Automated Tilt Conveyor for Cylinder Head

Sathiyaamoorthy V, Balamurugan S, Sivakumar A, Arumugam K, Palani S

Abstract: Cylinder head is one of the main components of an Automobile Engine. In machine shop there are three bays having machines in which the cylinder head is machined. Makino machine is one of them where the operations like roughing, semi finish; drilling and tapping are carried out. The component has to be loaded by use of a manipulator in a vertical position into the machine such that its rocker face should be facing the operator. So, the component coming from the previous operation through a conveyor with combustion face on top should be tilted to 90 degree such that its rocker face will be facing the operator in a horizontal position. This tilting process has been carried out manually which results in damage of valve guide and valve seat of a cylinder head. This leads to reduction in quality and productivity and also it results in increased operator fatigue since the cylinder head weighs heavy. There is also a chance that when tilting the component manually the component may fall down and hurts operator which results in increased value of effort and ergonomic index. To overcome this problem our research work a modification is made in the conveyor of the makino machine with a low cost automatic arrangement provided for cylinder head tilting purpose.

Keywords: Automobile, automatic tilting, cylinder head Makino machine.

I. INTRODUCTION

Drilling is the method for providing hole or else extends a hole on the object through applying force by rotating drill tool. The cutting tool of drill has normally as twist since it is edges with sharp with cylindrical tool offer by means of a helical groove beside its length for allowing cut the metal. The pointed edges having surfaces with conical and make grinding at bottom end of drill while rotating and which is cut metal by means of peeling with circular layer by layer while applying force towards the working job.. The form of removal metal as coiled as well as it escapes by helical grooves in drill.

The coolant has generally utilized during the drilling process for removing heat due to friction to obtain better finish of hole. Drilling machine has the simplest, moderate as well as accurate tool which is use full in machine shop as well as tool room.

Zou et al (2008) used a machine vision related system, here individual camera acquire molding image and the Harris Corner Detector method to detect reference point of pallet and pouring cup center has found using Hough Transform[1,4,6]. Zhifeng (2011) found teaching playback technique for ensuring molten metal’s are quickly as well as exactly send to the cavity of the mold which free from over spilling on through cup of sprue [3]. Asgher et al analyzed the highly precise the control of rate of flow using the control feed forward to employ the rate of flow model of inverse dynamics [5]. Asgher et al (2014) applied machine vision image capturing methods and here images are corrupted during the acquisition by using the techniques such as Normalized Convolution (NC) as well as High Resolution Normalized Convolution (HR-NC) for corrupted image with the intention of regain missing as well as corrupted small information and the acquisition of data lose [7]. Chi et al (2015) suggested the modern output of canny edge detector. The investigation of vision based machine for the detection of tolerance as well as methods in novel for identifying dimensional correction and applying algorithms [8], Kosler (2016) introduced the process for improving safety of working environment as well as ergonomics [2, 9]. Shahid et al (2017) initiated the novel method for automation of the process of sand casting through machine vision method to position the mold [10, 11, and 12].

The objective of the study is to fabricate a tilting component which will be placed in a conveyor before the makino machine. This tilting component will tilt the component to 90 degree such that rocker face of the cylinder head will be facing the operator. The component should be tilted smoothly and slowly in order to avoid damage. The tilting component to be made should be of low cost and it should carry out the work at faster rate when compared to manual operation. By using the lifting component, the process is made easier and damage free which results in increased productivity of cylinder head in machine shop. Because many of the components will malfunction in assembly section due to damage occurred in tilting the component. It also reduces the effort and ergonomic index value. So it is more important to replace the manual operation with an automatic tilting operation.

II. REAMING AND MILLING

Reaming is the operation of finishing an existing hole very smoothly and accurately in size. A drill will not producea hole having sufficiently good qualities of finish and accuracy for many purposes.
Therefore, when a very accurate, smooth hole is required the hole is first drilled a little undersize. Then it is reamed to the correct size. The accuracy to be expected is within +/- 0.005 mm. The reamer has multi tooth cutter which is rotates as well as moves linearly into an already existing hole. The reamers are typed as hand reamers, chucking or machine reamers, adjustable reamers, expansion reamers, taper reamers, shell reamers and carbide tipped reamers.

Milling machines are used to produce parts having flat as wells as curved shapes. Intricate shapes, which cannot be produced on the other machine tools, can be made on the milling machines. Normally milling operation split into two namely: Up milling as well as down milling. The various kinds of milling machines are Duplex, Triplex and Planer. Under the special type of milling machines are Rotary table, Drum type, Planetary, Pantograph, profiling and tracer controlled milling. Specially the various types of drilling machines are specified as Portable drilling machine, Sensitive and upright or bench drilling machines, Radial, drilling with Multiple spindle machines, Upright drilling, Turret machine, Drilling machine for deep hole.

III. PROBLEM ANALYSIS

The components to be placed inside the makino machine are to be in a vertical position with rocker face facing the operator. Due to this the component coming from the previous operation with combustion face on top should be tilted by 90 degree in order to pick it and place inside the makino machine with the help of manipulator. This tilting work is done manually which often damages the guide valve and seat and also results in wear of the component’s surface. It also results in decreased operator safety due to tilting the component manually which may hurt the operator.

In this study the details of the process used in cylinder head machining are collected. The cylinder head section has several numbers of machines and then makino machine is running at the 3rd bay. The components that are damaged due to manual tilting are completely analyzed. This study aims at various methods of tilting the component and which method yields good result without a damage in valve guide and valve seat in the cylinder head.

IV. METHODOLOGY

The tilting component is made after analyzing various methods and mechanisms for tilting operation. Finally a perfect design for tilting purpose is made. The design consists of a rectangular bunk with nylon pads fixed on it. The rectangular bunk is made with a hole in order to place a shaft inside it. Two plates hole diameter as that of rectangular bunk are made and it is jointly welded with another plate of same length at the bottom. The two sides of plate hole position and shaft is inserted into it. The fabrication is done according to the design. Now the setup is completed. In order lift the component pneumatic pressure is used. So, a separate pneumatic cylinder is connected to the tilting component made. A Pressure reducer valve is used in order to control the pressure. This total assembly is fixed to a conveyor. Two rollers in a conveyor are taken out. The process is checked once by placing a cylinder head over the conveyor. When the pressure is given, the cylinder head is tilted to 90 degree automatically

A. Design procedure

The cylinder head is automatically tilted by designing a conveyor with a tilting setup.

Figure 1: Design view of nylon pad

The tilting setup consists of shaft, bracket, nylon pad, pneumatic cylinder. Design for each part is made separately and they are assembled together using CREO software. The operations carried out during the fabrication of parts are milling, drilling and tapping. The parts are then assembled according to the design and fixed to the conveyor and pressure is given by pneumatic cylinder. The Design vie of of nylon pad, bracket, shaft and view of pneumatic cylinder have displayed the Figures with respect of 1; 2; 3 as well as 4.

Figure 2: Design view of bracket

Figure 3: Design view of shaft

The Working of double acting cylinder with piston on one side is shown in Figure 5.
cylinder head has to be tilted to 90 degree. This process has been carried out by manual operation which results in damage of valve guide and valve seat. Our project is made on the basis to prevent this with the help of low cost automation arrangement provided for cylinder head tilting purpose. It consists of a bunk, nylon pad, plates, shaft and pneumatic cylinder. All the above parts are made by CREO. This reduces the damage in the cylinder head (valve guide and valve seat) and leads to increase in productivity and reduction in operator fatigue since cylinder head weighs heavy. This arrangement is act as a proper solution for the problem in tilting the cylinder head component in the conveyor of a makino machine.

**REFERENCES**

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