

DESIGN AND DEVELOPMENT OF DYNAMO TESTING MACHINE

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Abstract - A fixture is an important thing of manufacturing system that serves to constrain workpiece with respect to a production device, restrain the work piece from movement underneath the motion of manufacturing forces, and aid the work piece to save you work piece deformation at some point of production. A fixture is a manufacturing device. The principle aim is to find, maintain and assist the work securely so that the desired machining operations may be finished. Set blocks and feeler or thickness gauges are also used to offer reference of the cutter with the work piece. A fixture ought to be without problems mounted with the table and the system. As a end result the designs may be carried out. Fixture is basically used in milling machines. but it could also be used for different operations on maximum of the usual machining equipment like drilling device.

Key Words: Dynamo, Machine, Principles, Modelling, FEA.

1. INTRODUCTION

A fixture is a unique device for containing a workpiece in right function at some point of the manufacturing operations. For helping and clamping the workpiece tool is supplied. Common checking, positioning, individual marking and non-uniform quality in production process are removed with the aid of fixture. This increases productiveness and decreases operation time. Fixtures are broadly used in enterprise realistic production due to features and its merits.

IDENTIFICATION OF PROBLEM AND NEED OF PROJECT

Some problems were introduced during the testing of tools as follows:

- The major use of man power.
- Productivity was very low as pressing the tool very much.
- Also required electricity in large amount.

This all effects on production rate of hence we need to increase the production rate and to achieve the accurate testing of tools and also operating of tools and to get the quality of products so as to remove the problems it is necessary to make some modification and it is deciding the accurate operating of tools and hence it will increase the production rate as well as reduce manpower. There are some benefits of dynamo testing machine as follows:

- Manpower required is decreased and may be employed at some other place.

- Productivity improves since no. of tools can easily check will increase.
- We can achieve a good quality of finished products as well as safety for workers.

1.1 METHODOLOGY

- DTM needs to develop following changes.
- Changes required can implement such as
 - Weight displaying meter.
 - Torque measuring meter.
 - Advance tachometer.
 - Digital readings.
 - Sensors.
- Give Electric input.
- Manufacture Testing Fixture

1.2 OBJECTIVES

The paper basically is based on achieving following objectives:

- To manufacture "Dynamo Testing Machine."
- Implement various advance controls like tachometer, pressure gauge, weight displaying unit etc.
- Produce fixture with more accuracy and less Complexity. Increase production rate of testing.

2. DESIGN OF FIXTURE

The successful designing and development of a fixture needs a systematic and logically suited plan. With careful scrutinization of the machining parameters the workpiece will be subjected to, the fixture needs to be designed. Many a times the functional requirements are forgotten to be taken into consideration which pose difficulties later practically. The fixture design is a complicated task which should be handled creatively. The process time can range from several hours to weeks. Briefly the task can be summarized into five steps.

The following is a detailed analysis of each step:

Step 1: Define Requirements

The problem to be solved should be clearly identified and understood before initiating the fixture design process. The requirements should be clearly stated with every concerned aspect but, the main objectives should not be allowed to deviate. All the basic questions should be taken

into consideration like the tooling parameters, the type of process, the production is first-time or an improvement over an existing one, etc.

Step 2: Collect and Analyze Information

The most important step is to collect all the relevant data for the purpose of evaluation. The data should be mostly up-to-date. Scrutinize all the data carefully and check for pending part modifications. Every item or information should be noted properly as per the guidelines. The notes make the information more useful for further references. Ideas regarding various designs should be made available with the help of brainstorming. Four categories of design concerns need to be taken into account at this time: workpiece stipulations, task variables, availability of equipment, and workforce. The categories form to be the most important during examination phase and should be thoroughly studied before commencing the fixture design.

Step 3: Develop Numerous Choices

There are several possibilities to execute a plan or develop a better design. Human have a habit to refine same design, leaving out several other possibilities. Therefore, with proper brainstorming sessions numerous choices for the design should be made available. Further brainstorming sessions can help to further come to an optimal design and the best route to execute it. The feasibility and the cost effectiveness of the designs should be taken into consideration. More creativity should be put into the design by using standard clamping and mounting devices. The surfaces to be clamped may be round, cylindrical, flat and therefore the holding devices should be of better standards to provide effective holding.

Step 4: Choose the Best Possibility

The best design should be drawn out by considering various factors stated in the third step. The arrangement, clamping power options, cost, and effectiveness should be given more importance.

Step 5: Implement the Design

In the final part the design are converted into practical reality. The final drawings are made and the designs are simulated with appropriate computer software for various conditions. The tooling is finally made and put to tests. Various practical considerations and sound design considerations guidelines should also be used. The fixture should be made with minimal costs while improving its efficiency.

3. DESIGN AND MODELLING OF SYSTEM

The important parts of the system are:

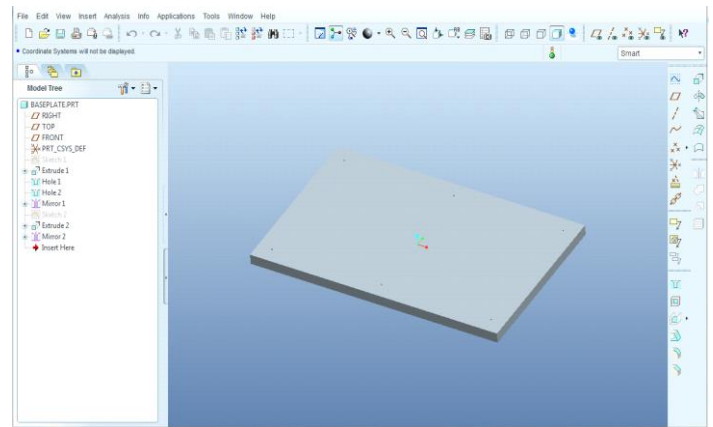
- Base Plate
- Upper Plate
- Supporting Plate
- Channel Plate
- Channel
- Rod
- Bush
- Nut
- Gripper

5.1 Base Plate

Dimensions of base plate are as follows:

Area -800×250mm

Thickness-30mm



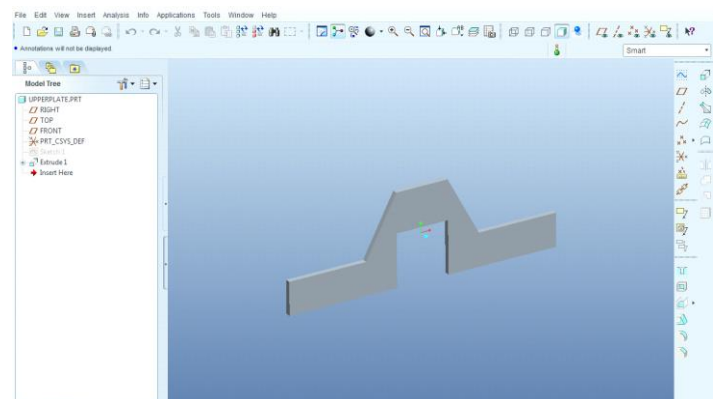
5.2 Upper Plate

Dimensions of Upper Plate are as follows:

Length-1040mm

Thickness-25mm

Material-Mild steel



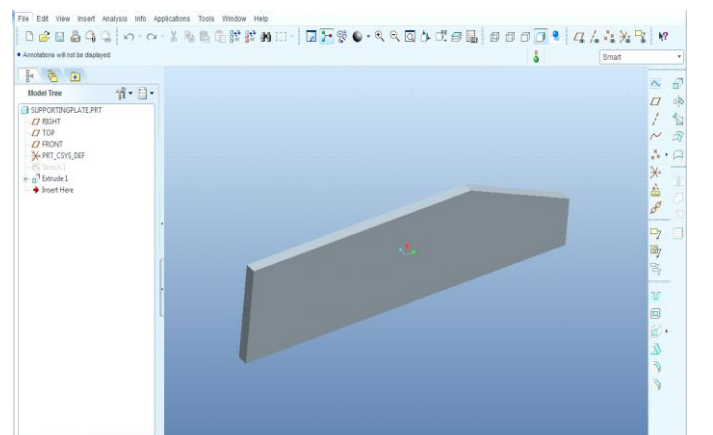
5.3 Supporting Plate

The dimensions of supporting plate are as follows:

Length-500mm

Thickness-15mm

Height-120mm



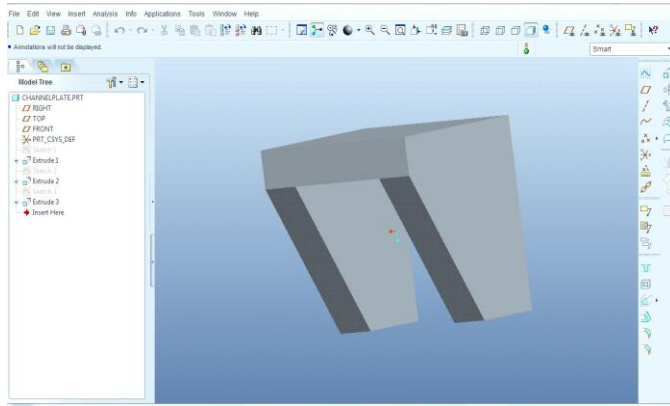
5.4. Channel Plate:

The dimensions of channel plate are as follows:

Upper part length: 120mm

Thickness: 25mm,

Height: 100mm



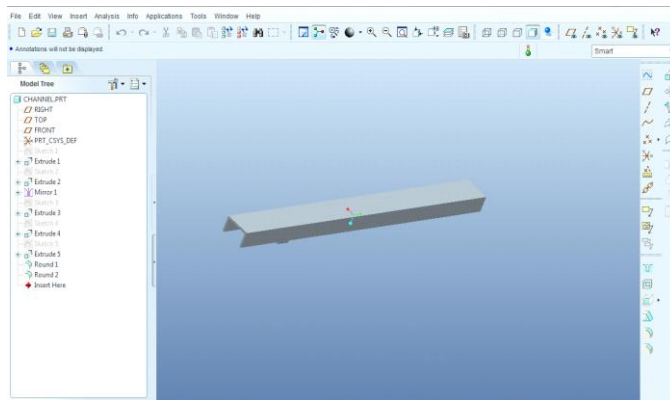
5.5. Channel

The dimensions of Channel are as follows:

Overall length: 1170mm

Thickness: 6mm

Height: 50mm

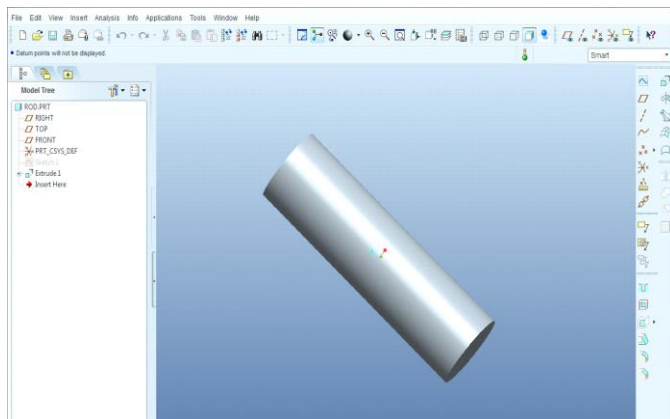


5.6. Rod

The dimensions of the rod are as follows:

Length: 85mm,

Diameter of rod: 25mm



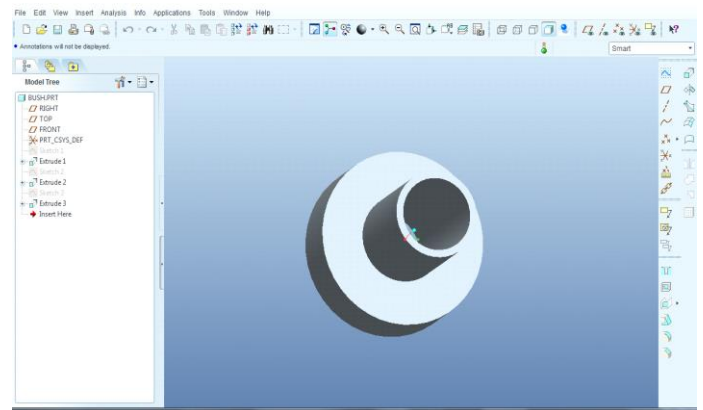
5.7. Bush

The dimension of the bush is as follows:

Height: 60mm

Big diameter: 60mm

Small diameter: 30mm



5.8. Gripper

The dimensions of the gripper are as follows:

Overall length: 130mm

Radius of inner part: 30.8mm

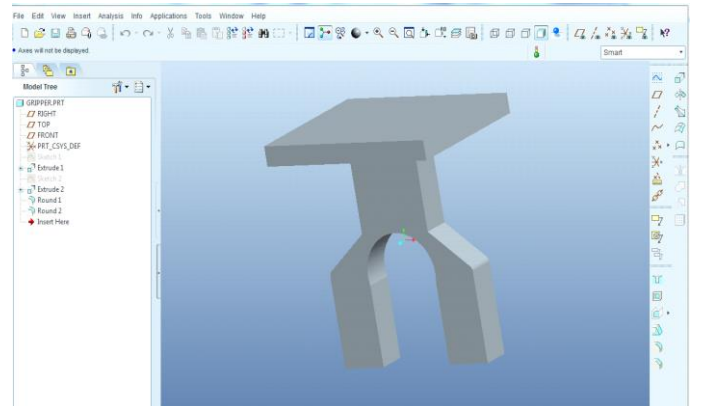
Thickness: 25mm

The upper part of gripper dimensions are:

Length: 145mm

Thickness: 50mm

Height: 125mm.



5.9 Assembly

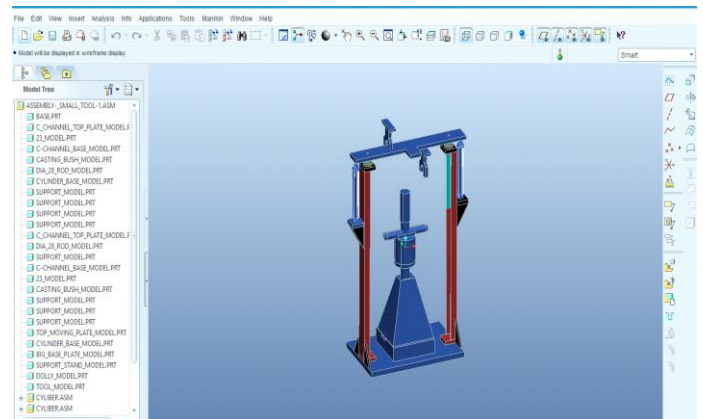


Fig.5.9.1 Assembly of parts

4. FORCE CALCULATIONS

Tool Piston diameter: 35 mm

Cylinder outer diameter: 45 mm

The actual force acting on the frame:

$$F = P \times A$$

$$\text{But, } A = \pi/4 \times d^2$$

$$= \pi/4 \times 35^2$$

$$\text{Hence, Area } A=962.11 \text{ mm}^2$$

We know,

$$1 \text{ bar} = 10^5 \text{ N/m}^2$$

Hence, for tool operating at 6 bar,

$$6 \text{ bar} = 6 \times 10^5 \text{ N/m}^2$$

$$= 6 \times 10^5 \times 10^{-6} \text{ N/mm}^2$$

$$6 \text{ bar} = 0.6 \text{ N/mm}^2$$

Hence, total force = 0.6×962.11

$$\text{TOTAL FORCE} = 577.26 \text{ N}$$

Now

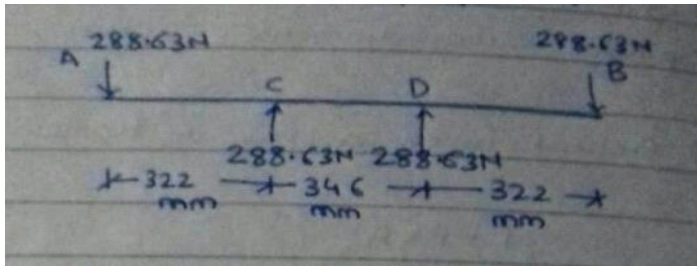
Force acting on each channel,

$$= \frac{\text{total force}}{2}$$

$$\text{ie } F/2 = 577.26 / 2$$

$$\text{Hence force on each channel} = 288.63 \text{ N}$$

2 reactions on top plate:



$$\Sigma MA = 0$$

$$(288.63 \times 322) + (288.63 \times 663) - (RB \times 390) = 0$$

$$\text{Hence } RB = 288.63 \text{ N}$$

$$\& RA = 288.63 \text{ N}$$

3. Required pressure for cylinder :

$$P = F/A$$

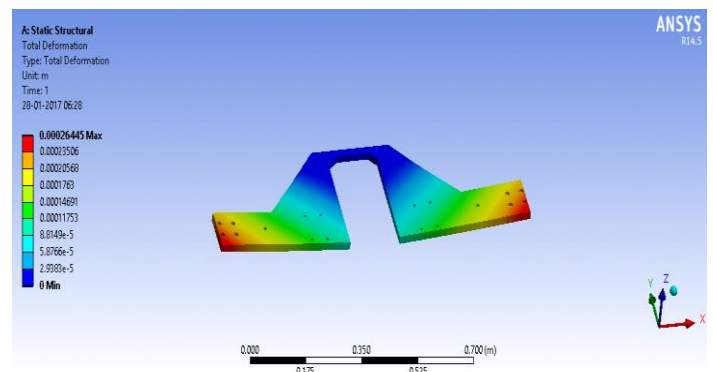
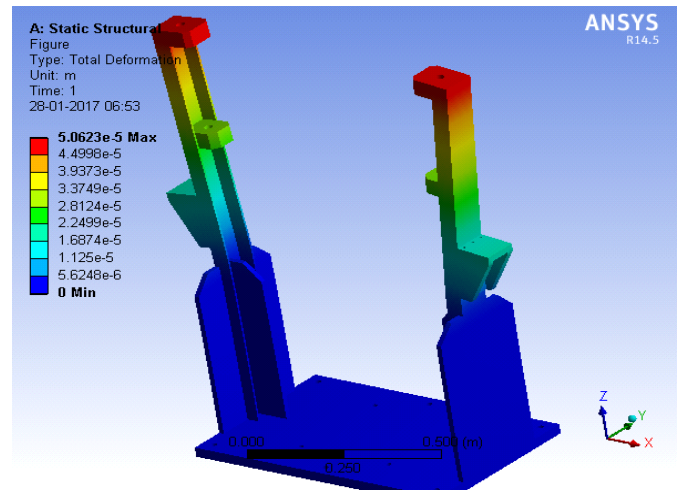
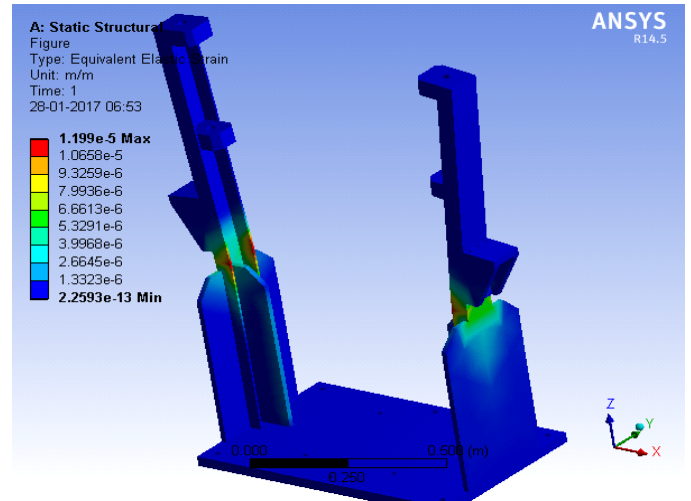
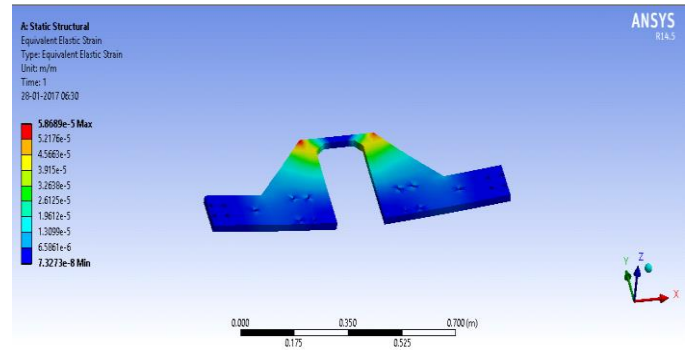
$$= 288.63 / (\pi/4) \times 35^2$$

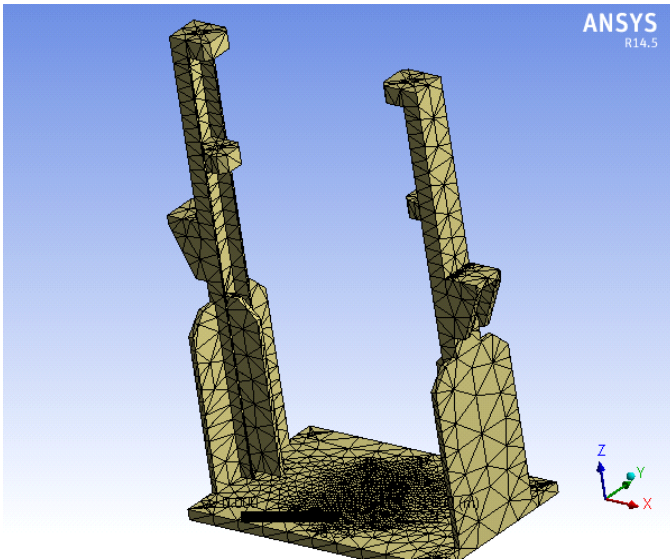
$$= 35890 \times 10^{-5} \text{ bar}$$

$$P=3.58 \text{ bar}$$

5. FEA ANALYSIS

Like everyone pointed out meshing is a common term used to denote the pre-processing phase of the finite element analysis (FEA) which uses the finite element method. (FEM) hence after the material selection, it is necessary to build a predictive computational model in real-world scenarios. Thus it helps to figure out that what amount of stress would induce on which element of the structure. Hence, here, ANSYS is used for the finite element analysis (FEA) of the fixture.





6. FINAL INSTALLATION



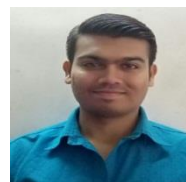
7. CONCLUSIONS

On the basis of this work done we can conclude that, Manual Testing Machine is a conventional process with lots of dis-advantages like old tachometer, lack of sensors etc. Changes are required to make with various advance controls like pressure gauge, tachometer etc. testing machine is totally manually operated, requires a skilled operator. Noise is high for operation of testing in the manual testing machine. Dynamo Testing Machine will improve production rate as well as accuracy.

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BIOGRAPHIES



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