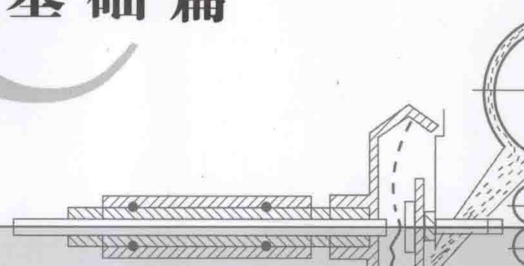
English for Mechanics
Reading Course

机械专业英语阅读

ESP

任文利 谢小正 卫佳◎主编

基础篇



SWJTUP 西南交通大学出版社

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图书在版编目（CIP）数据

机械专业英语阅读 / 任文利，谢小正，卫佳主编.
—成都：西南交通大学出版社，2015.3
ISBN 978-7-5643-3794-0

Ⅰ. ①机… Ⅱ. ①任… ②谢… ③卫… Ⅲ. ①机械工程－英语－阅读教学－高等学校－教材 Ⅳ. ①H319.4

中国版本图书馆 CIP 数据核字（2015）第 040027 号

机械专业英语阅读

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责任编辑	金雪岩
特邀编辑	石　丁
封面设计	墨创文化
出版发行	西南交通大学出版社 （四川省成都市金牛区交大路 146 号）
发行部电话	028-87600564　028-87600533
邮政编码	610031
网　　址	http: //www.xnjdcbs.com
印　　刷	成都中铁二局永经堂印务有限责任公司
成品尺寸	185 mm × 260 mm
印　　张	10.5
字　　数	361 千字
版　　次	2015 年 3 月第 1 版
印　　次	2015 年 3 月第 1 次
书　　号	ISBN 978-7-5643-3794-0
定　　价	27.00 元

课件咨询电话：028-87600533

前　言

阅读在整个大学英语教学中占有举足轻重的地位，它是帮助学生积累语言材料和获取各种信息的重要渠道，也是培养学生综合语言能力的重要一环。但目前的大学英语阅读教学长期受传统教学理念的影响，普遍存在费时低效的现象。其根本原因之一在于，阅读课程的教学一直都侧重阅读技巧等能力的培养，很少关注阅读内容本身对学生的影响。单纯的语言技能传授可能让学生对英语学习失去动力，产生厌倦感。要走出大学英语教学的这种困境，必须转变思想，进行改革。编者从多年教学实践中发现，改变教学内容可以激发学生学习的兴趣。本书就是以此为出发点而编书。本教材遵循“大学英语教学应以学科内容为依托”的改革理念，根据机械工程专业的特点，参考中外有关机械制造的英语教材，结合普通高等院校学生对英语学习的需要编写而成。

本教材主要对机械制造技术基础知识进行了介绍，全书共分为 8 单元，每个单元有三篇文章，其中 Text A 为重点要求掌握，Text B 要求理解，Text C 要求了解。每篇文章都配备了练习题，以帮助学生巩固和深化学习内容。无论是文章题材的选取还是习题的编写都充分体现专业性、针对性以及实用性。

本教材内容系统、难度适中，可供机械工程专业和相关专业学生以及其他从业人员使用。本书第一至第五单元由兰州理工大学谢小正老师编写，第六至第八单元由兰州交通大学任文利老师编写，卫佳老师编写了第六至第八单元习题部分。全书由任文利老师统稿，兰州交通大学外国语学院陈静教授审稿。

由于编者水平所限，加之时间仓促，书中难免会有一些错误和不足之处，恳请读者批评指正，以便今后改进。

本教材的出版得到了“2012 外研社—甘肃省普通高等学校英语教学改革研究课题”“以内容为依托的大学英语阅读教学研究”项目的资助。在此表示感谢！同时，感谢兰州理工大学红柳青年基金及兰州理工大学机械工程国家级实践教学中心对作者的部分资助！

编　者

2015 年 1 月

Contents

UNIT 1

Manufacturing Overview

The manufacturing and production industry can be traced back to the Industrial Revolution period between the 18th and 19th century. The term manufacturing may refer to a range of human activities, from handicraft to high tech, but is most commonly applied to industrial production, in which raw materials are transformed into finished goods on a large scale. Manufacturing takes turns under all types of economic systems. Without manufacturing and production, there'd be no products to market or sell. People who work in manufacturing and production don't just create products; they create them as quickly as possible, as inexpensively as possible, and in the necessary quantities. Therefore, it is a rather complex activity in which many processes are encompassed and many techniques are used.

Text A What Is Manufacturing?

As you begin to read this article, take a few moments to inspect the different objects around you: your watch, chair, stapler, pencil, calculator, telephone, and light fixtures. You will soon realize that all these objects had a different shape at one time. You could not find them in nature as they appeared in your room. They have been transformed from various raw materials and assembled into the shapes as you now see. A paper clip, for example, was once a piece of wire. The wire was once a piece of metal obtained from ores.

Some objects are made of one part, such as nails, bolts, and wire or plastic coat hangers, metal brackets, and forks. However, most objects—automobile engines, ballpoint pens toasters, bicycles, computers and thousand more—are made of a combination of several parts made from a variety of materials. A typical automobile, for example, consists of about 15,000 parts, and a C-5A transport plane is made of more than 4,000,000 parts. All are made by various processes that were called manufacturing. Manufacturing, in its broadest sense, is the process of converting raw materials into products. It encompasses the design and production of goods, using various production methods and techniques.

Manufacturing is the backbone of any industrial nation. Its importance is emphasized by the fact that, as an economic activity, it comprises approximately one third of the value of all goods and services produced in industrial nations. The level of manufacturing activity is directly related to the economic health of a country. Generally, the higher the level of manufacturing activity in a country, the higher is the standard of the living of its people.

Manufacturing also involves activities in which the manufactured product is itself used to make other products. Examples are large presses used to form sheet metal for car bodies, metalworking machinery used to make parts for other products, and sewing machines used to make clothing. An equally important aspect of manufacturing activities is servicing maintaining this machinery during its useful life.

The word manufacturing is derived from the Latin manufactus, meaning made by hand. The word manufacture first appeared in 1567, and the word manufacturing appeared in 1683. In the modern sense, manufacturing involves making products from raw materials by various processes, machinery, and operations, following a well-organized plan for each activity required. The word product means something that is produced, and the words product and production firstly appeared during the fifteenth century. The word production is often used interchangeably with the word manufacturing. Whereas manufacturing engineering is the term used widely in the United States to describe this area of industrial activity, the equivalent term in Europe and Japan is production engineering.

Because a manufactured item has undergone a number of changes in which a piece of raw material has become a useful product, it has a value—defined as monetary worth or marketable price. For example, as the raw material for ceramics, clay has a certain value as mined. When the clay is used to make a ceramic dinner plate, cutting tool, or electrical insulator, value is added to the clay. Similarly, a wire coat-hanger or a nail has a value over and above the coat of a piece of wire. Thus manufacturing has the important function of adding value.

Manufacturing is generally a complex activity, involving people who have a broad range of disciplines and skills and a wide variety of machinery, equipment, and tooling with various levels of automation, including computers, robots, and material-handling equipment. Manufacturing activities must be responsive to several demands and trends.

A product must fully meet design requirements and specifications.

A product must be manufactured by the most economical methods in order to minimize costs.

Quality must be built into the product at each stage, from design to assembly, rather than relying on quality testing after the product is made.

In a highly competitive environment, production methods must be sufficiently flexible so as to respond to changing market demands, types of products, production rates, production quantities, and online delivery to the customer.

New development in material, production methods, and computer integration of both technological and managerial activities in a manufacturing organization must constantly be evaluated with a view to their timely and economic implementation

Manufacturing activities must be viewed as a large system, each part of which is interrelated to others. Such systems can be modeled in order to study the effect factors such as changes in market demands, product design, material and various other costs, and production methods on product quality and cost.

The manufacturing organization must constantly strive for higher productivity, defined as the optimum use of all its resources: materials, machines, energy, capital, labor, and technology. Output per employee per hour in all phases must be maximized.

New Words

stapler ['steɪplə(r)] *n.* 订书机
calculator ['kælkjʊleɪtə] *n.* 计算器
ore [ɔ:] *n.* 矿，矿石
nail [neɪl] *n.* 指甲，钉子
bolt [bəʊlt] *n.* 螺栓，螺钉，膨胀锚钉，角钢螺丝，毛边书
bracket ['brækɪt] *n.* 支架
engine ['endʒɪn] *n.* 引擎，发动机；机车，火车头；工具
encompass [ɪn'kʌmpəs] *vt.* 包含；包围，环绕；完成
backbone ['bækbəʊn] *n.* 支柱；主干网；决心，毅力；脊椎
machinery [mə'ʃi:n(ə)rɪ] *n.* 机械，机器，机构，机械装置
sewing ['səʊɪŋ] *n.* 缝纫；缝纫业
well-organized [wel'ɔ:gənaɪzd] *adj.* 有序的；很有条理的
Latin ['lætɪn] *adj.* 拉丁语的，拉丁人的
interchangeably [ɪntə'tʃeɪndʒəbli] *adv.* [数] 可交换地
monetary ['mʌnɪt(ə)rɪ] *adj.* 货币的，财政的
phase [feɪz] *n.* 阶段

Useful Expressions and Phrases

paper clip　纸夹
coat hanger　衣架，挂衣钩
sewing machine　缝纫机
handling equipment　搬运设备，[交]装卸设备，起重运输设备
sheet metal　金属薄片
car body　[车辆]车身
market demand　[贸易]市场需求
economic activity　[经]经济活动
ballpoint pen　圆珠笔
transport plane　运输机

Note

C-5A transport plane: C-5A 运输机是美国洛克希德公司生产的大型战略军用运输机，也是美国空军现役最大的战略运输机，它能够在全球范围内运载超大规格的货物并在相对较短的距离里起飞和降落。

Exercises

Ⅰ. Decide whether the following statements are true (T) or false (F) after reading the text.

1. (　)Manufacturing is the backbone of any industrial nation.
2. (　)The word manufacture first appeared in 1683.
3. (　)A product must fully meet design requirements and specifications.
4. (　)Manufacturing activities mustn't be viewed as a large system.
5. (　)The manufacturing organization must constantly pursue higher productivity.

Ⅱ. Choose the right answer after reading the text.

1. Why is it difficult to find the objects around you in nature? (　　)
   A. Because they have a different shape at one time.
   B. Because they have been transformed from raw materials.
   C. Because they have been assembled into different shapes.
   D. Because they are made of many parts.
2. Which of the following is not the manufacturing activity? (　　)

A. Converting raw materials into product.

B. Obtaining raw materials from ores.

C. Servicing and maintaining machinery during its useful life.

D. Assembling components into a machine.

3. As to the demands manufacturing activities must meet, which of the following is NOT true? ( )

A. A product must fully meet design requirements and specifications.

B. A product must be manufactured by the most economical methods in order to minimized costs.

C. Quality must be built into the product at each stage, from design to assembly, rather than relying on quality testing after the product is made.

D. A computer must be used during manufacturing process.

4. In a highly competitive environment, production methods must. ( )

A. be sufficiently flexible

B. respond to changing demands

C. meet certain standards

D. meet customer's demands

5. is what the manufacturing organization must constantly strive for. ( )

A. Optimum use of machines

B. Higher market price

C. Less use of materials

D. Higher productivity

Ⅲ. Fill in the blanks with proper words or phrases according to the text.

1. The level of manufacturing activity is directly related to ________________ of a country. Generally, the higher the level ________________ in a country, the higher is the ________________________.

2. Because a manufactured item has undergone a number of changes in which a piece of raw material has become a useful product, it has __________________, defined as monetary worth or ___________________.

3. Manufacturing is generally ____________________, involving people who have a broad range of disciplines and skills and a wide variety of ___________, equipment, and tooling with various levels of ________________________, including computers, robots, and __________________.

4. In a highly competitive environment, production methods must be sufficiently flexible so as to respond to ______________________, types of products, production rates, production quantities, and ___________________________.

5. Manufacturing activities must be viewed as a large system, each part of which is interrelated to others. Such systems can be ______________________ in order to study the effect factors such as changes in market demands, _________________, material and various other costs, and production methods on ________________________.

Ⅳ. Find the definition in Column B which matches the word in Column A.

Column A	Column B
1. calculator ( )	A. any distinct time period in a sequence of events
2. bracket ( )	B. a system of means and activities whereby a social institution functions
3. phase ( )	C. include in scope; include as part of something broader; have as one's sphere or territory
4. encompass ( )	D. relating to or involving money
5. backbone ( )	E. a small machine that is used for mathematical calculations
6. machinery	F. a central cohesive source of support and stability
7. interchangeably ( )	G. either of two punctuation marks used in computer programming and sometimes used to enclose textual material
8. monetary ( )	H. in an interchangeable manner

Ⅴ. Answer the following questions after reading the text.

1. What is manufacturing in broadest sense?
2. Why is manufacturing the backbone of industrial nation?
3. What does manufacturing mean in modern sense?
4. Why does the author say that the manufacturing has the important function of adding value?
5. In what way does the text say that manufacturing is a complex activity?

Ⅵ. Fill in the blanks with an appropriate word listed below. Change the form where necessary.

productivity	comprise	backbone	interrelated	model
strive	undergone	optimum	combination	encompass

1. Multimedia is the ____________ of computer and video technology.

2. True love ____________ a commitment and must be mutual.

3. The weekly report shall ____________ the following parts.

4. His whole attitude has ____________ a subtle change.

5. Public security and public administration are closely ____________.

6. He materialized his ideas by building a ____________.

7. Those who ____________ for justice must understand that it consists of more than the venting of resentments.

8. The ____________ has been stepped up fifty per cent.

9. The ____________ design is the essential purpose of engineering studies.

10. Steel is the ____________ of China's booming economy.

Ⅶ. Translate the following sentences into Chinese.

1. A product must fully meet design requirements and specifications.

2. Manufacturing activities must be responsive to several demands and trends.

3. A product must be manufactured by the most economical methods in order to minimized costs.

4. Quality must be built into the product at each stage, from design to assembly, rather than relying on quality testing after the product is made.

5. The manufacturing organization must constantly strive for higher productivity, defined as the optimum use of all its resources: materials, machines, energy, capital, labor, and technology. Output per employee per hour in all phases must be maximized.

Text B Introduction to Modern Manufacturing System

Manufacturing is not just the transformation of raw materials into value-added outputs meeting specifications. It has a much broader meaning. The CAM definition of manufacturing essentially captures this broad meaning: Manufacturing is a series of interrelated activities and operations involving design, material selection, planning, production, quality assurance, management and marketing of discrete consumer and durable goods.

This definition of manufacturing lays a foundation for the need for systems thinking. That shows the complexities involved in manufacturing because of the large number of interrelated activities. There is need for coordinated efforts from every organ of an organization. Furthermore, for a manufacturing organization to remain competitive, it must deliver products to customers at the minimum possible cost, the best possible quality, and the minimum lead time starting from the product conception stage to final delivery, service, and disposal. To accomplish these objectives, a high level of integration is required among all these activities.

For all the advances in manufacturing we are indebted to our ancestors who developed the steam engine, water mills, wind mills, iron furnaces, and other innovations. The concept of division of labor, introduced by Adam Smith in 1776, had a profound influence on the creation of the factory system and on productivity improvement. Development of flow line assembly system for engines by Henry Ford in 1913 was a giant step toward integrated manufacturing. This led to the realization of reduced labor and increased production rate.

Frederick Taylor introduced the scientific approach to many such ideas. Others production specialists in the scientific management movement, such as Frank B · Gilbreth and Henry L. Gantt, made especially significant contributions. Gilbreth's primary contribution was the identification, analysis, and measurement of fundamental motions involved in performing work. Gantt devised the so-called Gantt chart which provides a systematic graphic procedure for preplanning and scheduling work activities, reviewing progress, and schedule updating. The Great Depression of 1929 forced everyone to think in a new direction requiring employee motivation and satisfaction, which led to the development of the idea of job enrichment and enlargement.

In the area of machines, Devol G · C · developed a controller device in 1946 that could record electrical signals magnetically and play them back to operate a mechanical machine. A number of interesting developments since then in the areas of numerically controlled machine tools, robotics, material handling systems, and computer control systems have led to the current state of automated manufacturing technology, such as flexible manufacturing systems. We provide a brief historical perspective on each of these.

Numerically Controlled Machines

The first successful numerically controlled machine was demonstrated at the Massachusetts Institute of Technology (MIT) under a Subcontract from Parsons Corporation of Traverse City, Michigan, funded by the U.S. Air Force in the 1950s. Automatic tool changers and indexing worktables were added in the 1960s. During this period the concept of direct numerically controlled (DNC) systems, in which several NC machines are linked to a main computer, was developed. Control system development in 1971 was the next milestone and led to the introduction of microcomputer controlled NC machines, also called CNC machines. The major advantage of

CNC was the ability to store many part programs in memory, in addition to communicating with other controllers or a central computer. The advantage of CNC and DNC were combined in other systems that are also known as DNC, but here DNC stands for distributed numerically controlled. In such DNC systems several CNC machines are linked to a main host computer. In the 1980s CNC machines were further developed by making them capable of carrying hundreds of tools, having multiple spindles, and controlling movements in up to six axes. These capabilities, coupled with developments in computer communication technology, have led to advances in automated manufacturing systems such as computer integrated manufacturing systems.

Material Handling System

Material handling is an integral part of any manufacturing system. Manufacturing system performance can be significantly improved by using computer controlled material flow, which reduces waiting time and work-in-process inventory compared with manual loading and unloading and manual material handling systems. To this end, developments in floor-mounted and overhead roller conveyors, stacker cranes, and automated guided vehicles have contributed substantially to smooth material flow on the factory floor. Through a system of programmable logic controllers, computer, and computer networks, the material handling systems, material storage systems, and machine tools can be integrated to configure an automated manufacturing system to meet customer requirements.

Robotics

The word "ROBOT" was first used to mean "forced labor" in a satirical fantasy play, "Rossum's Universal Robots", written by Karel Capek in 1921. Robotics, along with the technological developments in the areas of microprocessor and numerical control, has advanced the frontiers of automation. The technology for the present generation of robots was developed by Cyril Walter Kenward in 1954 in Britain and G · C · Devol in the United States. The first computer-type robot programming research was developed at Stanford Research Institute in 1973 for research called WAVE, followed by the language AL in 1974. The two languages were subsequently developed into commercial VAL language. In the 1980s several off-line programming systems were developed. Since then, several types of robots have been built and several robot programming languages have been developed. Robots were being used in industry for applications including painting, welding, material handling and assembly.

Computer Control System

Computer control systems have provided a major impetus to automation. The use of mainframe computers in the 1950s and 1960s for planning, scheduling, and controlling batch production became quite commonplace. A number of management information systems and database management systems were developed and used for a variety of functions in companies. Accounting, payroll, shop floor control and maintenance information systems are a few examples. Factory automation also resulted from advances in local area and wide area networks (LANs and WANs), bar codes, programmable logic controllers (PLCs), and computer controls. Automatic identification technologies such as bar code systems, automatic data collection and analysis systems, and real-time transfer of information provided a stimulus to the growth of factory automation.

Flexible Manufacturing System

The technological developments in CNC, DNC, PLC, robotics, AGVs, automated storage and retrieval system (AS/RSs), automatic tool changers, tool magazines, modular fixture, local area networks, and associated technologies such as group technology laid foundations for automated manufacturing of a high to a medium variety of parts having low to medium levels of demand. This led to the evolution of FMSs in the early 1960s. The Sunstrand Corporation was one of the first to develop such systems to manufacture a variety of aircraft gearbox castings. The system has eight NC machine centers and two multispindle drills linked by a computer controlled roller conveyer system. Although it did not have the flexibility of current-day FMSs, it was the first system with built-in automated material flow integration. Current systems provide higher levels of flexibility and a high degree of automation.

Other Significant Supporting Technologies

Besides developments in the areas already mentioned, the need for reduced cost and lead time and high quality led to the introduction of quality engineering approaches to product design, which introduced the concept of loss function and signal-to-noise ratio for product design. Material requirements planning and manufacturing resource planning, just-in-time manufacturing philosophy, group technology, and cellular manufacturing led to significant changes in the way production is now planned and controlled at the shop floor.

New Words

value-added ['vælju-'ædɪd] *adj.* 加值的，增值的

specification [spesɪfɪ'keɪʃ(ə) n] *n.* 规格，说明书，详述

coordinated [kəʊ'ɔ:dɪneɪtɪd] *adj.* 协调的

ancestor ['ænsestə] *n.* 始祖，祖先

furnace ['fɜ:nɪs] *n.* 火炉，熔炉

profound [prə'faʊnd] *adj*. 深厚的，意义深远的，渊博的
giant ['dʒaɪənt] *adj*. 巨大的；巨人般的
specialist ['speʃ(ə)lɪst] *n*. 专家
contribution [kɒntrɪ'bju:ʃ(ə)n] *n*. 贡献，捐献；投稿
identification [aɪ'dentɪfɪˌkeɪʃ(ə)n] *n*. 鉴定，识别；认同；身份证明
fundamental [fʌndə'ment(ə)l] *adj*. 基本的，根本的
n. 基本原理，基本原则
so-called ['səʊ'kɔ:ld] *adj*. 所谓的，号称的
graphic ['græfɪk] *adj*. 形象的，图表的，绘画似的
enrichment [ɪn'rɪtʃmənt] *n*. 丰富，改进，肥沃，发财致富
magnetically [mæg'netɪkli] *adv*. 有磁力地，有吸引力地
milestone ['maɪlstəʊn] *n*. 里程碑，划时代的事件
inventory ['ɪnv(ə)nt(ə)rɪ] *n*. 存货，存货清单；详细目录；财产清册
satirical [sə'tɪrɪk(ə)l] *adj*. 讽刺性的，讥讽的，爱挖苦人的
frontier ['frʌntɪə] *n*. 前沿，边界，国境
impetus ['ɪmpɪtəs] *n*. 动力，促进，冲力
bar-code ['bɑ:kəʊd] 条形码，电脑条码
stimulus ['stɪmjʊləs] *n*. 刺激，激励，刺激物
retrieval [rɪ'tri:vl] *n*. 检索，恢复，取回，拯救
modular ['mɒdjʊlə] *adj*. 模块化的，模数的，有标准组件的

Useful Expressions and Phrases

quality assurance [经管]质量保证，品质保证
durable goods 耐用品
lay a foundation 奠定基础，奠基，打下基础
be indebted to 感激的
steam engine 蒸汽机
water mill 水磨，水力磨粉机，水车
wind mill 风车
assembly system 装配系统
the great depression 大萧条，经济大萧条
historical perspective 历史展望
host computer 主机
automated manufacturing system 自动加工系统，自动化生产系统