
NC Technology

1、 Research current situation of NC lathe in our times

Research and development process to such various kinds of new technologies as numerical control lathe , machining center , FMS , CIMS ,etc. of countries all over the world, linked to with the international economic situation closely. The machine tool industry has international economy to mutually promote and develop, enter 21 alert eras of World Affairs, the function that people's knowledge plays is more outstanding , and the machine tool industry is regarded as the foundation of the manufacturing industry of the machine, its key position and strategic meaning are more obvious. Within 1991-1994 years, the economic recession of the world, expensive FMS, CIMS lowers the temperature, among 1995-2000 years, the international economy increases at a low speed, according to requisition for NC lathe and the world four major international lathes exhibition in order to boost productivity of users of various fields of present world market (EMO , IMTS , JIMTOF , China CIMT of Japan of U.S.A. of Europe), have the analysis of the exhibit, there are the following several points mainly in the technical research of NC lathe in our times:

(1)、 Pay more attention to new technology and innovation

Worldwide , are launching the new craft , new material , new structure , new unit , research and development of the new component in a more cost-effective manner, developmental research of for instance new cutter material , the new electric main shaft of main shaft structure , high speed , high-speed straight line electrical machinery ,etc.. Regard innovating in improvement of the processing technology as the foundation, for process ultra and hard difficult to cut material and special composite and complicated part , irregular curved surface ,etc. research and develop new lathe variety constantly.

(2)、 Improve the precision and research of machine tooling

In order to improve the machining accuracy of the machining center , are

improving rigidity of the lathe , reduction vibration constantly, dispel hotly and out of shape, reduce the noise , improve the precision of localization of NC lathe , repeat precision , working dependability , stability , precision keeping, world a lot of country carry on lathe hot error , lathe sport and load out of shape software of error compensate technical research, take precision compensate , software compensate measure improve , some may make this kind of error dispel 60% already. And is developing retrofit constantly, nanometer is being processed.

(3)、 Improve the research of the machine tooling productivity

World NC lathe, machining center and corresponding some development of main shaft , electrical machinery of straight line , measuring system , NC system of high speed, under the prerequisite of boosting productivity.

(4)、 What a lot of countries have already begun to the numerical control system melt intelligently, openly, study networkedly

A、 elligent research of the numerical control system

Mainly showing in the following aspects: It is intelligent in order to pursue the efficiency of processing and process quality, the self-adaptation to the processing course is controlled, the craft parameter produces research automatically; Join the convenient one in order to improve the performance of urging and use intelligently, to the feedback control , adaptive operation , discerning automatically load selects models automatically , since carries on research whole definitely ,etc. of the electrical machinery parameter; There are such research of the respect as intelligent automatic programming , intelligent man-machine interface , intelligence diagnosing , intelligent monitoring ,etc..

B、 The numerical control system melts and studies open

Mainly showing in the following aspects: The development of the numerical control system is on unified operation platform, face the lathe producer and support finally, through changing, increasing or cutting out the structure target(numerical control target), form the seriation, and can use users specially conveniently and the technical know-how is integrated in the control system, realize the open numerical control system of different variety , different grade fast, form leading brand products

with distinct distinction. System structure norm of the open numerical control system at present, norm , disposing the norm , operation platform , numerical control systematic function storehouse and numerical control systematic function software developing instrument ,etc. are the core of present research to pass through.

C、Meeting the manufacture system of the production line , demand for the information integration of the manufacturing company networkedly greatly of numerical control equipment, it is a basic unit of realizing the new manufacture mode too.

2、 Classification of the machining center

(1) Process according to main shaft space position when it classifies to be as follows, horizontal and vertical machining center.

Horizontal machining center, refer to the machining center that the axis level of the main shaft is set up . Horizontal machining center for 3-5 sport coordinate axis, a common one three rectilinear motion coordinate axis and one turn the coordinate axis of sports round (turn the workingbench round), it can one is it is it finish other 4 Taxi processing besides installing surfaces and top surfaces to insert to install in work piece, most suitable for processing the case body work piece . Compared with strength type machining center it, the structure is complicated, the floor space is large, quality is large, the price is high.

Vertical machining center, the axis of the main shaft of the vertical machining center, in order to set up vertically, its structure is mostly the regular post type, the workingbench is suitable for processing parts for the slippery one of cross, have 3 rectilinear motion coordinate axis generally , can find a room for one horizontal numerical control revolving stage (the 4th axle) of axle process the spiral part at workingbench. The vertical machining center is of simple structure, the floor space is small, the price is low, after allocating various kinds of enclosures , can carry on the processing of most work pieces .

Large-scale gantry machining center, the main shafts are mostly set up vertically, is especially used in the large-scale or with complicated form work piece , is it spend the many coordinate gantry machining center to need like aviation , aerospace

industry , some processing of part of large-scale steam turbine.

Five machining centers, this kind of machining center has function of the vertical and horizontal machining center, one is it after inserting , can finish all five Taxi processing besides installing the surface to install in work piece, the processing way can make form of work piece error lowest , save 2 times install and insert working, thus improve production efficiency , reduce the process cost.

(2)Classify by craft use

Is it mill machining center to bore, is it mill for vertical door frame machining center , horizontal door frame mill the machining center and Longmen door frame mill the machining center to divide into. Processing technology its rely mainly on the fact that the door frame is milled, used in case body, shell and various kinds of complicated part special curve and large processes , curved surface of outline process, suitable for many varieties to produce in batches small.

Complex machining center, point five times and compound and process mainly, the main shaft head can be turned round automatically, stand, lie and process, after the main shaft is turned round automatically, realize knowing that varies in the horizontal and vertical direction.

(3)Classify by special function

Single workingbench , a pair of workingbench machining center;

Single axle , dual axle , three axle can change machining center , main shaft of case;

Transfer vertically to the tower machining center and transfer ;

One hundred sheets of storehouses adds the main shaft and changes one one hundred sheets of machining centers;

One hundred sheets of storehouses connects and writes hands to add the main shaft and change one hundred sheets of machining centers;

One hundred sheets of storehouses adds the manipulator and adds one pair of main shafts to transfer to the tower machining center.

3、 Development trend of the current numerical control lathe

At present, the advanced manufacturing technology in the world is rising

constantly, such application of technology as ultrafast cutting , ultraprecision processing ,etc., the rapid development of the flexible manufacturing system and integrated system of the computer one is constant and ripe, have put forward higher demand to the process technology of numerical control. Nowadays the numerical control lathe is being developed in several following directions.

(1) . The speed and precision at a high speed , high accuracy are two important indexes of the numerical control lathe , it concerns directly that processes efficiency and product quality. At present, numerical control system adopt-figure number, frequency high processor, in order to raise basic operation speed of system. Meanwhile , adopt the super large-scale integrated circuit and many microprocessors structure, in order to improve systematic data processing ability , namely improve and insert the speed and precision of mending operation. Adopt the straight line motor and urge the straight line of the lathe workingbench to be servo to enter to the way directly, it is quite superior that its responds the characteristic at a high speed and dynamically. Adopt feedforward control technology , make it lag behind error reduce greatly , thus improve the machining accuracy cut in corner not to track.

For meet ultrafast demand that process, numerical control lathe adopt main shaft motor and lathe structure form that main shaft unite two into one, realize frequency conversion motor and lathe main shaft integrate , bearing , main shaft of electrical machinery adopt magnetism float the bearing , liquid sound pigeonhole such forms as the bearing or the ceramic rolling bearing ,etc.. At present, ceramic cutter and diamond coating cutter have already begun to get application.

(2) . Multi-functional to is it change all kinds of machining centers of organization (a of capacity of storehouse can up to 100 of the above) automatically to furnished with, can realize milling paring , boring and pares , bores such many kinds of processes as paring , turning , reaming , reaming , attacking whorl ,etc. to process at the same time on the same lathe , modern numerical control lathe adopt many main shaft , polyhedron cut also , carry on different cutting of way process to one different position of part at the same time. The numerical control system has because adopted many CPU structure and cuts off the control method in grades, can work out part

processing and procedure at the same time on a lathe , realize so-called " the front desk processes , the backstage supporter is an editor ". In order to meet the needs of integrating the systematic one in flexible manufacturing system and computer, numerical control system have remote serial interface , can network , realize data communication , numerical control of lathe, can control many numerical control lathes directly too.

(3) . Intelligent modern numerical control lathe introduce the adaptive control technology, according to cutting the change of the condition, automatic working parameter, make the processing course can keep the best working state , thus get the higher machining accuracy and roughness of smaller surface , can improve the service life of the cutter and production efficiency of the equipment at the same time . Diagnose by oneself , repair the function by oneself, among the whole working state, the system is diagnosed, checked by oneself to CNC system and various kinds of equipment linking to each other with it at any time. While breaking down , adopt the measure of shutting down etc. immediately , carry on the fault alarm, brief on position , reason to break down ,etc.. Can also make trouble module person who take off automatically , put through reserve module , so as to ensure nobody demand of working environment. For realize high trouble diagnose that requires , its development trend adopts the artificial intelligence expert to diagnose the system.

(4) . Numerical control programming automation with the development of application technology of the computer, CAD/CAM figure interactive automatic programming has already get more application at present, it is a new trend of the technical development of numerical control. It utilize part that CAD draw process pattern , is it calculate the trailing punishing to go on by cutter orbit data of computer and then, thus produce NC part and process the procedure automatically, in order to realize the integration of CAD and CAM. With the development of CIMS technology , the full-automatic programming way in which CAD/CAPP/CAM integrates has appeared again at present, it, and CAD/CAM systematic programming great difference their programming necessary processing technology parameter needn't by artificial to participate in most, get from CAPP database in system directly.

(5) . The dependability of the dependability maximization numerical control lathe has been the major indicator that users cared about most all the time . The numerical control system will adopt the circuit chip of higher integrated level , will utilize the extensive or super large-scale special-purpose and composite integrated circuit, in order to reduce the quantity of the components and parts , to improve dependability . Through the function software of the hardware, in order to meet various kinds of demands for controlling the function, adopt the module , standardization , universalization and seriation of the structure lathe noumenonn of the hardware at the same time , make not only improve the production lot of the hardware but also easy to is it produce to organize and quality check on.. Still through operating and starting many kinds of diagnostic programs of diagnosing , diagnosing , diagnosing off-line online etc. automatically, realize that diagnoses and reports to the police the trouble to hardware , software and various kinds of outside equipment in the system. Utilize the warning suggestion, fix a breakdown in time; Utilize fault-tolerant technology, adopt and design the important part " redundantly ", in order to realize the trouble resumes by oneself; Utilize various kinds of test , control technology , exceed Cheng , one one hundred sheets of damages , interfering , cutting out ,etc. at the time of various kinds of accidents as production, carry on corresponding protection automatically.

(6) . Control system miniaturization systematic miniaturization of numerical control benefit and combine the machine , electric device for an organic whole. Adopt the super large-scale integrated component , multi-layer printed circuit board mainly at present, adopt the three-dimensional installation method , make the electronic devices and components must use the high density to install, narrow systematic occupying the space on a larger scale. And utilize the new-type slim display of colored liquid crystal to substitute the traditional cathode ray tube, will make the operating system of numerical control miniaturize further. So can install it on the machine tool conveniently, benefit the operation of the numerical control lathe correctly even more.