

A
PROJECT PROPOSAL
ON
CAPSTONE PROJECT PLANNING
(22058)



CPP - SUBJECT TEACHER

Prof. D. S. ZALTE



MECHANICAL ENGINEERING DEPARTEMENT (0078)

K. K. WAGH POLYTECHNIC, NASHIK-03.

2021-2022



K. K. WAGH POLYTECHNIC, NASHIK – 03 PROJECT TITLE

Academic Year: 2020-21.

Semester: V

Programme: Mechanical Engineering.

Scheme: 'I'.

Class: T.Y.M.E.

Group: '12'.

Course: Capstone Project Planning [CPP].

Course Code: 22058.

Name of Sponsor: Omkar industries.

Name of Guide: Prof. P. B. Yelmane

Name of CPP Subject Teacher: Prof. D. S. Zalte.

Title of Micro Project: *“Modification and fabrication of clamping device for Drilling Machine”*

Group Members:

Sr. No.	Roll No.	Name of Member	Seat Number
1	34	Rohit Mahesh Nikumbh	202870
2	35	Ayush Mangesh Palve	202871
3	46	Atharv Ashish Vispute	202882
4	49	Harshwardhan .C. Pawar	202885

Estimated Cost: 15000/-

Signature of Guide

Signature of CPP Subject Teacher

Prof. Prof. P. B. Yelmane

Prof. D. S. Zalte

RATIONALE

In machining fixtures, minimizing work piece deformation due to clamping and cutting forces is essential to maintain the machining accuracy. The various methodology used for clamping operation used in different application by various authors are reviewed in this project. Fixture is required in various industries according to their application. This can be achieved by selecting the optimal location of featuring elements such as locators and clamps. The fixture set up for component is done manually. For that more cycle time required for loading and unloading the material. So, there is need to develop system which can help in improving productivity and time. The drilling fixtures develop by us will reduce operation time and increases productivity and high quality of operation is possible. The design of a fixture is a highly complex and intuitive process, which require knowledge. Fixture design plays an important role at the setup planning phase. Proper fixture design is crucial for developing product quality in different terms of accuracy, surface finish and precision of the machined parts in existing design the fixture set up is done manually, so the aim of this project is to replace with pneumatic fixture to save time for loading and unloading of component.

Keywords: drilling, fixture, accuracy, clamping, productivity.

2. INTRODUCTION

Increasing the productivity and accuracy are the two basic aims of mass production. As we know the solution to this is by reducing the set up cost of the machine and also reducing the manual fatigue. In this case the device that caters our needs is the use of jigs. Let us take one example. Let us consider that one gets an order of say 1000 products. There need to be three holes drilled on this product. In such a case the designer tries to draw out every single hole with the help of square, straighteners, scribes and center hole. In order to align the axis of the hole with the axis of the drill we generally go for trial and error method. Accuracy is the main problem in such cases. In doing so it increases the work load on the operator. Hence using of jig to position and guide the tool to its right path is preferred rather than using scribes, square, straighteners or center punch etc. Thus the productivity is increased which is done by eliminating individual positioning, marking and frequent checking. Interchangeability is the chief advantage here. All the parts fit in properly except only the similar components are interchangeable. One does not need to repeatedly clamp and unclamp the object for various purposes like positioning as the locating, clamping and guiding of the tool is done by the jig itself. Bushing which is a tool guiding tool is used. So it reduces the presence of skilled laborer. Drill jig helps to drill, ream and tap at a much faster speed and with great accuracy as compared to holes done conventionally by hand. The responsibility of maintain the accuracy of the hole is now shifted from the operator and given to the jig.

3.LITERATURE SURVEY

Literature Survey 1:

Title: DESIGN AND MANUFACTURING OF JIGS FOR DRILLING MACHINE

Authors: Smit Patel¹, Sahil Vasoya², Ankur Joshi³

Abstract: Mass production aims at high productivity to reduce unit cost, and interchangeability to facilitate easy assembly. It could be achieved by the use of jigs. Jigs are provided with tool guiding element such as drill bushes. In this project attempt is made to design drill jig plate. Basically this project will show drill jigs plates that are going to be manufactured and for that analysis too. So for drilling operation at different angle and different position such jigs are made for accurate, precise drill operation in this project. Drill jig increases productivity by eliminating individual positioning, marking and frequent checking. Also jig reduces the repetitive nature required for drilling holes, because the locating, clamping and guiding of the tool is done by the jig itself.

(<https://www.irjet.net/archives/V4/i3/IRJET-V4I3480.pdf>)

Keywords : -Design, Manufacturing, Total Deformation Analysis, Maximum Principle Stress, Acrylic material.

Literature Survey 2:

Title: Design and Fabrication of Indexing Set Up for Drill Jig

Authors : Sangamesh¹, V. V. Kulkarni²

Abstract: The scope of this work is to design and fabricate the indexing set up for actuator support component drill jig which is having holes at 900 apart. Jigs are mainly used for mass production and for interchangeable parts concept in the manufacturing of the indexing system. In this work main focus is given to the shaft which is to withstand the weight of the drill jig and the work piece while indexing. To achieve this, these components such as shaft, hydraulic jack were designed and manufactured.

The theoretical calculations of deflection and stress of the shaft to withstand the load of the drill jig and work piece were done and compared with Ansys results. The results of theoretical and Ansys average deflection and average stress error found are 0.0715 percent and 0.627 percent respectively. Comparison has also been done with manual and hydraulic indexing cycle times. The results of average percentage time saved are 71.94 percent by hydraulic indexing.

(<https://www.irjet.net/archives/V3/i6/IRJET-V3I6381.pdf>)

Keywords :-drill jig, hydraulic jack, rotating shaft.

Literature Survey 3:

Title: DESIGN AND DEVELOPMENT OF HYDRAULIC FIXTURE FOR MACHINING HYDRAULIC LIFT HOUSING

Authors: Shailesh S Pachbhai1* and Laukik P Raut2

Abstract: Loading and unloading of workpiece in manual clamping is time consuming process, so reducing machining time, set up time etc. is a main aim of process. The job having cylindrical shape, this is a challenging task for design engineer, hence hydraulic fixture design is incorporated in manufacturing industry. Except toggle clamp, no other option is available to hold cylindrical object, hence special type of fixture is design for this case, which can be used for machining of hydraulic lift housing, Fixture reduces operation time, increases productivity, and best quality of operation is possible. The project deals with the designing of different parts of fixture assembly, 3D modelling by using Pro-E WILDFIRE 5.0, finite element analysis of hydraulic lift housing by using ANSYS software.

(http://www.ijmerr.com/v3n3/ijmerr_v3n3_27.pdf)

Keywords :- Fixture, Accuracy, Clamping, Toggle clamp.

Literature Survey 4:

Title : DESIGN AND ANALYSIS OF MILLING FIXTURE FOR PNEUMATIC ACTUATOR COMPONENTS

Authors: Shivanand Vathare1, Sudhir S Mathapati* 2 and Poojesh Anvekar3

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 Solid Edge V20 Software is used to model the Milling fixture and analysis work was carried out by using ANSYS 13 Workbench Software.

(<http://www.recentscientific.com/sites/default/files/2064.pdf>)

Keywords: - Analysis, Milling Fixture, Solid Edge.

Literature Survey 5:

Title: Design of Jig for Multihead Drilling Machine

Authors:

1. K.Saravanakumar
2. ,P.Dineshkumar
3. ,V.R.Dinesh kumar
4. ,T.Mahalingam
5. ,G.Maheswaran

Abstract: The project is about a design and development of multi head drilling jig for holding cylindrical parts for mass production of drilling operation. Drilling jig is used whenever is necessary to drill hole to exact location. It identified the numerous advantages that are associated with the use of jigs in manufacturing to include: production increase, cost reduction, interchangeability and high accuracy of parts, reduction of the need for inspection and quality control expenses, reduction of accident as safety is improved, automation of machine tool to an appreciable extent, easy machining of complex and heavy components, as well as low variability in dimension which leads to consistent quality of manufactured products. The work also explained that since the design is dependent on numerous factors which are analysed to achieve an optimum output, that jigs and fixtures should be made of rigid light materials to facilitate easy handling. For adequate strength and rigidity, a mild steel with 16 millimetres diameter was chosen for the design of a sample jig. Finally jigs must be provided with adequate clearance which should allow for variations in size of components especially during forging, milling, and casting operations.

(http://www.ijirset.com/upload/2017/march/218_MECH%20013.pdf)

Keywords :- Components, Work-Holding, Manufacturing, Production, Operation, Devices, Machining, Work-Piece, Clamping, Bushes.

4.PROBLEM DEFINITION

Problem Definition 1:

The jigs were made of mild steel, aluminum, etc. material. These materials are very heavy to carry if the size of jig is big. It can cause back pain or stress to the workers. It also reduces the energy of worker.

Due to heavy material following problem occurs:

1. Stress to the worker
2. Handling of jig
3. Increase in set up time
4. Reduce productivity

Problem Definition 2:

Indexing is to move from one set position to another in order to carry out a sequence of operation. In order to increase the production rate, reduce the labor effort and also to reduce the lead time, for all these purpose new indexing type of drill jig is used. The main object of reducing indexing time is achieved with the help of hydraulic jack which help the drill jig to be indexed by 1800 for drilling holes on top and bottom face of the work piece. The rotation of the drill jig is obtained by the rotating shaft supported in two ball bearings.

Problem Definition 3:

1. Fixture setup is done manually due to this cycle time is more.
2. Over tightening or loosening of screw leads to machining defects.
3. Product quality is not obtained as per specification.
4. Sometimes rejection rate is observed.
5. Manual clamping leads to accidents.
6. More hectic to operator to load and unload

Problem Definition 4:

A pneumatic cylinder mainly consists of a piston, a cylinder and a valve or port. The piston is covered by a diaphragm, or a seal, which keeps the air in the upper position of the cylinder, allowing the air pressure to force the diaphragm downward, moving the piston underneath, which in turn moves the valve system, which is linked to the internal part of the actuator. Pneumatic actuators may only have one spot for single input, top or bottom, depending on action required. In this project head and cover part of the actuator should be milled. Here milling fixture is designed for head and cover part of the pneumatic actuator.

Problem Definition 5:

1. Error observed in PCD of components at drilling operation.
2. Spacing between equi-spaced holes is not maintained.
3. A problem occurs in assembly of such components.
4. Rework and rectification is required for such components.
5. Production idle time is increased.
6. Production cost increased.
7. CDD (Contractual Delivery Date) is not maintained.

5.PROPOSED DETAILED METHODOLOGY OF SOLVING IDENTIFIED PROBLEM

PROPOSED METHODOLOGY 1:

1. We have manufactured a jig of acrylic material.
2. We have manufactured a jig of two steps, which will be used for drilling of two different diameter faces.
3. We have manufactured a jig by which we can make hole in two perpendicular directions.
4. We have manufactured a jig which can fit the work piece and jig doesn't come out while drilling.

PROPOSED METHODOLOGY 2:

The basic methods used for the successful operation of the above concept are conventional machining, different methods of locating and clamping methods. Also the requirements of the project, such as increasing productivity, are reducing the lead time. Indexing is done with the help hydraulics. The setup is fabricated by using conventional machining operations. The parts such as hydraulic jack, shaft etc. are designed by using basic design formulae. Modeling is done by software.

PROPOSED METHODOLOGY 3:

As solution to this problem greatly helps the industries to increase their productivity, this problem is needed to be solved to meet the current trends of designing and manufacturing. Solution to this problem requires hydraulic fixture in modeling software's which are now a day's back bone of all design and manufacturing industries (Dan Ding Guoliang *et al.*, 2002).

PROPOSED METHODOLOGY 4:

Depending upon the study of the components suitable location and clamping methods have been adapted.

Location : For the components spigot location is taken. According to the dimension of the spigot the fixture base plate is cut for location purpose, and four resting pads are been provided to rest the component on it. Now the component is located on the spigot location and is rested on the resting pad. Due to the spigot location and resting pads the part cannot move/rotate horizontally with respect to x-y direction. Hence 4-DOF (translator motion) and 4-DOF (rotational motion) are arrested. In z-direction, downward motion is arrested.

Clamping : Here it is used strap clamps. Strap clamps are provided to hold the component rigidly on fixture base plate. Liner is used to press fit the locating pin. Four resting pad are used at the bottom of fixture plate.

PROPOSED METHODOLOGY 5:

1. Decide to design and manufacture Jigs by using mild steel material because mild steel material is light and tough, strength, heat resistance, weather resistance and color verity.
2. Decide To Manufacturing of Common Jigs i.e. one PCD on a single jig

6.RESOURCES AND CONSUMABLE REQUIRED

1. Locators:

A locator is usually a fixed component of a fixture. It is used to establish and maintain the position of a part in the fixture by constraining the movement of the part. For work-pieces of greater variability in shapes and surface conditions, a locator can also be adjustable.

2. Clamps:

A clamp is a force-actuating mechanism of a fixture. The forces exerted by the clamps hold a part securely in the fixture against all other external forces.

3. Supports:

A support is a fixed or adjustable element of a fixture. When severe part displacement/deflection is expected under the action of imposed clamping and processing forces, supports are added and placed below the work-piece so as to prevent or constrain deformation. Supports in excess of what is required for the determination of the location of the part should be compatible with the locators and clamps.

4. Fixture Body:

Fixture body, or tool body, is the major structural element of a fixture. It maintains the spatial relationship between the fixturing elements mentioned above, viz., locators, clamps, supports, and the machine tool on which the part is to be processed.

It consists of mainly;

4.1. Frame

4.2. Pneumatic cylinder

4.3. 5/2 Valve DCV

4.4. Pneumatic hoses and fittings

4.5. Shaft

4.6. Nut and Bolt

7.ACTION PLAN

SR. NO.	PLANNED WEEK	ACTIVITIES PLANNED	ACTIVITIES EXECUTED
1	Week-1	<ul style="list-style-type: none"> ➤ Formation of Project Group. ➤ Basic Idea of C.P.P. ➤ Group Meeting. 	<ul style="list-style-type: none"> ➤ Project group of 4 members was finalized. ➤ A basic idea and structure of the subject was explained by the subject teacher Mr.. D. S. Zalte. ➤ Meeting between group members and Mr. D.S. Zalte was held.
2	Week-2	<ul style="list-style-type: none"> ➤ Allotment of Project Guide. ➤ Meeting with Project Guide. 	<ul style="list-style-type: none"> ➤ Mr. D. S. Zalte was allotted as our guide. ➤ Discussion about various alternatives with guide.
3	Week-3	<ul style="list-style-type: none"> ➤ Research on Project Topics. ➤ Discussion of Project Topic with Project Guide. ➤ Finalization of Project Topic. 	<ul style="list-style-type: none"> ➤ Research of project topic by visiting various industries. ➤ Discussion of project topics with project guide. ➤ Finalization of topic along with documentation.
4	Week-4	<ul style="list-style-type: none"> ➤ Collection of Basic Information Required. ➤ Initializing the Information of Project Topic. 	<ul style="list-style-type: none"> ➤ Collection of basic information about project topic. ➤ Collection of information about detailed working condition of project.

5	Week-5	➤ Submission of Title Page and Abstract.	➤ Submission of Title Page and Abstract as per standard format.
6	Week-6	➤ Finalization of Workplace. ➤ Organizing of Resources.	➤ Visit to the workplace and finalization of workplace. ➤ All the collected data to be organized.
7	Week-7	➤ Project Proposal. ➤ Logbook.	➤ Preparation of project proposal. ➤ Preparation and maintaining the logbook.
8	Week-8	➤ Survey of Materials Required In Market.	➤ Market survey of required materials and testing of materials.
9	Week-9	➤ Tentative Designing.	➤ Tentative designing of project.
10	Week-10	➤ CAD Drawings.	➤ Drafting of the CAD drawings as per the design.
11	Week-11	➤ Solid Modeling Drawings.	➤ Drafting of 3D drawings according to the design.
12	Week-12	➤ Analysis of Drawings.	➤ Analysis of various components of the project from the drawings.
13	Week-13	➤ Project Report. ➤ Presentation on SEMESTER-V Project Report.	➤ Preparation of Semester-V 'Project Report'. ➤ Preparation of presentation on Semester-V 'Project Report'.
14	Week-14	➤ Final Submission of CPP.	➤ Final submission of Capstone Project Planning.

**A
PROJECT PLANNING REPORT
ON
MODIFICATION AND FABRICATION OF
CLAMPING DEVICE FOR DRILLING MACHINE**



SUBMITTED BY

34 Rohit Mahesh Nikumbh
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STUDENTS OF T.Y.M.E.-SEM.-V

Under the guidance of

CPP – Subject Teacher

Prof . D. S. Zalte



MECHANICAL ENGINEERING DEPARTEMENT (0078)
K.K.WAGH POLYTECHNIC, NASHIK-03
2021-2022

CHAPTER 1

INTRODUCTION AND BACKGROUND OF THE INDUSTRY OR USER BASED PROBLEM

Increasing the productivity and accuracy are the two basic aims of mass production. As we know the solution to this is by reducing the set up cost of the machine and also reducing the manual fatigue. In this case the device that caters our needs is the use of jigs. Let us take one example. Let us consider that one gets an order of say 1000 products. There need to be three holes drilled on this product. In such a case the designer tries to draw out every single hole with the help of square, straighteners, scribes and center hole. In order to align the axis of the hole with the axis of the drill we generally go for trial and error method. Accuracy is the main problem in such cases. In doing so it increases the work load on the operator. Hence using of jig to position and guide the tool to its right path is preferred rather than using scribes, square, straighteners or center punch etc. Thus the productivity is increased which is done by eliminating individual positioning, marking and frequent checking. Interchangeability is the chief advantage here. All the parts fit in properly except only the similar components are interchangeable. One does not need to repeatedly clamp and unclamp the object for various purposes like positioning as the locating, clamping and guiding of the tool is done by the jig itself. Bushing which is a tool guiding tool is used. So it reduces the presence of skilled laborer. Drill jig helps to drill, ream and tap at a much faster speed and with great accuracy as compared to holes done conventionally by hand. The responsibility of maintain the accuracy of the hole is now shifted from the operator and given to the jig.

CHAPTER 2

LITERATURE SURVEY FOR PROBLEM IDENTIFICATION AND SPECIFICATION

RESEARCH PAPERS

2.1 LITERATURE SURVEY 1:

Title: DESIGN AND MANUFACTURING OF JIGS FOR DRILLING MACHINE

Authors: Smit Patel¹, Sahil Vasoya², Ankur Joshi³

Abstract: Mass production aims at high productivity to reduce unit cost, and interchange ability to facilitate easy assembly. It could be achieved by the use of jigs. Jigs are provided with tool guiding element such as drill bushes. In this project attempt is made to design drill jig plate. Basically this project will show drill jigs plates that are going to be manufactured and for that analysis too. So for drilling operation at different angle and different position such jigs are made for accurate, precise drill operation in this project. Drill jig increases productivity by eliminating individual positioning, marking and frequent checking. Also jig reduces the repetitive nature required for drilling holes, because the locating, clamping and guiding of the tool is done by the jig itself.

(<https://www.irjet.net/archives/V4/i3/IRJET-V4I3480.pdf>)

Keywords :-Design, Manufacturing, Total Deformation Analysis, Maximum Principle Stress, Acrylic material.

• PROBLEM DEFINITION 1:

The jigs were made of mild steel, aluminum, etc. material. These materials are very heavy to carry if the size of jig is big. It can cause back pain or stress to the workers. It also reduces the energy of worker.

Due to heavy material following problem occurs:

1. Stress to the worker
2. Handling of jig
3. Increase in set up time
4. Reduce productivity

2.2 LITERATURE SURVEY 2:

Title: Design and Fabrication of Indexing Set Up for Drill Jig

Authors : Sangamesh1, V. V. Kulkarni2

Abstract: The scope of this work is to design and fabricate the indexing set up for actuator support component drill jig which is having holes at 900 apart. Jigs are mainly used for mass production and for interchangeable parts concept in the manufacturing of the indexing system. In this work main focus is given to the shaft which is to withstand the weight of the drill jig and the work piece while indexing. To achieve this, these components such as shaft, hydraulic jack were designed and manufactured.

The theoretical calculations of deflection and stress of the shaft to withstand the load of the drill jig and work piece were done and compared with Ansys results. The results of theoretical and Ansys average deflection and average stress error found are 0.0715 percent and 0.627 percent respectively. Comparison has also been done with manual and hydraulic indexing cycle times. The results of average percentage time saved are 71.94 percent by hydraulic indexing

(<https://www.irjet.net/archives/V3/i6/IRJET-V3I6381.pdf>)

Keywords :-drill jig, hydraulic jack, rotating shaft.

• PROBLEM DEFINITION 2:

Indexing is to move from one set position to another in order to carry out a sequence of operation. In order to increase the production rate, reduce the labor effort and also to reduce the lead time, for all these purpose new indexing type of drill jig is used. The main object of reducing indexing time is achieved with the help of hydraulic jack which help the drill jig to be indexed by 1800 for drilling holes on top and bottom face of the work piece. The rotation of the drill jig is obtained by the rotating shaft supported in two ball bearings

2.3 LITERATURE SURVEY 3:

Title: DESIGN AND DEVELOPMENT OF HYDRAULIC FIXTURE FOR MACHINING HYDRAULIC LIFT HOUSING

Authors: Shailesh S Pachbhai^{1*} and Laukik P Raut²

Abstract: Loading and unloading of workpiece in manual clamping is time consuming process, so reducing machining time, set up time etc. is a main aim of process. The job having cylindrical shape, this is a challenging task for design engineer, hence hydraulic fixture design is incorporated in manufacturing industry. Except toggle clamp, no other option is available to hold cylindrical object, hence special type of fixture is design for this case, which can be used for machining of hydraulic lift housing, Fixture reduces operation time, increases productivity, and best quality of operation is possible. The project deals with the designing of different parts of fixture assembly, 3D modelling by using Pro-E WILDFIRE 5.0, finite element analysis of hydraulic lift housing by using ANSYS software.

(http://www.ijmerr.com/v3n3/ijmerr_v3n3_27.pdf)

Keywords :- Fixture, Accuracy, Clamping, Toggle clamp.

- **PROBLEM DEFINITION 3:**

1. Fixture setup is done manually due to this cycle time is more.
2. Over tightening or loosening of screw leads to machining defects.
3. Product quality is not obtained as per specification.
4. Sometimes rejection rate is observed.
5. Manual clamping leads to accidents.
6. More hectic to operator to load and unload.

2.4 LITERATURE SURVEY 4:

Title : DESIGN AND ANALYSIS OF MILLING FIXTURE FOR PNEUMATIC ACTUATOR COMPONENTS

Authors: Shivanand Vathare¹, Sudhir S Mathapati*² and Poojesh Anvekar³

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 Solid Edge V20 Software is used to model the Milling fixture and analysis work was carried out by using ANSYS 13 Workbench Software.

(<http://www.recentscientific.com/sites/default/files/2064.pdf>)

Keywords: - Analysis, Milling Fixture, Solid Edge.

• PROBLEM DEFINITION 4:

A pneumatic cylinder mainly consists of a piston, a cylinder and a valve or port .The piston is covered by a diaphragm, or a seal, which keeps the air in the upper position of the cylinder, allowing the air pressure to force the diaphragm downward, moving the piston underneath, which in turn moves the valve system, which is linked to the internal part of the actuator. Pneumatic actuators may only have one spot for single input, top or bottom, depending on action required. In this project head and cover part of the actuator should be milled. Here milling fixture is designed for head and cover part of the pneumatic actuator.

2.5 LITERATURE SURVEY 5:

Title: Design of Jig for Multihead Drilling Machine

Authors: K.Saravanakumar 1,P.Dineshkumar 2,V.R.Dinesh kumar
3,T.Mahalingam4,G.Maheswaran 5

Abstract: The project is about a design and development of multi head drilling jig for holding cylindrical parts for mass production of drilling operation. Drilling jig is used whenever is necessary to drill hole to exact location. It identified the numerous advantages that are associated with the use of jigs in manufacturing to include: production increase, cost reduction, interchangeability and high accuracy of parts, reduction of the need for inspection and quality control expenses, reduction of accident as safety is improved, automation of machine tool to an appreciable extent, easy machining of complex and heavy components, as well as low variability in dimension which leads to consistent quality of manufactured products. The work also explained that since the design is dependent on numerous factors which are analysed to achieve an optimum output, that jigs and fixtures should be made of rigid light materials to facilitate easy handling. For adequate strength and rigidity, a mild steel with 16 millimetres diameter was chosen for the design of a sample jig. Finally jigs must be provided with adequate clearance which should allow for variations in size of components especially during forging, milling, and casting operations.

(http://www.ijirset.com/upload/2017/march/218_MECH%20013.pdf)

Keywords :- Components, Work-Holding, Manufacturing, Production, Operation, Devices, Machining, Work-Piece, Clamping, Bushes.

• PROBLEM DEFINITION 5:

1. Error observed in PCD of components at drilling operation.
2. Spacing between equi-spaced holes is not maintained.
3. A problem occurs in assembly of such components.
4. Rework and rectification is required for such components.
5. Production idle time is increased.
6. Production cost increased.
7. CDD (Contractual Delivery Date) is not maintained.

CHAPTER 3

PROPOSED DETAILED METHODOLOGY OF SOLVING IDENTIFIED PROBLEM WITH ACTION PLAN

3.1 PROPOSED METHODOLOGY 1:

1. We have manufactured a jig of acrylic material.
2. We have manufactured a jig of two steps, which will be used for drilling of two different diameter faces.
3. We have manufactured a jig by which we can make hole in two perpendicular directions.
4. We have manufactured a jig which can fit the work piece and jig doesn't come out while drilling.

3.2 PROPOSED METHODOLOGY 2:

The basic methods used for the successful operation of the above concept are conventional machining, different methods of locating and clamping methods. Also the requirements of the project, such as increasing productivity, are reducing the lead time. Indexing is done with the help hydraulics. The setup is fabricated by using conventional machining operations. The parts such as hydraulic jack, shaft etc. are designed by using basic design formulae. Modeling is done by software.

3.3 PROPOSED METHODOLOGY 3:

As solution to this problem greatly helps the industries to increase their productivity, this problem is needed to be solved to meet the current trends of designing and manufacturing. Solution to this problem requires hydraulic fixture in modeling software's which are now a day's back bone of all design and manufacturing industries (Dan Ding Guoliang *et al.*, 2002).

3.4 PROPOSED METHODOLOGY 4:

Depending upon the study of the components suitable location and clamping methods have been adapted.

Location : For the components spigot location is taken. According to the dimension of the spigot the fixture base plate is cut for location purpose, and four resting pads are been provided to rest the component on it. Now the component is located on the spigot location and is rested on the resting pad. Due to the spigot location and resting pads the part cannot move/rotate horizontally with respect to x-y direction. Hence 4-DOF (translator motion) and 4-DOF (rotational motion) are arrested. In z-direction, downward motion is arrested.

Clamping : Here it is used strap clamps. Strap clamps are provided to hold the component rigidly on fixture base plate. Liner is used to press fit the locating pin. Four resting pad are used at the bottom of fixture plate.

3.5 PROPOSED METHODOLOGY 5:

1. Decide to design and manufacture Jigs by using mild steel material because mild steel material is light and tough, strength, heat resistance, weather resistance and color verity.
2. Decide To Manufacturing of Common Jigs i.e. one PCD on a single jig

RESOURCES AND CONSUMABLES REQUIRED

1. Locators:

A locator is usually a fixed component of a fixture. It is used to establish and maintain the position of a part in the fixture by constraining the movement of the part. For work-pieces of greater variability in shapes and surface conditions, a locator can also be adjustable.

2. Clamps:

A clamp is a force-actuating mechanism of a fixture. The forces exerted by the clamps hold a part securely in the fixture against all other external forces.

3. Supports:

A support is a fixed or adjustable element of a fixture. When severe part displacement/deflection is expected under the action of imposed clamping and processing forces, supports are added and placed below the work-piece so as to prevent or constrain deformation. Supports in excess of what is required for the determination of the location of the part should be compatible with the locators and clamps.

4. Fixture Body:

Fixture body, or tool body, is the major structural element of a fixture. It maintains the spatial relationship between the fixturing elements mentioned above, viz., locators, clamps, supports, and the machine tool on which the part is to be processed.

It consists of mainly;

4.1. Frame

4.2. Pneumatic cylinder

4.3. 5/2 Valve DCV

4.4. Pneumatic hoses and fittings

4.5. Shaft

4.6. Nut and Bolt

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ACTION PLAN

SR. NO.	PLANNED WEEK	ACTIVITIES PLANNED	ACTIVITIES EXECUTED
1	Week-1	<ul style="list-style-type: none">➤ Formation of Project Group.➤ Basic Idea of C.P.P.➤ Group Meeting.	<ul style="list-style-type: none">➤ Project group of 4 members was finalized.➤ A basic idea and structure of the subject was explained by the subject teacher Mr.. D. S. Zalte.➤ Meeting between group members and Mr. D.S. Zalte was held.
2	Week-2	<ul style="list-style-type: none">➤ Allotment of Project Guide.➤ Meeting with Project Guide.	<ul style="list-style-type: none">➤ Mr. D. S. Zalte was allotted as our guide.➤ Discussion about various alternatives with guide.
3	Week-3	<ul style="list-style-type: none">➤ Research on Project Topics.➤ Discussion of Project Topic with Project Guide.➤ Finalization of Project Topic.	<ul style="list-style-type: none">➤ Research of project topic by visiting various industries.➤ Discussion of project topics with project guide.➤ Finalization of topic along with documentation.
4	Week-4	<ul style="list-style-type: none">➤ Collection of Basic Information Required.➤ Initializing the Information of Project Topic.	<ul style="list-style-type: none">➤ Collection of basic information about project topic.➤ Collection of information about detailed working condition of project.

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5	Week-5	<ul style="list-style-type: none">➤ Submission of Title Page and Abstract.	<ul style="list-style-type: none">➤ Submission of Title Page and Abstract as per standard format.
6	Week-6	<ul style="list-style-type: none">➤ Finalization of Workplace.➤ Organizing of Resources.	<ul style="list-style-type: none">➤ Visit to the workplace and finalization of workplace.➤ All the collected data to be organized.
7	Week-7	<ul style="list-style-type: none">➤ Project Proposal.➤ Logbook.	<ul style="list-style-type: none">➤ Preparation of project proposal.➤ Preparation and maintaining the logbook.
8	Week-8	<ul style="list-style-type: none">➤ Survey of Materials Required In Market.	<ul style="list-style-type: none">➤ Market survey of required materials and testing of materials.
9	Week-9	<ul style="list-style-type: none">➤ Tentative Designing.	<ul style="list-style-type: none">➤ Tentative designing of project.
10	Week-10	<ul style="list-style-type: none">➤ CAD Drawings.	<ul style="list-style-type: none">➤ Drafting of the CAD drawings as per the design.
11	Week-11	<ul style="list-style-type: none">➤ Solid Modeling Drawings.	<ul style="list-style-type: none">➤ Drafting of 3D drawings according to the design.
12	Week-12	<ul style="list-style-type: none">➤ Analysis of Drawings.	<ul style="list-style-type: none">➤ Analysis of various components of the project from the drawings.
13	Week-13	<ul style="list-style-type: none">➤ Project Report.➤ Presentation on SEMESTER-V Project Report.	<ul style="list-style-type: none">➤ Preparation of Semester-V 'Project Report'.➤ Preparation of presentation on Semester-V 'Project Report'.
14	Week-14	<ul style="list-style-type: none">➤ Final Submission of CPP.	<ul style="list-style-type: none">➤ Final submission of Capstone Project Planning.

CONCLUSION

In this project, a complete model of work holding device of the high torque drilling machine was fabricated in the carpentry shop of the institute central workshop. Before fabrication a complete CAD model was prepared for optimum use of material and space. All the components were made locally. The device is controlled by tightening the screws provided on the rear side of the frame. The fixture can hold flat components and is operated manually.

1. Locators, 2Clamps, 3 Supports, 4Fixture Body

- It consists of mainly;

1. Frame
2. Pneumatic cylinder
3. 5/2 Valve DCV
4. Pneumatic hoses and fittings
5. Shaft
6. Nut and Bolt

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