

# Development of Fixture and Gauge of DOC Bracket for W109-Engine

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**Abstract**— A fixture is designed, built to hold, support and locate every component to ensure that each is drilled or machined with accuracy and manufactured individually to save time for loading and unloading of component. A fixture can be designed for the particular job using production tools which make the standard machine tool more versatile to work as specialized machine tools. They are normally used in small scale production by semi skilled operators. A gauge is a device used in measurements or in order to display certain dimensional information. A wide variety of tools exist which serve such functions, ranging from simple pieces of material against which sizes can be measured to complex pieces of machinery. Depending on usage, a gauge can be described as "a device for measuring a physical quantity". This project aims at designing a welding fixture used for performing welding operations on the DOC bracket used in W109 Engine The objective of our project is to design and optimize the welding fixture and also to develop an autonomous gauge for determining position, orientation, of the T-Nuts and to check whether the bracket is according to the prescribed dimension.

**Keywords**— *Fixture, Firmly Locating Work piece, Improve Accuracy, Product Quality, Save time.*

## 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.

A fixture should be securely fastened to the table of the machine upon which the work is to be done. Though largely used on milling machines, fixtures are also designed to hold the work for various operations on most of the standard machine tools. Fixtures vary in design based on the use of relatively simple tools to expensive or complicated devices. Fixture helps to simplify metalworking operations performed on special equipment's.

### 1.1 Objective of Study

The objective of this study is to design and manufacture a welding fixture and go gauge to improve productivity of a DOC bracket manufacturing in company. The DOC Bracket is used as a mounting bracket for W109 Engine. The aim is to also improve productivity of the company during manufacturing DOC Bracket by identifying the critical constraints that are causing the production lag.

### 1.2 Rule for Fixture Design

Workpiece holding devices are critical components in the manufacturing system because of its effect in the part accuracy, product cost and lead time (its effect in loading and unloading time and total machining time). These holding devices can be classified into two branches.

- a) General purpose holding devices; such as chuck (3 jaws or 4 jaws), vise, face plate, ..etc. It can be used to hold workpieces but with larger time to achieve higher accuracy which may increase the cost.
- b) Special holding devices; jig and fixture. It can be produced to hold a certain workpiece lot size or a group of workpieces lot sizes. That holding devices increase the initial cost but decrease the loading and unloading time, the current cost, and increase the quality.

Fixtures are special work holding devices that designed to hold, locate and support workpieces against the tool (cutting tool, assembly tools, or inspection tools) during manufacturing operations (machining, assembly or inspection). The rule of fixture design begins with the product geometry and process planning of the product and ends with the fixture.

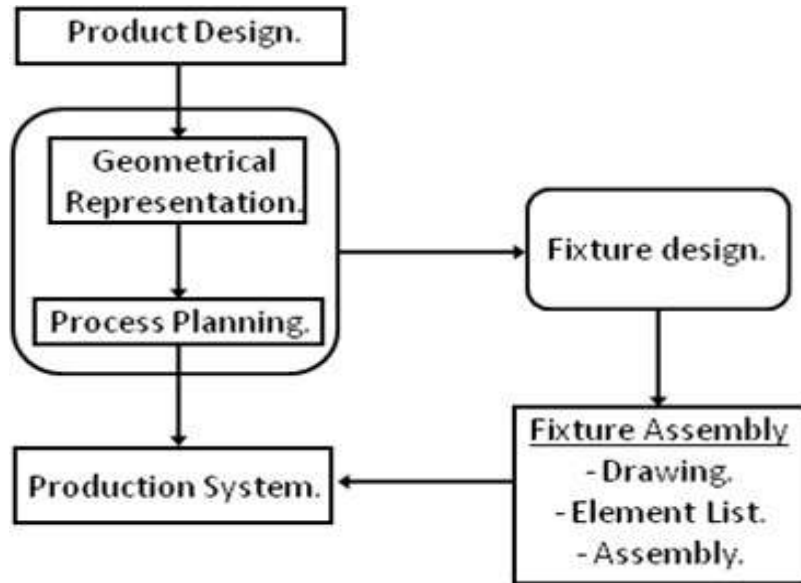


Fig. 1.2 Rule for Designing A Fixture

## II. METHODOLOGY

In order to overcome problems of welding T-nut on the DOC bracket a welding fixture will be made and a go gauge will be made for inspection of holes and angles of DOC bracket. A go gauge will reduce the time of inspection because previously the dimensions were checked by Vernier caliper so it was time consuming and with the use of welding fixture the nut will be weld at perfectly 90 degree instantly so the productivity will also be increased.

### 2.1 Methodology for fixture

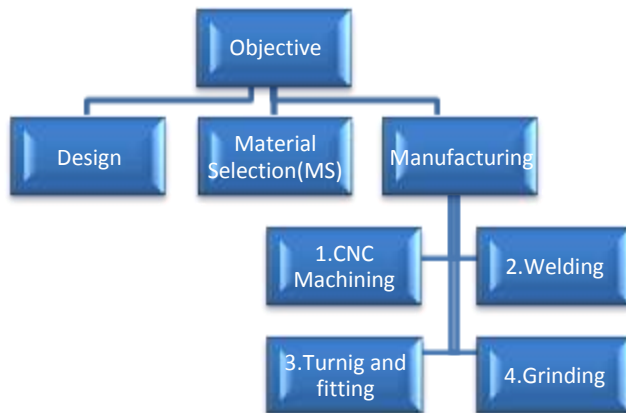


Fig. 2.1.1 Methodology for fixture

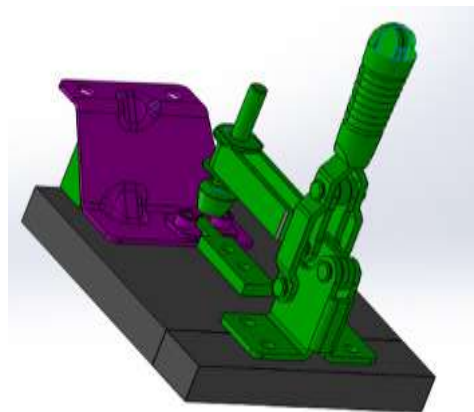


Fig. 2.1.2 Solid model of fixture



Fig. 2.1.3 Manufactured fixture

## 2.2 Methodology for gauge

The methodology of gauge will be same as fixture only the sequence manufacturing operations will be different.

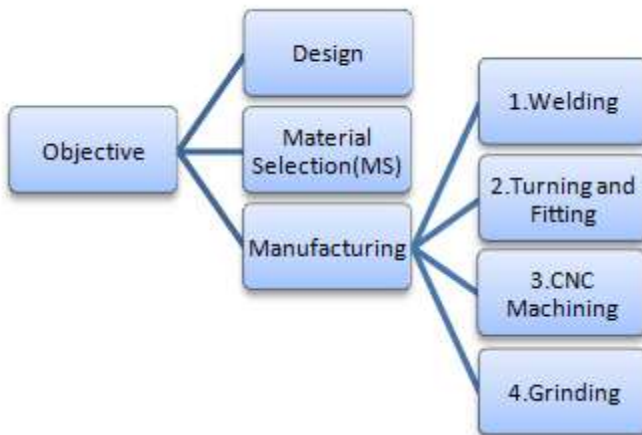


Fig. 2.2.1 Methodology for gauge

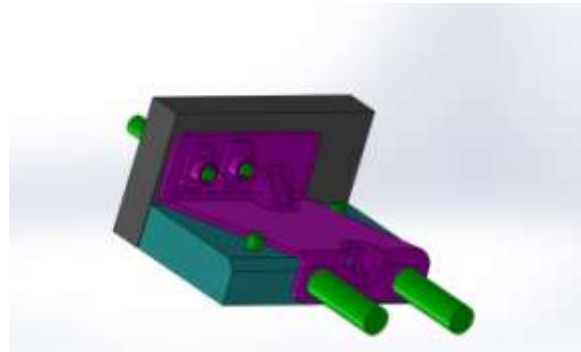


Fig. 2.2.2 Solid model of gauge



Fig. 2.2.3 Manufactured gauge

### III. CONCLUSION

The literature represented in this project describes the importance of fixture and gauges in the field of production. Fixture reduces or sometimes eliminates the efforts of marking, measuring and setting of workpiece on a machine and maintains the accuracy of performance. The workpiece and tool are relatively located at their exact positions before the operation automatically within negligible time. So it reduces product cycle time. Variability of dimension in mass production is very low so manufacturing processes supported by use of fixtures and gauges can be used to maintain a consistent quality..In this project we developed the fixtures and gauges required for DOC bracket. Due to developed fixture and gauge, assembly operation becomes easy, low rejection due to less defective production is observed. It reduces the production cycle time so increases production capacity.. Operators working become comfortable as his efforts in setting the work piece can be eliminated. Semi-skilled operators can be assigned the work so it saves the cost of manpower also.

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