iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 5 **Issue:** II **Month of publication:** February 2017

DOI: http://doi.org/10.22214/ijraset.2017.2099

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Volume 5 Issue II, February 2017
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

Design of Milling Fixture for Differential Case

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Abstract*: Over the previous century, fabricating has gained impressive ground new machine apparatuses, superior cutting devices and present day producing forms empower today's commercial enterprises to improve parts quicker and then at any other time. Apparatuses assume a vital part on diminishing creation process duration and guaranteeing generation quality. Hence to lessen generation cost, installation outline, creation and its testing is basic.*
Keywords*: machine, cost, testing, outline, creation*

I. INTRODUCTION

In spite of the fact that work holding techniques have additionally progressed extensively, the essential standards of bracing and finding are still the same. apparatuses are the creation instrument utilized find and hold a work piece in position amid assembling process. Apparatuses are utilized to fabricate copy parts precisely. The right relationship and arrangement between the cutter, or other apparatus and the work piece must be kept up. to do this, an apparatus is outlined and worked to hold, bolster and find work piece to guarantee that every work piece is machined inside as far as possible. set squares and sensor or thickness gages are utilized with apparatus to reference the cutter to the work piece. an apparatus ought to be safely affixed to the table of the machine up on which the work is finished. despite the fact that to a great extent utilized on processing machines, installations are likewise intended to hold work for different operations on a large portion of the standard machine instruments.

II. LITERATURE REVIEW

Janakiram and Keats (1995) found that the FMEA was well-known useful tool in the design process but it is virtually ignored in most process quality improvement paradigms. Sheng and Shin (1996) discussed the implementation of FMEA for both product design and process control.

Pantazopoulos and Tsinopoulos (2005) found that FMEA is one potential apparatus with expanded use in dependability designing for the electrical and electronic parts creation field and in addition in muddled assemblies(aerospace and car commercial ventures).

Segismundo and Miguel (2008) proposed a systematization of specialized danger administration using FMEA to streamline the basic leadership process in new item advancement (NPD).

Chang and Cheng (2010) proposed a creative methodology, which incorporates the intuitionist fluffy set (IFS) and the basic leadership trial and assessment research facility (DEMATEL) approach for prioritization of disappointments in an item FMEA.

III. STATEMENT OF PROBLEM AND OBJECTIVES

A. Statement of the Problem

The main objective of the dissertation work is to Design, Manufacturing and Analysis of milling fixture for “Differential case”component used in axle assembly of a L&T trucks. In this dissertation work modeling is carried out using Co-Create software and cutting force acting on the component is calculated and analyzed using Ansys to determine the safe working condition of the fixture.

B. Objectives of the Project

The main object is to build up an enhanced comprehension of the interrelation right from the idea of the fixture, to the fixture is designed considering some of the objectives like

Design for component performance.

Design for Manufacturability and Assembly.

Increase the production rate by designing the fixture that will produce parts as quickly as possible.

Selection of good fixture layout for the design which helps in ease of manufacturing of the fixture and to minimize the defects.

Detailed study of manufacturing process of different parts that are used in the fixture.

Creating manufacturing drawing of each part of the fixture components.

Use of predictive analysis tool, Ansysis used to simulate the force acting on the fixture during machining and then to utilize the

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results obtained in the design of the fixtures.

C. Scope of Project Work

The technical methodology has been made to begin with the
Preliminary investigation of component, machine etc.
Conceptual design considering machine specification and critical parameters.
Minimum set up time of operation .
Modelling and assembly is carried out.
Detailed design and detailed Drafting for manufacturing.
Process planning and cost estimation.
Tool manufacture – vendor support.
Proving of fixture is done by Co-ordinate measuring machine (CMM).
Tool try out and evaluation.

IV. METHODOLOGY

Methodology is a systematic approach for the realization of total task. It consists of the following detail:

Study of the segment: The investigation of the part is the most essential and the initial step for the planner. The segment drawings are painstakingly examined to remove the most extreme conceivable measure of data. The essential data accessible is the basic measurements, finding and clasping zones.

Geometric model of the segment: Geometric demonstrating of part is done utilizing Co-Create considering all the basic measurements.

Step by step plan Calculations: It is completed to decide the different outline parameters that decide cutting power affected on the part amid processing operation.

Selection of tooling materials: The matreials utilized as a part of the assembling of installation changes relying upon the applications. Legitimate material choice and appropriate mix of compounds in fluctuating rates are required for completed apparatus.

Solid demonstrating of the apparatus: 3-D displaying of the whole shape is done utilizing Co-Create programming. For the better comprehension of 2D drawings and representation, demonstrating has been finished. The required measurements are dictated by figuring, which is utilized amid demonstrating of the instrument.

Analysis: Dynamics Analysis is conveyed utilizing ansys programming before instrument assembling to decide the twisting of the part amid operation, to check the best possible choice of clasping.

Tool fabricating process: Raw material is moved into the completed apparatus in this action by and large, amid assembling. Every part of the apparatus is made by alluding to their separate configuration drawings. Before taking up assembling, the apparatus drawings are contemplated and a procedure arrangement for every part is readied. Consideration is offered on manufacturability amid configuration stage itself. Resistance and hardness required and related viewpoints are chosen for execution.

Tool experiment with and investigating: After the apparatus is made and collected, the instrument is "attempted" to see that part created is consistent with the geometry and measurements determined by the client. Tryout is a methodology where the instrument is subjected to genuine working condition and the execution of the apparatus is noted. After the apparatus has been gone for, the part is altogether reviewed for different imperfections. On the off chance that any imperfections are discovered, it is reasonably improved.

Cost Estimation: Tool cost estimation is pivotal, particularly for little and medium clump of generation runs, where the expense of an instrument speaks to a critical rate of the item advancement cost.

A. Functional Aspects of the Component

This component is used in Trucksaxle assembly. The Differential case is made up of mild steel having a minimum tensile strength of 55kgf/mm^2.

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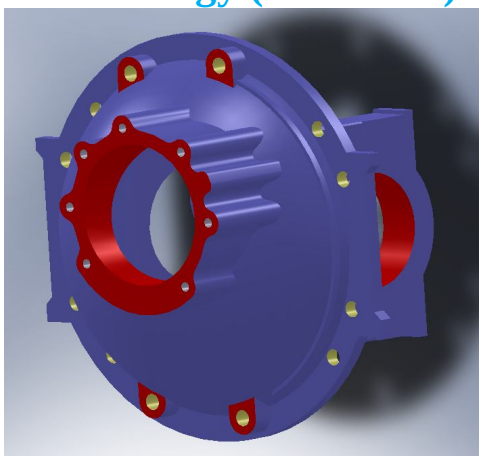

Fig1mild steel component

B. Methodology of the Analysis

Obtain the solid model of the component
↓
Study the model
↓
Check for any data loss in the model — Yes → (back to Obtain the solid model of the component)
↓ No
Collection of input data
(Material properties, loads and boundary condition)
↓
Mesh the solid model
↓ No → (back to Mesh the solid model)
Element quality check
↓ Yes
Define material and boundary conditions
↓
Application of maximum cutting and clamping force
↓
Analysis runs in Ansys workbench
↓
Determination of deformation
↓
Interpretation of result recommendations

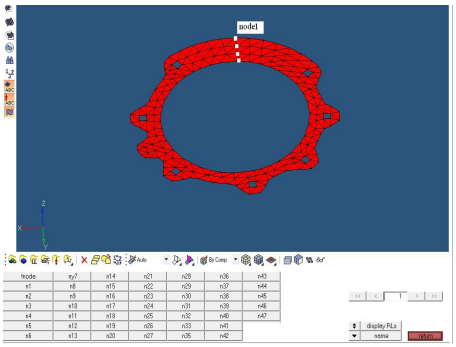

Fig2 Meshed component

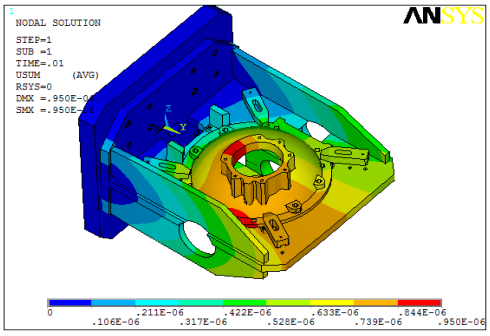

Fig3 Nodal displacement

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V. CONCLUSIONS

The fixture is designed with least number of components. Considering the dynamic forces over the component, analysis has been done; it shows the possible displacement, nodal stress and deformed shape of the component. This indicates that the component will not get distorted during the milling operation. The design check data has shown that the design is safe. By considering all the above mentioned facts, the proposed design of the fixture will meet the necessary requirements to achieve optimum production rate.

VI. ACKNOWLEDGMENT

I am grateful to the sanctum of "Ballari Institute of Technology and Management", the temple of learning, for providing an excellent platform to pursue our project work in good spirit. I express my sincere gratitude to my internal guide Mr. Shivakumar S Y department of Mechanical Engineering for their guidance, timely suggestions and encouragement at every step, which helped us to complete the work successfully. My deep and profound gratitude to Dr. Yadavalli Basavaraj Professor and Head of the Department of Mechanical Engineering for his constant help and support and granting us permission to carry out this project work. My deep and profound gratitude to our P G Coordinator Dr. Raghavendra Joshi for his constant help and support and granting us permission to carry out this project work. I would like to thank our beloved Principal Dr. V C Patil for having inspired and encouraging throughout the course of my master degree. I am thankful to all the teaching and non-teaching staff of our Mechanical Engineering Department for their constant support. I express heartfelt thanks to our Parents and Friends who have always supported and encouraged us on every stage and helped us to complete this project successfully.
Finally, I am thankful to all those that have helped me directly and indirectly during this course of work.

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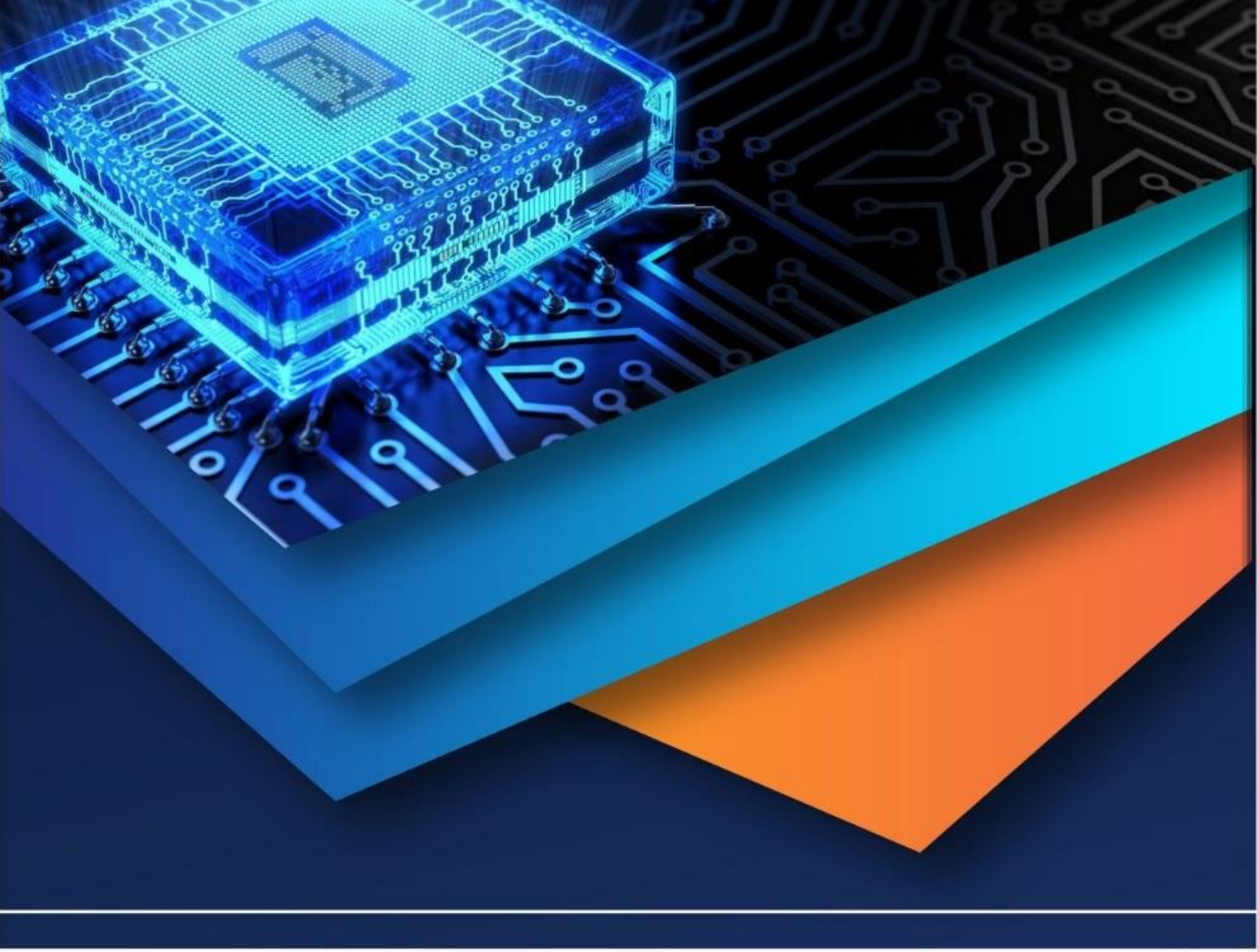

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