AN OVERVIEW ON CNC MACHINES, THER GROWTH AND WORKINGS

[1]Ramendra Kumar Vashishtha, [2]Dr. Mohammad Israr

Department of Mechanical Engineering

[1,2]OPJS University, Churu (Rajasthan) – India

ABSTRACT

The objective of any machining process is to produce products of acceptable standards that meet customer requirements. CNC machines are gradually replacing the conventional machines. They give a better control on the output parameters of the products like good surface finish, reduced cutting force, increased tool life, etc. Machining parameters can be optimized offline and part programs written accordingly, to produce parts of desirable output. The CNC machines are accurate instruments which need to be operated carefully for their effectiveness. Cutting forces play a major role in the safety of the machine tool, cutting tool and the work piece. So, selecting proper cutting parameters like cutting speed, feed rate and depth of cut is very important. In this article we will study about the growth, and workings of the CNC machining Tools.

I. INTRODUCTION

CNC remains for Computer Numerical Control and has been around since the mid 1970's. Before this, it was called NC, for Numerical Control. (In the mid 1970's computers were acquainted with these controls, thus the name change) While individuals in many strolls of life have never known about this term, CNC has contacted relatively every type of manufacturing process somehow. On the off chance that you'll be working in manufacturing, it's possible that you'll be managing CNC all the time.

Origin and growth of machine tool

A machine tool is a machine for shaping or machining metal or other inflexible materials, usually by cutting, exhausting, granulating, shearing or different forms of misshaping. Machine tools utilize some sort of tool that does the cutting or shaping. All machine tools have some means of constraining the work piece and give a guided movement of the parts of the machine. Thus the relative movement between the work piece and the cutting tool (which is known as the tool way) is controlled or constrained by the machine to in any event some degree, as opposed to being altogether "spur of the moment" or "freehand" [1].

The precise meaning of the term machine tool varies among users, as itemized in the "Terminology and key concepts" section. It is safe to say that all machine tools are "machines that assistance individuals to make things", despite the fact that not all industrial facility machines are machine tools.

Today machine tools are regularly fueled other than by human muscle (e.g., electrically, using pressurized water, or by means of line shaft), used to make made parts (components) in various ways that incorporate cutting or certain different kinds of misshaping. With their intrinsic precision, machine tools empowered the practical production of interchangeable parts.

Before CNC

While there are exceptions to this announcement, CNC machines ordinarily supplant (or work related to) some current manufacturing process/es. Take one of the simplest manufacturing processes, penetrating openings, for instance. A bore press can obviously be utilized to machine openings. (It's feasible that nearly everybody has seen some type of bore press, regardless of whether you don't work in manufacturing.) A man can put a penetrate in the bore hurl that is anchored in the shaft of the bore press. They can at that point (manually) select the coveted speed for revolution (regularly by exchanging belt pulleys), and enact the shaft [2]. At that point they manually pull on the plume lever to drive the bore into the work piece being machined.

As you can without much of a stretch see, there is a considerable measure of manual intervention required to utilize a penetrate press to bore openings. A man is required to accomplish something relatively every progression en route. While this manual intervention might be adequate for manufacturing organizations if however few openings or work pieces must be machined, as amounts develop, so does the probability for exhaustion because of the dullness of the activity. What's more, do take note of that we've utilized one of the simplest machining tasks (boring) for our model.

II. CAM SYSTEM

For simple applications (like boring gaps), the CNC program can be produced manually, That is, a programmer will take a seat to compose the program furnished just with pencil, paper, and mini-computer.

Once more, for simple applications, this might be the plain most ideal approach to create CNC programs. As applications get more confounded, and especially when new projects are required all the time, composing programs manually turns out to be substantially more troublesome [3]. To streamline the programming process, a computer supported

manufacturing (CAM) framework can be utilized. A CAM framework is a product program that keeps running on a computer (regularly a PC) that assists the CNC programmer with the programming process. As a rule, a CAM framework will remove the dreariness and drudgery from programming.

In numerous organizations the CAM framework will work with the computer supported outline (computer aided design) drawing created by the organization's plan building division. This disposes of the requirement for reclassifying the work piece setup to the CAM framework. The CNC programmer will just determine the machining activities to be performed and the CAM framework will make the CNC program (much like the manual programmer would have composed) automatically [4].

III. DNC SYSTEM

Once the program is developed (either manually or with a CAM framework), it must be stacked into the CNC control,in spite of the fact that the setup individual could type the program directly into the control, this would resemble utilizing the CNC machine as an exceptionally costly. On the off chance that the CNC program is developed with the assistance of a CAM framework, at that point it is as of now as a content record. In the event that the program is composed manually, it tends to be composed into any computer utilizing a typical word processor (however most organizations utilize a special CNC content tool for this reason). In any case, the program is as a content document that can be moved directly into the CNC machine. A distributive numerical control (DNC) framework is utilized for this reason [5].

A DNC framework is simply a computer that is connected with at least one CNC machines. Until as of late, rather rough sequential communications protocol (RS-232c) must be utilized for exchanging programs. Fresher controls have more present communications capabilities and can be arranged in more customary ways (Ethernet, and so on.). Despite strategies, the CNC program should obviously be stacked into the CNC machine before it very well may be run.

IV. TYPES OF CNC MACHINES

As stated, CNC has touched almost every facet of manufacturing. Many machining processes have been improved and enhanced through the use of CNC. Let's look at some of the specific fields and place the emphasis on the manufacturing processes enhanced by CNC machine usage.

In the Metal Removal Industry

Once the program is developed (either manually or with a CAM system), it must be stacked into the CNC control,despite the fact that the setup individual could type the program directly into the control, this would resemble utilizing the CNC machine as an exceptionally costly,on the off chance that the CNC program is developed with the assistance of a CAM system, at that point it is as of now as a content document. In the event that the program is composed manually, it very well may be composed into any computer utilizing a typical word processor (however most organizations utilize a special CNC content tool for this reason) [6]. In any case, the program is as a content record that can be moved directly into the CNC machine. A distributive numerical control (DNC) system is utilized for this reason.

A DNC system is just a computer that is coordinates with at least one CNC machines. Until as of late, rather rough sequential communications protocol (RS-232c) must be utilized for exchanging programs. More up to date controls have more present communications capabilities and can be organized in more customary ways (Ethernet, and so on.). Despite techniques, the CNC program should obviously be stacked into the CNC machine before it very well may be run.

In the Metal Fabrication Industry

In manufacturing terms, creation generally alludes to activities that are performed on moderately thin plates. Think of a metal file organizer. The majority of the essential segments are made of steel sheets. These sheets are sheared to measure, gaps are punched in proper spots, and the sheets are twisted (framed) to their last shapes. Once more, tasks ordinarily portrayed as manufacture activities incorporate shearing, fire or plasma cutting, punching, laser cutting, framing, and welding. Really, CNC is intensely engaged with relatively every aspect of manufacture. CNC back diversions are ordinarily utilized with shearing machines to control the length of the plate being sheared [7]. CNC lasers and CNC plasma cutters are additionally used to convey plates to their last shapes. CNC turret punch presses can hold an assortment of punch-and-pass on mixes and punch gaps in all shapes and sizes through plates. CNC squeeze brakes are utilized to twist the plates into their last shapes.

In the Electrical Discharge Machining Industry

Electrical discharge machining (EDM) is the process of removing metal using electrical sparks which burn away the metal. CNC EDM comes in two structures, vertical EDM and Wire EDM. Vertical EDM requires the utilization of a terminal (ordinarily machined on a CNC machining center) that is of the state of the cavity to be machined into the work piece. Picture the state of a plastic container that must be machined into a form. Wire EDM is regularly used to make punch and kick the bucket mixes for bites the dust sets utilized in the fabrication business. EDM is one of the lesser known CNC operations since it is so firmly

identified with making tooling utilized with other manufacturing processes.

In the Woodworking Industry

As in the metal removal industry, CNC machines are heavily used in woodworking shops. Operations include routing (similar to milling) and drilling. Many woodworking machining centers are available that can hold several tools and perform several operations on the work piece being machined.

Other Types of CNC Machines

Many forms of lettering and engraving systems use CNC innovation. Water fly machining uses a high pressure water fly stream to slice through plates of material. CNC is even used in the manufacturing of many electrical components. For instance, there are CNC loop winders, and CNC terminal area and soldering machines [8].

The high seclusion of present day secluded systems and the selling point's need and fitness of a strongly customized design cause a major basic in the profitable sector. This for the most part happens because of the unpredictable personalization of each single board and because of necessity of diminishing production line costs, mistakes, and minding out orders times. The advanced and versatile CNC machines available, with their superb administration software, give a precise solution of these problems. Anyway CNC machines must be accurately supplied with continuous part-programs, exhaustive and much enhanced. Present day CNC Machines can connect the realistic configurators specialized peculiarities with the inside and outer production departments, encouraging accurately and continuously the more sophisticated production's lines.

V. WORKINGS OF CNC

As you may as of now have guessed, everything that an administrator would be required to do with customary machine instruments is programmable with CNC machines. Once the machine is setup and running, a CNC machine is very easy to continue running. Truth be told CNC administrators have a tendency to get very exhausted amid long generation runs on the grounds that there is so little to do. With some CNC machines, even the work piece stacking process has been mechanized. (We don't intend to over-streamline here. CNC administrators are usually required to do different things identified with the CNC activity like estimating work pieces and making changes in accordance with keeps the CNC machine running great work pieces.) How about we take a gander at a portion of the specific programmable functions

Motion Control

All CNC machine types share this shared trait: They all have at least two programmable directions of movement called tomahawks. A pivot of movement can be direct (along a straight line) or rotational (along a round way). One of the primary specifications that suggest a CNC machine's intricacy is what number of tomahawks it has. As a rule, the more tomahawks, the more mind boggling the machine. The tomahawks of any CNC machine are required to cause the movements required for the manufacturing process. In the penetrating model, these (3) pivot would position the apparatus over the opening to be machined (in two tomahawks) and machine the gap (with the third hub). Tomahawks are named with letters. Basic straight hub names are X, Y, and Z. Regular turning hub names are A, B, and C [9].

Programmable Accessories

A CNC machine wouldn't be very helpful if all it could only move the work piece in two or more axes. Almost all CNC machines are programmable in several other ways. The specific CNC machine type has a lot to do with its appropriate programmable accessories. Again, any required function will be programmable on full-blown CNC machine tools. Here are some examples for one machine type.

Automatic Tool Changer

Most machining centers can hold many tools in a tool magazine. When required, the required tool can be automatically placed in the spindle for machining.

Spindle Speed and Activation

The spindle speed (in revolutions per minute) can be easily specified and the spindle can be turned on in a forward or reverse direction. It can also, of course, be turned off.

Coolant

Many machining operations require coolant for lubrication and cooling purposes. Coolant can be turned on and off from within the machine cycle.

The CNC Program

Think of giving any arrangement of well-ordered instructions. A CNC program is simply another sort of instruction set. It's composed in sentence-like configuration and the control will execute it in consecutive request, well ordered. An exceptional arrangement of CNC words are utilized to convey what the machine is proposed to do. CNC words start with letter addresses (like F for unify, S for spindle speed, and X, Y and Z for hub movement). At the point when put together in a sensible technique, a gathering of CNC words make up an order that take after a sentence. For some random CNC machine compose, there may be around 40-

50 words utilized all the time. So in the event that you contrast learning with compose CNC projects to taking in a remote dialect having just 50 words, it shouldn't appear to be excessively hard to learn CNC programming [10].

The CNC Control

The CNC control will interpret a CNC program and actuate the arrangement of directions in successive request. As it peruses the program, the CNC control will actuate the proper machine functions, cause pivot movement, and when all is said in done, adhere to the instructions given in the program. Alongside interpreting the CNC program, the CNC control has a few different purposes. All present model CNC controls enable projects to be changed (altered) if botches are found. The CNC control permits special verification functions (like dry run) to affirm the rightness of the CNC program. The CNC control permits certain critical administrator contributions to be indicated separate from the program, similar to apparatus length esteems. All in all, the CNC control enables all functions of the machine to be manipulated.

VI. CONCLUSION

By and large materials are machined in Computer Numerical Control (CNC) machines to get great surface finish, dimensional precision and complex geometrical shape. In machining, impressive measure of material is expelled from the crude material in the type of chips to get the coveted size and shape. This technique for metal evacuation is a more costly process when contrasted with other manufacturing processes, for example, forging, casting and so forth. Because of high capital and machining expenses of the CNC machines, there is a need to work the machines as adequately as conceivable in request to recover the required pay. With the improvement of innovation, CNC machines are driven specifically from documents made by CAD programming bundles, so a segment can move from outline to generation and testing with no intermediate paper drawing work being required. As these refined machines are becoming increasingly imperative for any manufacturing industry, it is vital that the machine ought to be without blame with more noteworthy precision levels. Advanced control frameworks with AC servomotors and drives guarantee the exactness level in these machines however the issues identified with the nature of intensity supply to these machines still remain.

REFERENCES

[1]. Abou-El-Hossein, KA, Kadirgama, K, Hamdi, M &Benyounis, KY 2007, 'Prediction of cutting force in end-milling operation of modified AISI P20 tool steel', Journal of Materials Processing Technology, vol.182, pp.241-247.

[2]. Adetoro OB & Wen PH 2010, 'Prediction of mechanistic cutting force coefficients using ALE formulation', International Journal of Advanced Manufacturing Technology, vol. 46, pp. 79-90.

[3]. AhmetHascalik&UlasCaydas 2008, 'Optimization of turning parameters for surface roughness and tool life based on the Taguchi method', International Journal of Advanced Manufacturing Technology, vol. 38, pp. 896-903.

[4]. Alauddin M, El Baradie MA &Hashmi MSJ 1996, 'Optimization of surface finish in end milling Inconel 718', Journal of Materials Processing Technology, vol.56, no.1, pp.54-65.

[5]. Aldo Braghini Junior, Anselmo Eduardo Diniz& Fernando Teixeira Filho 2009, 'Tool wear and tool life in end milling of 15–5 PH stainless steel under different cooling and lubrication conditions', International Journal of Advanced Manufacturing Technology, vol. 43, pp.756-764.

[6]. AmanAggarwal&Hari Singh 2005, 'Optimization of machining techniques – a retrospective and literature review', Sadhana, Part 6, pp.699-711.

[7]. AykutCanakci, FatihErdemir, TemelVarol& Adnan Patir 2013, 'Determining the effect of process parameters on particle size in mechanical milling using the Taguchi method: Measurement and analysis', Measurement, vol.46, pp.3532-3540.

[8]. AzlanMohdZain , HabibollahHaron&Safian Sharif 2010, 'Application of GA to optimize cutting conditions for minimizing surface roughness in end milling machining process', Expert Systems with Applications, vol.37, pp.4650-4659.

[9]. AzlanMohdZain, HabibollahHaron, Sultan NomanQasem&Safian Sharif 2012, 'Regression and ANN models for estimating minimum value of machining performance', Applied Mathematical Modelling, vol.36, pp.1477-1492.

[10]. Azmi AI, Lin RJT & Bhattacharyya D 2013, 'Tool wear prediction models during end milling of glass fibre-reinforced polymer composites', International Journal of Advanced Manufacturing Technology, vol.67, pp.701-718.