

# 英语阅读

(机械类)

Science English Readings

(Mechanical Engineering)

● 吴树敬 李鹏飞  
● 刘利君 陈大明  
编



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吴树敬

刘利君



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## 内 容 提 要

《英语阅读(机械类)》是根据国家教委颁发的《大学英语教学大纲(理工科用)》中有关专业阅读阶段的要求而编写的机械类专业技术英语阅读教材,主要供通过了大学英语四级考试(CET)的学生使用。

本书共分 15 单元,每一单元内包含 A、B、C 三篇课文,每篇课文之后都配有测试阅读理解能力的练习题。书后附有练习答案。

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## 前 言

国家教委颁发的《大学英语教学大纲(理工科用)》中有关专业阅读阶段的要求规定:专业阅读阶段的教学目的是通过指导学生阅读有关专业的书刊和文选,培养阅读英语科技资料的能力,使其能以英语为工具获取有关专业所需要的信息。根据上述规定,我们近年来对英语专业阅读这门课程的建设做了一定的努力和探索,对本科生的英语教学实行了四年不断线的方针。在所有专业的本科生完成了基础英语学生任务之后,三年级按学科大类为他们分别开设专业科技英语课,于四年级为其开设专业英语文献阅读课。

为了保证本书的编写质量,我们采取了编写组与顾问组相结合的编书办法。由英语教师组成编写组,聘请有关专业的专家、教授组成顾问组。本书所选用的课文都是通过顾问组专家们的精心挑选与编写组的反复磋商集体审定的。这些文章选自国外近百种书刊资料,其标准是:语言要规范,文字要流畅,风格要鲜明,难易要适度;体裁上注重多样性和广泛性;内容上力求做到选材的科学性、知识性和趣味性。如本书选用的45篇课文中,有教科书性的、科学论文性的,有机械发展史料,也有科学名人传记,还有科技发展趋势展望,其宗旨在于扩大学生的专业知识视野,为阅读专业英语文献奠定扎实的基础,并藉以激发和增强学生对其所从事专业的热爱。

本书共分15单元,按其中数个单元内容的相关程度,共分4个群落,每个群落反映出某个共同性的主题,如机械制造、加工工艺和原理就融合为一个群落。每一单元内又包含A、B、C三篇课文。A篇一般为重点讲授内容,B篇可在教师指导下进行自学或进行课堂活动;机械大类内不同的专业也可根据自己所需内容的侧重点不同,适当调换A篇和B篇的位置。C篇可作课上快

速阅读训练使用。本书可供 70 学时使用。

本书每篇课文之后都配有测试学生阅读理解能力的练习题，用以帮助其正确获取有关信息。这些练习题大多是根据原文中信息点出现的先后顺序设计的，因此便于教学使用。

本教材经过在北京理工大学的两轮试用后，任课教师与学生均作出了积极反响，认为使用大类统一教材便于组织教学和进行检查；该教材课文内容新颖、知识性强、图文并茂，学起来有兴趣。又因该教材注意到了练习形式上与基础阶段的衔接，学生易于接受。总之，认为此教材走出了原有专业阅读教材的旧模式，针对性更强了。

参加本书顾问组的成员有：姚德源、朱小燕、陆晨、孙厚芳、辛企明、苑士华、刘福水、贾云得、刘培森、阎吉祥、孙志宏、文声敏、宋廷伦等。姚德源、朱小燕担任本书初审。借此机会，向他们表示诚挚的谢意。

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# UNIT 1

## Text A What Is Manufacturing ?

As you begin to read this article, take a few moments and 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 appear in your room. They have been transformed from various raw materials and assembled into the shapes that 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, wire or plastic coat hangers, metal brackets, and forks. However, most objects – automobile engines, ballpoint pens, toasters, bicycles, computers and thousands 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 we call 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 industrialized 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 industrialized 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 living of its people.

Manufacturing also involves activities in which the manufactured product is itself used to make other products. Examples are large



presses to form sheet metal for car bodies, metalworking machinery  
30 used to make parts for other products, and sewing machines for making clothing. An equally important aspect of manufacturing activities is servicing and 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,  
35 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 first appeared  
40 sometime during the fifteenth century. The word production is often used interchangeable 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*.

45 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,  
50 cutting tool, or electrical insulator, value is added to the clay. Similarly, a wire coathanger or a nail has a value over and above the cost of a piece of wire. Thus manufacturing has the important function of adding value.

Manufacturing is generally a complex activity, involving people  
55 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:

- 60
- A product must fully meet design requirements and specifications.
  - A product must be manufactured by the most economical methods in order to minimize costs.

- 65 • 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 on - time delivery to the customer.
- 70 • New developments in materials, 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.
- 75 • 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 of factors such as changes in market demands, product design, material and various other costs, and production methods on product quality and cost.
- 80 • 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.
- 85

### Comprehension Exercises

Choose a ), b ), c ), or d ) to complete each unfinished statement, making it closest in meaning to the relevant parts of the text :

1. It is not easy to \_\_\_\_\_ the objects when they appear around you.
  - a ) discover
  - b ) naturalize
  - c ) obtain
  - d ) categorize
2. A toaster is usually made of \_\_\_\_\_ made from \_\_\_\_\_.
  - a ) one part ... various materials
  - b ) several parts ... various materials

- c) one part ... one material  
d) several parts ... one material
3. \_\_\_\_\_ are made by various processes that we call manufacturing.  
a) The 15 000 parts of a typical automobile  
b) The 4 000 000 parts of a C-5A transport plane  
☒ c) The 15 000 parts and the 4 000 000 parts  
☒ d) The automobile and the C-5A transport plane
4. In the industrialized nations \_\_\_\_\_ makes up one third of the value of all goods and services.  
☒ a) manufacturing                      b) design  
c) production methods              d) production techniques
5. As manufacturing develops, the living standard \_\_\_\_\_.  
☒ a) will rise                              b) will not rise  
c) will not necessarily rise          d) will probably rise
6. Servicing and maintaining the machinery is \_\_\_\_\_.  
a) manufacturing  
b) the useful life of the machinery  
☒ c) also part of manufacturing  
d) equally important
7. The word manufacturing means making products \_\_\_\_\_ in its modern sense.  
a) only by hand  
b) only by machinery  
☒ c) by hand or by machinery  
d) neither by hand nor by machinery
8. Used as the raw material for ceramics, clay \_\_\_\_\_ after it is obtained from a mine.  
a) does not have any value  
☒ b) does have some value  
c) has an enormous value  
d) has little value
9. Manufacturing is an industrial activity which does not involve \_\_\_\_\_.  
a) people                                  b) machinery

c) automation

d) scoring

10. \_\_\_\_\_ is what a manufacturing organization tries its best to achieve.

a) Higher productivity

b) Abundant supply of materials

c) Higher market price

d) Great consumption of products

## Text B

### The Production Turn and Types

Manufacturing can be defined as the transformation of raw materials into useful products through the use of the easiest and least expensive methods. It is not enough, therefore, to process some raw materials and obtain the desired product. It is, in fact, of major importance  
5 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. Also, the production time should be as short as possible to enable  
10 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  
15 needed to achieve economical and trouble-free production. 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  
20 manufacturing. This is in addition to having a sound knowledge of the theoretical and practical aspects of the various manufacturing methods.

The standard of living in any nation is actually reflected in the

products and services available to its people. In a nation with a high  
25 standard of living, a middle-class family usually owns an automobile,  
a refrigerator, an electric stove, a dishwasher, a washing machine, a  
vacuum cleaner, a stereo, and — of course — a television set. Such a  
family also enjoys health care that involves modern equipment and fa-  
cilities. As you can easily see, all the above-mentioned goods, appli-  
30 ances, and equipment are actually raw materials that have been con-  
verted into manufactured products. Therefore, the more active in  
manufacturing raw materials the people of a nation are, the more plen-  
tiful those goods and services become; as a consequence, the standard  
of living of the people in that nation attains a high level. On the other  
35 hand, nations that have raw materials but do not fully exploit their re-  
sources by manufacturing those materials are usually poor and are  
referred to as “underdeveloped.” It is, therefore, the know-how and  
the capability of converting raw materials into useful products that  
basically determines the standard of living of a nation and not just  
40 the availability of minerals or resources within its territorial land. In  
fact, many industrial nations, such as Japan and Switzerland, import  
most of the raw materials which they manufacture and yet still main-  
tain a high standard of living.

### **The Production Turn**

45 In almost all cases, the main goal of a manufacturing project is  
to make a profit, the exception being projects that have to do with  
the national security or prestige. Now, let us establish a simplified  
model that illustrates the cash flow through the different activities as-  
sociated with manufacturing, so we can see how to maximize the pro-  
50 fit. As shown in Fig. 1, the project starts by borrowing money from a  
bank to purchase machines and raw materials and to pay the salaries  
of the engineers and other employees. Next, the raw materials are con-  
verted into products, which are the output of the manufacturing do-  
main. Obviously, those products must be sold (through the mar-  
55 keting department) in order to get cash. The latter is, in turn, used to  
cover the running costs as well as required payments to the bank; any  
surplus money left is actually the profit.

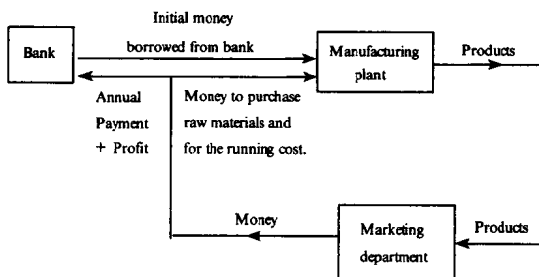


Fig . 1 The production turn.

We can see in this model that the sequence of events forms a continuous cycle (i. e., a *closed circuit*). This cycle is usually referred to as the *production turn*. We can also realize the importance of marketing, which ensures the continuity of the cycle. If the products are not sold, the cycle is obviously interrupted. We can also see that maximum profit is obtained through maximizing the profit per turn and/or increasing the number of turns per year (i.e., running the cycle faster). Obviously, these two conditions are fulfilled when products are manufactured in the easiest and least expensive way.

### Types of production

Modern industries can be classified in different ways. These include classification by process, classification by product, and classification based on the production volume and the diversity of products. The classification by process is exemplified by casting industries, stamping industries, and the like. When classifying by product, industries may belong to the automotive, aerospace, and electronics groups. The third method, i. e., classification based on production volume, identifies three main distinct types of production, mass, job shop, and moderate. Let us briefly discuss the features and characteristics of each type.

Mass production is characterized by the high production volume of the same (or very similar) parts for a prolonged period of time. An annual production volume of less than 50 000 pieces cannot certainly be considered as mass production. As you may expect, the production

85 volume is based upon an established or anticipated sales volume and is not directly affected by the daily or monthly orders. The typical example of mass-produced goods is automobiles. Since that type attained its modern status in Detroit, it is sometimes referred to as the Detroit type.

90 Job-shop production is based on sales orders for a variety of small lots. Each lot may consist of 20 up to 200 or more similar parts, depending upon the customers' needs. It is obvious that this type of production is most suitable for subcontractors who produce varying components to supply various industries. The machines employed must be flexible to handle variations in the configuration of the ordered components, which are usually frequent. Also, the employed personnel must be highly skilled in order to handle a variety of tasks, 95 which differ for the different parts that are manufactured.

Moderate production is an intermediate phase between the job-shop and the mass production types. The production volume ranges between 10 000 to 20 000 parts, and the machines employed 100 are flexible and multipurpose. This type of production is gaining popularity in industry because of an increasing market demand for customized products.

### Comprehension Exercises

Read each statement and decide whether it is true or false. Base your decision on the text.

1. It is also important to manufacture the desired product through employing the easiest, fastest, and most efficient methods.
2. To make a profit is the main goal of almost all manufacturing projects, including the national security-related ones.
3. The marketing department sells the products to get cash which is used to cover the costs of materials and machines, the payments to the engineers and other employees as well as those to the bank.
4. With a sound knowledge of materials, up-to-date machinery, problems in production, and various manufacturing methods, a manufacturing engineer can determine and define the equipment.

tools, and processes required in production.

5. The production turn is the cycle of events which a manufacturing organization gets through by obtaining a loan from a bank, making and selling products and paying back the loan.
6. The profit per turn can be maximized and the number of turns per year can be increased until the products are manufactured in the most efficient way.
7. The established sales volume rather than the daily or monthly orders has a direct influence on the production volume of mass production.
8. Since the ordered components often change, the machines used in job-shop production must be adaptable enough to manufacture the required products.
9. The highly skilled personnel in the job-shop manufacturing can handle products of the same type in quantity.
10. Manufacturers adopting moderate production is winning larger share of the market by turning out products which fit the special needs of the customers.

21

## Text C

### Moving Heavy Loads

- Ordinary cranes, used in the construction industry or for loading ships, can lift weights of up to 200 tonnes. But consider the following problems; a prefabricated 1 500- tonne section of a ship (such as the whole superstructure or the front part of the bow) has to be placed in its final position; a 6 000- tonne rocket has to be moved 5km (3 miles) to its launching site; a 7 000- tonne section of a stadium has to be placed in a new position. Each of these involves moving a heavy load, and each has been solved.
- 5

#### What are heavy loads?

- 10 The ability to move heavy loads is increasingly important to the engineering industries because the cost- saving of building assemblies



on a specific site before moving them to their final places is now accepted. But prefabricated structures are becoming larger and heavier. As new load-moving techniques have been developed, other industries  
15 have assessed their usefulness and have had to adopt them.

The word "heavy" is arbitrary, but for these purposes it includes loads ranging from hundreds of tonnes to tens of thousands of tonnes. Moving heavy loads has presented engineers with problems for thousands of years. Many suggestions have been put forward as to how  
20 stone was moved in the building of the pyramids and Stonehenge. Certainly a method using tree trunks as rollers would have been known at that period of history and animal or human power could have provided the motive force.

Man started with the lever and soon discovered the arrangements  
25 of the moving force, the load and the fulcrum (pivot) that would be most useful in particular applications. Archimedes is reputed to have claimed: "Give me a firm place on which to stand and I will move the earth". He realized that to use a long lever to gain a mechanical advantage would mean that a small movement of the load could be  
30 obtained with a large movement of the applied force.

### **The problems involved**

Moving heavy loads has always involved two different problems: how to reduce the friction underneath the load and how to provide sufficient force to overcome the friction remaining once the load is  
35 moving. To reduce friction, rolling logs were used and later wheels of various types. Grease was also applied to ease the movement of the load, particularly in the shipbuilding industry. More recently various "slippery" plastic coatings, such as polytetrafluorethylene (PTFE), have been used, as well as air and water cushions that operate like hovercraft.  
40

There are two kinds of friction involved in moving anything. Static or stationary friction has to be overcome to start something moving and dynamic or moving friction opposes its continued movement. The coefficient of friction between two materials is defined  
45 as the ratio of the force required to move the load to the weight