Numerical English 数控英语

吴凤仙

wuhan university press 武汉大学出版社

Lumerical English 数控英语

主 编 吴凤仙

副主编 李春兰

审稿 辛凌 刘国正

编 委 肖练武 耿保荃 肖兆武 张映辉



图书在版编目(CIP)数据

数控英语/吴凤仙主编. 一武汉: 武汉大学出版社,2007.3 21 世纪高校双语教学从书 英汉对照 ISBN 978-7-307-05296-3

Ⅰ.数… Ⅱ.吴… Ⅲ.数控机床—英语—双语教学—高等学校—教 材 IV. H31

中国版本图书馆 CIP 数据核字(2006)第 133427 号

责任编辑:黄朝昉 责任校对:程小宜 版式设计:杜 枚

出版发行:武汉大学出版社 (430072 武昌 珞珈山)

(电子邮件: wdp4@ whu. edu. cn 网址: www. wdp. com. cn)

印刷:湖北恒泰印务有限公司

开本: 720×1000 1/16 印张:13.375 字数:215 千字 插页:1

版次:2007年3月第1版 2007年3月第1次印刷

ISBN 978-7-307-05296-3/H · 469 定价:25.00 元(含一张 MP3 光盘)

版权所有,不得翻印;凡购我社的图书,如有缺页、倒页、脱页等质量问题,请与当地图书销售 部门联系调换。

前 言

数控技术以及其为基础的先进制造技术正在推进,并将继续推动机械工程技术的飞速发展,数控技术已经成为机械工程类专业学生的重要技术基础课程之一。随着数控技术的迅速提高,世界上一些发达国家的制造业大量转向中国,国外大批制造业专家以及先进技术装备也已涌入中国,专业人士需要阅读大量的原版英文技术资料,因此专业技术英语的学习和提高越来越重要,对我国学习机械工程专业和数控技术专业的学生来说,专业英语的学习非常重要和必要。另外,在中国英语课几乎一直是独立于其他科目之外的特殊课程,必须与工作和专业联系起来,才显得尤为重要。

编者根据高等职业教育数控技术应用专业领域技能型紧缺人才的培养目标,从高职教育和知识应用的实际出发,结合专业英语的教学实践编写了该教材,学生在具备了一定的数控专业知识的基础上,通过大量阅读和本专业有关的英文文章,获得专业英语阅读理解能力,从而促进对数控知识的理解和掌握。

本书共 10 个单元,介绍了数控机床,数控车床,数控车床操作,数控车床编程技术,数控车床编程,数控机床的伺服驱动系统,数控加工中心,数控机床操作,数控铣床加工工艺以及电火花加工等方面的知识。

本书主要体现以下几个特点:

- 1. 内容具有实用性和先进性。介绍了数控技术领域的最新技术和知识。
- 2. 图文并茂。大多数单元都配有与内容相关的插图,更直观,易于理解,即通过文中图例便可猜出各段文章大意,有利于专业英语的学习。
- 3. 生词加注音标。每篇课文后都安排有生词,并注出读音便于学生正确的朗读。
 - 4. 习题内容丰富,题型多样。
- 5. 每篇课文后有词汇、短语、注释和句子结构分析,书后有参考译文及习题参考答案。

本书在编写过程中,得到了襄樊学院刘国正、鄂纺机电学校刘自力、襄轴高级工程师杨凤鸣的大力支持并提出了宝贵的意见,在此一并表示感谢。由于编者水平有限,敬请读者批评指正!

编者 2007 年元月

Contents

Unit 1 Nun	nerical Control Machine 数控机床 ·····	• 1
Lesson 1	Creation and Development of NC Machine	• 1
Lesson 2	The Types of NC Machine	· 4
Lesson 3	Components of NC Machine	• 6
Lesson 4	Principle of Working for NC Machine	. 9
Lesson 5	Components and Accessories of NC Machine	11
Lesson 6	Key Pints of Learning about NC Machine	13
Unit 2 Nun	nerical Control Lathe 数控车床 ······	16
Lesson 1	Brief Introduction to NC Lathe	16
Lesson 2	Components of NC Lathe	20
Lesson 3	NC Lathe Axes of Motion	24
Lesson 4	Conventional Fixture Types of NC Lathe	25
Unit 3 NC	Lathe Operation 数控车床操作 ······	33
Lesson 1	Basic NC Lathe Operation ·····	33
Lesson 2	NC Lathe Operation Procedure	39
Unit 4 Tecl	hniques for NC Lathe Programming 数控车床编程技术	46
Lesson 1	Tool Edge Programming	46
Lesson 2	Setting up Tool Nose Radius Compensation	48
Lesson 3	Some Restrictions with Tool Nose Radius	
	Compensation ····	49
Lesson 4	Tool Nose Radius Compensation Command	51

Unit 5 No	C Lathe Programming 数控车床编程 55	
Lesson 1	The Characteristics of NC Lathe Programming 55	
Lesson 2	Types of Tool Positioning Modes	
Lesson 3	Interpolation Commands (CNC lathe)	
	·	
Unit 6 Se	rvo-drive System of NC Machine Tools	
数	控机床的伺服驱动系统 72	
Lesson 1	Basic Concept of Servo-System 72	
Lesson 2	Basic Requirement for Servo-Drive System 75	
Lesson 3	Open Loop Feed Servo-System 78	
Lesson 4	Closed-loop Servo-System ····· 81	
Unit 7 No	C Machining Centers 数控加工中心 87	
Lesson 1	Introduction to NC Machining Centers 87	
Lesson 2	Background on NC Machining Centers 89	
Lesson 3	Basic Operation of NC Machining Centers 91	
Unit 8 No	C Machine Operation 数控机床操作 99	
Lesson 1	•	
Lesson 2	•	
Lesson 3		
Lesson 4	Troubleshooting of NC Machine	
Unit 9 No	C Milling Machining Process 数控铣削加工工序 116	
Lesson 1	The Main Contents of NC Milling Machining Process · · · 116	
Lesson 2	The Selection for NC Milling Cutter 117	
Lesson 3	NC Milling Common Clamp and Mount 123	
Lesson 4	Part Positioning Base and Clamp when NC Milling 129	
Unit 10 Electrical Discharge Machining 电火花加工 136		
Lesson 1	The Brief Production to Electrical Discharge	
•		

Contents

	Machining 1	136
Lesson 2	NC WEDM Machine Tool 1	39
Lesson 3	NC Electric Discharge Shaped Machine 1	44
附录一:词汇	[表	. 50
附录二:参考	译文	.62
附录三:参考	答案	.97
金老文献		205

Unit 1

Numerical Control Machine 数 控 机 床

Lesson 1 Creation and Development of NC Machine

Numerical Control Machine is called NC for short. It is auto control technology which has been developed at modern times and it is a way in which the numerical information can fulfill the operation of the auto control machine. It minutes down in advance the machining procedure and the motion variable such as coordinate direction, steering and speed of axes on the control medium in the form of numbers and it automatically controls the machine motion by the NC device at the same time it also has some functions of finishing automatic tools conversion, automatic measuring, lubrication and automatic cool and so on.

Today the development of the NC machine completely depends on the NC system. The NC system has experienced two stages and six generations since American produced the first NC milling machine in 1952.

1. NC stage (1952—1970)

The early computing speed was very low, which did not have too much effect on the scientific computing and the data handling at the time, man had to set up a machine specialized computer as control system by using digital logic circuit and was called hard wired NC also NC for Short.

This stage experienced three generations:

The first generation NC (1952—1959): NC device was composed of an electronic tube element and the second generation NC (1959—1964) device of transistor tube element. The third generation NC (1965—1970) device of small and medium scale integrated circuits was carried out.

2. CNC stage (1970—)

General-purpose small-sized computers were mass-produced by 1970. Its computing speed was much higher than that in the 1950s—the 1960s. These general-purpose small-sized computers were much lower in cost and much higher in reliability than the specialized computers. Therefore they were transferred as the kernel parts of the NC system, since then they have come into computer numerical control (CNC) stage, with the development of computer technology, this stage also experienced three generations:

The fourth generation NC (1970—1974): In this period small-sized general computer control system of the large scale integrated circuit was already used a lot.

The fifth generation NC (1974-1990): In this period the microprocessor was applied to the NC system.

The sixth generation NC (1990—): The personal computer (PC) performance has been developed so high since the 1990s that it can meet the requirement of the kernel parts as the NC system. Since then the NC system has entered the PC-Based era. \cdot

New Words:

- 1. autocontrol [pataukan'traul]
- 2. procedure [prəˈsiːdʒə]
- 3. variable [vəˈriəbl]
- 4. coordinate [kau'a:dineit]
- 5. steer stia
- 6. axis [ˈæksiz]

- n. 自动控制
- n. (操作) 程序
- n. (可) 变量
- n. 坐标 (系)
- v. 操纵, 掌舵
- n. (pl. axes) 轴

- 7. medium ['mi:diam]
- 8. conversion [kən'vəɪʃən]
- 9. lubrication [luːbriˈkei [ən]
- 10. reliability [rilaiə biliti]
- 11. kernel ['kəːnl]
- 12. microprocessor ['maikrəprəu'sesə]

- n. 介质
- n. 转变, 转化 (作用)
- n. 润滑 (作用)
- n. 可靠性
- n. 核心
- n. 微信息处理器

Phrases:

1. minute down

2. date handling

3. set up

4. digital logic circuit

5. be composed of

6. integrated circuit

7. general-purpose

8. apply... to...

记录

数据处理

建立

数据逻辑电路

由……组成

集成电路

通用

运用于

Notes:

- 1. It minutes down in advance the machining procedure and the motion variable... on the control medium in the form of numbers. 它把机床的加工程序和运动变量……以数字的形式预先记录在控制介质上。
- 2. The early computing speed was very low, which did not have too much effect on the scientific computing and the date handling at the time. 早期计算机的运算速度低,这对当时的科学计算和数据处理影响还不大。
- 3. Man had to set up a machine specialized computer as control system by using digital logic circuit.
 - 人们不得不采用数字逻辑电路来建立一个机床专用计算机。
- 4. In this period the microprocessor was applied to the NC system. 在这时期微处理器运用于数控系统。

Lesson 2 The Types of NC Machine

Since it was introduced, NC technology has been applied widely including lathes and turning centers, milling machines and machining centers, punches, electrical discharge machines, flame cutters, grinders and testing and inspection equipment. The most complex CNC machine tool is the turning center (Fig. 1-1). It includes the vertical machining center, with the tool magazine on the left and the control panel on the right, which can be swiveled by the operator (Fig. 1-2), and the horizontal machining center, equipped with an automatic tool changer (Fig. 1-3). The electrical discharge machines (Fig. 1-4) and flame cutters (Fig. 1-5) are special types of NC machine.

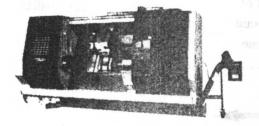


Fig. 1-1 A modern turning center and additional contents



Fig. 1-2 A vertical-spindle machining center



Fig. 1-3 A horizontal -spindle machining center



Fig. 1-4 A EDM

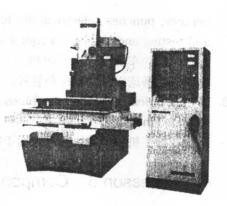


Fig. 1-5 A flame cutter machine

New Words:

- 1. lathe [leið]
- 2. punch [pant]
- 3. grinder ['qraində]
- 4. vertical ['vætikl]
- 5. swivel [swivl]
- 6. horizontal [hari'zantl]

- n. 车床
- n. 冲床, 穿孔机, 打孔机
- n. 磨工, 尤指磨刀具的工人
- adj. 立式的,垂直的
- v. 旋转
- adj. 水平式的, 卧式的

Phrases:

- 1. turning center
- 2. milling machine
- 3. electrical discharge machine 电火花加工机床
- 5. automatic tool changer
- 6. tool magazine 刀具库 可具体 可以
- 车削加工中心
- 铣床

richita intellace pand extension accompanies and option Notes:

1. Including lathes and turning centers, milling machines and machining

centers, punches, electrical discharge machines, flame cutters, ginders and testing and inspection equipment.

包括车床和车削中心、铣床和加工中心、冲床、电火花加工机床、线切割机床、磨床以及测试检测装置。

2. The electrical discharge machines and flame cutters are special types of NC machine.

电火花加工机床和线切割机床属于特种加工的数控机床。

Lesson 3 Components of NC Machine

NC machine is composed the following parts (Fig. 1-6).

NC System

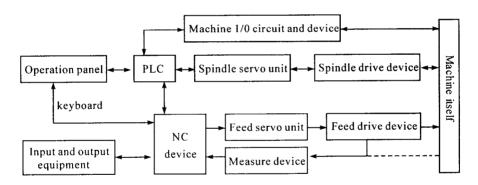


Fig. 1-6 Components of NC machine

1. NC device

The NC device is the kernel of the NC system. Its function is to handle the input part machining program or operation command, then output control command to the appropriate executive parts and finish the work which the parts machining program and operation need. It mainly consists of computer system, position control panel, PLC interface panel, communication interface panel, extension function template and appropriate control software.

2. Servo unit, drive device and measure device

Servo unit and drive device include spindle servo drive device, spindle motor, feed servodrive device and feed motor. Measure device means position and speed measure device, it is a necessary device to finish the spindle control, closed-loop for the feed speed and for the feed position. The effect of spindle servo is to complete the cutting motion for the part machining and its controlled quality is speed. The effect of the feed servo system is to finish the shaping motion which the part machining need, and its controlled quantity is speed and position, the characteristic is to sensitively and accurately find the position of the NC device and the speed command.

3. Control panel

Control panel, called operation panel, is a tool used for mutual information between the operator and the NC machine. The operator can operate, program and debug the NC machine or set and alter the machine parameter, and he can also understand and inquire the motion condition of the NC machine by using the control panel. It is an input and output part.

4. Control medium and program input and output equipment

The control medium is an agent to record the part machining program and it is also the medium to set up contraction between man and machine. Program input and output equipment are the devices by which the information exchange can be done between the NC system and external equipment. Its effect is to input the part machining program recorded on the control medium into the NC system and to store or record the debugged part machining program on the appropriate medium with the output device. Today the control medium of the NC machine and the program input and output equipment are the disk and disk driver.

5. Machine itself

Machine itself, the object of NC system, is the executive part to fulfill the machining parts. It is composed of the main motion parts, feed motion parts, bearing rack and special device, automatic platform change system, automatic tool changer system and accessory device.

New Words:

- 1. input ['input]
- 2. output ['autput]
- 3. interface [intəfeis]
- 4. appropriate [ə'prəupriət]
- 5. servo [ˈsəːvəu]
- 6. spindle ['spindl]
- 7. characteristic [kæriktəˈristic]
- 8. sensitively ['sensitivli]
- 9. accurately ['ækju:ritli]
- 10. mutual ['mjuːtjuəl]
- 11. program [prəuqræm]
- 12. debug ['dirbaq]
- 13. alter ['o:ltə]
- 14. medium ['mi:diəm]
- 15. agent ['eidzənt]
- 16. accessory [ˈæksesəri]

- n. & v. 输入
- n. & v. 输出
- n. 接口
- adj. 适当的,恰当的
- n. 伺服机构、伺服 (电动机)
- n. (心、主) 轴
- n. 特点
- adv. 灵敏地
- adv. 准确地、精确地
- adj. 相互的、共同的
- v. 为……编制程序
- v. (程序) 调试
- v. 修改
- n. 介质
- n. 媒介
- adj. 辅助的、附属的

Phrases:

- 1. communication interface panel
- 2. control software
- 3. drive device
- 4. spindle motor
- 5. closed-loop
- 6. feed speed
- 7. cutting motion
- 8. shaping motion
- 9. bearing rack

- 通信接口板
- 控制软件
- 驱动装置
- 主轴电动机
- 闭环
- 进给速度
- 切削运动
- 成型运动
- 支承架

Notes:

- 1. It mainly consists of computer system, position control panel, PLC interface panel, communication interface panel, extension function template and appropriate control software.
 - 它主要由计算机系统、位置控制板、PLC 接口板、通信接口板、扩展功能模块以及相应的控制软件等组成。
- 2. The operator can operate, program and debug the NC machine or set and alter the machine parameter.
 - 操作人员可以通过它对数控机床进行操作、编程、调试或对机床参数进行设定或修改。
- 3. Control medium is agent to record part machining program. 控制介质是记录零件加工程序的媒介。
- 4. Today the control medium of the NC machine and the program input and output equipment are the disk and disk driver.
 - 目前,数控机床的控制介质和程序输入输出设备是磁盘和磁盘驱动器。

Lesson 4 Principle of Working for NC Machine

The principle of working for the NC machine (Fig. 1-7): First, based on the machined parts shape, size and process requirements, the NC machine programs the part machining by hand or by computer, changes a variety of motions the machine needs when machining parts and the technological parameter into program codes which control device can accept, and stores these codes on the control medium, then through the input device senses the information and puts it into the NC device. When the control medium is perforated tape, the NC machine may input the codes by the photoelectric tape reader; and when the control medium is a tape or a compact disk, it may input them by a driver. The information entering the NC device can be changed into impulse signals after processing and computing. Some impulse signals are transmitted to the servo system of the machine; some are transmitted to programmable controller and control the