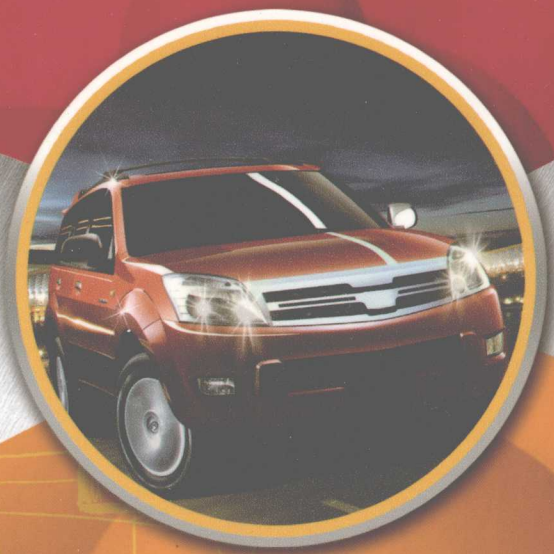
21世纪高职高专规划教材

——汽车运用与维修系列

汽车专业英语

主　编/李　晗　　副主编/张　义



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编委会

出版说明

进入21世纪以来，随着我国汽车工业的迅猛发展和人民生活水平的不断提高，随着公路运输设施和城市基础设施建设投资的迅速增加，以及政府鼓励汽车消费政策的逐步实施，我国汽车保有量迅速增长。目前，我国汽车数量每年以两位数的增长率递增，据此，预计仅汽车维修业近两年就将新增80万从业人员，其中大部分从业人员需要接受职业教育与培训。中国人民大学出版社经过充分的市场调研，策划出版了这套高职高专汽车运用与维修专业的系列教材。

本套教材紧密贴近我国高职教学改革的实际，力求体现以下几个特点：

1. 以企业需求为基本依据，以就业为导向

教材的编写以就业为导向，以能力为本位，能够满足企业的工作需求，提高学生学习的主动性和积极性。我们对每本书的主编精心遴选，除了要求主编必须是高职院校的骨干教师外，还要求他们有在一线汽车相关企业的工作经验或实验实训经历，确保教材的内容既能紧密贴合教学大纲，又能准确把握市场需求、加强实践操作环节内容。

2. 适应汽车企业技术发展，体现教学内容的先进性和前瞻性

本套教材关注我国汽车制造和维修企业的最新技术发展，通过校企合作编写的形式，及时调整教材内容，突出本专业领域的新知识、新技术、新工艺和新方法，克服旧教材存在的内容陈旧、更新缓慢、片面强调学科体系完整、不能适应企业发展需要的弊端。每本教材结合专业要求，使学生在学习专业基本知识和基本技能的基础上，及时了解、掌握本领域的最新技术发展及相关技能，实现专业教学基础性与先进性的统一。

3. 教材内容按模块化形式编写

教材力求摆脱学科课程旧思想的束缚，从岗位需求出发，尽早让学生接触实践操作内容。根据具体的专业情况，有的是每本书一个模块，有的是每本书分为多个模块，每部分内容都以工作岗位所需要的技能展开。

4. 跨区域开发、整合多方优势

由于我国幅员辽阔，各地区经济发展都具有不同的地域特点，而作为与经济建设密切相关的职业教育也必然存在区域间的差异。为了打造出一套适用性强、博采众长的教材，我们在教材的策划阶段，即与不同区域的众多开设汽车相关专业的高职院校取得了联系，并进行了深入调研，经过反复研讨后确定了具体的编写大纲。教材在编写过程中得到了辽宁交通高等专科学校、承德石油高等专科学校、长春汽车工业高等专科学校、内蒙古交通职业技术学院、河南交通职业技术学院、河北交通职业技术学院、广东轻工职业技术学院等二十多家职业院校的参与与大力支持。

5. 教材配备完善的立体化教学资源

本系列教材在研发的同时，希望能够在相关课件的开发制作方面做出自己的特色，从而提升教材的核心竞争力。通过对市场的前期调研，我们对目前已经出版的相关教材配套

课件情况进行了分析，针对目前同类产品存在的不足，制定了专业基础课教材课件完整、专业主干课教材演示视频丰富、全系列教材教学资源整合形成网上资源平台的策划思路，力求使本套教材成为真正的立体化教材。

本套教材在编写过程中，除了得到多所高职院校的帮助外，《汽车维修技师》、辽宁交通高等专科学校汽车研究所、辽宁鑫迪汽车销售服务有限公司、大连新盛荣汽车销售服务有限公司、辽宁宝时汽车销售服务有限公司、安徽宝德汽车维修有限公司等在技术和资料方面给予了很多支持，在此表示衷心的感谢。

希望本套教材的出版能够为高职高专院校汽车运用与维修专业的教学工作起到积极的促进作用，也欢迎本套教材的使用者针对教材中存在的不足提出宝贵的建议。

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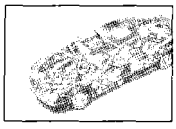

前言
Preface

随着汽车工业的国际化，社会对于汽车从业人员的要求也就越来越高，对于既懂专业又懂英语的人才更是需求若渴，为此我们编写了本教材，以适应全国对更高层次的汽车专业技能人才的需求。

本教材在编写中以汽车构造为主线，主要介绍了汽车各个系统的基本构造及工作原理，同时选编了现代汽车技术方面的专业内容，如汽车电脑、安全气囊和智能车辆等。本书内容多采用外文原著，较好地反映了汽车专业英语自身特色，既介绍了汽车专业的传统知识，也涉及了汽车新技术、新结构，以及一些先进的设备和仪器的使用。全书共12个单元，每个单元由课文、词汇、短语和句子注释、练习组成，既增强了本书的自学性，又增强了阅读性；文中配有必要的插图，加深了读者的理解；每单元都有一段对话，有利于提高学习者的英语会话能力。

全书由辽宁交通高等专科学校汽车系李晗任主编、张义任副主编。参加本书编写的还有：辽宁交通高等专科学校汽车系的张红伟、田有为、杨洪庆、孙连伟、沈沉、张立新、明光星、仲琳琳、卢中德及沈阳农业大学的杨德旭。

限于编者的经历和水平，书中难免有错误和不妥之处，敬请广大读者批评指正。

编者

2009年2月

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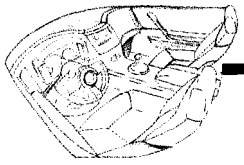


Unit 1

Engine Operating Principles and Engine Construction

Part A Engine Overall Mechanics

The engine is the source of power that makes the wheels go around and the car moves. The automobile engine is a machine that turns heat energy of fuel into mechanical energy for moving the vehicle. Because fuel is burned within the engine, it is also called for internal-combustion engine. The burning of gasoline inside the engine produces high pressure in the engine combustion chamber. This high pressure forces piston to move, the movement is carried by connecting rods to the engine crankshaft. The crankshaft is thus made to rotate; the rotary motion is carried through the power train to the car wheels so that they rotate and the car moves. (1)

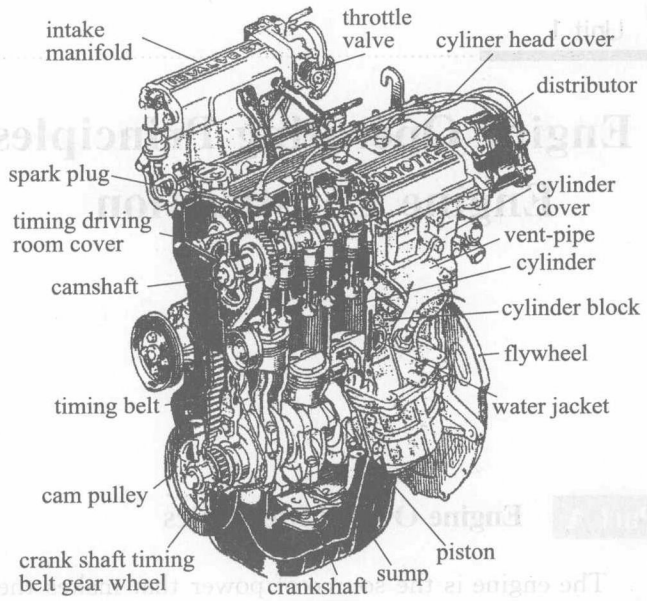
The engine needs different systems to perform above function. They are piston crank mechanism, valve mechanism, fuel system, ignition system, starting system, cooling system and lubricating system in a gasoline engine, yet there is no ignition system in a diesel engine because the diesel is burned by compression-ignition. (2)

Piston Crank Mechanism

Piston crank mechanism is the main engine sport body. Its function is to transform piston reciprocating movement into the crankshaft rotational movement. At the same time, piston crank mechanism changes the press on the pistons into the external output torque of the crankshaft to drive vehicle wheel rotation.

Valve Mechanism

In accordance with the requirements of each cylinder work cycle,



Engine overall structure

valve mechanism must open and close the intake valve and exhaust valve on time, so that fresh combustible gas mixture (gasoline engine) or air (diesel engine) access to the cylinder timely, exhaust from the cylinder to be discharged in time.

Fuel System

The engine requires a fuel system to supply it with a mixture of air and fuel. The conventional fuel system does this by pumping liquid gasoline from a tank into the carburetor, a mixing device that mixes the gasoline with air in correct proportion. The mixture is delivered to the engine where it is burned. But because the carburetor is a mechanical device that is neither totally accurate nor particularly fast in responding to changing engine requirements.[3] Adding feedback controls and other emission-related devices in recent years has resulted in very complex carburetors. The solution to the problems posed by a carbureted fuel system is electronic fuel injection (EFI).

Ignition System

The ignition system provides high-voltage electric sparks that ignite, or set fire to, the charges of air/fuel mixture in the engine combustion chambers.[4]

Starting System

The starting system's purpose is to change the electrical current into the mechanical energy to push the crankshaft around. By means of this, the engine can be started.

Cooling System

The engine also needs a cooling system, the combustion of the air/fuel mixture in the engine creates a very high temperature (as high as 2,000°C to 2,700°C). The cooling system takes heat away from the engine by circulating a liquid coolant between the engine and a radiator. The coolant gets hot as it goes through the engine. Thus, the coolant continually takes heat away from the engine, where it could do damage, and delivers it to the radiator. Air passing through the radiator takes heat away from the radiator.

Lubricating System

The engine also includes a lubricating system. The purpose of the lubricating system is to supply all moving parts inside the engine with lubricating oil; the oil keeps moving parts from wearing excessively.

Part B The Four-Stroke Engine

Four-Stroke-Cycle Gasoline Engine

The movement of the piston from its upper-most position (TDC, top dead center) to its lowest position (BDC, bottom dead center) is called a stroke. Most automobile engines operate on the four-stroke-cycle principle. A series of events involving four strokes of the piston complete one cycle. These events are: the intake stroke, the compression stroke, the power stroke, and the exhaust stroke. Two revolutions of the crankshaft and one revolution of the camshaft are required to complete one cycle.

On the intake stroke the piston is pulled down in the cylinder by the crankshaft and connecting rod. During this time the intake valve is held open by the camshaft. Since the piston has moved down in the cylinder, creating a low pressure area (vacuum), atmospheric pressure forces a mixture of air and fuel past the intake valve into the cylinder.[5] Atmospheric pressure is approximately 14.7 pounds per square inch (about 101.35 kilopascals) at sea level. Pressure in the cylinder during the intake stroke is considerably less than this. The pressure difference is the force that causes the air-fuel mixture to flow into the cylinder, since a liquid or a gas (vapor) will always flow from a high- to a low-pressure area.

As the piston is moved up by the crankshaft from BDC, the intake valve closes. The air-fuel mixture is trapped in the cylinder above the piston. Further piston travel compresses the air/fuel mixture to approximately one-eighth of its original volume (approximately 8 : 1 compression ratio) when the piston has reached TDC.[6] This completes the compression stroke.

When the piston is at or near TDC, the air-fuel mixture is ignited. The burning of the

air-fuel mixture takes place at a controlled rate. Expansion of the burning mixture causes a rapid rise in pressure. This increased pressure forces the piston down on the power stroke, causing the crankshaft to rotate.

At the end of the power stroke the camshaft opens the exhaust valve, and the exhaust stroke begins. Remaining pressure in the cylinder, and upward movement of the piston, force the exhaust gases out of the cylinder. At the end of the exhaust stroke, the exhaust valve closes and the intake valve opens, repeating the entire cycle of events over and over again.

To start the engine, some method of cranking the engine is required to turn the crankshaft and cause piston movement. (7) This is done by the starter motor when the ignition key is in the start position. When sufficient air/fuel mixture has entered the cylinders and is ignited, the power strokes create enough energy to continue crankshaft rotation. At this point, the ignition key is released to the run position and the starter is disengaged.

Sufficient energy is stored in the flywheel and other rotating parts on the power strokes to move the pistons and related parts through the other three strokes (exhaust, intake, and compression). The amount of air-fuel mixture allowed to enter the cylinders determines the power and speed developed by the engine.

Four-Stroke-Cycle Diesel Engine

The diesel engine is easily recognized by the absence of such components as spark plugs, ignition wires, coil, and distributor, common to gasoline engines.

Diesel engines, in principle, work in the same way as gasoline engines do. But diesel engine has its characteristic features that is different from the gasoline engine. Firstly, the explosive mixture of the gasoline engine is provided by EFI, but in the case of the diesel engine the supply is effected by an injection or "jerk" pump which forces a "shot" of fuel into each cylinder in turn according to the correct firing sequence. Secondly, the fundamental difference between gasoline and diesel engines is that in the gasoline engine the source of the heat for igniting the charge is the electric spark generated by the spark plug. (8) In the diesel engine the source of heat for igniting the charge is created within the engine by compressing pure air to a degree that will initiate combustion and then injecting the fuel at the right time in relation to the movement of the crankshaft. (9) Both classes of engines are of very similar construction. But as the diesel engine is called upon to withstand very much greater stresses due to higher pressures in cylinders, it has to be of more substantial construction, and is thus heavier. (10) In general, the diesel engine may weigh about 9.25 kilograms per kilowatt. The most important advantage of the gasoline engine is its lower weight per kilowatt. The gasoline engine for automobiles weighs about 6～17 kilograms per kilowatt, and gasoline engines for airplanes may weigh as little as 0.77 kilograms per kilowatt. This advantage prevents the diesel engine from replacing the

gasoline engine in some automobiles and airplanes. [11]

However, the diesel engine is more efficient, because it has higher compression ratio. Its ratio may be as high as 16 to 1. Up to 40 percent of the chemical energy of the burning fuel may be changed into mechanical energy. In addition, the diesel engine runs cooler than the gasoline engine. This advantage is especially obvious at lower speed. Diesel oil is not only cheaper than gasoline antifreeze mixture, but also safer to store.

Part C Engine Noise Diagnosis

There are different abnormal noises when the engine working sometimes. The following listing will point out the most common causes of sound itself and what must be done to correct them.

1. An abnormal sound originating from some form of piston ring problem is audible during engine acceleration. To correct the cause of ring noise, it may be necessary, therefore, to replace the rings, the pistons, or the sleeves or rebore the cylinders.

2. Piston slap is a very common noise most noticeable when an engine is cold. A piston that slaps against the cylinder wall produces a hollow, muffled, bell-like sound, quite audible when an engine is operating under load at low rpm. [12] Piston slap results from worn pistons or cylinders, collapsed piston skirts, excessive piston-to-cylinder wall clearance, misaligned connecting rods, or a lack of lubricating oil. Therefore, in order to correct piston slap, it will be necessary to replace or resize the pistons, rebore the cylinders or replace the sleeves, replace or realign the rods, or add oil to the engine.

3. A piston-pin knock is noticeable most of the time when an engine is idling. Piston pin noise is usually the result of a worn piston pin, piston-pin boss, pin bushing, or a lack of oil. To correct this problem, install oversize pins, replace the bushings and pins, or service the engine with oil.

4. A sound not frequently heard in an engine is that of a piston ring striking the ring ridge at the top of the cylinder. This particular problem causes a very distinct and high-pitched, metallic rapping or clicking noise audible at all engine speeds but particularly on deceleration. [13] To repair the cause of this sound, it will be necessary to replace the piston pin or connecting rod bearings.

5. An abnormal noise that is audible when the engine is running at speeds above 35 miles per hour (mph) without a load is usually the result of loose connecting-rod bearings. Loose rod bearings cause a light to heavy knock or pound, depending on how badly the bearings are worn. Connecting rod bearing noise can be due to a worn bearing, crankpin, misaligned rod, or lack of oil. To correct the noise, it will be necessary to replace the bearings, service or replace the crankshaft, realign or replace the rod, or service the engine with oil.

6. A loose vibration damper or flywheel can also cause abnormal engine noises. This

sound is more noticeable during engine acceleration from idle under load or at an uneven idle. But it is less apparent at higher engine rpm or during smoother engine operation. A loose flywheel, on the other hand, sets up either a heavy thump or a light knock at the back of the engine, depending upon the amount of play the flywheel has and the type of engine. You can detect a loose flywheel by shutting off the ignition switch at idle and then turning it on again just before the engine stops rotating. Also, operating the clutch pedal, at the same time the noise is audible at running speeds, will vary the sound enough so that it is easier to identify and then locate its source.

7. An abnormal noise that is audible upon engine acceleration under load is usually the result of a loose crankshaft main or thrust bearing. Main or thrust bearing noise is usually the result of worn bearings, crankshaft journals, or a lack of oil. To correct this noise, it will be necessary to replace the bearings, crankshaft, or service the engine with oil.

8. Excessive clearance in the valve train produces a noise that is usually more apparent during engine idle rpm than any other time.[14] Valve-train noise is brought about by improper valve adjustment, worn or damaged parts, dirty hydraulic lifter, or lack of clean lubricating oil. In order to correct the cause of the noise, it will be necessary to adjust the valves, replace worn or damaged parts, clean or replace the lifters, or service the engine's lubrication system.

9. The one abnormal sound unrelated to worn, damaged, loose, or maladjusted engine parts is detonation knock.

The noise is most noticeable during acceleration with the engine under load and operating at normal temperature. Excessive detonation is very harmful to the engine, and you should do everything possible to correct the cause as soon as possible. Detonation knock in an engine is usually the product of advanced ignition timing, excessive carbon build-up in the combustion chambers, or use of too low an octane fuel.[15] To correct this malfunction, check the distributor's advance mechanisms , check and reset the ignition timing adjustment, decarbonize the engine , or recommend a change in fuel to one with a higher octane rating.

Part D Dialogue

A: Hello! Welcome to Blue Sky Automobile Company. Can I help you?

B: I want to buy a car. Could you introduce some new model?

A: OK, I'd like to show you the new model, 2008 Buick Lacrosse.

B: Oh, it looks nice.

A: Yes, I bet you'll like it more after my introduction. Its unique RES (Remote Engine Start) permits you start the engine 50 metres away, and the AC (Air Conditioning) which has been set consequently start work. So you will feel very comfortable when you access the car.

B: Very good. Could you tell me more about the specifications of this model?

A: Sure. As you can see it's of deluxe body style with Black exterior, 2.4 Liter V6 engine.

B: How about its chassis?

A: It's electronically controlled six-speed automatic transmission with manual shift mode, four-wheel independent suspension and front and rear disc brake. All prove it is quite a good car.

B: I like it very much. What's the price?

A: The price is RMB 240,000.

B: Any discount?

A: Well, this is the newest model and very popular. I think it's worthy.

B: OK, I will take it.

A: Thank you.

New Words

1. engine ['endʒɪn] *n.* 发动机，引擎
2. mechanics [mɪ'kænɪks] *n.* 力学，机械学，机件
3. automobile ['ɔ:təməbi:l] *n.* 汽车
4. vehicle ['vi:ɪkl] *n.* 交通工具，车辆
5. gasoline ['gæsəli:n] *n.* 汽油
6. combustion [kəm'bʌstʃən] *n.* 燃烧，烧毁
7. chamber ['tʃeɪmbə] *n.* 房间，室
8. piston ['pɪstən] *n.* 〈机〉活塞
9. crankshaft ['kræŋkʃɑ:ft] *n.* 曲轴
10. diesel ['di:zəl] *n.* 柴油
11. reciprocating [rɪ'sɪprəkeɪtɪŋ] *adj.* 往复的，来回的，交替的
12. torque [tɔ:k] *n.* （尤指机器的）扭转力
13. cylinder ['sɪlɪndə] *n.* 圆筒，圆柱体，气缸
14. discharge [dɪs'tʃɑ:dʒ] *vt.* & *vi.* 放出，流出 *n.* 排放出的物体
15. pump [pʌmp] *n.* 泵，打气筒 *vt.* & *vi.* 用抽水机汲水，给……打气
16. tank [tæŋk] *n.* 油（水）箱，罐，槽
17. carburetor ['kɑ:bjuretə] *n.* 〈机〉化油器
18. deliver [dɪ'lɪvə] *vt.* & *vi.* 递送，交付
19. feedback ['fi:dbæk] *n.* 反馈，反馈信息
20. voltage ['vəʊltɪdʒ] *n.* 电压，伏特数
21. circulate ['sə:kjʊleɪt] *vt.* & *vi.* （使）循环，（使）流通，散布，传播
22. coolant ['ku:lənt] *n.* 冷冻剂，冷却液，散热剂
23. radiator ['reɪdɪeɪtə] *n.* 汽车引擎的冷却器，散热器

24. wear [weə] *n.* 穿，衣服，磨损 *vt.* 穿着，磨成 *vi.* 磨损，变旧，用坏
25. revolution [ˌrevə'luːʃən] *n.* 革命，彻底改变，旋转
26. camshaft ['kæmʃɑːft] *n.* 凸轮轴
27. vacuum ['vækjuəm] *n.* 真空，空间，空虚 *vt.* 用真空吸尘器清扫
28. approximately [ə'prɒksɪmətlɪ] *adj.* 近似地，大约
29. pound [paʊnd] *n.* 磅，英镑 *vt.* & *vi.* 连续重击
30. vapor ['veɪpə] *n.* 水蒸气 *v.* （使）蒸发
31. ignite [ɪg'naɪt] *vt.* & *vi.* 点燃，引发
32. flywheel ['flaɪwiːl] *n.* 飞轮
33. coil [kɔɪl] *n.* 卷，圈，线圈 *vt.* & *vi.* 将……卷（盘）成圈或螺旋形
34. distributor [dɪs'trɪbjʊtə] *n.* 分电器
35. explosive [ɪks'pləʊsɪv] *adj.* 爆炸的，爆发的 *n.* 爆炸物，炸药
36. pure [pjʊə] *adj.* 纯的，纯净的，完全的
37. initiate [ɪ'nɪʃɪeɪt] *vt.* 开始，着手
38. antifreeze ['æntɪfriːz] *n.* 防冻剂
39. noticeable ['nəʊtɪsəbl] *adj.* 显而易见的，明显的，显著的
40. hollow ['hɒləʊ] *adj.* 空的 *n.* 洞，坑，凹地 *vt.* 挖洞
41. muffle ['mʌfl] *vt.* 压抑，捂住 *n.* 沉闷的声音
42. collapse [kə'læps] *vi.* 倒塌，塌下，崩溃 *n.* 倒塌，崩溃
43. align [ə'laɪn] *vt.* 使成一线
44. sleeve [sliːv] *n.* 衣服袖子，套管，套筒
45. pitch [pɪtʃ] *n.* 音调，音高
46. bearing ['beərɪŋ] *n.* 轴承
47. idle ['aɪdl] *adj.* 空闲的，闲着的 *vi.* 闲逛，空转 *n.* 怠速
48. vibration [vaɪ'breɪʃən] *n.* 震动
49. damper ['dæmpə] *n.* 起抑制作用的因素
50. clearance ['klɪərəns] *n.* 净空，余隙
51. octane ['ɒkteɪn] *n.* 辛烷
52. specification [spesɪfɪ'keɪʃən] *n.* 说明书，详细的计划书，说明
53. deluxe [dɪ'lʌks，dɪ'lʊks] *adj.* 豪华的，华丽的 *adv.* 豪华地
54. chassis ['ʃæsɪ] *n.* （车辆的）底盘，（飞机的）机架
55. ridge [rɪdʒ] *n.* 脊，山脊
56. valve [vælv] *n.* 阀，活门

Phrases and Expressions

1. internal-combustion engine 内燃机
2. heat energy 热能
3. mechanical energy 机械能