Non - Conventional Cutting

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Abstract

Non-Conventional Cutting having certain advantages of high accuracy, no direct contact of tool and workpiece so there is less/no wear etc. Hence, non-conventional type Laser cutting of sheet metals is widely used all over the world since it combines high speed with excellent cutting quality. Until now LASER is only used for straight metal cutting. By observing this we are going to introduce non-conventional turning by using LASER. It will reduce metal to metal contact. We are planning to achieve LASER cutting on cylindrical surface. For that we will make one fixture on which linear motion and rotary motion of job is carried out. By this synchronization, achieved turning will be measured in terms of surface roughness, material removal rate, etc.

Keywords: Non-Conventional Cutting, LASER Cutting, Turning Operation

I. INTRODUCTION

Generally cutting operations are carried out by two ways. 1) Conventional cutting and 2) Non-conventional cutting. "Conventional machining" (also known as "manual machining") is generally regarded as using manually controlled machines, particularly lathes, mills and drill presses. The tool moves around the work by mechanical controls that are manually controlled. Example: Lathe, Drill, Mill etc.

Non-conventional machining does not require the direct contact of tool and work piece. Example: Electric arc machining, Laser cutting, electro discharge machining, plasma cutting etc.

Now, as non-conventional LASER is widely used in many applications because having so many advantages like precise and accuracy cutting, flexible process, quality cut, variation in intensity of LASER beam, ability to focus at single point.

Laser cutting is a two-dimensional machining process in which material removal is obtained by focusing a highly intense laser beam on the workpiece. The laser beam heat subsequently melts/vaporizes the workpiece throughout the thickness or depth of the material thus creating a cutting front. The molten material is expelled from the cutting front by a pressurized assist gas jet. The assist gas, in addition to facilitating the material removal by melt expulsion, may also help in enhanced material removal through chemical reactions such as oxidation of the material. The cutting of the material then proceeds by the movement of the cutting front across the surface of the material. This is carried out by the motion of either focused beam and/or the workpiece relative to each other.

Laser cutting is a high-speed, repeatable, and reliable method for a wide variety of material types and thicknesses producing very narrow and clean-cut width. The process is particularly suited as a fully or semiautomated cutting process for the high production volumes. One of the first industrial applications of laser cutting using 200 W laser is cutting of slots in die boards. The lasers are now capable of cutting a wide range of metallic materials such as steels, superalloys, copper, aluminum, and brass, and nonmetallic materials such as ceramic, quartz, plastic, rubber, wood, and cloth.

II. WORK DONE

In ordinary cutting process, depth of cut and feeding is given to cutting tool. In this case, workpiece is having a rotary motion and LASER tool having linear motion for doing material removal process. Now, we are focusing on turning process with the help of LASER cutting machine.

For this purpose we will make one fixture which has required mechanism so we can get such type of turning operation.

In this process, we will use LASER machine beam as a tool and feed given to the workpiece. Here turning operation is obtained by giving the rotary as well as linear motion to the workpiece.

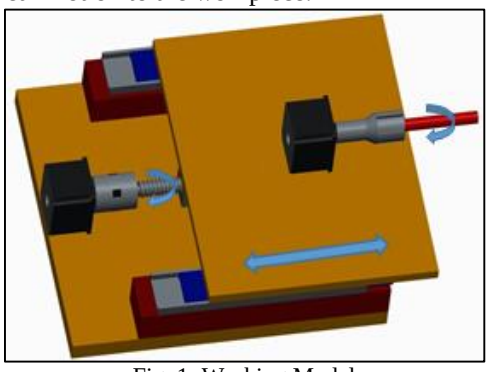

Fig. 1: Working Model

III. REQUIREMENT

Main essential parts of fixture are:

- Base
- Stepper motor & its Driver
- Ball screw
- Guide ways
- Coupling
- Collet or Chuck

IV. COMPUTER INTEGRATED FIXTURE

Our project is related to the turning operation by laser. So, for that we arrange one fixture in which two motion are required and both these motion are carried by stepper motor and controller. Controller is a device which drives motor by the use of computer software. So, the fixture is called as computer integrated fixture.

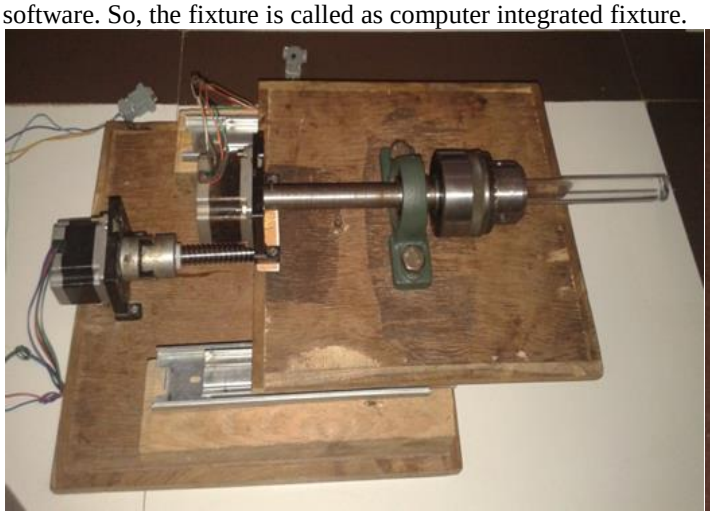

Fig. 2: Computer Integrated Fixture

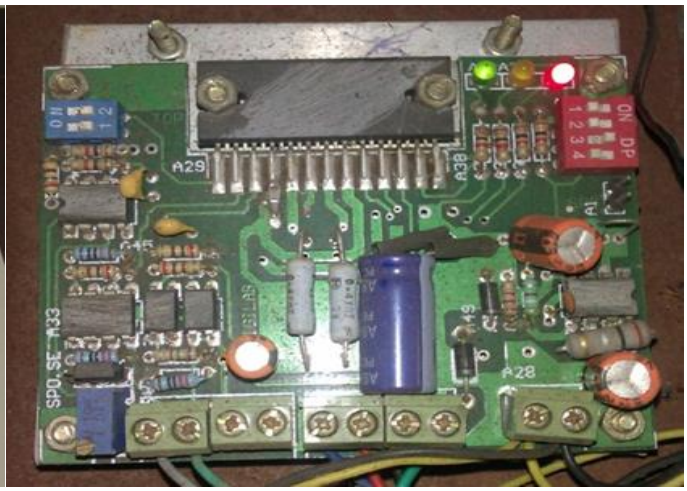

Fig. 3: Stepper Motor Driver

V. EXPERIMENTAL SETUP

Computer integrated fixture is now ready to use for further experiment by laser machine. The fixture is placed in the machine called mercury laser pro2.

Fig. 4: Mercury Laser Pro2 Machine with Computer Integrated Fixture

A. Final Machined Job

By the use of laser, we perform the experiment on acrylic rod and get different operation like turning, facing or parting and treading as shown in figure.

Fig. 5: Facing operation

Fig. 6: Turning operation

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