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# REVIEW ON WELDING FIXTURE FOR WATER-WELL MACHINE

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**Abstract** - *In water well machine, minimizing the deviation of drilling spindle and the table is essential to maintain drilling accuracy. Fixture is a vital resource for manufacturing. This paper research on a new fixture design which assist the production of water well machine with very less deviation of drilling spindle and table, thus the time required for production or the alignment of machine is reduced. The fixture set up for the machine is done manually. The proper alignment for water well machine lets us to drill with maximum accuracy and at the exact set target. The fixture helps us to increase production rate and is beneficial in every aspect.*

***Keywords***- *Welding fixture; water-well machine; drilling spindle; drilling accuracy;*

## I. INTRODUCTION

The fixture design process is a highly intuitive process that is based on heuristic knowledge and the experience of tool designers. Fixture planning and design is only one of many activities in manufacturing that requires a careful understanding of the complete process. The objective in this case is to manufacture a product considering the elements of process planning and fixture design, which plays the crucial role in eliminating the disadvantages. The function of a fixture is to hold a workpiece firmly in position during a manufacturing process. It is an activity that is sometimes neglected as a major contributor to reducing total manufacturing cost.

Most fixtures are dedicated fixtures i.e. designed for a particular part. Owing to the current trends in manufacturing promoting product mix, flexibility, and quality, many companies are demanding fixturing systems to be more flexible. Designing a suitable fixturing systems allow a variety of individual parts to be held during machining or assembly, thus minimizing the cost of producing fixtures, and reducing the storage needed for fixtures.

So, we are designing a fixture for Water well for eliminating the errors caused. The basic requirement of a fixture design in that it locates and secure the workpiece in the correct orientation and relationship so that the manufacturing process can be carried out according to design specification.

Fixture required for machining for welding, assembly, inspection, and other operations. Fixture directly influence the productivity, machining quality, and the cost of machined parts our Machine. Studies show that about 40 % of Operations that are rejected are mainly because of dimensioning errors due to poor fixture designs. In fact, the fixture design and production constitute 10–20 % of the total expenditure on manufacturing processes. The fixture in Water well machine is to create a structurally stable, long lasting, efficient well that has enough space to house pumps or other extraction devices, allows ground water to move effortlessly and sediment-free from the aquifer into the well at the desired volume and quality of the bore. Drilling Solution has large impact, external forces vibratory motions while operating which causes large errors for which need for a Fixture design.

Properly implemented, all of these fixtures will produce equally efficient and productive machining where ground water is available. Cable tool drilling generally is less labor-intensive but takes more time than (reverse) rotary drilling. Reverse rotary and rotary drilling require large amounts of circulation water and the construction of a mud pit, something to be considered if the well is to be drilled in a remote location with no access to water.

Designing a Fixture for results to wards reduced lead time errors, increased production, reduction in error costs, etc. Fixture considers the effects of pricing and inventory control on total production costs and was developed within an actual manufacturing environment. Fixtures make sure that workpiece maintains the designed dimensional specifications and tolerances the external cutting forces must be resisted by the fixture so that the operation remains in equilibrium.

The fixture-design in machine basically contains three phases: Planning, design and assembly. During the Planning stage, an initial configuration of the fixture is conceptualized. Decisions made here are referred to machine resources and facilities available, production volume and capacity, scheduling, material handling, and quality specifications. Production and process planners identify production requirements that typically include batch size, type of machine, production personnel, and total production cost. Other requirements such as quality standards may dictate functional considerations like inspection and tolerance specifications. In the fixture-design phase, two sub phases are necessary to constrain the workpiece for subsequent machining. The analysis phase is based on satisfying the principles and requirements of fixture design. During synthesis, locating, clamping, and supporting fixture elements are chosen to meet the design requirements. This phase is usually performed by the fixture designer or machinist. The final phase is assembly or construction of the fixture about the workpiece. Fixture assembly can be done manually by the machinist or automated. In most instances, this phase is performed simultaneously with the fixture-design phase.

## II. LITERATURE REVIEW

Wang et al. [1] presented literature survey of computer aided fixture designing and improvements (automation) in fixture designing. They have suggested some future aspects regarding fixture. Fixture design still continues to be a major Bottle neck in the promotion of current manufacturing, though numerous innovative CAFD techniques have been proposed.

Khodwe and prabhune [2] presented the design of a test bench for gear box to test a gearbox at the end of assembly line to check leakage, noise, gear shifting feeling and shift load in driving and dragging condition. They have included the design of fixture for gearbox, clamping arrangement, gear shifting arrangement, design of oil dispensing, extraction and filtration unit. They have done FEA of gear box fixture. They have concluded that their design of fixture is safe as error was within the acceptable limit.

Khetani et al. [3] had designed, analyzed and optimized the welding fixture of the brake pedal of a tractor by using ANSYS Workbench 14.5. From results of the thermal analysis they have observed that the thermal stresses are distributed around the welding points and by the graph they found that the temperature variation with respect to time.

Liao et al. [4] explained importance of fixture designing and different forces that should be considered while designing a fixture. They have presented design and analysis technique for a fixture which is subjected to time varying loads. By combination FEA and nonlinear rigid body dynamics a flexible multi body dynamic model is formulated.

Suthar et al. [5] presented the use of impeller structure as a fixture. Basically, impeller is used in the exhaust system of drum mix plant to remove dust particles. During welding, fixture is needed to hold the different parts of impeller. In this paper they explained new method in which we can use impeller structure itself as a fixture. For designing a proper impeller as a fixture, proper selection of tolerance has been done. In design for reducing welding distortion they have provided intermittent slots rather than long slots. Analysis is done using ANSYS workbench. From CFD analyses of impeller they have concluded that improper streamline in impeller assembly design is generated due to improper pressure, improper design of casting and improper design of impeller blade.

Cecil [6] presented the locator and clamp positions were not determined automatically. The approach adopted was interactive where the user specified the clamping, locating, and support points, and then selected the appropriate fixturing components in the desired positions. This work did not address the issue of automating the fixture design task. However, it attempted the development of a semi-automated methodology to aid in the generation of fixture design for a given part design. In, the primary locating surface and its related locator positions are assumed as a given, and the problem was reduced to determining the secondary and tertiary planes with their respective locator positions.

Amaral et al. [7] had studied “Design And Development Of Mini-Powered Water Drilling Rig” (2013).This paper presents a brief review of the development of water drilling rig. Water drilling in Nigeria was initiated as most other technologies in the country by much of western technologies and machineries. As early as the 1960s, huge drilling machines started to be imported into the country for water borehole construction. Together with these machineries came complex spare parts and high maintenance costs. Today’s trend is that Nigerians import used and obsolete gigantic machineries to bore holes which locally evolved portable machines would do very easily and economically.

## III. PROBLEM STATEMENT

The water well machine drilling spindle and table centre are facing problem of there is misalignment in both of them and hence it increase the time and increase the cost while production. While setting the centre without fixture the spindle give deviation of more than 2mm with respect to table which is un-expectable in actual working of water well machine it does not drill at target location. So it is imperative to pay attention towards enhancing the alignment and reducing time in order to improve quality of drilling.

### A. Objectives

- To reduce the time for setting before operation than machine without fixture.
- To maintain the canter, align.
- To reduce maintenance cost.
- To improve the productivity.
- To reduce the labour cost.
- Improve quality.
- To maintain dimensional accuracy.
- Reduce lead time.

## IV. METHODOLOGY

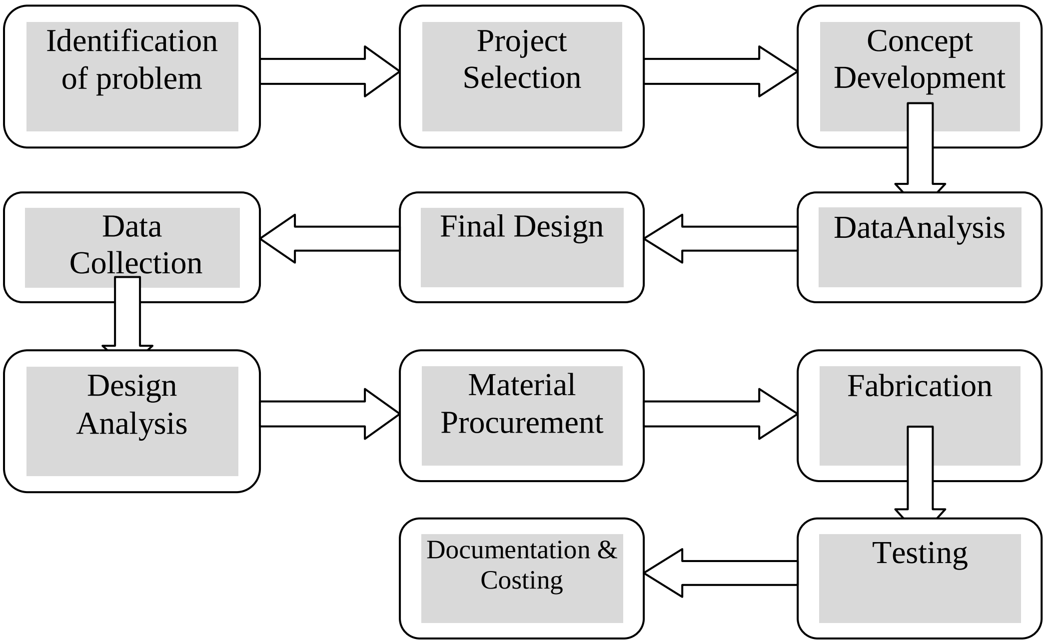


**Fig.No :- 1. Design process of fixture design**

## VI. DRILLING METHODS FOR WATERWELL MACHINE

Essentially, a drilling machine consists of a mast from which the drilling string components (tools plus drill pipes or cable) are suspended and, in most cases, driven. Modern systems are powered rotary-driven, but it is probably worth a short digression to describe some methods of manual drilling for water. Simple, low-cost methods include: -

### A) Hand-auger drilling

Auger drills, which are rotated by hand, cut into the soil with blades and pass the cut material up a continuous screw or into a ‘bucket’ (bucket auger). Excavated material must be removed and the auguring continued until the required depth has been reached. Auger drilling by hand is slow and limited to a depth of about 10 metres (maximum 20 metres) in unconsolidated deposits (not coarser than sand, but it is a cheap and simple process.

### B) Jetting

A method whereby water is pumped down a string of rods from which it emerges as a jet that cuts into the formation. Drilling may be aided by rotating the jet or by moving it up and down in the hole. Cuttings are washed out of the borehole by the circulating water. Again, jetting is useful only in unconsolidated formations and only down to relatively shallow depths and would have to be halted if a boulder is encountered.

 

**C) Rotary drilling**

Most borehole applications in the field will require rotary drilling. True rotary drilling techniques allow much deeper boreholes to be constructed, and use circulating fluids to cool and lubricate the cutting tools and to remove debris from the hole. Circulating fluids usually take the form of compressed air or of pumped water with additives, such as commercial drilling muds or foams.

**D) Sludging**

This method, which may be described as reverse jetting, involves a pipe (bamboo has been successfully employed) being lowered into the hole and moved up and down, perhaps by a lever arm. A one-way valve (such as someone's hand at the top of the pipe) provides pumping action as water is fed into the hole and returns (with debris) up the drill pipe. There may be simple metal teeth at the cutting end of the pipe, and a small reservoir is required at the top of the hole for recirculation.

**Fixture Design**

Fixture types fall generally into five groups:

**Plate Fixtures** – Plate fixtures are constructed from a plate with a variety of locators, supports and clamps. They are the most common type of fixture because their versatility makes them adaptable to a wide range of machine tools. They are made from many different kinds of materials, which are governed only by the part being machined and the process being performed.

**Angle-Plate Fixtures** – Angle-plate fixtures are a modification of plate fixtures in that rather than a reference surface parallel to the mounting surface, it is set perpendicular to the mounting surface.

**Vise-Jaw Fixtures** – Vise-jaw fixtures are modified inserts for vises designed to accommodate a particular work piece. These fixtures are the least expensive and simplest to modify. The only limitations to these types of fixtures are size of the part and capacities of available vises.

**Indexing Fixtures** – Indexing fixtures are used to reference work pieces that need machining details set at prescribed spacing. Indexing fixtures must have a positive means to accurately locate and maintain the indexed position of the part.

**Multi-Part or Multi-Station Fixtures** – Multi-part or multi-station fixtures are normally used for either machining multiple parts in a single setup, or machining individual parts in sequence, performing different operations at each station.

In addition to their basic construction, fixtures may be classified in respect to the process or machine tool to be used in the machining process. The primary types include:

**Milling Fixtures** – Milling fixtures are the most common type of fixture and include standard vises and clamps. However, as the work piece size, shape and complexity becomes more sophisticated so does the fixture. Tombstones, which are commonly used on horizontal machining centers, come in a wide variety of configurations to hold multiple parts on up to four sides of the fixture. The t-slots of the machine table are standardized in size and spacing and are the primary means of holding work and fixturing devices for machining. Fixtures are typically mounted to the table using a variety of accessories such as clamps, straps, t-slot bolts, nuts and jacks.

**Lathe Fixtures** – The same basic design principles that apply to milling fixtures also apply to lathe, or turning, fixtures, with one major difference. In most milling operations, the cutting tool rotates during machining, while with turning the part rotates. This situation creates another condition the tool designer must deal with - centrifugal, or rotational, force. Work holding devices include two to six jaw chucks and collets of varying shapes and diameters. Work may also be held between the head and tail stock of the lathe or "between centers."

**Grinding Fixtures** – Grinding fixtures are a family of fixtures rather than a single classification. The two major types of grinding fixtures are those used for surface grinding and cylindrical grinding. The magnetic table is the preferred work holding device on surface grinders. Cylindrical grinding is usually a secondary operation after turning. Often the same center holes used for between-centers turning may be used for grinding the part. As friction is more of a factor in grinding than in other processes, fixture design must allow for coolant flow and removal. If not built into the grinding machine itself, the fixture design should include wheel dressing capability as well.

**Broaching Fixtures** – Broaching fixtures hold and locate the part in relation to the broaching tool. Internal and external broaching requires different approaches to their respective designs. Internal broaching requires less clamping because the process tends to keep the part firmly seated on the fixture. External broaching requires resistance to both pull and push forces that are exerted on the part, requiring more sophisticated fixturing.

## VII. CONCLUSION

An fixture design system is developed to provide a fixture design system capable of being integrated with other machine in future to increase productivity and quality. The system used to design a fixture for each set-up in a process plan. the system developed has the following salient features-

- It integrates the functions of the interactive, fixture design system into one environment and this gives the flexibility to achieve a design goal efficiently and effectively.
- It reduce the design lead time when using the semi automated or automated fixture design module.
- The job changing and alignment time period i.e. set-up time, is reduced significantly.
- Real time force measurement can be carried out by using the developed system.

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