



21世纪高职高专规划教材

专业英语

(机械类用)

第2版

夏虹 主编



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机械工业出版社

本书是根据高等职业技术教育教学的要求编写的。全书共分4大部分,内容包括:机械工程材料、机械零件、机械加工和各类机床以及现代加工制造技术,同时附加了产品说明书范例和参考译文等内容,以便于教学、自学和应用。本书取材力求应用面广,并具有专业词汇量和语言丰富、实用性强的特点,希望读者借助本书的学习,能达到提高阅读水平和应用专业英语的目的。

本书可作为高等职业技术学院、高等院校专科、成人教育学院、职工大学等大专层次的机械类专业英语课程的教材,也可作为广大自学者和工程技术人员的参考用书。

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第2版前言

近年来，机械工程学科得到了飞速发展，该领域的工程技术人员接触英语文献和进行国际技术交流的机会越来越多，迫切需要通过提高机械工程学科学生和专业技术人员的英语水平，加强学生专业英语的应用能力，以适应当前经济全球化和科学技术国际化的要求。

本书在吸纳、分析第1版使用反馈信息的基础上，结合实际应用和专业英语教学实践特点，将全书分为4大部分，共计37篇文章，涉及工程材料、机械零件、机械加工和现代加工技术等方面内容，并对每篇英语原文提供了参考译文和有关词汇、短语的注解，更便于教学和自学者使用。另外，针对广大使用者的要求，本书增加了产品说明书范例，以便于参考和应用。

本书取材基本源于英文文献原著，并结合高职高专教育的实际，在内容的深度和广度等方面进行了适当的选取和删节。本书推荐学时为36~48学时。

本书由夏虹主编。第1部分和第4部分由夏虹编写，第2部分由许英姿编写，第3部分由许英姿和许英超编写。最后由夏虹、许英姿定稿。本书在编写过程中得到多位同行和专家的热心帮助和悉心审核，王利民教授担任了本书的主审并提出许多宝贵意见。对此，我们一并表示衷心的感谢！

尽管做了极大努力，但因编者水平有限，在编写、翻译等过程中，难免有疏漏和不足，衷心欢迎读者批评指正。

编者

第1版前言

本教材是根据高中毕业3年制、兼顾2年制的高职高专教学计划需要编写而成的。

在编写本书时，我们从高职教育的实际出发，结合专业英语的教学实践，确定编写的指导思想和教材特色为：从机械专业出发，循着机械制造过程的自然顺序，由浅入深，由简到繁，循序渐进。

本书分为五大部分，共计45篇文章。所涉及的内容包括：工程材料、热处理、机械零件、机械加工及各类机床、切削原理、公差与配合、计算机辅助设计与制造、数控技术、机器人技术等。本书推荐学时为36学时，带*号内容可根据具体情况选用。

本书取材基本源于英、美、澳大利亚文献原著。为保持原著的语言风格，编者对原文只做删节，不做改写。在每篇短文后，给出了文中生词、词组以及某些专业词组，并对正文中一些疑难句子给出了注释或参考译文。短文后还给出部分思考题，供练习用。本书选材广泛，语言规范，难度适中，便于自学。

全书由夏虹主编。第一部分由夏虹和孙振忠编写，第二部分由许英姿编写，第三部分由杨爱兰编写，第四部分由王延遐编写，第五部分由夏虹编写，最后由夏虹、许英姿、孙振忠定稿。本书在编写过程中得到河南科技大学徐顺利副教授的大力帮助和悉心审阅，并担任了本书的主审。此外，还得到其他多方面人员的热心支持，对此，我们表示由衷的感谢！

由于水平有限，时间仓促，不足和错漏之处在所难免，祈望读者不吝赐教。

编者

目 录

第 2 版前言

第 1 版前言

Part 1 Fundamentals of Manufacturing	1
Unit 1 Definition of Manufacturing	1
Unit 2 Design Materials and Production	3
Unit 3 Engineering Materials	6
Unit 4 Classification of Materials	9
Unit 5 Properties of Materials	13
Unit 6 Heat Treatment and Hot Working of Metals	20
Unit 7 Mechanics	23
Unit 8 Measurement	26
Unit 9 Inspection and Quality Control	29
Part 2 Mechanical Parts	34
Unit 10 Link and Joint	34
Unit 11 Power Screws	36
Unit 12 Clutches	38
Unit 13 Engine Parts	40
Unit 14 Gears	43
Unit 15 Gear Manufacture	48
Unit 16 Shafts	53
Unit 17 Springs	55
Unit 18 Belt Drives	58
Unit 19 Bearings	60
Unit 20 Cams	62
Unit 21 Turbine Engine Bearings for Ultra-High Temperatures	64
Unit 22 Couplings	68
Part 3 Manufacturing	73
Unit 23 Shaping and Planning Operations	73
Unit 24 Grinding Machines	78
Unit 25 Casting	83
Unit 26 Die Casting and Investment (or Lost Wax) Casting	88
Unit 27 Metal Cutting	92

Unit 28	Fundamentals of Manufacturing Accuracy	97
Unit 29	Surface Roughness	102
Part 4	New Technologies in Manufacturing	105
Unit 30	Numerical Control (NC)	105
Unit 31	CAD / CAM	107
Unit 32	Scope of CAD/CAM	108
Unit 33	Computer-Integrated Manufacturing	110
Unit 34	Robots	112
Unit 35	Machining Center	113
Unit 36	List of Various Mechatronic Systems	116
Unit 37	Mechanical Engineering in the Information Age	118
产品说明书范例	123
参考译文	133
词汇表	169
参考文献	181

Part 1 Fundamentals of Manufacturing

Unit 1 Definition of Manufacturing

Manufacturing can be defined as the transformation of raw materials into useful products through the use of the easiest and least-expensive methods^[1]. It is not enough, therefore, to process some raw materials and obtain the desired product. It is, in fact, of major importance to achieve that goal through employing the easiest, fastest, and most efficient methods. If less efficient techniques are used, the production cost of the manufactured part will be high, and the part will not be as competitive as similar parts produced by other manufacturers^[2]. Also, the production time should be as short as possible to enable capturing a larger market share.

The function of a manufacturing engineer is, therefore, to determine and define the equipment, tools, and processes required to convert the design of the desired product into reality in an efficient manner. In other words, it is the engineer's task to find out the most appropriate, optimal combination of machinery, materials, and methods needed to achieve economical and trouble-free production^[3]. Thus, a manufacturing engineer must have a strong background in materials and up-to-date machinery as well as the ability to develop analytical solutions and alternatives for the open-ended problems experienced in manufacturing. This is in addition to having a sound knowledge of the theoretical and practical aspects of the various manufacturing methods^[4].

NEW WORDS

- definition** *n.* 定义, 词义
raw *a.* 未加工的
transformation *n.* 转变
process *n. & v.* 过程, 制法, 程序
efficient *a.* 有效的
technique *n.* 技术, 技法
competitive *a.* 竞争的
define *v.* 划定……界限
convert *v. & n.* 转换, 改变

optimal *a.* 最理想的, 最令人满意的

background *n.* 背景, 经历

sound *a. & adv.* 坚实的(地), 充足的(地)

PHRASES AND EXPRESSIONS

trouble-free 优质的

up-to-date 当今的, 最新的

open-ended 无限制的

to be defined as 定义为……

as... as possible 尽可能的……

find out 发现

NOTES

[1] Manufacturing can be defined as the transformation of raw materials into useful products through the use of the easiest and least-expensive methods.

本句为被动语态, 主语 we 省略了。

全句译为: 制造是指采用最便利和最经济的方法将原材料加工成有用产品的转换过程。

[2] If less efficient techniques are used, the production cost of the manufactured part will be high, and the part will not be as competitive as similar parts produced by other manufacturers.

全句译为: 如果采用低效率的技术, 则加工零件的生产费用将提高, 从而使该零件无法与其他公司生产的同类零件进行竞争。

[3] In other words, it is the engineer's task to find out the most appropriate, optimal combination of machinery, materials, and methods needed to achieve economical and trouble-free production.

“it”在此是形式主语, 真正主语是“to find out the most appropriate, optimal combination of machinery, materials, and methods needed to achieve economical and trouble-free production”。

全句译为: 换句话说, 工程师的任务就是为获得既经济又优质的产品而去发现最适合、最理想的机械装置、材料及方法。

[4] This is in addition to having a sound knowledge of the theoretical and practical aspects of the various manufacturing methods.

全句译为: 此外, 就是要在各种制造方法方面具有坚实的理论基础知识和实践经验。

QUESTIONS

- (1) What is the definition of manufacturing?
- (2) Why should the production time be as short as possible?
- (3) What is the function of a manufacturing engineer?
- (4) Why must manufacturing engineer have a strong background knowledge?
- (5) What do you learn from this article?

Unit 2 Design Materials and Production

The cost of a product depends on raw materials, production costs for machines and labor, management and sales, warehousing and logistics, and overhead. Machine and labor costs are inexorably related and make up, along with raw materials expenditures, the bulk of production costs^[1]. When a material is chosen, the process, including the machine, is frequently specified. Alternatively, if a machine is available, the raw material that can be processed on that machine may be utilized. One could say that the purpose of economical production is to produce a product at a profit. This infers that the cost must be acceptable and competitive; also, a demand for the product must exist or must be created^[2].

Efficiency in Production

Since the first use of machine tools, there has been a gradual trend toward making machines more efficient by combining operations and by transferring more skill to the machine, thus reducing time and labor^[3]. To meet these needs, machine tools have become complex both in design and in control. Automatic features have been built into many machines, and some are completely automatic. This technical development has made it possible to attain the high production rate with low labor cost that is essential for any society wishing to enjoy high living standards^[4]. Computer-aided design and manufacturing are significant steps of progress.

Along with the development of production machines, the quality in manufacturing must be maintained. Quality and accuracy in manufacturing operations demand that dimensional control be maintained to provide parts that are interchangeable and give the best operating service. For mass production, any one of a quantity of parts must fit in a given assembly. A product made of interchangeable parts is quickly assembled, lower in cost, and easily serviced^[5]. To maintain this dimensional control, appropriate inspec-

tion facilities must be provided.

Three criteria that determine economical production are:

- (1) A functional but simple design that has appropriate aesthetic quality.
- (2) A material choice that represents the best compromise among physical properties, appearance, cost, and workability or machinability.
- (3) Selection of the manufacturing processes that will yield a product with no more accuracy or better surface finish than necessary and at the lowest possible unit cost.

Product Engineering and Design

It is important that the product be designed with material, manufacturing, and engineering to be competitive. For any manufactured product it is possible to specify a stronger, a more corrosion-resistant, or a longer life material, for example, but it is the engineer's obligation not to overlook the opportunity of economical production. This leads to value engineering, which is the substitution of cheaper materials or elimination of costly materials or of unnecessary operations.

To produce parts of greater accuracy, more expensive machine tools and operations are necessary, more highly skilled labor is required, and rejected parts may be more numerous. Products should not be designed with greater accuracy than the service requirements demand. A good design incensed consideration of a finishing or coating operation, because a product is often judged for appearance as well as function and operation. Many products, such as those made from colored plastics or other special materials, are more saleable because of appearance^[6]. In most cases the function of the part is the deciding factor. This is particularly true where great strength, wear, corrosion, resistance, or weight limitations are encountered.

For mass produced parts the design should be adaptable to mass production-type machines with a minimum of different setups. Whenever a part is loaded, stored, and reloaded into another machine, costs are involved that may not add value to the product.

NEW WORDS

- logistics** *n.* (复) 后勤供应
overhead *n.* 经常费用, 营业费用
warehousing *n.* 库存 (量)
inexorable *ad.* 不留情地, 无法改变地
expenditure *n.* 支出, 经费, 使用
bulk *n.* 大量, 大多数

- utilize** *v.* 利用
- profit** *n.* 利润, 收益
- complex** *a.* 复杂的 *n.* 复合体
- automatic** *a.* 自动的, 机械的 *n.* 自动装置, 自动化程度
- devote (to)** *v.* 把……奉献, 把……专用
- maintain** *v.* 维持, 保持, 维护
- interchangeable** *a.* 可互换的, 可交换的
- facility** *n.* 工具, 设备
- criterion** *n.* (复数 *criteria*) 标准, 准则
- aesthetic** *a.* 审美的, 艺术的
- compromise** *n.* 妥协, 折衷办法
- machinability** *n.* 可加工性
- yield** *v.* 产生, 出产
- obligation** *n.* 义务
- substitution** *n.* 替换, 代替
- elimination** *n.* 排除
- reject** *v.* 抵制, 抛弃
- coat** *v.* 覆以 (外加) 涂层
- adaptable** *a.* 能适应的, 适应性强的
- setup** *n.* 机构, 装置

PHRASES AND EXPRESSIONS

- make up 构成
- along with 随着
- the bulk of 大多数
- at a profit 获益
- computer-aided design 计算机辅助设计
- mass production 大量生产
- corrosion-resistant 抗腐蚀性的
- value engineering 价值工程

NOTES

[1] Machine and labor costs are inexorably related and make up, along with raw materials expenditures, the bulk of production costs.

全句译为: 机器和人工成本, 以及原材料的消耗构成产品价格的主要部分。

[2] This infers that the cost must be acceptable and competitive; also, a demand for

the product must exist or must be created.

全句译为：这意味着产品成本必须是可接受和具有竞争力的，且对该产品的需求必须是存在和可以形成的。

[3] Since the first use of machine tools, there has been a gradual trend toward making machines more efficient by combining operations and by transferring more skill to the machine, thus reducing time and labor.

全句译为：自从开始使用机器以来，就逐渐趋向于通过操作组合及使机器具有更多功能来提高机器效率，从而减少劳动时间和人力消耗。

[4] This technical development has made it possible to attain the high production rate with low labor cost that is essential for any society wishing to enjoy high living standards.

全句译为：这项技术的发展使得低劳动成本和高生产率成为可能，它正是任何希望拥有高生活水平的社会的基础。

[5] A product made of interchangeable parts is quickly assembled, lower in cost, and easily serviced.

全句译为：由互换性零件制成的产品装配更快、成本更低且更易于维护服务。

[6] Many products, such as those made from colored plastics or other special materials, are more saleable because of appearance.

全句译为：很多产品因为外观精美，如由彩色塑料或其他特殊材料制成，而使其更加畅销。

QUESTIONS

- (1) What is the cost of a product consisted of?
- (2) What is the purpose of economical production?
- (3) What are the criteria for economical production?
- (4) What is the meaning of value engineering?
- (5) Why should a product have a good appearance?

Unit 3 Engineering Materials

In the design and manufacture of a product, it is essential that the material and the process be understood. Materials differ widely in physical properties, machinability characteristics, methods of forming, and possible service life^[1]. The designer should

consider these facts in selecting an economical material and a process that is best suited to the product.

Engineering materials are of two basic types; metallic or nonmetallic. Nonmetallic materials are further classified as organic or inorganic substances. Since there is an infinite number of nonmetallic materials as well as pure and alloyed metals, considerable study is necessary to choose the appropriate one^[2].

Few commercial materials exist as elements in nature^[3]. For example, the natural compounds of metals, such as oxides, sulfides, or carbonates, must undergo a separating or refining operation before they can be further processed. Once separated, they must have an atomic structure that is stable at ordinary temperatures over a prolonged period. In metal working, iron is the most important natural element. Iron has little commercial use in its pure state, but when combined with other elements into various alloys it becomes the leading engineering metal. The nonferrous metals, including copper, tin, zinc, nickel, magnesium, aluminum, lead, and others all play an important part in our economy; each has specific properties and uses^[4].

Manufacturing requires tools and machines that can produce economically and accurately. Economy depends on the proper selection of the machine or process that will give a satisfactory finished product, its optimum operation, and maximum performance of labor and support facilities. The selection is influenced by the quantity of items to be produced. Usually there is one machine best suited for a certain output. In small-lot or job shop manufacturing, general-purpose machines such as the lathe, drill press, and milling machine may prove to be the best because they are adaptable, have lower initial cost, require less maintenance, and possess the flexibility to meet changing conditions. However, a special-purpose machine should be considered for large quantities of a standardized product. A machine built for one type of work or operation, such as the grinding of a piston or the surfacing of a cylinder head, will do the job well, quickly, and at low cost with a semiskilled operator.

Many special-purpose machines or tools differ from the standard type in that they have built into them some of the skill of the operator. A simple bolt may be produced on either a lathe or an automatic screw machine. The lathe operator must know not only how to make the bolt but must also be sufficiently skilled to operate the machine. On the automatic machine the sequence of operations and movements of tools are controlled by cams and stops, and each item produced is identical with the previous one^[5]. This "transfer of skill" into the machine, or automation, allows less skillful operators but does require greater skill in supervision and maintenance. Often it is uneconomical to

make a machine completely automatic, because the cost may become prohibitive.

The selection of the best machine or process for a given product requires knowledge of production methods. Factors that must be considered are volume of production, quality of the finished product, and the advantages and limitations of the equipment capable of doing the work. Most parts can be produced by several methods, but usually there is one way that is most economical^[6].

NEW WORDS

- characteristic** *a.* 特有的 *n.* 特性
metallic *a.* 金属的
nonmetallic *a.* 非金属的
organic *a.* 有机的
infinite *a.* 无穷的 *n.* 无尽
commercial *a.* 商业上的, 商业的
oxide *n.* 氧化物
sulfide *n.* 硫化物
carbonate *n.* 碳酸盐, 黑金刚石
refine *v.* 精炼, 提纯
optimum *n.* (复数 *optima*) 最适合条件
lathe *n.* 车床
flexibility *n.* 机动性, 灵活性
supervision *n.* 监督, 管理
cam *n.* 凸轮

PHRASES AND EXPRESSIONS

- suit to 适于
 nonferrous metal 有色金属
 general-purpose 普通用途
 special-purpose 特殊
 differ from... 与……不同
 either... or... 既……又……
 not only... but also... 不仅……而且……

NOTES

[1] Materials differ widely in physical properties, machinability characteristics, methods of forming, and possible service life.

全句译为：材料在物理性能、机加工特性、成形方法以及可能的使用寿命等方面有很大不同。

[2] Since there is an infinite number of nonmetallic materials as well as pure and alloyed metals, considerable study is necessary to choose the appropriate one.

全句译为：由于非金属材料与纯金属和合金的种类都比较繁多，所以在选择合适的材料时需要做大量的研究工作。

[3] Few commercial materials exist as elements in nature.

全句译为：工业用材料在自然界很少是以元素形式存在的。

[4] The nonferrous metals, including copper, tin, zinc, nickel, magnesium, aluminum, lead, and others all play an important part in our economy; each has specific properties and uses.

全句译为：非铁金属材料，包括铜、锡、锌、镍、镁、铝、铅等，在我们的经济中占有重要地位，而且每一种材料都有其特殊的性能和用途。

[5] On the automatic machine the sequence of operations and movements of tools are controlled by cams and stops, and each item produced is identical with the previous one.

全句译为：在自动机床上，工具的操作和运动是由凸轮和制动器来控制的，并且每一零件生产过程都与前一个相同。

[6] Most parts can be produced by several methods, but usually there is one way that is most economical.

全句译为：大多数零件可以有数种加工方法，但通常只有一种方法是最经济的。

QUESTIONS

- (1) Why are materials and designs important to manufacturing processes?
- (2) What are the basic types of engineering materials?
- (3) Why is iron the most important natural element?
- (4) What does economy depend on?
- (5) What is the meaning of "transfer of skill"?
- (6) What factors must be considered for the selection of production methods?

Unit 4 Classification of Materials

Materials for manufactured parts or machines have such diversified properties that even when performance and cost are considered, it is often difficult to decide the proper