现代汽车技术英语

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前 言

本书是为高等学校汽车专业高年级学生专业英语课的学习而编写的。专业英语的教学一般在学生完成基础英语的学习后进行，目的在于使学生有针对性地转入专业应用性的阅读实践。通过一定学时的专业英语阅读实践，巩固已经掌握的基本词汇和语法知识，扩大专业词汇量，了解和掌握科技文章的文体及语法结构方面的知识，提高专业英语的阅读能力和应用能力，使学生能以英语为工具，获取和交流本专业所需的信息。本书也可供具有一定英语基础的汽车工程技术人员和有关的管理人员使用。

本书内容以汽车构造为主，重点选编了反映现代汽车新技术以及维修、保养等方面的文章。在课文内容的编排上尽量照顾专业知识学习的系统性，基本上按汽车发动机和底盘的系统进行编排。全书共24单元，每个单元包括课文、词汇、注释和练习。词汇的重点是专业词汇，注释是针对课文中出现的长难句作语法分析和翻译，练习则按每个单元的内容选编。书末附有汽车安全检测设备和常用的一些保修设备及工具的中英文名称对照。

本书承蒙卢振雄教授审阅，在编写过程中得到了华南理工大学汽车教研组吴诰珪教授和朱刚老师的大力支持和帮助，在此一并深表谢意。

由于编者水平有限，错误及不妥之处在所难免，敬请读者批评指正。

编者

1997年11月

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Unit One

Engine Fundamentals

Automobiles have been operated successfully by electric motors, steam engines and internal combustion engines. The internal combustion engine burns fuel within the cylinders, and converts the expanding force of the combustion or "explosion" into rotary mechanical force used to propel the vehicle.

There are several types of internal combustion engines: two and four cycle reciprocating piston engines, gas turbines, free piston and rotary combustion engines. However, the four cycle and, to a lesser degree, the two cycle reciprocating engines have been refined to such a degree that they have almost complete dominance of the automotive field.

Internal combustion engines can be made to operate on almost anything that can be converted into a gas that will burn: wood, coal, alcohol, vegetable oils, mineral oils, etc. However, because of convenience, a wide variety of petroleum products are used as fuel: gasoline, kerosene, fuel oil, liquified petroleum gas (LP-Gas), etc. When kerosene, fuel oil, or LP-Gas is used, it is necessary to alter the design or equipment of the engine to other than standard gasoline engine practice.

Gasoline engines used in automotive vehicles are of two ba-

sic types, four cycle and two cycle. Either may be water-cooled or air-cooled. The basic automobile engine is the reciprocating piston, four cycle, water-cooled, poppet valve, gasoline engine.

Each "cylinder" of the typical automobile engine has a "piston", which reciprocates (moves back and forth) within the cylinder. Each piston is connected to the "crankshaft" by means of a link known as a "connecting rod".

In any internal combustion engine, there is a definite series of events that must occur in sequence:

1. Fill cylinder or chamber with an explosive mixture.
2. Compress mixture into a smaller space.
3. Ignite mixture or cause it to explode.
4. Utilize explosive or expansive force for power production.
5. Remove burned mixture from cylinder or chamber.

This series of events must be repeated over and over in the same sequence, automatically in each cylinder, if the engine is to run.

The first need is to fill the cylinder with an explosive mixture. If gasoline is the fuel, it must be mixed with the proper proportion of 10 to 15 parts of air to each part of gasoline to operate in a gasoline engine. This mixture is compounded automatically and continuously by a carburetor.

If the fuel is fuel oil (diesel engine), it is injected into the cylinders under high pressure. In diesel engines, the heat generated by compressing the air in the cylinder may be used to ignite the fuel. In gasoline engines, an electrical spark is used.

Most automobile engines operate on the four-stroke cycle. This type of engine is known as "four cycle" or "Otto cycle", af-

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ter the name of its inventor, Nikolaus Otto. The power production cycle consists of four strokes of the piston in a reciprocating engine. The first stroke draws the combustible mixture into the cylinder. The next stroke compresses the mixture. The third stroke is the power stroke, which begins when the mixture is ignited. The final stroke forces burned gases out of the cylinder.

In the two-stroke cycle (two cycle) engine, the piston takes over some of the valve function in order to obtain a power stroke each revolution of the crankshaft. Two cycle operation involves the use of ports in the cylinders. These ports are covered and uncovered by the movement of the piston, which acts like a valve in controlling the filling and emptying of the cylinder.

During the two-stroke cycle, both inlet and exhaust ports are covered by the piston, except for a short time at the extreme end of the stroke. A deflector is built into the top of the piston on the inlet side, to divert the fresh mixture up into the cylinder, while the exhaust is leaving the cylinder on the opposite side.

The size of an engine is determined by its bore, stroke and number of cylinders. Bore is the diameter of the cylinders. Stroke is the length of piston travel. The bore area multiplied by the stroke will give the displacement of one cylinder. Multiply this by the number of cylinders and you will have engine displacement or size.

For example, a Plymouth six cylinder engine has a bore of 3.4 in. and a stroke of 4.12 in. Engine displacement is :

Bore area (πr^2)

$3.1416 \times 2.9 = 9.1$ sq. in.

One cyl. displacement (Bore area $\times$ stroke)

9.1×4.12=37.5 cu.in.

Engine displacement(One cyl. × No.of cyl.)

37.5×6=225.0 cu.in.

Size alone , however, is not an exclusive measurement of power developed by the engine. Many other things need to be taken into consideration:

1. Engine rotating speed.
2. Compression ratio.
3. Valve size,lift and timing.
4. Internal engine friction.
5. Mechanical condition of parts.

New Words and Expressions

1. automobile 小客车,汽车,机动车
2. internal combustion engine 内燃机
3. fuel ①燃料,燃油 ②[动]加燃料,加燃油
4. cylinder 气缸,缸筒
5. convert…into 把……转变成,把……转化为
6. propel [动]推进,推动
7. vehicle 车辆,机动车辆,运载工具
8. four cycle reciprocating piston engine 四冲程往复活塞式发动机
9. automotive 汽车的
10. a wide variety of 许许多多的,种类繁多的
11. petroleum 石油,石油产品
12. gasoline 汽油
13. kerosene 煤油
14. fuel oil 柴油
15. liquified petroleum gas (LP-Gas) 液化石油气
16. gasoline engine 汽油发动机

17. poppet valve　菌形气门，菌形阀
18. crankshaft　曲轴
19. by means of　用，通过，借助于
20. connecting rod　连杆
21. in sequence　挨次，逐一，顺序
22. explosive mixture　可燃混合气
23. ignite　[动]点燃，点火；发火，着火
24. carburetor　化油器
25. diesel engine　柴油机
26. electrical spark　电火花
27. stroke　行程
28. Otto cycle　奥托循环
29. combustible mixture　可燃混合气
30. power stroke　做功冲程
31. take over　接替，接受，接办
32. revolution　旋转，转数，循环
33. except for　除……之外
34. deflector　导流台，导流板
35. bore　①孔，孔径；气缸 ②[动]镗孔，钻孔，扩孔，镗气缸
36. diameter　直径
37. displacement　位移，排量，工作容积
38. engine displacement　发动机排量
39. compression ratio　压缩比
40. timing　正时，定时
41. friction　摩擦，摩擦力
42. mechanical condition　机械状况，机械条件

Notes

1. Internal combustion engines can be made to operate on almost anything that can be converted into a gas that will burn : wood, coal, alcohol, vegetable oils, mineral oils, etc.

几乎任何可转化成可燃气体的东西：木柴、煤、酒精、植物油、矿物油等都可使内燃机工作。

wood, coal, alcohol, vegetable oils, mineral oils, etc. 是 anything 的同位语，有割裂现象。

2. This type of engine is known as "four cycle" or "Otto cycle", after the name of its inventor, Nikolaus Otto.

发动机的这种循环称为"四行程循环"，或以发明者尼古拉斯·奥托的姓名命名为"奥托循环"。

介词 after 作"依据"解。

3. sq. in. 是 square inch 的缩写，意思是"平方英寸"。

4. cu. in. 是 cubic inch 的缩写，意思是"立方英寸"。

Exercises

Ⅰ. Put the following expressions into English:

1. 把往复运动转变成旋转运动
2. 水冷发动机
3. 柴油汽车
4. 火花点火式发动机
5. 通过连杆与曲轴连接
6. 使气缸充满可燃混合气
7. 空气与汽油的合适比例
8. 四冲程发动机
9. 气缸排量
10. 90 毫米的缸径

Ⅱ. Translate the following passage into Chinese:

The production model 1. 6 L VW swirl-chamber engine was used as the basis for the work on the 3-cylinder engine. With the retention of the basic dimensions, a bore of 76. 5 mm and a

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stroke of 86. 4 mm, a cylinder volume of 1. 2 L was obtained. All components not specific to the 3-cylinder design were taken over from the production engine.

The 3-cylinder crankshaft has a 120° crank offset, and the firing order is 1-2-3. The oscillating masses were compensated to 50 percent by balance weights on the crankshaft.

Because of its uncompensated first-order rotational inertia, the 3-cylinder engine develops a typical oscillation arising as a result of a negatively-rotating moment. It would be possible to compensate for this by means of a compensator shaft counter-rotative to the crankshaft, but without altering the basic design, this could be mounted only outside the crankcase.

Another new area of approach took the form of a decoupled bearing system with auxiliary frame for the drive unit ,and this method was used on the research vehicle.

Unit Two

Engine Classification

Before you study the detailed construction of the engine parts, you should know something about the several classes into which diesel, dual-fuel and gas engines may be divided. We can classify the engines in several ways: (1) operating cycle, (2) piston action, (3) piston connection, (4) cylinder arrangement, (5) method of fuel injection, and (6) speed.

Operating Cycle. Diesel and gas-burning engines can be divided into two groups based on the number of piston strokes per cycle, either four or two. An engine which needs four strokes to complete one cycle is a four-stroke cycle engine or, for short, a four-cycle engine. If it needs only two strokes to complete a cycle , we call it a two-stroke cycle engine or, for short , a two-cycle engine. Thus, a two-cycle engine fires twice as often as a four-cycle engine.

Piston Action. An engine's piston action may be classified as (a) single-acting, (b) double-acting, or (c) opposed-piston.

Single-acting engines use only one end of the cylinder and one face of the piston to develop power. This working space is at the end away from the crankshaft, that is , at the upper end of a vertical engine.

Double-acting engines use both ends of the cylinder and both faces of the piston to develop power on the upstroke as well as on the downstroke. The construction is complicated; therefore, double-acting engines are built only in large and comparatively low-speed units, generally to power motorships.

An opposed-piston engine has cylinders in each of which two pistons travel in opposite directions. The combustion space is in the middle of the cylinder between the pistons. There are two crankshafts: the upper pistons drive one, the lower pistons the other. Note that each piston is single-acting; that is , it develops power with only one face of the piston.

Piston Connection. The piston may be connected to the upper end of the connecting rod either directly ("trunk-piston" type),or indirectly ("crosshead" type).

In trunk-piston engines, a horizontal pin within the piston is encircled by the upper end of the connecting rod. This is by far the most common construction.

In crosshead-type engiens, the piston fastens to a vertical piston rod whose lower end is attached to a sliding member called a "crosshead", which slides up and down in guides. The crosshead carries a crosshead pin which is encircled by the upper end of the connecting rod. This more complicated construction is required in double-acting engines.

Cylinder Arrangement. A diesel or gas-burning engine has its cylinders arranged in one of several ways. Four basic cylinder arrangements are: (a) cylinder-in-line, (b) V-arrangement, (c) flat, and (d) radial.

A Cylinder-in-line Arrangement. This is the simplest and

most common arrangement, with all cylinders arranged vertically in line. This construction is used for engines having up to 12 cylinders. Engines are also built with horizontal cylinders, usually one or two, in a few cases with three cylinders.

If an engine has more than eight cylinders, it becomes difficult to make a sufficiently rigid frame and crankshaft with an in-line arrangement. Also, the engine becomes quite long and takes up considerable space. The V-arrangement, with two connecting rods attached to each crankpin , permits reducing the engine length by almost one-half, thus making it much more rigid, with a stiff crankshaft. It also costs less to manufacture and install. This is a common arrangement for engines with eight, twelve, and sixteen cylinders. Cylinders lying in one line are called a "bank," and the angle between the banks may vary, in manufacturing practice, from 30° to 120°, the most common angles being between 40° and 75°. (A complete circle is 360°.)

A flat engine is a V-engine with the angle between the banks increased to 180 deg. This arrangement is used where there is little headroom, as in trucks, buses, and rail cars. Flat engines are also called "opposed-cylinder" engines.

In a radial engine all the cylinders are set in a circle and all points toward the center of the circle. The connecting rods of all the pistons work on a single crankpin, which rotates around the center of the circle. The name "radial" is given because each cylinder is set on a radius of the circle, that is a line from the center of the circle to its circumference. Such a radial engine occupies little floor space. By attaching the connecting rods to a master disk surrounding the crankpin, as many as twelve cylin-

ders have been made to work on a single crankpin.

Method of Fuel Injection. Diesel engines are divided into air-injection engines and solid or mechanical-injection engines. Air-injection engines use a blast of highly compressed air to blow the fuel into the cylinder. Air-injection was commonly used on early diesel engines but with the development of solid-injection systems the air-injection engine is rapidly disappearing.

Speed. All diesel and gas-burning engines may be divided into three classes according to speed: low-speed, medium-speed and high-speed engines. Automotive diesel engines often run faster than 1,200 rpm, but the great majority of other engines run between 350 and 1,200 rpm and are termed medium-speed engines.

New Words and Expressions

1. dual-fuel engine 双燃料发动机
2. gas engine 汽油发动机,可燃气体发动机
3. (be) divided into 被分成
4. cylinder arrangement 气缸排列,气缸布置
5. fuel injection 燃油喷射
6. for short 为简略起见,简称
7. single-acting 单作用的
8. (be) away from 离开,远离,不在……处
9. upstroke (活塞)上行程
10. downstroke (活塞)下行程
11. motorship 内燃机船,汽船
12. crosshead 十字头,滑块
13. trunk-piston engine 筒状活塞式发动机
14. by far 最,非常,大大

15. cylinder-in-line　直列式气缸

16. sufficiently rigid frame　足够刚性的机架

17. take up　占有

18. crankpin　曲柄销

19. truck　卡车，载货汽车

20. rail car　轨道车辆，机动有轨车辆

21. flat engine　卧式发动机，平置式发动机

22. radial engine　径向式发动机，星形发动机

23. as many as　多达，达……之多

24. the great majority of　大部分，大多数

Notes

1. An opposite-piston engine has cylinders in each of which two pistons travel in opposite directions.

对置式发动机的每个气缸中有两个活塞沿相反方向运动。

in each of which 引导的定语从句说明 cylinders。in each of which 在从句中作状语。

2. There are two crankshafts; the upper pistons drive one, the lower pistons the other.

有两根曲轴：上面的活塞驱动一根，下面的活塞驱动另一根。

the lower pistons the other 省略了与前一分句相同的谓语动词 drive.

3. In crosshead-type engines, the piston fastens to a vertical piston rod whose lower end is attached to a sliding member called a "crosshead", which slides up and down in guides.

在十字头型发动机中，活塞连接在一根垂直的活塞杆上。活塞杆的下端又连接在一个叫做"十字头"的滑块上，十字头在导轨中上下滑动。

这是一个主从复合句。由 whose 引导的定语从句说明 piston rod。由 which 引导的定语从句说明 crosshead。

4. …, with all cylinders arranged vertically in line.

……，所有的气缸垂直排列成行。

这是一种介词后的分词独立结构，补充说明情况。all cylinders 和