轮机综合英语阅读

Comprehensive English for Marine Engineers

主　编　刘　宁　吴万千　王占礼
副主编　刘　蓓　陈　蓓　江　园
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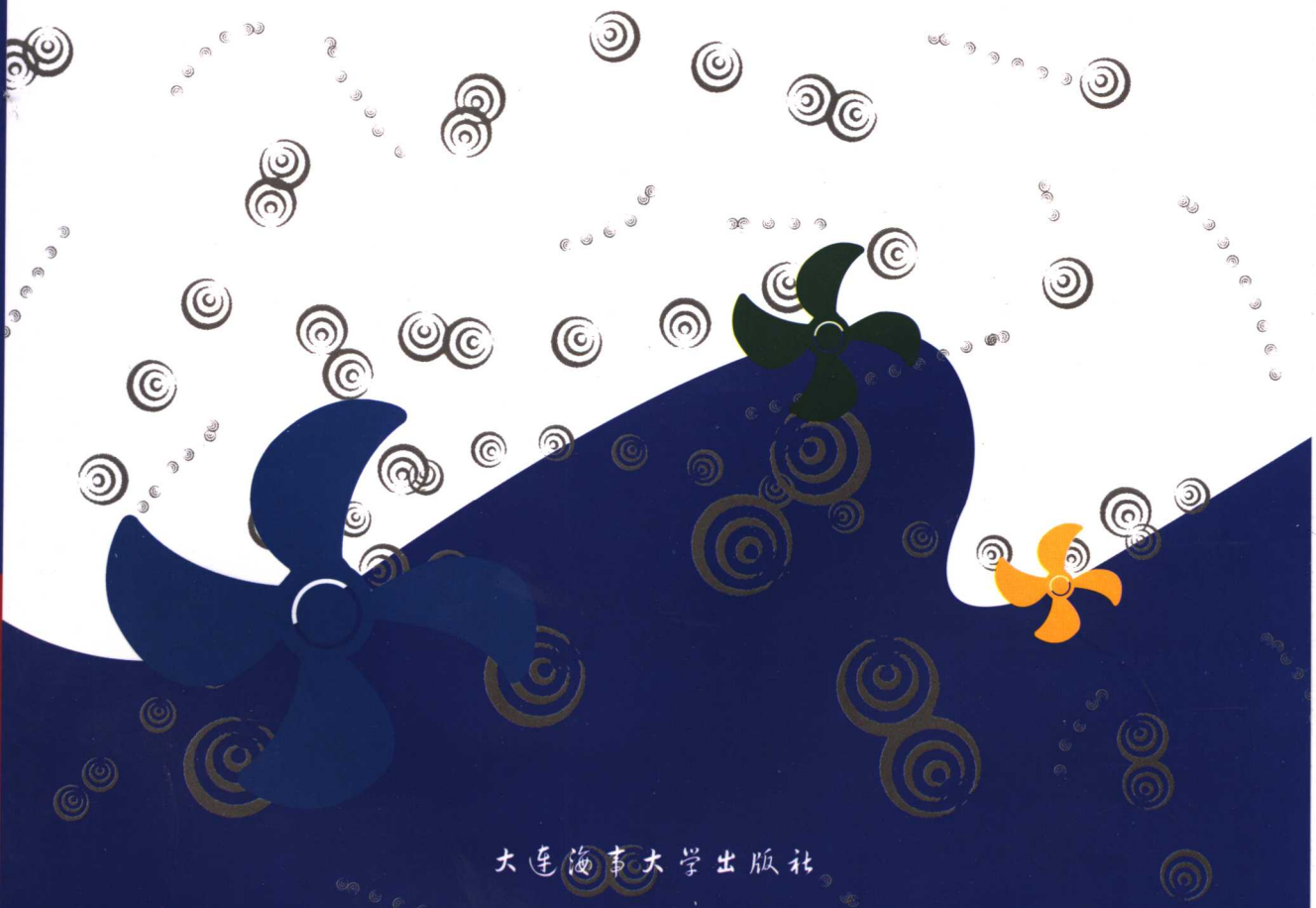

大连海事大学出版社

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前　言

本书的编写参照了中华人民共和国海事局制定的《中华人民共和国海船船员适任考试大纲》，体现了大纲中对 750 kW 及以上船舶轮机长、值班轮机员“轮机英语”考试的要求。在强调提高阅读能力的同时，兼顾了对专业口语的练习，适合于各类船员培训班轮机英语培训使用。在编写中注意了各级轮机人员的不同英语要求，选材覆盖了主机、辅助机械、船舶自动化、安全操作、国际公约以及书写部分的修理单、轮机日志、事故报告等。课文内容与船员实际工作密切联系，并配有插图，以便使学员能更好地理解课文，每课后配有大量的练习。为便于学习，词汇加注了音标，每篇课文后对疑难或重点的句子都有注释。大量的针对课文内容或与其相关的练习更使学员在学习中得到充分练习，使书中内容易于接受。

本书也突出了考前培训和船员实际应用的特点，提高船员适任证书统考的合格率。该书在工作实践中也具有一定的使用价值和参考价值。

CONTENTS

UNIT 1 MARINE DIESEL ENGINES

TEXT A Types of Diesel Engines

The majority of ships around the world continue to be powered exclusively by diesel engines. The predominance of diesel engines has come from improved engine efficiencies and designs compared to other forms of propulsion such as steam or gas turbines. Many combinations and configurations of diesel engine power plant exist.

Slow speed diesel engines

Slow speed diesel engines are large, especially tall, and heavy and operate on the two-stroke cycle. These are the largest diesel engines ever built. Engine powers up to 100,000 kW are available from a single engine. They are tall to allow for long strokes which improve engine efficiency. The large physical size of the engine and components leads to slow rotational speed with speeds up to 300 rpm considered to be slow. For equivalent power output, the two-stroke diesel engine is significantly lighter than the four-stroke one. This is most apparent for large power requirements where the two-stroke engine produces much more power for the same weight.

Large, slow speed, two-stroke marine diesel engines offer the advantages of;

1. burning poorer quality, cheaper fuel
2. providing large power from a single, less complicated machine comprising fewer individual cylinders and moving parts
3. having a low rotational speed allowing them to be directly coupled to the propeller and removing the need for gearboxes, and
4. being reversible and thus eliminating the need for reversing gear or controllable pitch propellers.

Merchant ships driven by slow speed diesel engine will usually have a single large main engine directly coupled to a single fixed pitch propeller. The thrust forces from the propeller will be transferred to the hull of the ship through a thrust bearing .

Medium speed, four-stroke diesel engines

Medium speed engines operate in speed ranges from 300 to 900 r/min. The majority of medium speed engines operate on the four-stroke cycle. They are most common as the propulsion engines in smaller ships, ro-ro and passenger ships. They are used widely as the electrical power generation engines in most merchant cargo ships.

Four-stroke engines have more moving parts, are more complex and produce less power for equivalent weight compared to two-stroke slow speed engines. Medium speed engines do,

however，offer several advantages.

1. The engines are compact—they are not long or high，this allows them to fit in engine rooms with low head space such as those in ro-ro ships.
2. Medium speed engines use less oil than slow speed engines.
3. Recent developments have produced medium speed engines capable of burning low quality heavy fuel oil.
4. Engines of considerable power，to 25,000 kW and more，have been developed，allowing a large power system to be achieved with compact engines and engine room. This makes them suitable for passenger ship applications where the smaller the space provided for engines and machinery the more space is available for paying passengers.

Most medium-speed diesel engines are non-reversible meaning that a controllable pitch propeller is usually employed to cater for astern thrust.

High-speed diesel engines

The most common diesel engine throughout the world is the high-speed engine. The majority of these engines operate on the four-stroke cycle but a significant proportion utilize the two-stroke cycle. These engines have running speeds over 1,000 r/min and are ideally suited to driving land-based vehicles such as buses and trucks. The application of high-speed diesel engines as propulsion engines at sea is limited to smaller vessels such as tugs，ferries and barges etc.. They are regularly used for electrical power generation in support of a medium-speed propulsion engines and on large ships their use is limited to emergency power generation to small applications such as diesel driven emergency pumps and compressors.

Words and Phrases

exclusively	[ik'sklu:sɪvli]	*ad.*	排外地, 专有地
diesel	['di:zəl]	*n.*	柴油机
predominance	[pri'dɔmɪnəns]	*n.*	优势
efficiency	[i'fiʃənsi]	*n.*	效率, 功效
turbine	['tə:bin, -bain]	*n.*	蜗轮
configuration	[kən,figju'reiʃən]	*n.*	构造，结构
stroke	[strəuk]	*n.*	冲程
cycle	['saikl]	*n.*	周期，循环
component	[kəm'pəunənt]	*n.*	成分，部件
rpm-revolution per minute			每分钟转速
equivalent	[i'kwivələnt]	*a.*	相等的，相当的
		n.	等价物，相等物
comprise	[kəm'praiz]	*v.*	包含，由……组成
cylinder	['silində]	*n.*	汽缸
couple	['kʌpl]	*v.*	耦合，连接

propeller	[prəˈpelə]	*n.*	推进器,螺旋桨
gearbox	[ˈgiəbɔks]	*n.*	变速箱
reversible	[riˈvə:səbl]	*a.*	可换向的
eliminate	[iˈlimineit]	*v.*	排除, 消除
reversing gear			换向齿轮[机构]
controllable pitch propeller			可调螺距螺旋桨, 调距桨
fixed pitch propeller			固定螺距螺旋桨, 定距桨
thrust bearing			推力轴承
ro-ro ship			滚装船
compact	[ˈkɔmpækt]	*a.*	紧凑的，紧密的
engine room			机舱
cater for			迎合
astern	[əsˈtə:n]	*ad.*	在船尾
proportion	[prəˈpɔ:ʃən]	*n.*	比例，部分
utilize	[ˈju:tɪlaiz]	*v.*	利用
tug	[tʌg]	*n.*	拖船
ferry	[ˈferi]	*n.*	摆渡，渡船
barge	[bɑ:dʒ]	*n.*	驳船
emergency	[iˈmə:dʒnsi]	*n.*	紧急情况
pump	[pʌmp]	*n.*	泵
		v.	(用泵)抽(水)
compressor	[kəmˈpresə]	*n.*	压缩机

Notes

1. The predominance of diesel engines has come from improved engine efficiencies and designs compared to other forms of propulsion such as steam or gas turbines.
   与其他形式的推进装置如蒸汽机或燃气轮机相比，柴油机的优势在于改进的发动机的效率和设计。
2. This makes them suitable for passenger ship applications where the smaller the space provided for engines and machinery the more space is available for paying passengers.
   这使得这些发动机适合于用在客船上，在客船上发动机和机器占的空间越小，可容纳乘客的空间就越大。
   “where…”为状语从句。其中“the smaller…the more…”为形容词比较级的结构，译为“越……就越……”。又如 The farther north you go，the more severe the winters are. 你越朝北走，冬天就越寒冷。

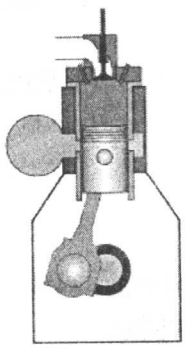
TEXT B How Does a Marine Diesel Engine Work?

The diesel engine is a type of internal combustion engine which ignites the fuel by injecting it into hot, high pressure air in a combustion chamber. The marine diesel engine is a type of diesel engine used on board ships. The principle of its operation is as follows:

A charge of fresh air is drawn or pumped into the engine cylinder and then compressed by the moving piston to very high pressure.

When the air is compressed, its temperature rises so that it ignites the fine spray of fuel injected into the cylinder. The burning of the fuel adds more heat to the air charge, causing it to expand and force the engine piston to do work on the crankshaft which in turn drives the ship's propeller.

The operation between two injections is called a cycle, which consists of a fixed sequence of events. This cycle may be achieved either in four strokes or two. In a four-stroke diesel engine, the cycle requires four separate strokes of the piston, i.e. suction, compression, expansion and exhaust. As its name implies a two-stroke cycle takes place in two consecutive strokes of the engine piston, or one revolution of the crankshaft. Thus each operation in the cycle is repeated during every revolution of the engine. The two strokes of the cycle may be termed: compression stroke and power or expansion stroke. Its operation is as follows:



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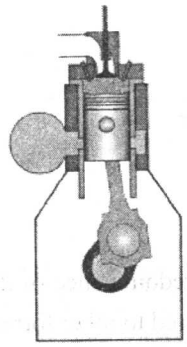

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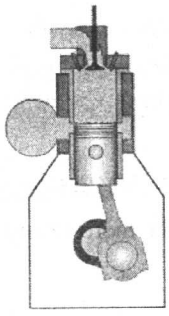

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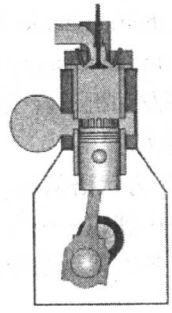

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Fig. 1-a Two-stroke cycle

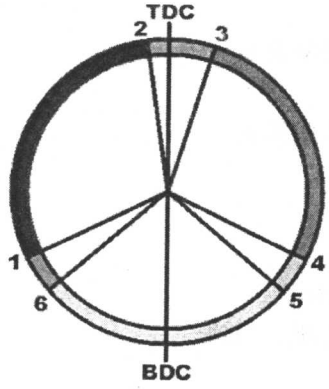
1. The crankshaft is revolving clockwise and the piston is moving up the cylinder, compressing the charge of air. Because energy is being transferred into the air, its pressure and temperature increase. By the time the piston is approaching the top of the cylinder (known as Top Dead Center or TDC) the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

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.

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 vapour and unused oxygen) begin to leave the cylinder.

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". The piston now goes past Bottom Dead Centre and starts moving up the cylinder, closing off the scavenge ports. The exhaust valve then closes and compression begins.

The two stroke cycle can also be illustrated on a timing diagram.



1 - 2 Compression	1. approx 110° BTDC
2 - 3 Fuel Injection	2. approx 10° BTDC
3 - 4 Power	3. approx 12° ATDC
4 - 5 Exhaust Blowdown	4. approx 110° ATDC
5 - 6 Scavenging	5. approx 140° ATDC
6 - 1 Post Scavenging	6. approx 140° BTDC

Fig. 1-b Two-stroke cycle and timing diagrams

The main difference between the two-stroke and the four-stroke cycles is the power developed. The two-stroke cycle engine, with one working or power stroke every revolution, will, theoretically, develop twice the power of a four-stroke engine of the same swept volume. Inefficient scavenging however and other losses, reduce the power advantage to about 1.8. For a particular engine power the two-stroke engine will be considerably lighter—an important consideration for ships. Nor does the two-stroke engine require the complicated valve operating mechanism of the four-stroke. The four-stroke engine however can operate efficiently at high speeds, which offsets its power disadvantage; it also consumes less lubricating oil.

Each type of engine has its applications, which on board ship have resulted in the slow speed

(i.e. 80 to100 r/min) main propulsion diesel operating on the two-stroke cycle. At this low speed the engine requires no reduction gearbox between it and the propeller. The four-stroke engine (usually rotating at medium speed, between 250 and 750 r/min) is used for auxiliaries such as alternators and sometimes for main propulsion with a gearbox to provide a propeller speed of between 80 and 100 r/min.

Words and Phrases

ignite	[ig'nait]	*v.*	点火，点燃
chamber	['tʃeimbə]	*n.*	室，房间
principle	['prinsəpl]	*n.*	原则，原理
compress	[kəm'pres]	*v.*	压缩
inject	[in'dʒekt]	*v.*	注射，喷射
injection	[in'dʒekʃən]	*n.*	注射，喷射
sequence	['si:kwəns]	*n.*	次序，顺序，序列
suction	['sʌkʃən]	*n.*	吸入
imply	[im'plai]	*v.*	暗示，意味
consecutive	[kən'sekjutiv]	*a.*	连续的，连贯的
TDC	Top Dead Center		上止点
bar	[bɑ:(r)]	*n.*	巴（压强单位）
injector	[in'dʒektə]	*n.*	喷油器
atomize	['ætəmaiz]	*v.*	将……喷成雾状
droplet	['drɔplit]	*n.*	小滴
oxygen	['ɔksidʒən]	*n.*	[化]氧
nitrogen	['naitrədʒən]	*n.*	[化]氮
carbon dioxide			[化]二氧化碳
port	[pɔ:t]	*n.*	港口，左舷，气口
scavenge	['skævindʒ]	*v.*	扫气
pressurize	['preʃəraiz]	*v.*	增压，使……加压
via	['vaiə, 'vi:ə]	*prep.*	经，通过，经由
BDC	Bottom Dead Centre		下止点
illustrate	['iləstreit]	*v.*	举例说明，图解
timing	['taimiŋ]	*n.*	定时
diagram	['daiəgræm]	*n.*	图表
theoretically	[θiə'retikəli]	*ad.*	理论上
swept volume			容积排量
inefficient	[ˌini'fiʃənt]	*a.*	效率低的，效率差的
mechanism	['mekənizəm]		机械装置，机构
offset	['ɔ:fset]	*v.*	抵消，弥补

application	[ˌæpliˈkeiʃən]	*n.*	应用，运用
auxiliary	[ɔːgˈziljəri]	*a.*	辅助的
alternator	[ˈɔːltə(ː)neitə]	*n.*	交流发电机

Notes

1. The burning of the fuel adds more heat to the air charge, causing it to expand and force the engine piston to do work on the crankshaft which in turn drives the ship's propeller.
   燃油的燃烧给缸内空气加入了更多的热量，使空气膨胀并迫使发动机活塞对曲轴作功，随之驱动螺旋桨。
   该句主语为“The burning of the fuel”，“causing it...the ship's propeller”为现在分词短语作结果状语。
2. The two-stroke cycle engine, with one working or power stroke every revolution, will, theoretically, develop twice the power of a four-stroke engine of the same swept volume.
   每转有一个工作或作功冲程的二冲程发动机理论上产生的功率是同样容积排量的四冲程发动机的两倍。
   With 后面加复合宾语，表示伴随关系
3. Nor does the two-stroke engine require the complicated valve operating mechanism of the four-stroke.
   二冲程发动机也不需要四冲程发动机复杂的阀操纵机构。
   该句是就该段落第一句的延续，继续阐述二冲程发动机的优势。
   nor：(用在肯定句后，内容与主句一致并有所加强，用倒装语序)也不
   e.g. They are happy, nor need we worry. 他们很幸福，我们也不必担心。
4. The four-stroke engine (usually rotating at medium speed, between 250 and 750 r/min) is used for auxiliaries such as alternators and sometimes for main propulsion with a gearbox to provide a propeller speed of between 80 and 100 r/min.
   四冲程柴油机（通常以中速运转，转速在250～750 r/min）用于发电机，有时作推进主机，用减速箱提供 80～100 r/min 的转速。

Exercises

Ⅰ. Answer the following questions according to the text:

1. According to the revolutions of the crankshaft, how can diesel engine be divided into?
2. What advantages do large, slow speed, two-stroke marine diesel engines offer ?
3. What is the speed range of medium speed engines ?
4. What advantages do medium speed engines offer ?
5. What is the application of high-speed diesel engines?
6. What does the term “cycle” mean?
7. Please name the four strokes of a four-stroke diesel engine according to their sequence.

8. How many revolutions of the crankshaft does it take for a two-stroke engine to complete one power stroke? What about a four-stroke one?
9. Among the four strokes of a four-stroke diesel engine, which strokes are the downward strokes and which strokes are the upward strokes?
10. Say something about the comparison of two-stroke and four-stroke cycles.

II. Choose the best answer for each of the following:

1. Of all types of commercial internal combustion engines now built, the _____ usually gives the best performance, and hence it is quite commonly used in marine applications, especially in larger sizes.
   A. steam engine　　B. gasoline engine
   C. gas turbine　　D. diesel engine
2. Large, slow speed, two-stroke marine diesel engines offer the advantages of the following except _____.
   A. burning poorer quality, cheaper fuel
   B. providing large power
   C. being reversible
   D. using less oil than medium speed engines
3. The thrust forces from _____ will be transferred to the hull of the ship through a thrust bearing .
   A. the propeller　　B. the engine
   C. the impeller　　D. the crankshaft
4. Medium speed engines are suitable for passenger ship applications where _____the space provided for engines and machinery _____ space is available for paying passengers.
   A. smaller/ more　　B. the smaller/ the more
   C. the small/the less　　D. the small/the much
5. Most medium-speed diesel engines are _____ meaning that a controllable pitch propeller is usually employed to cater for astern thrust.
   A. non-reversible　　B. reversible
   C. variable　　D. controllable
6. In the diesel engine, fuel is admitted directly into the cylinder and combustion takes place as a result of _____ .
   A. the heat of compression　　B. a carburetor
   C. a igniter　　D. the heat given by an outside source
7. The majority of medium and high-speed diesel engines for main or auxiliary drive operate on_____ , which takes place during four consecutive strokes, or two complete revolutions, of the engine.
   A. the two-stroke cycle　　B. the four-stroke cycle
   C. the four stroke cycle　　D. the two stroke cycle
8. In a two-stroke engine, the incoming air is pressurized by_____, which is driven by the

outgoing exhaust gases.

A. a turbo-blower　　B. the compressor

C. the piston　　D. pushrod

9. For a particular engine power the two-stroke engine will be considerably _____ the four-stroke engine—an important consideration for ships.

A. lighter than　　B. heavier than

C. as light as　　D. not as light as

10. As its name implies _____ takes place in two consecutive strokes of the engine piston, or one revolution of the crankshaft.

A. a two-stroke cycle　　B. a four-stroke cycle

C. either A or B　　D. neither A nor B

11. The most common diesel engine throughout the world is_____ .

A. the low speed engine　　B. the medium speed engine

C. the high-speed engine　　D. none of the above

12. The operation between two fuel injections is called _____.

A. a power stroke　　B. a working cycle

C. circulation　　D. a sequence

13. During working, when the piston is near the _____, the air ignites the fine spray of fuel.

A. TDC　　B. DTC

C. BDC　　D. BCD

14. Compression takes place in the cylinder through the _____ motion of the piston.

A. downward　　B. upward

C. inward　　D. outward

15. When the piston of an engine is at the lowest point of its stroke, the engine is said to be on _____.

A. bottom dead center　　B. inner dead center

C. top dead center　　D. TDC

16. The two-stroke cycle engine, with one working or power stroke every revolution, will, theoretically, develop _____ the power of a four-stroke engine of the same swept volume.

A. as much as　　B. less than

C. twice　　D. twice as many as

17. For a particular engine power the two-stroke engine will be considerably lighter _____ the complicated valve operating mechanism of the four-stroke.

A. nor the two-stroke engine requires

B. nor does the two-stroke engine require

C. nor the two-stroke engine require

D. nor do the two-stroke engine require

18. Each type of engine has its applications, which on board ship have resulted in the slow speed main propulsion diesel operating _____ cycle.

A. on the four-stroke

B. in the two-stroke

C. on the two-stroke

D. either on the two-stroke or on the four-stroke

19. The four-stroke engine is used for auxiliaries such as alternators and sometimes for main propulsion with _____ to provide a propeller speed of between 80 and 100 rev/min.

A. a control box　　B. a governor

C. a monitor　　D. a gearbox

20. In an engine with air inlet valve and exhaust valve on its cylinder heads the fresh air will enter into the cylinder _____ and the gases exhaust _____, there being an adequate overlap between the inlet opening and the exhaust closing.

A. downwards / upwards　　B. upwards / downwards

C. downwards / downwards　　D. upwards / upwards

Ⅲ. Translate the following into English:

1. 一定量的新鲜空气被泵入汽缸并被运动的活塞压缩至很高的压力。
2. 燃油的燃烧增加了缸内空气的热量，使空气膨胀并迫使发动机活塞对曲轴作功，随之驱动螺旋桨。
3. 四冲程柴油机的工作循环需四个独立的活塞行程，即吸气、压缩、膨胀和排气。
4. 当活塞到达上止点时，空气的温度和压力都上升到很高的值。
5. 在二冲程柴油机中，曲轴每转一圈就能作出一个作功冲程。
6. 理论上说，二冲程柴油机能产生相同尺寸的四冲程柴油机的两倍功率。然而，扫气不充分和其他损失使这一优势降到大约 1.8 倍。
7. 四冲程柴油机（通常以中速运转，转速在 250～750 r/min）用于发电机，并且有时作推进主机，用减速箱提供 90～120 r/min 的速度。

Ⅳ. Reading comprehension:

Passage 1

The diesel engine is a type of internal combustion engine that was invented by Rudolf Diesel. He received a patent for the diesel engine in 1892 and the primary goal was to create an efficient alternative to the gasoline engine. Both gasoline engines and diesel engines work by creating a controlled explosion in a sealed piston chamber. The small explosion rapidly moves the piston which in turn rotates the output shaft. In a gasoline engine, a mixture of fuel and air are injected into the chamber and then ignited with a spark created by a spark plug. A diesel engine, on the other hand, does not rely on a sparkplug to ignite the mixture. Fuel is forced into the chamber and the high pressure generates enough heat to ignite the fuel/air mixture.

Some diesel engines rely on a glow plug to heat the chamber to minimize the amount of pressure required for the engine to turn. Without such an added heat source, the pressure required to achieve ignition (especially when the engine is cold) would be prohibitively high. Diesel engines require diesel fuel for the combustion process to function properly. Diesel fuel is cheaper than regular gasoline because less refining is required. In addition, diesel engines are more efficient.