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Design and Development of Motor Bracket by using suitable Machining Processes

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ABSTRACT:-The Motor in the system is one of the most important components of Bottle moulding machine. High performance machines has their motor component supported by the mounting bracket to its frame. It plays a very much important role in improving the comfort & work environment of a system as well as the motor component. The improvement of the motor bracket system has been the subject of intense interest for many years. It is required to design the proper motor mounting bracket for a bottle moulding machine. As such, the motor bracket has been designed as a frame work to support bottle moulding machine. Fatigue of motor mounting bracket has been continuously a concern which may lead to structural failure if the resulting stresses are high and excessive. Prolonged exposure to whole-body stresses in the working environment may lead to failure and in some cases it may damage the bottle moulding machine. Therefore, the frequency of the bracket should be more than the motor frequency to avoid the resonance. The brackets on the frame that support the motor undergo high static and dynamic stresses as well as huge amount of vibrations. Hence, dissipating the vibrational energy and keeping the stresses under a predetermined level of safety should be achieved by careful designing and analysis of the mount brackets. To achieve this requirements motor mount bracket should have the high surface finish, low surface roughness and high accuracy.

KEYWORDS:Bottle moulding machine, Motor bracket, Frame work, Stresses.

I. INTRODUCTION

A Motor Bracket is a device that is used to support motor. It is also used as a mounting for motor to stabilize motor. One end of the bracket is connected to the motor while other end there is a gear assembly from which a shaft comes outside which is connected to the rotary table which is the part of Bottle moulding machine for producing the bottles. Motor Bracket has been designed as a framework to support motor. The main concern is for vibration and fatigue of Motor bracket which may lead to structural failure, if resulting vibration and stress are excessive.

The motor mounting assembly includes a supporting plate to be attached to a frame component. A pair of isolators placed relative to each other on the supporting plate, and a pair of motor mounting brackets arranged to be positioned on the isolators and attached to an machine assembly, where in the isolators e.g. Rubber are arranged to maintain the engine mounting bracket in relation to the support plate thereby dampening engine vibration and controlling engine vibration relative to the vehicle.

The strong significance on the cost has demanded the component manufacturers to improve the performance of their product and to find the suitable methods cell manufactured products at optimum cost. These demands have created exciting challenges for designers and engineers and material researchers.[1]

II. PROBLEM DEFINITION

The motor is used to rotate the rotating table of bottle moulding machine. And due to high vibrations and lack of stability there were frequent breakdowns and accidents. This affected the production cycle and overall cost of manufacturing. To overcome these challenges a bracket(mounting) was required. So the company asked us to manufacture it providing the material which is FCD400. The design was provided which included fits and tolerances within few mm. We have to find a proper and reliable machining process with proper cost management and work on it.[2]

III. OBJECTIVES

1. Achieving low surface roughness and high surface finish of motor bracket.
2. Maintaining perfect concentricity of motor bracket and shaft to avoid collision.
3. Achieving desired Limits, tolerances provided by the customer to increase life of motor by reducing the vibrations.
4. Optimising the bracket to maintain stability between rotating table and motor.[3]

IV. METHODOLOGY

- First of all we define the objective of the project and then study the loading conditions of the bracket. It involves study of different cases for which we determine the loading conditions after which we do the modeling in CATIA. Then we convert the model from its parent format to IGES.
- Selecting the correct material required for the purpose based on its physical and chemical properties.
- Using die casting to get desired shape.
- Applying the correct machining process to get required results.
- Check whether required dimensions and measurements are obtained from the process or repeat the procedure.
- If the same process does not give results apply other machining processes to get the outcome.
- For aesthetics and resistance to wear maintain low surface roughness and high surface finish.[4]

V. DESIGN

Total length after process was to be 240 ± 0.1 mm and width was 165 mm.
Bore of 101 ± 0.035 mm and a counter bore of 180 ± 0.04 mm.
Total 6 tapping of M12 through

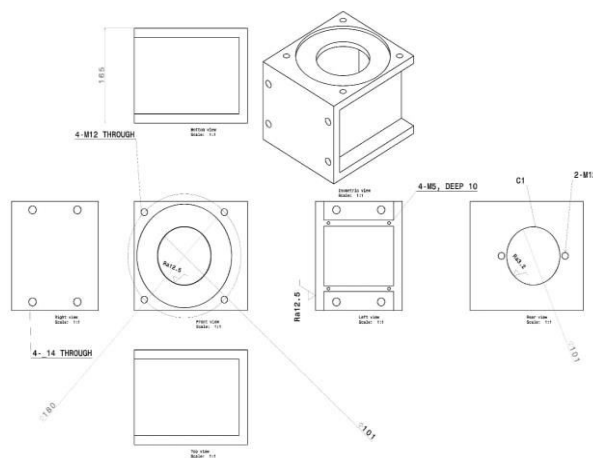


Figure 1:- Motor Bracket Design

VI. MODELLING

The Motor Bracket model prepared in CATIA with an bracket size above mentioned it and quality criteria as given below in the table of quality criteria. At first we organized the bracket and given each and every position an appropriate name with which have similar thickness.

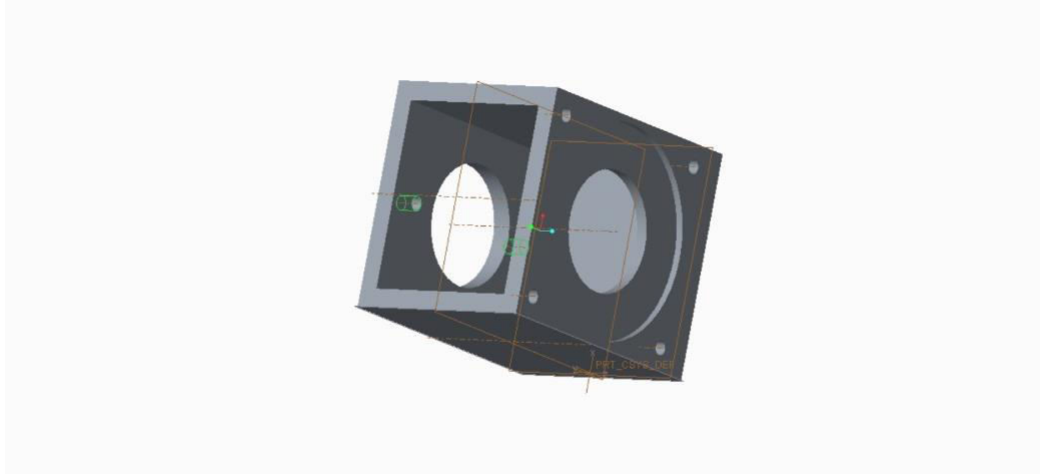


Figure 2:- 3D Model Of Motor Bracket

VII. MATERIAL SELECTION

Material: FCD 400-10
Standard: JISG 5502 (Jufeng special steel)
Matrix structure: Ferrite Stucture[2]

Composition of Material :
Carbon(C%) : 3.5 – 4.00
Silicon(S%) : 2.00-2.70
Mangnese(Mn%) : 0.30 max
Phosphorus(P%) : 0.05 max
Sulphur (S%) : 0.02 max
Remaining Ferrous

VIII. EXPERIMENTAL WORK

The material selected was Spheroidal graphite cast iron (FCD400). Gooseneck casting or Hot chamber die casting was used.

The, Milling operations were performed to remove excess material.

Case-1:Use of lathe machine

To perform machining processes we decided to use lathe machine. The bore was present on the die casted job we have extend it. But it was difficult to mount the job on conventional chuck so we replaced the chuck with back plate. The two nuts acts as the stopper for job. And the two opposite holes are provided to hold the job. Dowel pins were inserted in the holes to hold the job tightly. Drilling operations were performed followed by tapping. The bore was extended and a counter bore was performed. For surface finishing grinding was done. (From this we concluded that the machining done on lathe machine was not correct and reliable as the required dimension parameters were not achieved.)[4]

Case-2 : Use of Vertical Machining Center (VMC)

We decided to extend the bore and counter bore on VMC.

(From the above inspection, it was concluded that again the required dimensions were not achieved using VMC machine)[4]

Case-3 : Use of Computer Numerical Control (CNC)

First of all we develop a CNC chuck according to the Motor Bracket on Traditional lathe machine and Milling Machine. Then, we perform on the CNC machine. We extend the bore of Motor Bracket and to achieve Concentricity and maintain surface finish and roughness factor.[6]

IX. RESULTS

SR No.	DESCRIPTION	DIM & TOLERANCE(mm)	INDTRUMENT USED	READINGS	REMARKS
1	Total Length	240+0.1 -	Vernier	+0.05	OK
2	Width	165	Vernier	+0.00	OK
3	Bore	101+0.035 -0	Optihite	+0.02	OK
4	Counter bore	180+0.04 -0	Optihite	+0.1	OK
5	Concentricity	$\Phi 0.04$	Optihite	+0.035	OK
6	Tapping	M12	Gauge	OK	OK
7	Roughness		Roughness Comparator	15.35	OK

Table 1:- Result Table

X.CONCLUSION

We carried out various machining processes to get required parameters and dimensions. Most of the operations were performed on lathe machine but it was unable to achieve concentricity on it. Use of VMC also didn't meet the requirements. Performing these operations on CNC we got the required parameters and dimensions as well as were able to achieve surface roughness. So to conclude use of CNC machine for performing machining processes is an excellent option.

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