Report on a flow chart of the tool setup and cnc program check

Education, Teaching

Lathes are being used since a long period of time and tooling and designing method, and the purposes for which it has been used most of the times are drilling and boring holes that are usually conical or cylindrical in shape. The manual lathe usage primarily depends upon the machinist and the experience in the designing field. With time there has been a major improvement in the efficiency and quality of part development, which is a result of numerical control into the process of tool designing and the use of lathe. The most advanced and the latest technique in this area is CNC lathe, which is computer numerical control process, where the lathe is programmed in order to follow the numerical instructions and complete the process of tool creation by the control of operated units directly.

CNC is used in order to manufacture parts with the help of a computerized controller, which operates on various motors that are driven into the machine axis. There is an extensive use of hydraulics in setting up CNC lathe and using the tool in order to produce the parts. The accuracy of the machine which is used for tool design and cutting purpose depends primarily on the factor whether an open loop control system is used or a closed loop control system is used. In the open loop control system the cost of the equipment is lower and there is a requirement of additional hardware and electronics for the positioning of the tool however at the same time the disadvantage is the difficulty which is faced in fixing the positioning error. On the other hand in a closed loop control system, the servomotor receives the electronic moment passes which are sent from the control and these are detected, counted and managed by device which provides feedback and is known as transducer.

This is a stepwise process where signals are sent back to the control by the transducer and similarly the current position is managed from the driven access according to the programming which is done to control the movements. The CNC lathe is an extremely helpful device which has the capability to produce the parts with great accuracy and can be programmed appropriately to deliver various options, dimensions and shapes.

" Discuss the tool holding systems used on a typical CNC lathe”

The tool holding devices have a very important role in the use of CNC lathe, as this is one factor which impacts the positioning and an error free execution of part production. There is a huge variation between the two holding systems and primarily depend upon the requirement and the material type which has to be held , usually high-speed steel, tungsten carbide and ceramic are held using the holding systems. Hence, the setup has to be absolutely proper while working on a CNC lathe otherwise if this is not perfect then there is a huge risk of damage being caused to the tooling machine; hence for any purpose either prototyping or production run it is important to ensure that the setup is accurate.

The two loading systems are adjusted with their chuck jaws so that they can accommodate the material. The material which is held by the jaws of the chuck can be adjusted with the help of two screws and it can be moved in order to adjust the clamping force in such a manner that the material is properly held but not crushed. The next step is to insert the tooling which may be in the form of a drill, boring bowers and insert holders which are required to turn the outside diameter of the material which is being shaped. The holder must be selected appropriately as they vary in size and shape

and are usually fixed with the help of screws present in tool turret. The teaching arm is then used in order to teach each tool and then they are more together towards the teaching eye. As soon as the teaching eye is touched, the machine produces a beep sound to make the user aware that now the control is aware of the location of the tip of the tool and the precision cutting can start. The zero point is set from where the program will start cutting the raw material, the tool may be previously thought and it will automatically reset both the X and the z-axis to zero. This point by default will be accepted as the machine as a base for all the respective cutting dimensions. Now the tool is set and the program can be called up so that the machine may accept the G code in order to start the cutting work.

Software use in the production of part programs . . .

Computer-Aided Design (CAD) and Computer-Aided Manufacturing (CAM) are the software technologies which are used in order to create part production programs. The most important thing to understand in case of part production programming is the debugging phase, and the requirement to build an accurate program initially. The computer-aided design is primarily the creation of models which are defined with the help of geometric parameters and they present a three-dimensional representation of part production which can be hypothetically carried out using simulation methodology. Similarly the computer aided Manufacturing system utilizes the geometric design data in order to produce the machine control. With the help of CAD the movement of a part can easily be simulated in a three dimensional structure which can get picked the production process. Not only the geometric movements, but it can also help to hypothetically test the angles,

speeds and feed rates of the tools including the positioning of part holding clams and many other areas which are complex and require great accuracy. The integration of CAD and CAM systems are quite common now, and there are various attempts to create software which can easily help to create three-dimensional diagrams test them and then without any information transfer use the same application in order to create the program that can control the tool design machine.

As we already discussed that the positioning and other geometric factors are really important in order to save the machine from being damaged, the CAD systems are extremely helpful in creating models which are accurate and easy to make. They are not only more efficient than the previous methods of the usage of rulers, squares etc but they also provide a hypothetical environment to conduct a proactive check. CAD provides three-dimensional structures which can be rotated in any way, and is as good as a person rotating an object in his hands in the real world and therefore the internal shape and spatial relationships can also being easily determined.

The drill design and the geometric details according to which the program is developed

N01 T1 G97 S800 M03

(Tool no. 1 is selected / constant surface speed control is not required / and the spindle rotates / in Clockwise direction)

N02 G00 X45 Z2 G42

(Point to point position is attained at rapid feed/ the x and z axis are adjusted/ cutter compensation is adjusted right)

N03 G71 U2 R1

(The turning cycle starts / 2 points on the relative axis U which is parallel to y / with arc radius of 1)

N04 G71 P50 Q120 U0. 25 W0. 1 F0. 25

(The turning cycle continues/ dwell time is 50 / relative axis parallel to x and z / with feed rate 25)

N05 G00 X15. 8

(Once again reached point to point position at rapid feed/X axis adjusted)

N06 G01 X23. 8 Z-2 F0. 2

(Linear interpolation / x and z axis adjusted / feed rate 2)

N07 G01 Z-25

(Linear interpolation / z axis adjusted)

N08 G01 X28. 07

(Linear interpolation / x axis adjusted)

N09 G01 X34 Z-33

(Linear interpolation / x and z axis adjusted)

N10 G01 Z-48

(Linear interpolation / z axis adjusted)

N11 G01 X42

(Linear interpolation / x axis adjusted)

N12 G01 Z-58

(Linear interpolation / z axis adjusted)

N13 G00 X100 Z100

(Once again reached point to point position at rapid feed/ the x-axis and y-axis reach (100, 100) coordinates)

N14 G92 S1200

(Thread cutting cycle starts / spindle speed 1200)

N15 T3 G96 S150 M03

(Tool no. 3 is selected/ constant speed surface control is implemented/ the spindle speed is maintained at 150/ the rotation is clockwise)

N16 G00 X45 Z3

(point to point position at rapid feed is reached / x and z moved)

N17 G70 P50 Q120

(Finishing cycle / dwell time 50)

N18 G00 X100 Z100

(reached point to point position at rapid feed/ the x-axis and y-axis reach (100, 100) coordinates)

N19 M30

Program end and following function can be added it required.

Works Cited

Benjamin, AB 2006, 'How CAD Keeps It Simple', Design News, 11 January

2006, pp. 22-27.

Christman, A 2005, 'Technology Trends in CAM Software', Modern Machine Shop, Birmingham.

Hayden, DS 2004, 7 Easy Steps to Cnc Programming Book II: Beyond the Beginning, Haydenpub , Machasney Park.

Leondes, C 2001, Computer-Aided Design, Engineering, and Manufacturing: Vol. 5 of The Design of Manufacturing Systems, CRC Press, New York.

Mattson, M 2010, CNC Programming, Delmar Cengage Learning, Chicago.

Smid, P 2008, CNC Programming Handbook, NCPlot, Boston.

The Industrial Centre 2009, CNC IC Proffesional Training Guide, InnovtiveCreative, Hong Kong.

Thyer, GE 1998, Computer Numerical Control of Machine Tools, Heinemann Professional Publisihing, Tokyo.