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A Review On Design And Development Of Fixture For Face Milling Operation

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Abstract

Modelling the fixture design is a kind of difficult process because several factors are involved: design, planning of a process and manufacturing. In this review paper literature survey is presented. According to the application fixture can be designed. Design of new fixture is required to overcome drawbacks. So, there is a need to design and develop fixture which can help in improving productivity, accuracy and reduction of time. This review aims at the Design of face milling fixture using considering different parameters and modeling according to the application.

Keywords- Fixture ,Productivity, Accuracy, Time, Modelling

I. INTRODUCTION

Fixtures simplify the working operation performed on the special components. In fixture for supporting and clamping the work piece, locators, clamps and support plates are provided. In order to explore the capabilities and benefits of fully-active fixtures, it is important to look into the new fixturing strategies that such systems could render possible. A design and planning methodology that takes into account the capabilities of these fixtures is necessary to achieve this.

Fixtures are mostly designed for a definite operation to process a specific work piece. They are designed and manufactured individually. Fixtures are used to produce duplicate parts accurately. In order to produce parts in precise manner the parts must be firmly and perfectly fixed to the fixture. To do this a fixture is designed and built to hold support and locate the work piece to ensure the work piece is machined within the specified limits.

Fixture is attached to milling machine table. Milling fixture consists of the some main components like base, clamps, rest blocks, locating points and gauging surfaces. Base plate is the base of a milling fixture. A base plate has accurate undersurface and forms main body on which various components are mounted. It may be constructed of steel plate, mild steel or cast iron, depending upon the size, shape and complexity of the part.

The fixture design methodology aims to capture the dynamic behaviour of a fixture workpiece system under moving and dynamic loads exerted by the manufacturing process. It's outputs are the fixturing strategies that should be followed together with it's parameters, in order to reduce the displacement of the workpiece below a user defined limit.

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The design of fixture varies based on the use of relatively simple tools to expensive or complicated devices. Fixtures simplify the working operation performed on the special components. In fixture for supporting and clamping the work piece, locators, clamps and support plates are provided.

Generally, fixture consists of following components:

1. Locators:
   It is a fixed components of a fixture. It is used to maintain the position of part in the fixture.
2. Clamps:
   Clamp is a component which is used to actuate force. Part is kept securely in the fixture against all the external forces.
3. Supports:
   It is a fixed or adjustable element of a fixture.
4. Fixture Body:
   It is major structural element of a fixture. It maintains relationship between all the components mentioned above.

The steps involved in Fixture design are as follows:

(1) Define requirements

(2) Gather information

(3) Analyse the data

(4) Choose the best option

(5) Implementation

II. LITERATURE SURVEY

B Vijaya ramnath, C Elanchezhian, S Jayaprakash et al [1] stated a paper on Friction stir welding (FSW) which is a process of joining two plates in which there is a relative motion between the tool and work piece, which produces the heat required that makes the material of the two edges to join by atomic diffusion In this paper, we developed a milling fixture and its clamping setup for Vertical Milling Machine in which Friction-Stir Welding operations are to occur. The fixture was designed with required specifications. The screw clamps are designed in such a manner to hold the work pieces rigidly during whole operation. Later, the testing of the fixture is carried out by the use of ANSYS Software. The fixture is designed and analyzed for three different materials. The materials analyzed are Cast Iron , Die Steel and Tool Steel and Hard Alloy. After analyzing, the better material can be used for Friction-Stir Welding operations. Relevance of this paper with our project is here a milling fixture is designed and anaylsed on which Friction stir welding process occurs using Vertical milling machine. The fixture then is anaylsed on ANSYS software for three materials that is cast iron, die steel and hard alloy.

Zufang Yang et al[2] studied and analyzed system time which can be controlled as well as milling accuracy which can be achieved by using techniques. Also checking of temperature adaptability which can be adopted at very high temperature can be changed with the help of working conditions.

Jixiong Fei, BinLin et al[3] proposed a theory on dynamic deformation of the thin walled structures by using a movable milling fixture instead of fixed milling fixture. Normally during a fixed milling process dynamic deformation leads to deformation in thin walled structure. Hence to overcome this situation fixed milling fixture element can be used to support the back surface of the work-piece. Due

to this setup number of movable fixture elements can be reduced, the deformation between two fixed elements can be suppressed effectively. Main work of this present paper focuses on suppressing the machining deformation of the flexible work-piece by a newly proposed method. The main advantage of this process has a direct effect on the surface quality of milling plate when a moving fixture is placed at the work-piece at its back surface. The surface roughness of that with the supporting elements is much smaller than one without using the movable milling fixture. In addition, the measured deformation of the specific point on the work-piece surface in good agreement with the predicted results, which demonstrates the proposed analytical methods can be used to predict the milling deformation. In order to analyze the deformation, the component is simplified to a thin-walled plate subjected to the milling force. The fixture element is simplified to an oscillator which supports the plate at its back surface. Besides, it is assumed that the separation between the work-piece and the moving fixture won't happen during milling. During machining, both the milling force and the oscillator will move at a velocity of the feeding speed along the feeding direction. It can be concluded that the fixture elements support the work-piece at some fixed points in their investigation, which is aimed to minimize the deformation of the whole component. However, the surface quality is mainly related to the contact part between the tool and the work-piece. Therefore, there is no need to concern the deformation suppression of the whole structures.

Lorenzo Sallese et al[4] stated that, the mitigation of chatter vibrations in milling has collected the interest of several researches in the last decades. One of the most industrial related alternatives is represented by active fixtures, complex mechatronic devices capable of actuating the workpiece during machining operations, with the purpose of stabilizing the process by generating counteracting vibrations.

Hugo M B de Carvalho et al[5] proposed a paper on Vibration analysis and eficiency in interrupted face milling processes. It deals with the planning of face milling process that how the milled part is produced and how an incorrect or incomplete planning will result in loss of productivity. This paper proposes that loss of productivity be avoided by applying vibration analysis and consideration of energy efficiency in the development of face milling processes for interrupted cutting.

III. CONCLUSION

An ideal fixture should not only provide the machining repeatability and high productivity, it should also offer a solution which reduces workpiece distortion due to clamping and machining forces. Active research in this area has contributed much design knowledge and rules in fixture automation in the last 20 years. This paper summarises some of the major contributions made by the fixture research community at the time of writing.

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