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Design, Optimization and Analysis of Milling Fixture

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Abstract: ***The manufacturing industry of small scale provides wide range of products to fulfill the market needs. To face many challenges of market these industries should increase their production rate with good quality and accuracy. The manual production is of low production rate and long throughput time. Moreover, standardization of manual processes is difficult and also its difficulty in maintenance, thus fixtures is used on the machines. Therefore, this study aims to design a Fixture. Basically, Fixture is a work holding device to guide the tool. The main purpose of making this fixture is to perform the milling operation without any need of shifting the job regularly. This results in reduction of production time and increase in production rate. This will lead to decreasing manufacturing time and also the machining cost. In this work the Milling fixture is designed and analyzed for the stresses and deformation that occur during the machining process. The CAD modeling Software is used to model the Milling fixture and analysis work will be carried out by using ANSYS Workbench Software.***
Keywords: FEA, Fixture, Analysis.

I. INTRODUCTION

A fixture is a supporting device which hold and locates the workpiece securely so the required machining operations can be performed effectively. A fixture holds the various work piece in same positions. Also it is heavier than a jig, and it's fixed or bolted to table of machine to ensure proper rigidity. Fixtures has various design. It designed to hold work piece for various operations on most of the standard machine tools.

When a work piece is placed into a fixture, it must first assume a stable resting against the gravity. Then, the locators should provide accurate localization. clamps are activated in a such a way that workpiece should be not moved at the time of working .

The performance of the fixture is verified at a manufacturing by checking accuracy in geometry of workpiece. The geometric error is mainly determined by the fixture localization accuracy and the work piece static and elastic deformation during manufacturing.

Modular fixture is nothing but fixture to hold work piece for multiple operations on a single clamping and a same machine.

The various types of fixtures are Plate fixture, angle-plate fixtures, Vice-jaw fixtures, Indexing fixtures, profiling fixtures. The different operations that use fixtures are boring, drilling, milling, turning, facing, etc.

II. LITRETURE REVIEW

1) First Operation Machining Fixture, IJEIT Volume 2, Issue 4. Shailesh S Pachbhai and Laukik P Raut,(2014)]

There are many standard work holding devices such as jaw chucks, machine vises, drill chucks, collets, etc. which are widely used in workshops and are usually kept in stock for general.

2) Design and development of hydraulic fixture for machining hydraulic lift housing, International journal of mechanical engineering and robotics research, ISSN 2278 –0149,Vol. 3, No. 3. A.D.Kachare, Prof. G.M.Dahane, (2012),

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3) Design and FEA Analysis of Fixture for Multitasking operations Santosh Hiremath*, Nagareddy.G, Naresh Kumar and C.Limbadri Mechanical Engineering Department, GHRCEM Pune, India

The main aim of this paper is to minimize the setup time and increasing the productivity by continuous product manufacturing operations on single machine.

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The design and FEA analysis has done on modular fixture which is used in manufacturing suction and discharge casing of pumps. Jigs and Fixtures are special purpose tools which are used to facilitate production (machining, assembling and inspection operations) when the work piece are to be produced on a mass scale

III. OBJECTIVES

The main aim of this paper is to find out wheather the design sustain the milling operation with the given cutting Parameters and to find best way to reduce production cost with optimize time and evaluate the results by considering various factor.
The aim of the second part of the thesis work is to estimate the loads acting on the baseplate when it is lifted off the ground, study the stress distribution on the CAD model of the baseplate and verify the designstrength by comparing maximum stress on the plate with yield strength of the materialFixture are used to locates and constrain work piece during a machining operations, minimizing work piece and fixture tooling deflections due to clamping and cutting forces are critical to ensuring accuracy of the operations and inspection operations) when the work piece are to be produced on a mass scale. The purpose of the fixture is to holds, locates and supports the work piece securely. Modular fixture is nothing but fixture to hold work piece for multiple operations on a single clamping and a same machine. A fixture is bolted or clamped to the machine table. Our research aim is to minimize the setup time and increasing the productivity by continuous product manufacturing operations on single machine.

IV. DESIGN

To analyze the maximum and minimum dimensions of the work piece and understand the concept we design two dimensional design of require specifications in CAD software.

V. ELEMENT OF FIXTURE

There are some common element to fixture which are as follows

1) Locator-Its main function is to maintain the position of part for performing various operations on workpiece by constraing movement of workpiece.
2) clamp- The forces exerted by clamp hold a part securely in the fixture against all other external forces
3) support- support may be fixed or adjustable determination of the location of the part should be compatible with clamp.
4) Fixture Body- it is a supporting element of fixture. Clamp, locator support this are the various element mounted on the body.

VI. DESIGN MODEL

This section is related to the second part of the thesis work. The designs presented are re-designed as per the instructions and allowances provided by CAD engineers and supervisor at the Industry.

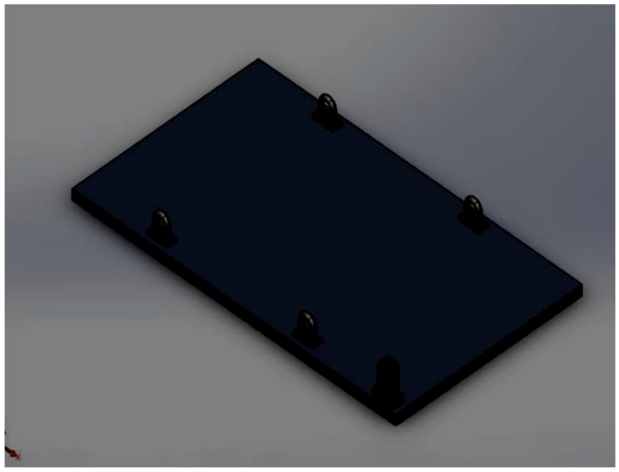


Figure 2 Base Plate Design

VII. TRUSS

The truss structure is designed in such a way that it supports the top plate which is holding the work-piece, i.e. the tail wing of the Apache. The truss

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VIII. CONCLUSIONS

It reduce the time required for loading and unloading of workpiece and efficiency and reliability of workpiece increases. The time required for all setup is minimum 60 minutes.

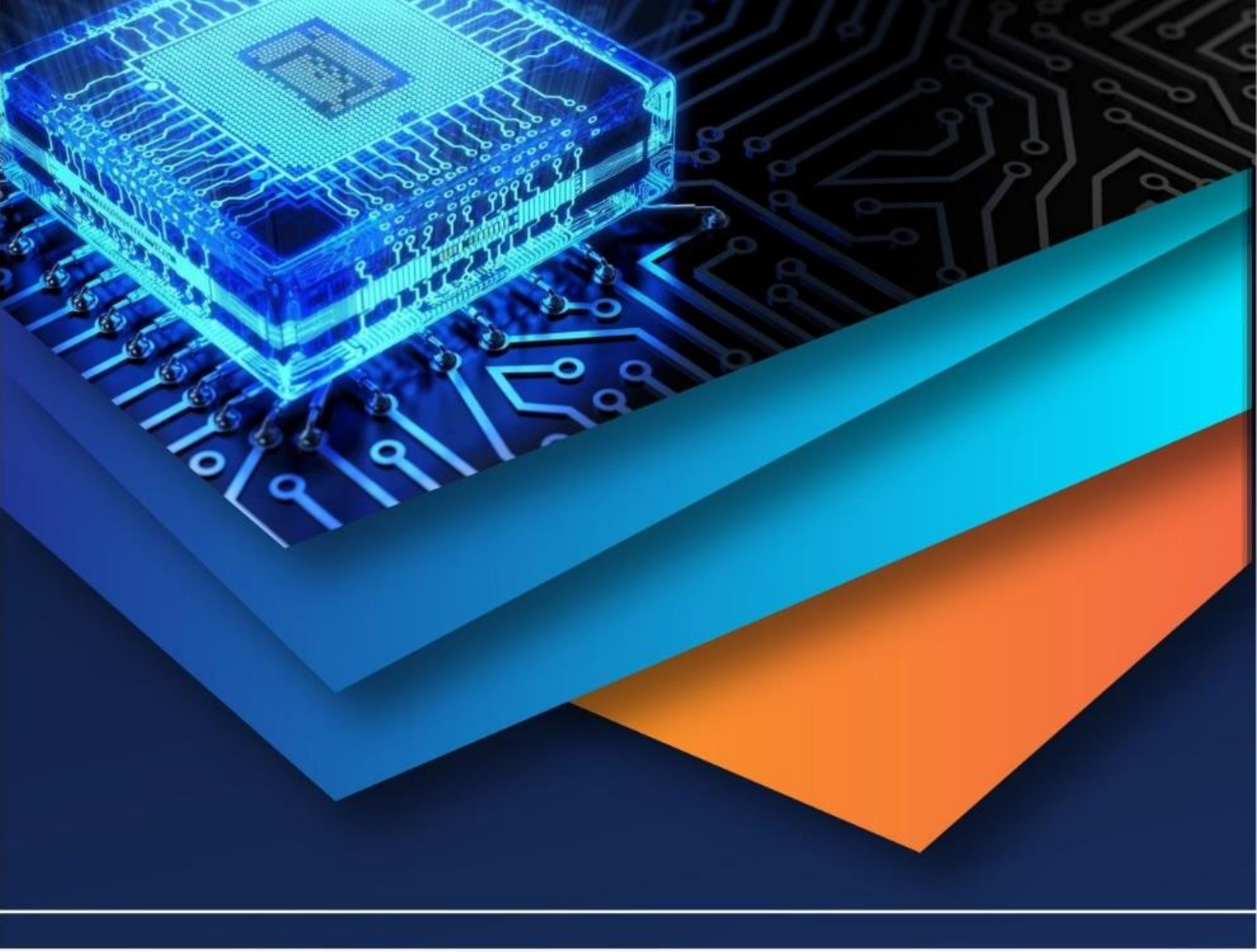
IX. SCOPE

The manufacturing industry of small scale provides wide range of products to fulfill the market needs. To face many challenges of market these industries should increase their production rate with good quality and accuracy. The manual production is of low production rate and long throughput time. Moreover, standardization of manual processes is difficult and also its difficulty in maintenance, thus fixtures is used on the machines. Therefore, this study aims to design a Fixture. Basically, Fixture is a work holding device to guide the tool. The main purpose of making this fixture is to perform the milling operation without any need of shifting the job regularly. This results in reduction of production time and increase in production rate. This will lead to decreasing manufacturing time and also the machining cost. In this work the Milling fixture is designed and analyzed for the stresses and deformation that occur during the machining process. The CAD modeling Software is used to model the Milling fixture and analysis work will be carried out by using ANSYS Workbench Software..

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