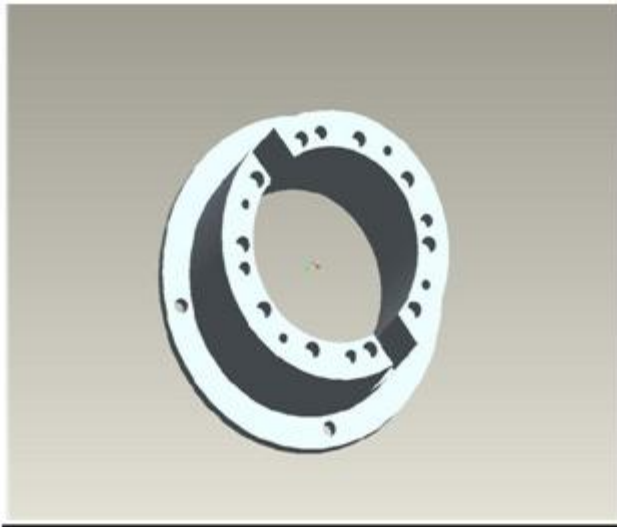
### **WORKING PRINCIPLE:**

- Hub is fixed on the fixture the fixture is holded at properly in header on the fixture. Bearing racer is put on the lower piston end and other one racer is put on the hub. Eight bolts are put on the hub. Its varied depends up on the no of bolts. Plunger is move from top to bottom at eighty ton pressure it is used to press the bolt on the hub. Center of the plunger ram is used to pressing the bearing racer on the top of the hub. After finishing process the ram is move to its home position. Then the hub is lifted and bearings are put on the hub.

### **DEFECT IN THE EXISTING DESIGN OF THE FIXTURE:**

- Separate machine for 8 bolt & 10 bolt hub pressing machine.
- Wheel hub lifted manually.
- Separate machine for bearing racer pressing machine.

### **EXISTING DESIGN MODEL-1:**

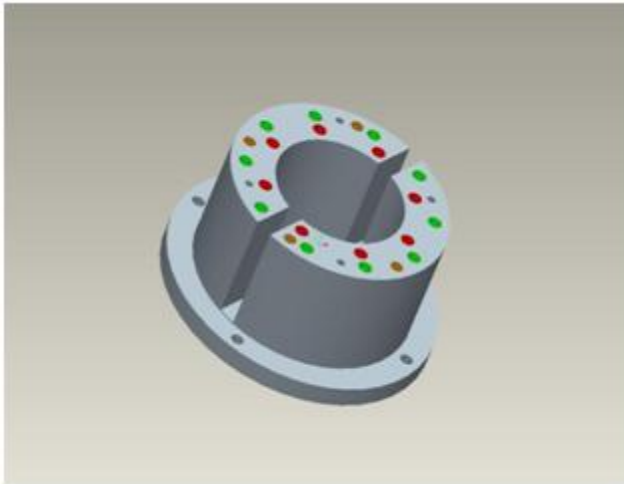


**10 BOLT HUB FIXTURE**

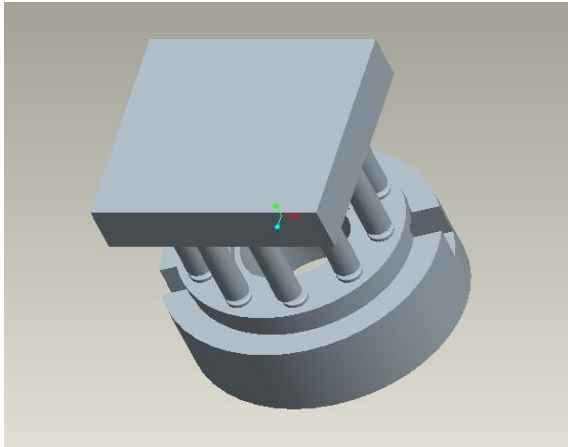
### **DESIGN MODEL-2:**



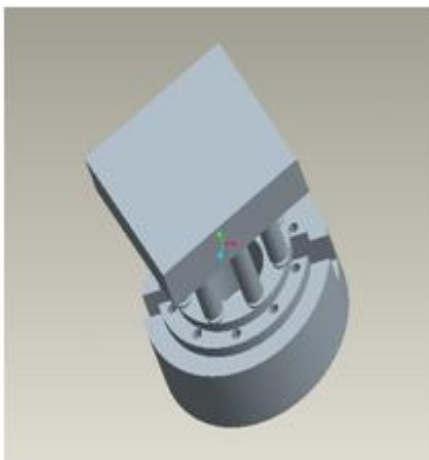
### **8 BOLT HUB FIXTUREPRESENT DESIGN :**



### **FINAL ASSEMBLY FIXTUREDESIGN**

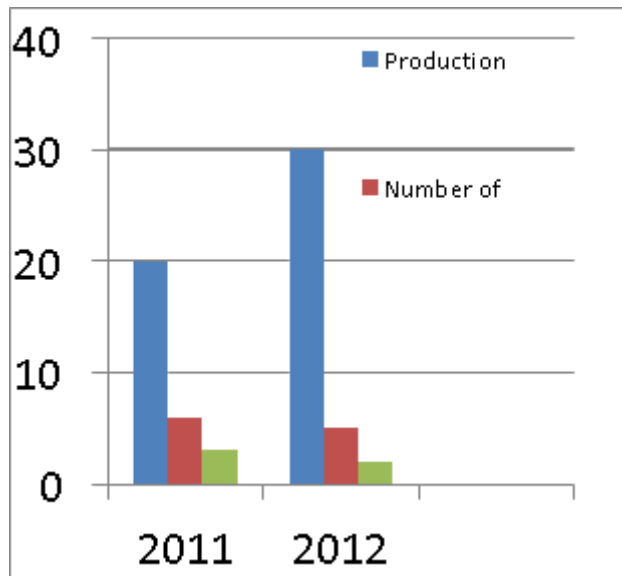


### **10- BOLT HYDRAULIC PRESSING ASSEMBLYDIAGRAM**





## CONCLUSION:



## PRODUCTION RATE GRAPHDIAGRA

In this project we have developed a new design of fixture performing the easy assembly of the wheel bolt hub assembly which is used in the axle. The procedure and principles that has to be followed while

## 8-BOLT HYDRAULICPRESSING DIAGRAM

designing and manufacturing are given. All the problems precious fixture was solved by the new design. So by this project it is possible to hub assembly the fixture platt very easily, the workersphysical strain is very much reduced, with less time consumption, good quality, and mass production.

## REFERENCES:

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- [2] Buffa elwood: modern production management[3]Koepke,c.a plant production control
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