**International Journal of Technical Research and Applications** e-ISSN: 2320-8163,
www.ijtra.com Volume 3, Issue 1 (Jan-Feb 2015), PP. 132-134

# ELIMINATION OF DEFECT IN CAPACITOR BY IMPLEMENTING FIXTURES

**Anil A Jadhav[1], Prof .Vilas Shinde[2]**
Post Graduate Student of Production Engineering,
Amrutvahini College of Engineering Sangamner
Ahmad Nagar Maharashtra India
aajadhav05@rediffmail.com

**Abstract— During Mass production it is necessary to hold the parts on the proper location. The system which holds the parts on the proper location which is called as fixture. Due to this device we can trust on our product. Fixtures accurately locate and secure a part during machining operations such that the part can be manufactured to design specifications. To reduce the design costs associated with fixturing, various computer-aided fixture design methods have been developed through the years to assist the fixture designer. Much research has been directed towards developing systems that determine an optimal fixture plan layout, but there is still a need to develop a CAFD method that can continue to assist designers at the unit level where the key task is identifying the appropriate structure that the individual units comprising a fixture should take. Also the design of a fixture depends a lot on the designer's expertise and experience and hence no solution is optimal or near optimal for a given work piece. In this study we took the part as capacitor for fixture development, after filling the resin the flatness and terminal height of the capacitor gone out of specification. To control the above parameters it is necessary to hold the part on proper position so that these parameters get corrected after resin curing.**

**Keywords-Fixture, Design, CNC, Computer Aided Fixture Design , Dedicated Fixtures,CAD**

## I. INTRODUCTION

In industrial life we are manufacturing the product in mass production. This increases the risk of failure in more numbers which cost the high amount to the organizations. Mass production aims at high productivity to reduce unit cost and interchangeability to facilitate easy assembly. This necessitates production devices to increase the rate of manufacture and inspection device to speed-up inspection procedure. Fixture are special purpose tools which are used to facilitate production like machining, assembling and inspection operations. The mass production of work-piece is base on the concept of interchangeability according to which every part produced within an established tolerance. Once the Fixture is properly set up, any number of duplicate parts may be readily produced without additional set up.

To increase the production in assembly and to decrease the failure rate in the assembly of the product. The fixture designing and manufacturing is considered as complex process that demands the knowledge of different areas, such as geometry, tolerances, dimensions, procedures and manufacturing processes. While designing this review work, a good number of literature and titles written on the subject by renowned authors are referred. All findings and conclusions obtained from the literature review and the interaction with fixture designers are used as guide to develop the present work.

## II. IMPORTANCE OF FIXTURES IN ASSEMBLLY

Resin plays an important role in metalized film capacitor. It absorbs the heat produced during working of capacitor as well as it protects the capacitor from the moisture. Some of the capacitor required jelly resin and some of the capacitor required the hard resin. But hard resin is also in liquid form while filling. Liquid curing process is very critical to fill the component and cure the component on same state. To get the proper dimension of the product we have to locate the products child part while assembling on specific location. For that we required the locating device and that device is called as the fixture

a) Types of operations in capacitor

1. Metalized film winding
2. Zinc spray on winding
3. Terminal Soldering or welding
4. Assembly
   - (i) Insert the capacitor in plastic case
   - (ii) Locate the terminals in fixture
   - (iii) Fill the resin
   - (iv) Cure the capacitor
5. Final inspection and Dispatch

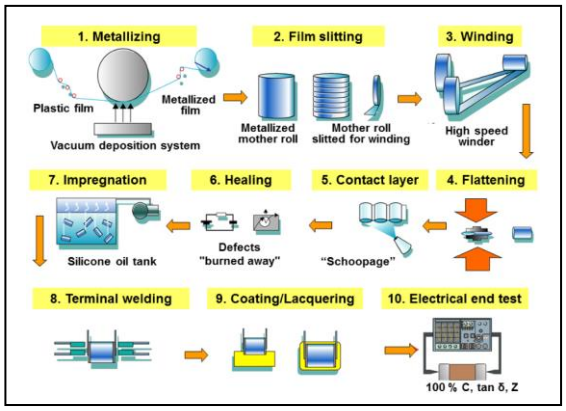


**Fig. 1**

1. Metalized film winding

This is the process were we wound the metalized film on winding machine in the form of round or flat here we are using the flat windings. Metalized film means polypropylene film 4 micron onwards with fine aluminum layer on it. Two films are used for winding to get the two poles in capacitor. During winding two films are overlaps over each other and make the wound element as per the required capacitance.

2. Zinc spray on winding

Zinc is sprayed on the wounded element for welding the terminals on the face of the capacitor. Melted zinc is sprayed over the face of the element with forced air.

3. Terminal Soldering or welding

In this process two terminal are soldered or welded on the two faces of the wound element. This two terminals are the two pole of the capacitor.

4. Assembly

Assembly is the process were we assemble the child part of the capacitor as per the Bill of material of the capacitor

(i) Insert the capacitor in plastic case
(ii) Locate the terminals in fixture
(iii) Fill the resin
(iv) Cure the capacitor

5. Final inspection and Dispatch

b) Fixture-Design Principles

The fundamental principles of basic fixture design, is as follow.These principles can be categorized into two major types- the supporting and locating (or vertical and horizontal locating) principles, and the clamping principles .Discussion of each of these is further organized according to its applications to different work piece geometries .

1.1. Supporting and Locating Principles

The main purpose of this section is to describe the "fixturing criteria" that ensure the precise locating and rigid supporting of the workpiece under various circumstances. There is a total of 12 (2 • 3 x 2) linear and rotational movements along the x-, y- and z-axes, including both positive and negative directions (see Fig. 1). Usually, supporters and Locators restrict at [east nine movements, with the remaining three possible movements constrained by clamps.

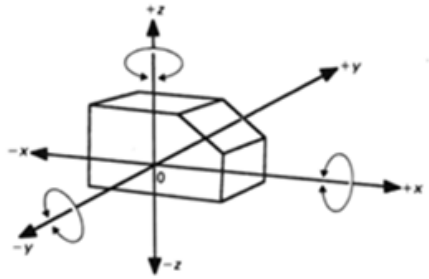


**Fig. 2**

There is a total of 12 degrees of movement: six linear movements (+x,+y, +z, - x, -y and -z) and six rotational movements (clockwise or counterclockwise around each of the three axes).

1.2. Clamping Principles

Horizontal Clamping

Vertical Clamping

Since during fixture design there are frequently recurring tasks and since the number of possible solutions is huge, process engineers have long been using computers to make their work faster and easier Aautomation of the Fixture Planning and Design . There have been numerous attempts to develop programs that will automate, or at least considerably speed up, the fixture design. Some work has focused on automated feature recognition, others have focused on fixture construction, and there were also some who tried to solve both tasks

## III. PROBLEM DEFINITIONS

During resin filling process terminal of the capacitor gets distorted during the curing and the location of the terminal gets shifted. Also due to shrinkage of the resin plastic case get warp itself, as the resin get shrink during curing process. This leads the defects like terminal shifting and the planarity of the capacitor which is important to the customer for his assembly purpose.

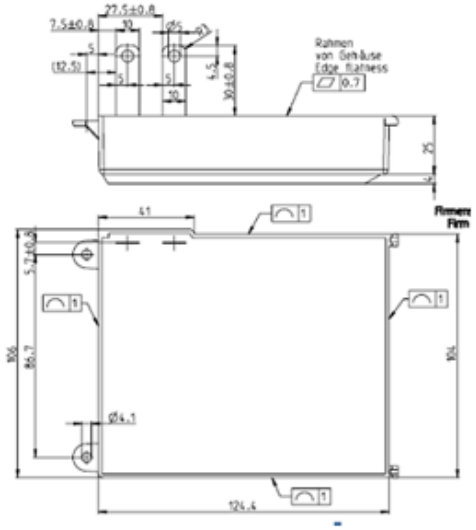

**Fig. 3**

As above fig shows the typical capacitor having square box contain the wound coil, plastic case, two terminals and resin in solid state. As specified we have to maintain the dimensions of the terminals as well as the flatness of the case.

## IV. DESIGN OF FIXTURE

The fixture design process essentially contained three phases: Planning, design, and assembly. During the planning stage, an initial configuration of the fixture is determined. Decisions made here are referenced to machine resources and facilities available, material handling, and quality specifications. In the fixture design phase, more detailed analysis is examined concerning locating, clamping, and supporting the workpiece. Subsequently, the particular fixture elements are selected to meet the design requirements. The final phase of assembly focuses on the construction of the fixture.

i. CAD Modeling
ii. Detailing of the part
iii. Material Selection
iv. Manufacturing
v. Validation

### i. CAD Modeling

Cad modeling is the initial stage of the fixture designing. In this stage we design the cad model of the fixture as per our requirement .That cad model we can use for directly machining if we use the cam software's for machining. Or we can do the detailing of that particular model and send to the supplier for manufacturing.

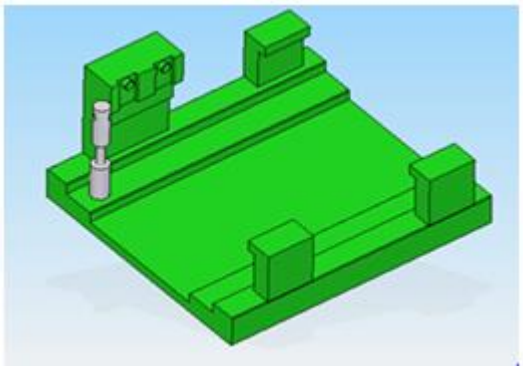

**Fig -4**

### ii. Detailing of the part

Detailing of the part is more important in fixturing for manufacturing point of view.

### iii. Material Selection

Fixture are made from a variety of materials, some of which can be hardened to resist wear. It is sometimes necessary to use nonferrous metals like phosphor bronze to reduce wear of the mating parts, or nylons or fiber to prevent damage to the work-piece. The materials often used in jigs are steel, iron, nylon, fiber and bronze. As this is the plastic case part than we have to take more care regarding material selection. Hence we selected aluminum as fixture material.

### iv. Manufacturing

Manufacturing of fixture is done on all higher end machines.CNC Lathe, Milling, Wire cutting and EDM. Since the accuracy of fixture is more important while filling the object.

### v. Validation

This is the part where we can prove our design and compare our product with final drawing supplied by customer. Validate the fixture by measuring all the parameters as per the specific requirement given by the customer. Take the process capability study of all the parameters .After doing process capability study hand over the fixtures to production.

## V. CONCLUSION

Fixtures have a direct impact upon product manufacturing quality, productivity and cost of the fixture. Designing of fixture in cad system is really helpful. Many academic and applications papers have been published in this area. But still Fixture design needs to be tested and evaluated in real manufacturing environments and integrated with other design activities, which often are related with production resources, equipment, cost and machining processes, etc.

Another main outcome of this project is control of rejection. Intended purpose is solved and the problem is completely resolved.

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