符合STCW78/95公约要求

航海高等教育与培训教材

轮机英语教程

□ 李品友　主编
□ 薛　菁　主审

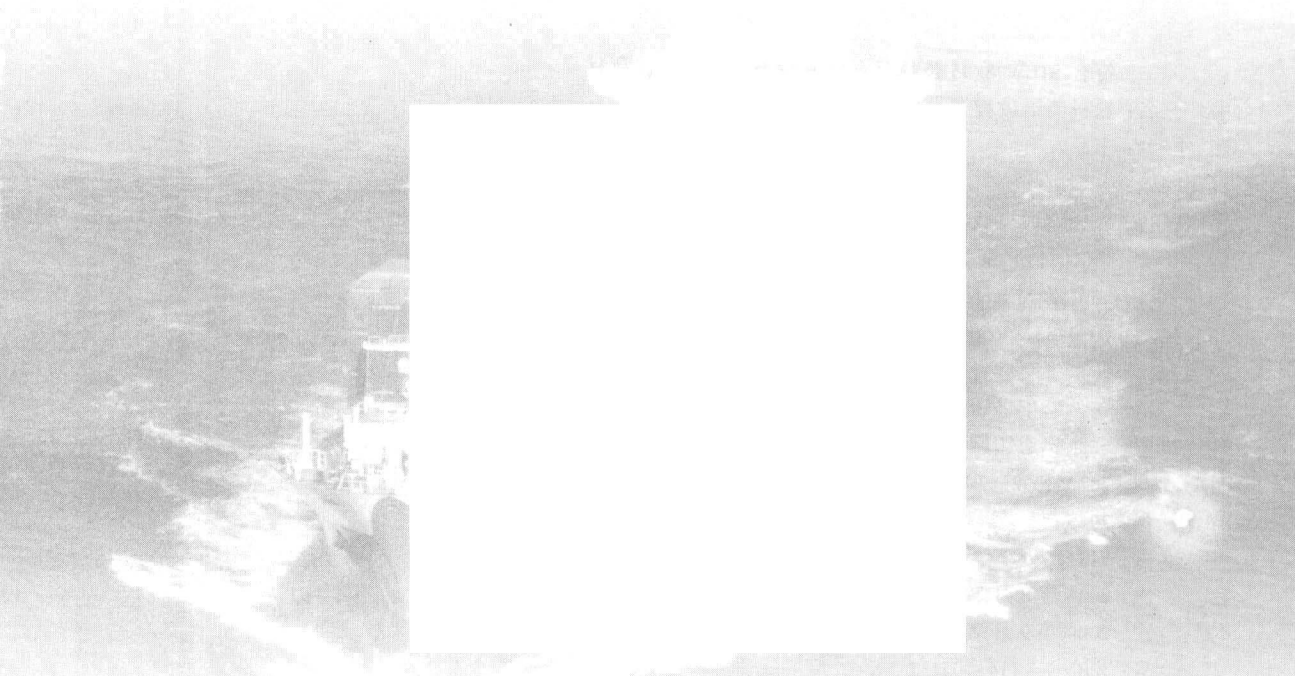
人民交通出版社

符合STCW78/95公约要求

航海高等教育与培训教材

轮机英语教程

□ 李品友 主编
□ 薛 菁 主审



人民交通出版社

内 容 提 要

本书是为船舶轮机管理人员学习英语而编写的。全书共分两大部分:第一部分是阅读理解,内容涉及现代轮机管理业务所涵盖的有关船舶柴油机及其工作系统、各种船舶辅助机械、船舶电气自动化、机舱业务管理以及相关国际公约法规等专业文献、每篇课文后有词汇表、难句注释、练习题和参考答案;第二部分是轮机英语统考试题注释、对中国海事服务中心组织编审的轮机英语试题库的试题逐一进行了注释。此外,为了使学员学习巩固英语基本词法和句法,"轮机英语基础语法"汇总了在轮机专业英语学习、考试中常见的语法,一并附于书后。

本书可作为海船轮机长、轮机员适任证书培训学习用书,也可作为广大轮机管理人员、大专院校轮机管理(工程)专业、船舶机械制造和修理专业学习专业英语的教材。

图书在版编目(CIP)数据

轮机英语教程/李品友主编 .—北京:人民交通出版社,2004.8
ISBN 7-114-05131-X

Ⅰ.轮… Ⅱ.李… Ⅲ.轮机-英语-教材 Ⅳ.H31

中国版本图书馆 CIP 数据核字(2004)第 058359 号

符合 STCW78/95 公约要求航海高等教育与培训教材

书　　名:轮机英语教程
著 作 者:李品友
责任编辑:黄兴娜
出版发行:人民交通出版社
地　　址:(100011)北京市朝阳区安定门外外馆斜街 3 号
网　　址:http://www.ccpress.com.cn
销售电话:(010)85285656,85285838,85285995
总 经 销:北京中交盛世书刊有限公司
经　　销:各地新华书店
印　　刷:北京凯通印刷厂
开　　本:787×1092　1/16
印　　张:20.5
字　　数:512 千
版　　次:2004 年 8 月第 1 版
印　　次:2004 年 9 月第 1 版第 2 次印刷
书　　号:ISBN 7-114-05131-X
印　　数:3001—5000 册
定　　价:35.00 元
(如有印刷、装订质量问题的图书由本社负责调换)

前　言

随着我国加入 WTO，世界经济全球化的进一步深入，越来越多的海船轮机长、轮机员将走出国门，加入到国际海员劳务输出队伍。提高我国海船轮机长、轮机员的英语素质，对保证他们在竞争日趋激烈的国际航运、劳务输出市场中处于领先地位至关重要。与此同时，为了满足 STCW 公约对海员英语运用能力更高的要求，中华人民共和国海事局已经并将进一步对《海船轮机长、轮机员英语考试和评估大纲》进行改革和完善，《轮机英语》科目的考试和评估也正在从广度和深度上进行调整。因此，轮机英语的教学培训应更着重于对轮机长、轮机员英语实际运用能力的培养。本书就是为适应这样的新形势而组织编写的。

较之以往的轮机英语教材，本书具有以下特点：

1. 课文的选材更注重于对轮机设备的操作和管理方面的专业文献，撷取了许多优秀轮机英语教材的精粹，同时吸收了编者长期从事轮机英语教学培训过程中总结出来的经验；

2. 针对现代船舶轮机管理技术对轮机专业英语的特殊要求，许多课文配备了图片，这有助于引导学员用英语思考专业问题；

3. 增加了有关重要国际公约方面的阅读文献，这一方面有助于学员对相关国际法规的理解，另一方面也适应国家海事局对海船船员国际公约知识考查力度进一步加强的趋势；

4. 编写体系更适合于教学培训和自学巩固，每篇课文后对难点和重点进行了必要的注释，并配有一套旨在巩固和提高的练习题，练习题遴选和吸收了国内外海船轮机长、轮机员适任证书考试中的经典试题；

5. 系统地对中国海事中心组织编审的轮机英语统考试题库进行了注释，供学员考证前强化训练之用。

在编写中，我们参考了国内外有权威性的《轮机工程手册》和有关期刊中具有代表意义的专业文献。全书取材密切结合现代轮机管理专业实际需要，编写体系合理，条理清楚。相信本书对广大轮机管理人员学习专业英语，提高专业英语素质和应试能力定能有所裨益。

本书的编写工作始终得到中国海事服务中心，上海海事大学商船学院、继续教育学院，交通部上海船员培训中心等单位的鼎力支持，也得到了上海海事大学轮机系同仁、航运企业轮机界和英语界的前辈和朋友们的热情鼓励。上海海事大学继续教育学院院长薛菁同志对全书进行了审定，在此一并表示衷心的感谢！

由于编者水平所限，本教材中不足和错误之处在所难免，敬请广大同仁和读者不吝指正。谨先致谢！

李品友

2004 年 6 月

CONTENTS

PART I READING COMPREHENSION 1

Lesson 1 Brief Introduction to the Marine Diesel Engines 1
Lesson 2 The 4-stroke Cycle and the 2-stroke Cycle 8
Lesson 3 Diesel Engine Construction (I) 15
Lesson 4 Diesel Engine Construction (II) 23
Lesson 5 The Fuel Pump and the Fuel Injector 31
Lesson 6 Combustion of Fuel Oil 39
Lesson 7 Main Diesel Engine Cooling System 45
Lesson 8 Preparation for Standby 52
Lesson 9 Scavenge Fire 58
Lesson 10 Operating Troubles and Their Remedies 65
Lesson 11 Deck Machinery 71
Lesson 12 Steering Gear 77
Lesson 13 Steam Boiler 84
Lesson 14 Oily Water Separator 91
Lesson 15 Oil Purifier 99
Lesson 16 Marine Refrigeration 112
Lesson 17 Fresh Water Generator 120
Lesson 18 Troubleshooting Centrifugal Pumps 128
Lesson 19 Alternator Operation 135
Lesson 20 Switchboards 141
Lesson 21 Central Engine Room Operating System Components 148
Lesson 22 Centralized Control and UMS 155
Lesson 23 Bunkering 162
Lesson 24 Oil Record Book Instruction 168
Lesson 25 Making the Rounds Before Taking Over the Watch 175
Lesson 26 Basic Principles to be Observed in Keeping an Engineering Watch(I) 182
Lesson 27 Basic Principles to be Observed in Keeping an Engineering Watch(II) 189
Lesson 28 International Safety Management Code (I) 197
Lesson 29 International Safety Management Code (II) 204
Lesson 30 More Detailed Inspections for PSC 211

PART II NOTES TO THE EXAMINATION QUESTIONS FOR MARINE ENGINEERS 222

Appendix Basic English Grammar for Marine Engineers 297

PART I READING COMPREHENSION

Lesson 1 Brief Introduction to the Marine Diesel Engines

The 2-Stroke Crosshead Engine

The 2-stroke crosshead engine has long been the favored main propulsive power unit for most types of merchant vessels. As the price of oil rose, developments in the design of these engines allowed them to burn the poorer residual fuels(1). This combined with major improvements in turbocharger design and waste heat recovery, raised their efficiency and power output, so they were able to win the steam turbine plants which operated at much lower efficiencies.

The number of companies which design and build these engines (along with their licensees) have reduced over the years due to takeovers, amalgamations, and closure. Three companies still in business are MAN B&W (formed by the amalgamation of those two giants of the industry); The Wartsila Corporation (formally Wartsila NSD) who design and build the Sulzer engines; Mitsubishi Heavy Industries in Japan also design and build their own 2-stroke engine, the UE.

Due to the longevity of these engines and the professionalism of the engineers in charge of them, there are still ships sailing the globe powered by engines which are no longer built. Doxfords, Gotaverkens, Fiats are names which may bring back memories as well as the older designs of Burmeister and Wain, Sulzer, and MAN.

Although the picture shown (Fig. 1) is of a Sulzer RTA engine, this text is intended to give a general insight into the design of the 2-stroke crosshead engine, and it is not our intention to pick out any particular engine for criticism, constructiveness or otherwise. We chose this particular picture because it was simple and clear. As a matter of fact, since this picture was published, further modifications have been made to this particular engine.

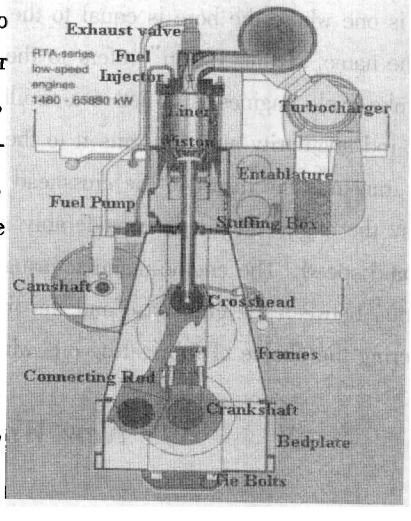


Fig. 1

The Medium Speed 4-Stroke Trunk Piston Engine

The medium speed 4-stroke trunk piston engine (Fig. 2) can be found on most medium to large merchant vessels even if the main engine is either a steam turbine or a 2-stroke crosshead engine. In these cases it will often be found that the electrical power is supplied by alternators driven by

medium speed 4-stroke engines. They are the favored method of propulsion on ships where head room is a minimum, for instance, on ferries and passenger vessels, and where, as is the current trend for these ships, diesel electric propulsion is utilized. Diesel electric propulsion allows the engines to be placed wherever is most suitable, as they no longer have to be aligned with reduction gearing and shafting as is the case with conventional installations.

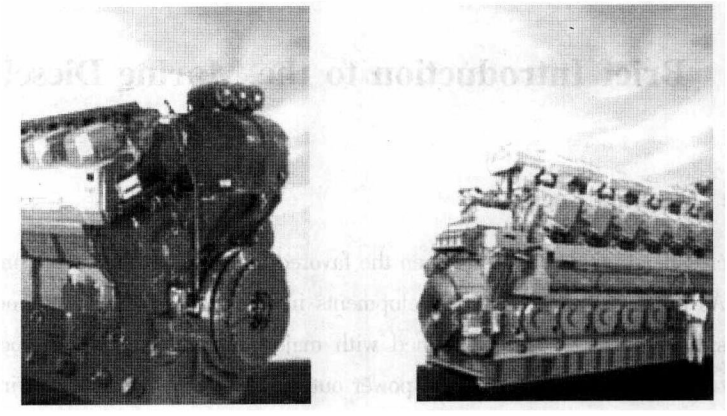


Fig.2

Generally, medium speed engines run at between 250 ~ 850 rpm. Above this range they are defined as high speed engines. Although not as powerful as their 2-stroke crosshead cousins, the largest 4-stroke engines are delivering just over 2000kW per cylinder. Advances in design and materials have led to an increase in efficiency, together with an increase in turbocharger pressure ratios which allow a greater quantity of fuel to be burnt per cycle. Medium speed engines have a higher power to weight ratio than the slow speed two strokes, but due to the higher speeds tend to have reduced maintenance intervals[(2)]. The largest of these engines have a bore of 640mm and a stroke of 900mm (Wartsila 64), although engines which are nearly "square" are more the norm. For example, the Sulzer ZA40 has a bore of 400mm and a stroke of 560mm or the MAN-B&W 58/64 which has a bore of 580mm and a stroke of 640mm. A square engine is one where the bore is equal to the stroke.

The name "Trunk Piston" refers to the piston skirt or trunk. The purpose of the skirt or trunk in four-stroke cycle engines is to act in a similar manner to a crosshead. It takes the thrust caused by connecting-rod angularity and transmits it to the side of the cylinder liner, in the same way as the crosshead slipper transmits the thrust to the crosshead guide[(3)]. With such engines, which are termed trunk-piston engines, the engine height is considerably reduced compared with that of a crosshead engine of similar power and speed. The engine-manufacturing costs are also reduced. It means of course that there is no separation between the crankcase and the liner and piston. This has its disadvantages, especially when considering the choice of lubricating oils when burning high sulphur residual fuels.

New Words and Expressions

favored　　*adj*.有利的

merchant　　*adj*.商业的

waste heat recovery	废热回收装置
takeover	*n*.接管 接收
amalgamation	*n*.合并
closure	*n*.关闭
longevity	*n*.长寿
professionalism	*n*.专业技能
intention	*n*.意图
pick out	选择
criticism	*n*.评论
constructiveness	*n*.有建设性的意见
modification	*n*.改进型
ferry	*n*.渡轮
diesel electric propulsion	柴油机-电力推进装置
trunk-piston engine	筒状活塞发动机
high sulphur residual fuel	高硫分的渣油

Notes to the Text

1. As the price of oil rose, developments in the design of these engines allowed them to burn the poorer residual fuels.

随着油价的上升,二冲程柴油机设计上的进展使得它们能燃烧质量更差的渣油。

该句用来说明二冲程十字头柴油机能长时间用作商船主推进装置的原因。

2. Medium speed engines have a higher power to weight ratio than the slow speed two strokes, but due to the higher speeds tend to have reduced maintenance intervals.

中速机的功率与重量之比(单位重量发出的功率)比低速二冲程机的要高,但是由于转速高,维护保养的间隔期就缩短了。

句中,have 和 tend 是由 but 连接的两个谓语动词。

3. The purpose of the skirt or trunk in four-stroke cycle engines is to act in a similar manner to a crosshead. It takes the thrust caused by connecting-rod angularity and transmits it to the side of the cylinder liner, in the same way as the crosshead slipper transmits the thrust to the crosshead guide.

四冲程柴油机中活塞裙所起的作用和(二冲程机中)十字头的作用是类似的。它承受连杆运动时产生的侧向推力,并传递到缸套侧面,就像十字头滑块将推力传递到十字头导板一样。

Exercise

I. Reading Comprehension.

Passage 1

The diesel engine is a form of internal combustion engine similar to that used in a bus. Its power is expressed as brake horsepower. This is the power put out by the engine. Effective horsepower is the pow-

er developed by the piston in the cylinder, but some of this is lost by friction within the engine. Large diesel engines, which have cylinders nearly 3 ft in diameter, turn at the relatively slow speed of about 108 rpm. These are known as slow speed diesel engines. They can be connected directly to the propeller without gearing. Although higher power could be produced by higher revolutions, this would reduce the efficiency of the propeller, because a propeller is more efficient the larger it is and the slower it turns. These large slow running engines are used in the larger merchant ships, particularly in tankers and bulk carriers. The main reason is their low fuel consumption. More and more of the large merchant vessels are being powered by medium-speed diesel engines. These operate between 150 and 450 rpm, therefore they are connected to the propeller by gearing. This type of engine was once restricted to smaller cargo ships, but now they are used in fast cargo liners as well as in tankers and bulk carriers. They are cheaper than slow speed diesel engines, and their smaller size and weight can result in a smaller, cheaper ship.

1. The diesel engine is similar to the gasoline engine in that _____.
   A. both of them are ignited by compressed air
   B. both of them are the forms of external combustion engines
   C. both of them have spark plugs
   D. the power is developed by the piston in the cylinder
2. Which of the following statements is FALSE?
   A. The slow speed diesel engines can be connected to the propeller without reduction gearing.
   B. Higher power of the engine could be produced by higher rpm.
   C. Higher power of the engine would increase the efficiency of the propeller.
   D. The slower the propeller turns, the higher its efficiency will be.
3. The reason why more and more of the large merchant vessels are being powered by medium-speed diesel engines is _____.
   A. they operate between 150 and 450 rpm
   B. they are connected to the propeller by gearing
   C. their smaller size and weight
   D. they can be connected directly to the propeller without gearing
4. The brake horsepower is _____.
   A. effective horsepower
   B. the power put out by the engine
   C. the power developed by the piston in the cylinder
   D. the power developed by the propeller

Passage 2

In steam turbines high pressure steam is directed into a series of blades or vanes attached to a shaft, causing it to rotate. This rotary motion is transferred to the propeller shaft by gears. Steam is produced by boiling water in a boiler, which is fired by oil. Recent developments in steam turbines which have reduced fuel consumption and raised power output have made them more attractive as an alternative to diesel power in ships. They are 50 percent lighter and on very large tankers some of the steam can be used to drive the large cargo oil pumps. Turbines are often used in container ships, which travel at high speeds.

Gas turbines differ from steam turbines in that gas rather than steam is used to turn a shaft. These

have also become more suitable for use in ships. Many naval vessels are powered by gas turbines and several container ships are fitted with them. A gas turbine engine is very light and easily removal for maintenance. It is also suitable for complete automation.

Nuclear power in ships has mainly been confined to naval vessels, particularly submarines. But this form of power will be used more in merchant ships as oil fuels become more expensive. A nuclear-powered ship differ from a conventional turbine ship in that it uses the energy released by the decay of radioactive fuel to generate steam. The steam is used to turn a shaft via a turbine in the conventional way.

1. How many types of marine engine are discussed in the passage?
   A. two
   B. three
   C. four
   D. five
2. Steam turbines have become more attractive as an alternative to diesel power in ships _____.
   A. because their rotary motion is transferred to the propeller shaft by gears
   B. because the steam can also to drive the large cargo oil pumps
   C. because of the reduced fuel consumption and raised power output
   D. because they are 50 percent lighter
3. Gas turbines differ from steam turbines in that _____.
   A. steam rather than gas is used to turn a shaft
   B. vapor rather than gas is used to turn a shaft
   C. the former uses gas to turn a shaft
   D. the latter uses gas to turn a shaft
4. "radioactive fuel" refers to _____.
   A. the fuel possessing radioactivity
   B. the residual oil
   C. the fuel which is found by radio
   D. the fuel which is active when received radio signals

II. Look at the illustration (Fig.3) below and choose the best answer.

1. The parts labeled "I and II", shown in the illustration are properly called the _____.
   A. intake and exhaust valves
   B. scavenging poppets
   C. fuel valves
   D. exhaust valves
2. The engine cylinder illustrated is of the _____.
   A. dry liner type
   B. wet liner type
   C. type integrally machined in the block
   D. integral wet liner type

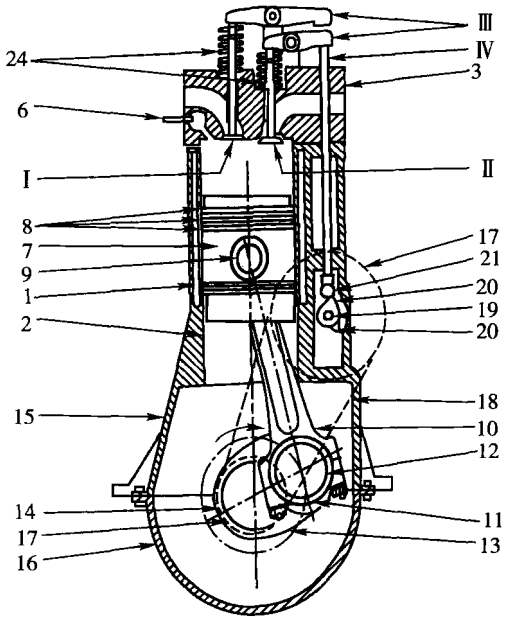


Fig.3

3. The combustion of fuel for the illustrated engine is initiated by _____.

A. a spray of fuel into a turbulence combustion chamber

B. fuel sprayed into an energy cell

C. fuel injection provided by a unit injector

D. individual Bosch fuel pumps

4. The engine shown in the illustration is a _____.

A. four-stroke/cycle on the exhaust stroke

B. two-stroke/cycle on the exhaust stroke

C. four-stroke/cycle on the intake stroke

D. two-stroke/cycle on the intake stroke

Ⅲ. Put the following into English.

1. 现代柴油机利用废气涡轮增压器。
2. 增压空气通常被冷却以提高进气密度。
3. 柴油机的换气是指新鲜空气的供给和废气的排除。
4. 柴油机的起动是靠把压缩空气以适当的顺序通往气缸实现的。
5. 燃油被喷入高温、高压的燃烧室时就被点燃。
6. 在四冲程柴油机中,循环需要四个独立的冲程。
7. 柴油机是一种靠压缩发火的内燃机。
8. 柴油机和汽油机都属于内燃机。

9. 柴油机和汽油机的不同之处在于前者是压缩燃烧式。

10. 在内燃机船上通常安装一个废气锅炉以回收主机废气中带有的一些热量。

Keys to the Exercises

I.

Passage 1　1.D;2.C;3.C;4.B

Passage 2　1.B;2.C;3.C;4.A

II.

1.A;2.C;3.A;4.C

III.

1. Modern diesel engines make use of exhaust gas driven turbochargers.

2. The pressurized air is usually cooled to increase the charge air density.

3. Gas exchange of diesel engine is the supply of fresh air and removal of exhaust gas.

4. Diesel engines are started by supplying compressed air into the cylinders in an appropriate sequence.

5. The fuel is ignited when it is injected into the hot, high temperature combustion.

6. In a four-stroke diesel engine, the cycle requires four separate strokes.

7. Diesel engine is a type of internal combustion engine, which is ignited by compression.

8. Both the diesel engine and the gasoline engine belong to the internal combustion engine.

9. The diesel engine differs from the gasoline engine in that the former is ignited by compression.

10. On motor ships, an exhaust gas boiler is often fitted to recover some of the heat carried in the exhaust gas from the main engine.

Lesson 2 The 4-stroke Cycle and the 2-stroke Cycle

The four-stroke cycle is so called because it takes four strokes of the piston to complete the processes needed to convert the energy in the fuel into work. Because the engine is reciprocating, this means that the piston must move up and down the cylinder twice, and therefore the crankshaft must revolve twice. The four strokes of the piston are known as the suction stroke, the compression stroke, the power stroke, and the exhaust stroke.

1. SUCTION: The crankshaft is rotating clockwise and the piston is moving down the cylinder. The inlet valve is open and a fresh charge of air is being drawn or pushed into the cylinder by the turbocharger (Fig.4a).

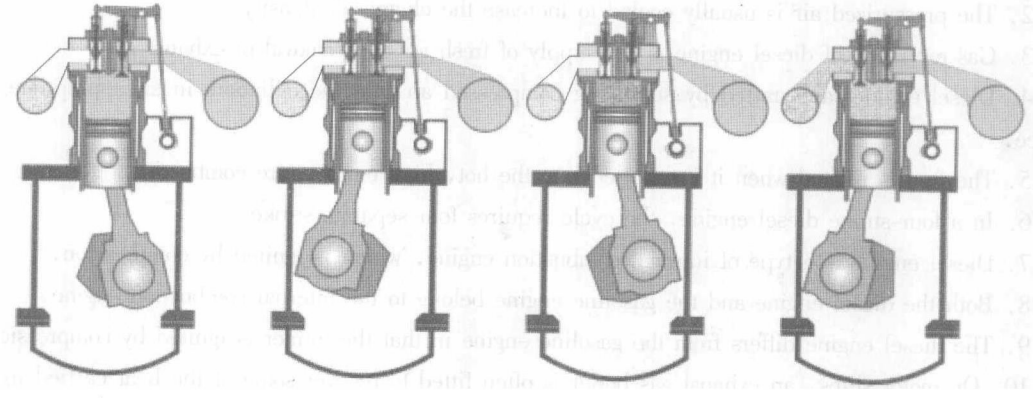


Fig.4

2. COMPRESSION: The inlet valve has closed and the charge of air is being compressed by the piston as it moves up the cylinder. Because energy is being transferred into the air, its pressure and temperature increase. By the time the piston is approaching the top of the cylinder (known as Top Dead Center or TDC), the pressure is over 100 bar and the temperature over 500°(Fig.4b).

3. POWER: Just before TDC fuel is injected into the cylinder by the fuel injector. The fuel is "atomized" into tiny droplets. Because they are very small, these droplets heat up very quickly and start to burn as the piston passes over TDC. The expanding gas from the fuel burning in the oxygen forces the piston down the cylinder, turning the crankshaft. It is during this stroke that work energy is being put into the engine; during the other 3 strokes of the piston, the engine is having to do the work (Fig.4c)[1].

4. EXHAUST: As the piston approaches the bottom of the cylinder (known as Bottom Dead Center or BDC) the exhaust valve starts to open. As the piston now moves up the cylinder, the hot gases (consisting mostly of nitrogen, carbon dioxide, water vapor and unused oxygen) are expelled from the cylinder. As the piston approaches TDC again the inlet valve starts to open and the cycle repeats itself (Fig. 4d).

The two-stroke cycle is so called because it takes two strokes of the piston to complete the processes needed to convert the energy in the fuel into work[2]. Because the engine is reciprocating, this means that

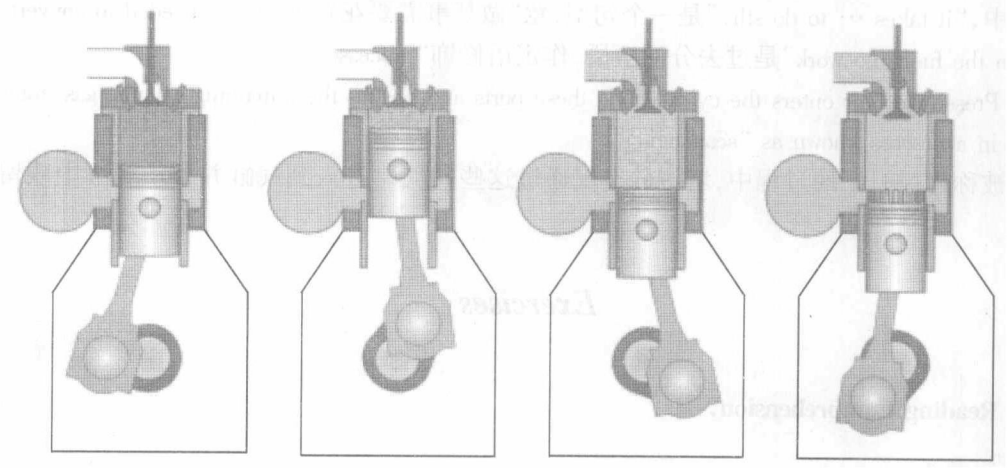
the piston must move up and down the cylinder, and therefore the crankshaft must revolve once.

1. The crankshaft is revolving clockwise and the piston is moving up the cylinder, compressing the charge of air. Because energy is being transferred into the air, its pressure and temperature increase. By the time the piston is approaching the top of the cylinder (known as Top Dead Center or TDC) the pressure is over 100 bar and the temperature over 500° (Fig.5a).

2. Just before TDC fuel is injected into the cylinder by the fuel injector. The fuel is "atomized" into tiny droplets. Because they are very small, these droplets heat up very quickly and start to burn as the piston passes over TDC. The expanding gas from the fuel burning in the oxygen forces the piston down the cylinder, turning the crankshaft. It is during this stroke that work energy is being put into the engine; during the upward stroke of the piston, the engine is having to do the work (Fig.5b).

3. As the piston moves down the cylinder, the useful energy from the burning fuel is expended. At about 110°after TDC the exhaust valve opens and the hot exhaust gas (consisting mostly of nitrogen, carbon dioxide, water vapor and unused oxygen) begin to leave the cylinder (Fig.5c).

4. At about 140°after TDC the piston uncovers a set of ports known as scavenge ports. Pressurized air enters the cylinder via these ports and pushes the remaining exhaust gas from the cylinder in a process known as "scavenging"[3]. The piston now goes past Bottom Dead Center and starts moving up the cylinder, closing off the scavenge ports. The exhaust valve then closes and compression begins (Fig.5d).



a) b) c) d)

Fig.5

New Words and Expressions

reciprocating	*adj*.往复式的
clockwise	*adj*.顺时针的
approach	*v*.到达
atomize	*v*.雾化
tiny	*adj*.细小的
expel	*v*.赶走,排出

nitrogen	*n*.氮气
carbon dioxide	二氧化碳
expend	*v*.花费,消耗
scavenge ports	扫气口

Notes to the Text

1. It is during this stroke that work energy is being put into the engine; during the other 3 strokes of the piston, the engine is having to do the work.

就是在这个冲程(指作功冲程)期间,作功的能量被输入到发动机,而在活塞的其他三个冲程期间,发动机不得不(对活塞)作功。意即:在四个冲程中,只有作功冲程产生能量,其他三个冲程不但没有提供能量,反而需要消耗能量。

句中"It is …that…"是个强调句型。

2. The 2-stroke cycle is so called because it takes two strokes of the piston to complete the processes needed to convert the energy in the fuel into work.

二冲程循环之所以被称为"二冲程",是因为完成燃油中的能量转变成功率的过程需要活塞两个冲程。

句中,"it takes … to do sth."是一个句型,意"做某事需要花费……"。"needed to convert the energy in the fuel into work"是过去分词短语,作定语修饰"processes"。

3. Pressurized air enters the cylinder via these ports and pushes the remaining exhaust gas from the cylinder in a process known as "scavenging".

在被称作"扫气"的过程中,增压的空气通过这些扫气口进入到气缸并推动气缸中残留的废气。

Exercises

I. Reading Comprehension.

Passage 1

In four-stroke cycle engines the head contains passages connecting to air supply and exhaust manifolds, and also carries the air and exhaust valves as well as the fuel injectors. Air and exhaust valves are opened into the cylinder mechanically by push rods and rocker arms operated by the camshaft, and are closed by the combination of pressure within the cylinder and the force of the valve springs. The camshaft is gear or chain driven from the crankshaft at one-half of crankshaft RPM, in order to complete one cycle of events in two revolutions.

In general, in two-stroke cycle engines, air is supplied to the cylinder through a row of ports arranged around the circumference of the cylinder liner just above the BDC position of the piston crown, the piston and ports therefore serving the same function as the air valves of the four-stroke cycle engine. In loop-scavenged engines, exhaust also takes place through a row of ports in the cylinder, these being arranged just above the air ports. Uniflow-scavenged engines (except opposed piston engines) exhaust takes

place through a valve (or two valves) in the cylinder head, which is operated by the camshaft. Since, in the two-stroke cycle, one cycle of events is complete in each revolution of the crankshaft, the camshaft speed is the same as that of the crankshaft.

1. What is the speed of the crankshaft in a four-stroke/cycle engine when the camshaft is turning at 750 rpm?

   A. 375 rpm B. 500 rpm C. 750 rpm D. 1500 rpm

2. In a two-stroke/cycle diesel engine, the camshaft rotates at _____.

   A. twice the crankshaft speed

   B. half the crankshaft speed

   C. the same speed as the crankshaft

   D. a speed independent of the crankshaft

3. Which of the following statements is FALSE?

   A. In loop-scavenged engines, exhaust ports are being arranged just above the air ports.

   B. In uniflow-scavenged engines, exhaust must take place through a valve (or two valves) in the cylinder head.

   C. In two-stroke cycle engines, air is supplied to the cylinder through scavenging ports.

   D. In two-stroke engine, it takes one revolution of the crankshaft to make one power stroke.

4. Camshafts are usually driven by timing gears or _____.

   A. push rods

   B. chain drives

   C. rocker arms

   D. flywheels

Passage 2

The cylinder cover is made of cast iron and is provided with two inlet valves, two exhaust valves, a central mounted fuel injection valve and an indicator valve. The inlet valves are mounted with separate seating rings made of special heat-resistant cast iron. These rings are pressed into the cylinder cover in cooled conditions. The exhaust valve seatings are special, water-cooled seating rings. These rings are also pressed into the cylinder cover in cooled conditions.

Each cylinder cover is provided with cooling water from a screwed-on tubular cooling water jacket through radial bores in the thick bottom of the cover. Each of the radial bores is connected to two side bores. The cover has further separate bores that lead to the cooling water jacket and the bores in the cylinder cover to a common outlet chamber. The cylinder cover and cylinder liner are assembled by means of four threaded studs screwed into the frame. Tightening is effected by means of hydraulic tools, and sealing by means of a thin ring mounted between the cylinder cover and the cylinder liner. A starting valve is mounted on the side of the cylinder cover.

The engine has oil-cooled pistons of cast iron. The pistons are provided with three compression rings and a spring-loaded scraper ring. A space for cooling oil is provided at the top of the piston. The scraper ring prevents lubricating oil from being drawn up into the combustion chamber.

Oil for cooling the piston crown is led from a bore in the crankshaft through a channel in the connecting rod and the connecting rod journal, to the bushing for the gudgeon pin. This bushing is provided

with an annular groove from which part of the oil is led for lubricating the gudgeon pin. The remaining oil continues through bores in the gudgeon pin and the piston to piston cooling chamber.

1. According to the passage, which of the following may be provided on top of the cylinder cover?
   A. two starting valves
   B. a fuel injector
   C. an indicator
   D. all of the above
2. Which of the following is true?
   A. The inlet valve seating rings are of heat-resistant cast steel.
   B. There are six studs by which the cylinder cover and liner are tightened.
   C. The exhaust valve seatings are cooled by water.
   D. A copper ring is mounted between the cylinder cover and the liner.
3. Which of the following is NOT true?
   A. The pistons are cooled by oil.
   B. Four piston rings are fitted to each piston.
   C. The scraper ring scrapes the oil downwards.
   D. The piston cooling is of splash type.
4. This passage is mainly about _____.
   A. the cooling of the cylinder covers
   B. the cooling of the piston
   C. the working principle of the four-stroke diesel engine
   D. the construction of the cylinder covers and pistons

II. Look at the illustration(Fig.6) below and choose the best answer.

1. If point 1 in the ideal cycle diagram illustrated is the beginning of the compression stroke, which

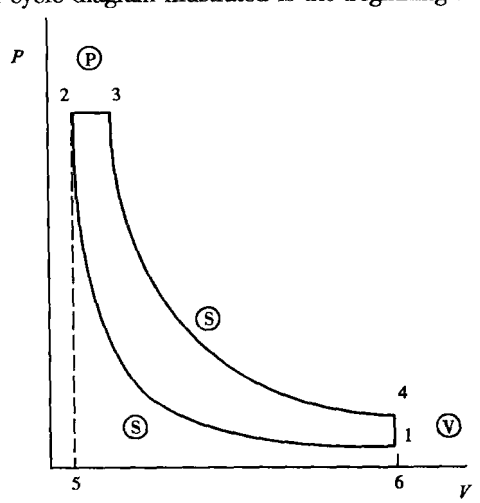


Fig.6