21世纪高等职业技术教育 机电一体化 数控技术 专业规划教材

数控技术专业英语

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副主编　窦芳霞　马迅红

Shukong jishu zhuanye yingyu

北京理工大学出版社
BEIJING INSTITUTE OF TECHNOLOGY PRESS

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内容简介

本书旨在帮助读者通过较短时间的学习能较大幅度地提高专业英语阅读和英译中的能力，具有题材广泛，内容丰富，专业性、实用性强等特点。

本书立足于现代制造业，针对数控技术主题，用原汁原味的英语，全面、系统地描述了数控机床相关的各类信息。本书共12个单元，从数控专业的历史与发展前景谈起，介绍了数控操作、数控编程、数控安全与维护、PLC、CAD/CAM应用、柔性制造系统、自动控制系统、交流伺服电机、工业机器人等方面的数控技术知识，最后以求职就业的内容结束。每个单元由对话、课文、阅读材料、练习和科技英语翻译技巧五个部分构成。书后附录部分，收录了常用专业术语、机械专业缩略语、中英文合同范本、按字母顺序排列的词汇表、练习答案和课文参考译文。

本书相当于一本原版的数控技术入门教材，可作为高职高专院校数控专业的英语教材，也可以作为工程技术人员的自学参考书。

图书在版编目（CIP）数据

数控技术专业英语／马佐贤主编．—北京：北京理工大学出版社，2006.8
ISBN 7-5640-0766-4

Ⅰ．数…　Ⅱ．马…　Ⅲ．数控机床-英语-高等学校：技术学校-教材　Ⅳ．H31

中国版本图书馆CIP数据核字（2006）第088896号

出版发行／北京理工大学出版社
社　　址／北京市海淀区中关村南大街5号
邮　　编／100081
电　　话／（010）68914775（办公室）　68944990（批销中心）　68911084（读者服务部）
网　　址／http：//www.bitpress.com.cn
经　　销／全国各地新华书店
印　　刷／北京地质印刷厂
开　　本／787毫米×960毫米　1/16
印　　张／15.5
字　　数／296千字
版　　次／2006年8月第1版　　2006年8月第1次印刷
印　　数／1～4000册　　责任校对／张　宏
定　　价／23.00元　　责任印制／吴皓云

出 版 说 明

当前，高度发达的制造业和先进的制造技术已经成为衡量一个国家综合经济实力和科技水平的重要标志之一，成为一个国家在竞争激烈的国际市场上获胜的关键因素。

如今，中国已成为制造业大国，但还不是制造业强国。我们要从制造业大国走向制造业强国，必须大力发展以数控技术为主的先进制造技术，提高计算机辅助设计与制造（CAD/CAM）的技术水平。

制造业要发展，人才是关键。尽快培养一批高技能人才和高素质劳动者，是先进制造业实现技术创新和技术升级的迫切要求。高等职业教育既担负着培养高技能人才的任务，也为自身的发展提供了难得的机遇。

为适应制造业的深层次发展和数控技术的广泛应用，根据高等职业教育发展与改革的新形势，北京理工大学出版社组织知名专家、学者，与生产制造企业的技术人员反复研讨，以教育部《关于加强高职高专人才培养工作的若干意见》等文件对高职高专人才培养的要求为指导思想，确立了“满足制造业对人才培养的需求，适应行业技术改革，紧跟前沿技术发展”的思路，编写了这套高职高专教材。本套教材力图实现：以培养综合素质为基础，以能力为本位，把提高学生的职业能力放在突出位置，加强实践性教学环节，使学生成为企业生产服务一线迫切需要的高素质劳动者；以企业需求为基本依据，以就业为导向，增强针对性，又兼顾适应性；课程设置和教学内容适应技术发展，突出机电一体化、数控技术应用专业领域的新知识、新技术、新工艺和新方法；教学组织以学生为主体，提供选择和创新的空间，构建开放、富有弹性、充满活力的课程体系，适应学生个性化发展的需要。

本套教材的主要特色有：

1. 借鉴国内外职业教育先进教学模式，顺应现代职业教育教学制度的改革趋势；
2. 以就业为导向，进行了整体优化；
3. 理论与实践一体化，强化了知识性和实践性的统一。

本套教材适合于作为高职高专院校机电一体化、数控技术、机械制造及自动化、模具设计与制造等专业的课程教学和技能培训用书。

北京理工大学出版社

前　言

数控机床涉及制造业的方方面面，因此清楚这些复杂机床的功能就成为每个从事制造业人员的当务之急。在快速发展的数控技术专业领域，大量的原版英文技术资料和 Internet 提供的国外最新的技术信息与动态，使得英语水平对于专业技术的学习和提高有着举足轻重的作用。

本书以提高学生专业英语的阅读和写作能力，扩展和深化学生对本学科关键技术的认知，培养具备国际竞争力的技术人才为目的，本着先进、实用的选材原则和简明、系统的组织原则，充分吸收当前最新技术成果和教学成果，为数控技术专业学生提供一个提高英语水平和专业素养的平台。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来编写该教材。学生在具备一定数控专业知识的基础上，通过大量的、文字内容相对浅显的阅读获得专业英语阅读理解能力和英汉互译能力，加深对数控专业知识的理解。本书相当于一本原版的数控技术入门教材，实现了“不是学英语而是用英语学”的双语教学理念。

本书共 12 个单元，充分考虑到英语与专业、普通英语与专业英语的衔接，融会贯通。从数控专业的历史与发展前景谈起，介绍了数控操作、数控编程、数控安全与维护、PLC、CAD/CAM 应用、柔性制造系统、自动控制系统、交流伺服电机、工业机器人等方面的数控技术知识，最后以求职就业的内容结束。

本书在编写过程中力求体现下列特点：

1. 立足于现代制造业，针对数控技术主题，用原汁原味的英语，全面、系统地描述了数控技术相关的各类信息。介绍了数控领域的最新技术和知识，以图文并茂的方式表达，通过专业知识帮助和促进英语水平的提高。具有一定的趣味性，让读者感觉轻松愉快。

2. 根据目前学生现有的基础水平，从实际生产应用出发，突出了数控技术专业英语词汇的专业性和内容的实用性、趣味性。

3. 各个单元配以与内容相关的插图，图文并茂，更直观，易于理解。

4. 生词加注音标，便于学生朗读，形成正确的发音。

5. 课后习题着眼于专业知识，内容丰富，形式多样。

6. 各个单元配备一条知名产品英语广告语，实用好记。

7. 书的最后列有附录，如将常用缩略语、词汇按字母顺序列表，便于读者查询。

8. 结合教学内容，穿插介绍了科技英语翻译的基本技巧。

9. 每个单元分对话、课文、阅读、翻译四个部分，各部分又自成体系。

10. 每个单元配有练习题，供学生复习巩固。

本书可作为高职高专院校数控技术专业的英语教材，也可以作为工程技术人员的自学参考书。

本书由马佐贤（江苏联合职业技术学院）主编，窦芳霞（江苏联合职业技术学院）和马迅红担任副主编（江苏联合职业技术学院）。参加本书编写的还有江苏电大武进学院的张雪娟，江苏联合职业技术学院的邵泽强、宋毅、吴展遥、戎水珍和新美亚电路（无锡）有限公司的袁莉。

在本书的编写过程中，得到了江苏联合职业技术学院无锡机电分院领导及外语和机电教研室各位老师的大力支持，他们为本书提出了宝贵的意见，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

Contents

Unit 1

The History of CNC and NC Development

Dialogue

Topical introduction: Tom and Mary have now just finished a class given by Professor Smith on the workings of the machine tools. Yet, they still have some questions, and so, they walk over to Prof. Smith.

Tom: (to Prof. Smith) Excuse me, sir, I'm Tom, one of your students in this class. Could I ask you some questions?

Smith: (to Tom) Why not? Come on, then.

Tom: Why do we name these machines numerical control machines?

Smith: A good question, boy. You know, uh-hm... NC, or numerical control, actually refers to the control of a machine tool or any other processing machines by using a series of mathematical information, or numerical data. It means the work of machines is controlled by a numerical control program.

Mary: Oh, Prof. Smith, the idea is nice enough. But what is the advantage of numerical control over the hand control? Isn't our hand more sensible or reliable than the programmed data?

Smith: In some ways, yes. A good example is some fine works, like a jade box, but the qualities of hand-made products may not be consistent or stable. What is more important, NC has proved to be much more advantageous in overall operation.

Mary: But what do you mean by overall operation?

Smith: Uh-huh, by it we mean the general industrial production practice. For example, NC should be adopted whenever there is similar raw material and work parts are produced in various sizes and complex shapes. Those production shops that may have frequent changeovers will surely benefit from NC programs.

Tom: Thank you, Prof. Smith, but I have another question. How can we use NC to get more

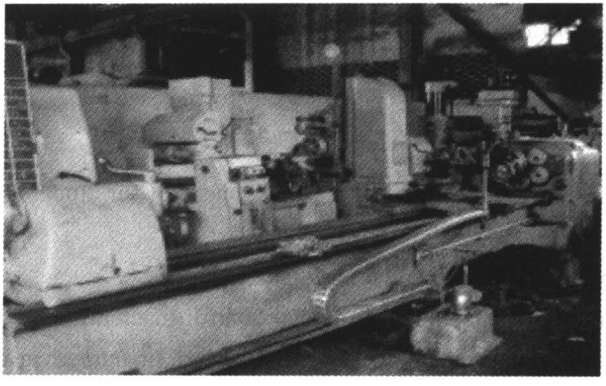
satisfactory results in the real production?

Smith: It's better to use NC tools together with other technical advances, such as programmed optimization of cutting speeds and feeds, work positioning, tool selection, and chip disposal.

Tom & Mary: Thank you Prof. Smith, NC sounds really promising from what we say.

Text

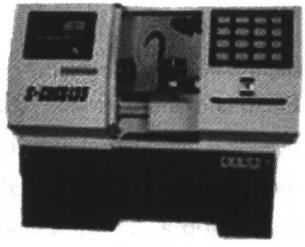
The History of CNC and NC Development



Numerical Control (NC) is any machining process in which the operations are executed automatically in sequences as specified by the program that contains the information for the tool movements. The NC concept was proposed in the late 1940s by John Parsons of Traverse City, Michigan. Parsons recommended a method of automatic machine control that would guide a milling cutter to produce a "thru-axis curve" in order to generate smooth profiles on work pieces.

In 1949, The U. S. Air Force awarded Parsons a contract to develop a new type of machine tool that would be able to speed up production methods. Parsons commissioned the Massachusetts Institute of Technology (M. I. T) to develop a practical implementation of his concept[1]. Scientists and engineers at M. I. T built a control system for a two-axis milling machine that used a perforated paper tape as the input media. In a short period of time, all major machine tool manufacturers were producing some machines with NC, but it was not until the late 1970s that computer-based NC became widely used. NC matured as an automation technology when inexpensive and powerful microprocessors replaced hard-wire logic-making computer-based NC systems.

When Numerical Control is performed under computer supervision, it is called Computer



Numerical Control (CNC). Computers are the control units of CNC machines, they are built in or linked to the machines via communications channels. When a programmer input some information in the program by tape and so on, the computer calculates all necessary data to get the job done.

On the first numerically controlled (NC) machines, numerical data was controlled by tape, and because of that, the NC systems were known as tape-controlled machines[2]. They were able to control a single operation entered into the machine by punched or magnetic tape. There was no possibility of editing the program on the machine. To change the program, a new tape had to be made.

Today's systems have computers to control data; they are called Computer Numerically Controlled (CNC) machines. For both NC and CNC systems, work principles are the same. Only the way in which the execution is controlled is different. Normally, new systems are faster, more powerful, and more versatile[3].

New Words and Expressions

numerical /nju(ː)'merikəl/ *adj.* 数字的，用数表示的
operation /ˌɔpə'reiʃən/ *n.* 运转，操作，实施
implementation /ˌimplimen'teiʃən/ *n.* 执行
profile /'prəufail/ *n.* 剖面，侧面，外形，轮廓
mature /mə'tjuə/ *adj.* 成熟的，到期的，*vt.* 使成熟
calculate /'kælkjuleit/ *v.* 计算，考虑，计划
punch /pʌntʃ/ *n.* 冲压机，冲床，打孔机 *vt.* 冲孔，打孔
versatile /'vəːsətail/ *adj.* 通用的，万能的
milling cutter 铣刀
machine tool 机床
hard-wire 硬线连接
magnetic tape 磁带
machining center 加工中心
electric discharge machine (EDM) 电火花机床
recommendation for... 关于……推荐值

Notes

1. Parsons commissioned the Massachusetts Institute of Technology (M. I. T) to develop a practical implementation of his concept.
   帕森委托麻省理工学院开发他设想中的实用机器。
   to develop a ... 作目的状语。
2. On the first numerically controlled (NC) machines, numerical data was controlled by tape and because of that, the NC systems were known as tape-controlled machines.
   that 指代上一句 on the first numerically controlled (NC) machines, numerical data was controlled by tape, 可译为:在最初的 NC 机床上,其数据由磁带提供及控制,因此这种数控系统被称为磁带控制机。
3. Normally, new systems are faster, more powerful, and more versatile.
   normally, -ly 结尾的副词单独作状语放于句首时,通常作评注状语。本句可译为:"一般说来,新系统加工速度更快,功率更大,功能更强。

Exercises

I. Work with your partner to answer the following questions.

1. What is the definition of NC & CNC?
2. Who proposed the NC concept in 1940s?
3. Give the list of NC/CNC technology in application.

II. Mark the following statements with T(true) or F(false) according to the text.

1. In 1950s, scientists and engineers at MIT built a control system for a two-axis milling machine that used microphone as the input tool. ( )
2. Computer-based NC became widely used in industry in 1970s because the major machine tool manufacturers were producing some machines with NC. ( )
3. The work principles of NC/CNC system are the same and the way of execution is different. ( )

III. Review the text and translate the following phrases into Chinese or English.

1. 加工中心
2. 铣刀
3. 机床
4. numerical control

5. milling machine

IV. Translate the following sentences into Chinese.

1. NC matured as an automation technology when inexpensive and powerful microprocessors replaced hard-wire logic-making computer-based NC systems.
2. Parsons recommended a method of automatic machine control that would guide a milling cutter to produce a "thru-axis curve" in order to generate smooth profiles on work pieces.

Supplementary Reading

The Applications of NC/CNC

Since its introduction, NC technology has found many applications, including lathes and turning centers, milling machines and machining centers, punches, electrical discharge machines (EDM), flame cutters, grinders, and testing and inspection equipment. The most complex CNC machine tools are the turning center, shown in Fig. 1-1 (A modern turning center with a ten-station turret that accepts quick-change tools. Each tool can be positioned in seconds with the press of a button), the machining center shown in Fig. 1-2 (Vertical machining center, the tool magazine is on the left of the machine. The control panel on the right can be swiveled by the operator) and Fig. 1-3 (Horizontal machining center, equipped with an automatic tool changer. Tool magazines can store 200 cutting tools).

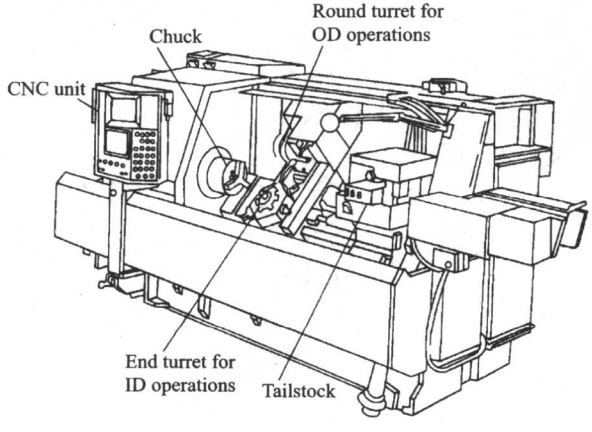


Fig. 1-1 A modern turning center with a ten-station turret that accepts quick-change tools

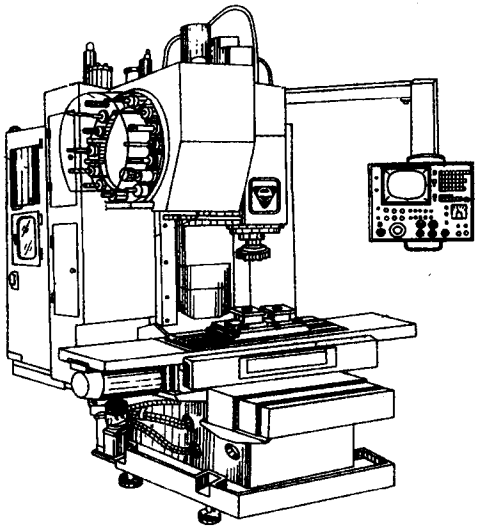


Fig. 1-2 A vertical-spindle machine center

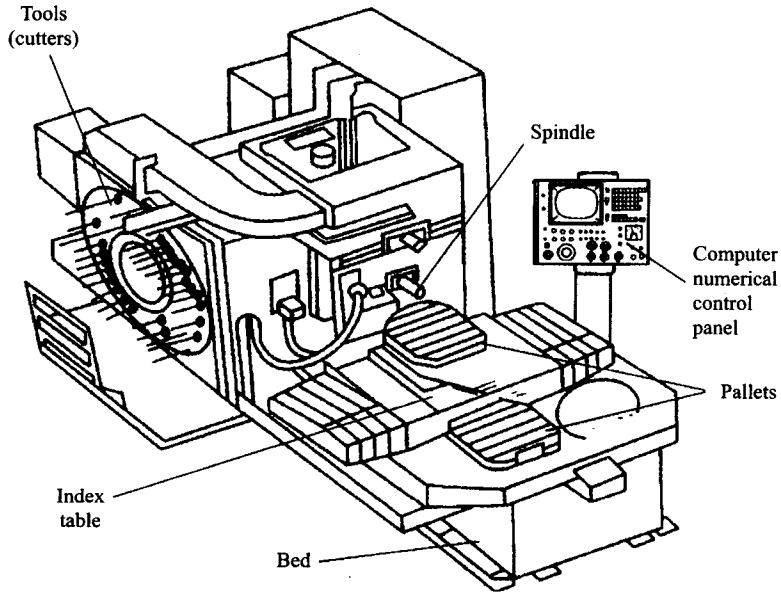


Fig. 1-3 A horizontal-spindle machine center

When preparing a program for a particular operation, the programmer must select all cutting data using recommendations for conventional machining. This includes proper selection of cutting speeds, federate, tools and tool geometry, and so on. When the programmer has chosen all of the necessary information properly, the operator loads the program into the machine and presses a button to start the cutting cycle. The CNC machine moves automatically from one machining operation to another, changing the cutting tools and applying the coolant. In a surprisingly short time, the work-piece is machined according to the highest quality standards. But that is not all. No matter how big the work series is, all of the parts will be almost identical in size and surface finishing. * At this time of advanced technology, with its high demands for surface finishing and tolerances of components in, for example, aerospace, nuclear, and medical equipment manufacturing, only CNC machines provide successful results.

New Words and Expressions

application /ˌæpliˈkeiʃən/ *n.* 请求，申请，申请表，应用
lathe /leið/ *n.* 车床
grinder /ˈgraində/ *n.* 磨床
vertical /ˈvəːtikəl/ *adj.* 垂直的，直立的，*n.* 垂直线，垂直面，竖向
punch /pʌntʃ/ *n.* 冲压机，冲床，打孔机 *vt.* 冲孔，打孔
turret /ˈtʌrit/ *n.* 转台，转塔刀架
panel /ˈpænl/ *n.* 面板，嵌板，仪表板
federate /ˈfedərit/ *n.* 进给率
coolan /ˈkuːlən/ *n.* 冷冻剂，冷却液，散热剂
tool geometry 刀具几何形状
turning center 车削中心
testing and inspection equipment 测试和检测设备
conventional machining 常规加工

Notes

* No matter how big the work series is, all of the parts will be almost identical in size and surface finishing.

No matter how 引导让步状语从句。译为：无论一个加工过程如何大，全部零件在尺寸和表面加工方面的工艺是相同的。