

CNC TECHNOLOGY

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- EEEEC of Fujian

Technology

Chapter 1 General Introduction

Some powerful & functional mechanical products & systems come into being with rapid developing of power-electronic technology / popularizing & deepening of computer technology's application and inter-combining & penetrating of computer information process function with dynamics of traditional mechanical equipment. NC machine is typical outcome from CNC technology applied in the field of machine building, with characteristics of advanced & combined techniques, making revolution in the mechanical manufacturing industry.

Application of CNC equipments grows day by day and the mechanical product updates more and more frequently & complicatedly. CNC technology is up-to-date accomplishment from the integrated application of Automation / Electronics / Computer Technology / Precision Measuring Technology / Mechanical Mechanism Knowledge, and so on. According to varied requirements of mechanical machining technique, production process automation comes true by application of computer for information process & control in whole manufacturing progress. CNC device could preferably solve machining problems for machine parts with complex & accurate structures, in varieties & medium or small batch. It is one type of automatic equipment in general purpose, flexible & high efficiency. At the same time NC technology is also one of the basic technologies of FMS (Flexible Manufacturing System) & CIMS (Computer Integrated Manufacturing System), and important composition part of mechatronics technology.

Section 1.1 Concept of CNC Technology

1.1.1 NC Technology

Numerical Control, abbreviated as NC, is one type of automatic control technology in flourishing development. NC is named relative to analog control. Control information in NC system is digital message, but analog in analogue control system.

NC control system is characterized as under:

1. Different word length could be adopted to express message in appropriated accuracy, so as to get precise information.
2. Logic & arithmetic operations and complicated information process could be executed.
3. With logic process function, information could be executed in varied way by appropriated instruction. So way & progress of information process could be revised by software programming, other than done by modifying circuit or mechanical mechanism, therefore, with function of flexibility.

With above features NC system is widely applied for path control in mechanical movement. Path movement is main control content in machine NC system & industrial robot. Furthermore,

logic process function of NC system could be easily used to control the on/off switch signals in mechanical system.

Hardware foundation of NC system is of the digital & logical circuits. Original NC system was built up by logical circuit and so called as Hardware NC system. With development of microcomputer the hardware NC system has been eliminated step by step and replaced by system of computerized numerical control, abbreviated as CNC. Computer could process digital message determined by software and complicated information that is hard for hardware logical circuit, so it greatly improves performance of NC system. Now, there are many manufacturing facilities equipped with NC system, such as NC machine / NC wire cut / NC electric spark / NC plotter / NC word-cutter / Industrial robot, and so on, in which NC machine is the most obviously developed. Therefore, CNC technology for NC machine is discussed particular-emphatically in this book.

1.1.2 NC Technology and NC Machine

NC technology is independent beyond NC machine, but firmly grows up with its development. Therefore, NC technology mostly means that of machine.

NC machine is normally constituted of Information Carrier / CNC System / Servo System and Machine Body, of which the basic configuration block-diagram is illustrated in Figure 1-1.

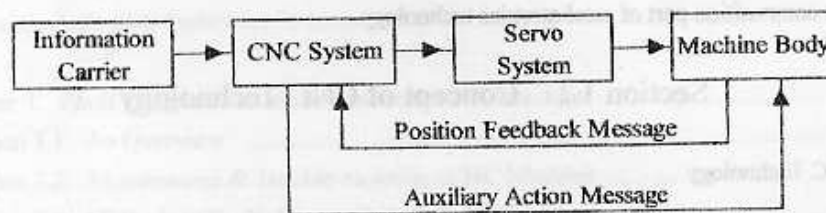


Fig.1-1 Composition of NC machine

1. Information Carrier

Information Carrier, also called as Access Medium, is used to record various machining information, such as technical process for machining part / technical parameter / displacement data, etc., for controlling machine movement and realizing part's machining. Normal Information Carriers are Punch Tape / Magnetic Tape / Magnetic Disc / Compact Disc, and so on. And through their reader the machining information recorded on Information Carrier is inputted into NC system. Machining program could also be inputted into NC machine direct by button on operational panel & keyboard, or into NC system from programming computer by Serial Port. One set of auto-programmer or CAD/CAM modules is also included in some advanced NC systems. Functions of programming / data & program inputting / memory displaying / printing, etc, could be realized by these devices.