

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
Національний університет кораблебудування
імені адмірала Макарова

Т. М. СОРОКІНА

**Методичні вказівки
з дисципліни
"АНГЛІЙСЬКА МОВА
ЗА ПРОФЕСІЙНИМ СПРЯМУВАННЯМ"**

У двох частинах

Частина 1

Рекомендовано Методичною радою НУК

Електронне видання
комбінованого використання на DVD-ROM



МИКОЛАЇВ • НУК • 2019

УДК 811.111(076)
С 65

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С 65 Методичні вказівки з дисципліни "Англійська мова за професійним спрямуванням" : у 2 ч. Ч. 1 / Т. М. Сорокіна. – Миколаїв : НУК, 2019. – 57 с.

Викладено питання, пов'язані з особливостями конструкцій двигунів внутрішнього згоряння та їх обслуговування. Запропоновані завдання складено відповідно до робочої програми і з урахуванням сучасних методів навчання.

Призначено для студентів денної і заочної форм навчання за напрямом підготовки 6.070104 "Морський та річковий транспорт", професійним спрямуванням "Експлуатація суднових енергетичних установок".

УДК 811.111(076)

Навчальне видання

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У двох частинах

Частина 1

(англійською та українською мовами)

Комп'ютерне верстання та складання *В. В. Москаленко*
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Формат 60×84/16. Ум. друк. арк. 3,5. Об'єм даних 24108 кб.
Тираж 15 прим. Вид. № 23. Зам. № 8.

Видавець і виготівник Національний університет кораблебудування
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Свідоцтво суб'єкта видавничої справи ДК № 6402 від 19.09.2018 р.

ВСТУП

Методичні вказівки призначені для аудиторної та самостійної роботи студентів за напрямом підготовки 6.070104 "Морський та річковий транспорт", професійним спрямуванням "Експлуатація суднових енергетичних установок" і охоплюють коло питань, пов'язаних з особливостями конструкцій двигунів внутрішнього згоряння та їх обслуговування.

Мета даних вказівок – розвиток навичок технічного перекладу, аналізу оригінальної літератури за фахом, засвоєння лексичного матеріалу, необхідного як для читання та перекладу, так і для розвитку навичок усного мовлення за професійним спрямуванням.

Методичні вказівки складаються з 11 розділів (Units), які у свою чергу поділяються на параграфи. Параграфи охоплюють різні види роботи, мають подібну будову і передбачають ознайомлення з матеріалом за фахом. Кожен Unit є окремим дидактично завершеним елементом.

Робота у рамках Unit передбачає виконання вправ і завдань з новим мовним та мовленнєвим матеріалом, виконання тренувальних лексичних вправ, опрацювання основного тексту і вправи на закріплення матеріалу.

Засвоєння змісту кожної теми завершується вмінням аналізувати конструктивні схеми роботи двигунів внутрішнього

згоряння та систем їх обслуговування, виконанням зворотного перекладу основних речень з української мови на англійську, які орієнтовані на перевірку знання фахової лексики, заповнення пропусків у реченнях для формуванням відповідей на післятекстові запитання.

Рівень складності методичних вказівок дає змогу комуніканту розуміти основні ідеї тексту, брати участь у дискусіях за фахом. Користувач мови чітко і детально спілкується у межах професійних тем, може висловлювати власну думку з конкретної проблеми, аргументовано пропонувати шляхи її вирішення.

UNIT 1. WHAT IS A MODERN SHIP?

Task 1. Learn the following words and word combinations:

navigation	навігація
govern	регулювати
high sea(s)	відкрите море
maritime law	морський закон
hovercraft	судно на повітряній подушці
engine	двигун
propulsion	рушійна сила
hydrofoil	підводне крило
sea-going ship	морський корабель
denote	визначити

Task 2. Read and translate the text:

An overall answer to this question is difficult because there are so many types and sizes. Many modern ships are so complicated from the structural point of view that it is difficult to say exactly to what basic structural class they belong. The choice is governed by the size of the ship and the duty for which it is intended. A ship may be defined as a vessel of considerable size adapted to navigation.

The word is used as a general term for sea-going vessels of every kind. A ship may also be defined as a masted vessel of every kind larger than a boat and suitable for navigation on the high seas. In maritime law the word "ship" is equivalent to "vessel" and it is not the form, the construction, the rig, the equipment or the means of propulsion that makes a ship, but the purpose and business of the craft as an instrument of marine transportation.

The word ship probably dominates in the following synonymic group by more frequent usage. Each word in the group denotes the basic notion, however differs in some shadow of meaning and consequently in usage and in combinations with other words.

The term "vessel" includes every description of water craft or other artificial contrivance used as a means of transportation. Craft

(pl. unchanged) " a term in marine parlance applied to every kind of vessel but more especially to small vessels nowadays sometimes more sophisticated from structural or propulsion points of view (e.g. hovercraft, hydrofoil craft). Boat " a small open craft propelled by oars, sails or some form of engine. This term is also applied to larger vessels built to navigate rivers and inland waters, and sometimes to sea-going vessels but in such case it is mostly used as a part of a compound word or expression (ferry boat, fishing boat, rowboat, and lifeboat).

Ship " is a sea-going engineering structure to perform different duties to ensure navigation, shipping and defense of the state's interests.

Task 3. Answer the questions:

1. What defines the basic structural class of a ship?
2. What is a general term for sea-going vessels of every kind?
3. What is the difference in the meaning of the terms "vessel" and "craft"?
4. What is a modern ship?

Task 4. Give Ukrainian equivalents for the following words:

modern, type, structure, adapt, navigation, mast, form, transportation, dominate, term, combination, construction, instrument.

Task 5. Match each of the words in column I with it's definition given in column II:

I	II
1. Ship	a) a small open craft propelled by oars, sails or some forms of engine
2. Vessel	b) mostly small vessels nowadays more sophisticated from structural or propulsion points of view
3. Craft	c) general word for all craft capable of floating on water and larger than rowboat
4. Boat	d) a sea-going engineering structure to perform different duties

Task 6. Translate the text from Ukrainian into English:

В останні роки намітилася чітка спеціалізація суден за призначенням, з'явилися нові типи суден: для перевезення навалювальних вантажів, зріджених газів, суховантажні судна відкритого типу, спеціалізовані високошвидкісні для перевезення вантажів укрупненими місцями (контейнеровози, судна-ліхтеровози для перевезення плавучих барж), пристосовані для швидкісної обробки в портах протягом декількох годин, що мають швидкість 25–30 вуз, комфортабельні пасажирські судна для морських подорожей, автомобільно-пасажирські пороми, спеціалізовані промислові судна і великі промислові бази, науково-дослідні судна, судна для освоєння континентального шельфу і Світового океану (бурові судна, плавучі бурові установки і т. п.).

Task 7. Speaking about a modern ship:



UNIT 2. GENERAL CLASSIFICATION OF CIVIL SHIPS

Task 1. Learn the following words and word combination:

sailing area	район навігації
motor ship (vessel)	теплохід (судно)
turbine	турбіна
nuclear reactor	ядерний реактор
light alloy	легкий сплав
fishing ship	риболовний корабель
ferry	пором
cruise ship	круїзний корабель
icebreaker	криголам
tug	буксир
maintenance	технічне обслуговування
dredger	землечерпалка
floating workshop	плаваюча майстерня
drilling rig	бурова установка
supply	постачання

Task 2. Read the text:

All civil ships can be classified according to the following principles:

1) Sailing area " sea-going ships (deep-sea unlimited and coastal navigation), roaders, inland water ships and "sea-river" ships.

2) Kind of main machinery " motor ships (diesel engine), turbine driven ships (steam or gas turbine), electro-driven ships (electro-motor), nuclear powered ships (nuclear reactor).

3) Type of propulsion device " ships with screw propeller, water jet and vane propeller devices, paddle, sails.

4) Architectonic-structural type " number of hulls (catamaran, trimaran), number and position of superstructures, decks; position of the engine room.

5) Kind of material employed in hull structure " steel, light-alloyed, plastic, wooden, iron-cement, composite ships.

6) Duty of a ship that is the service they are designed for.

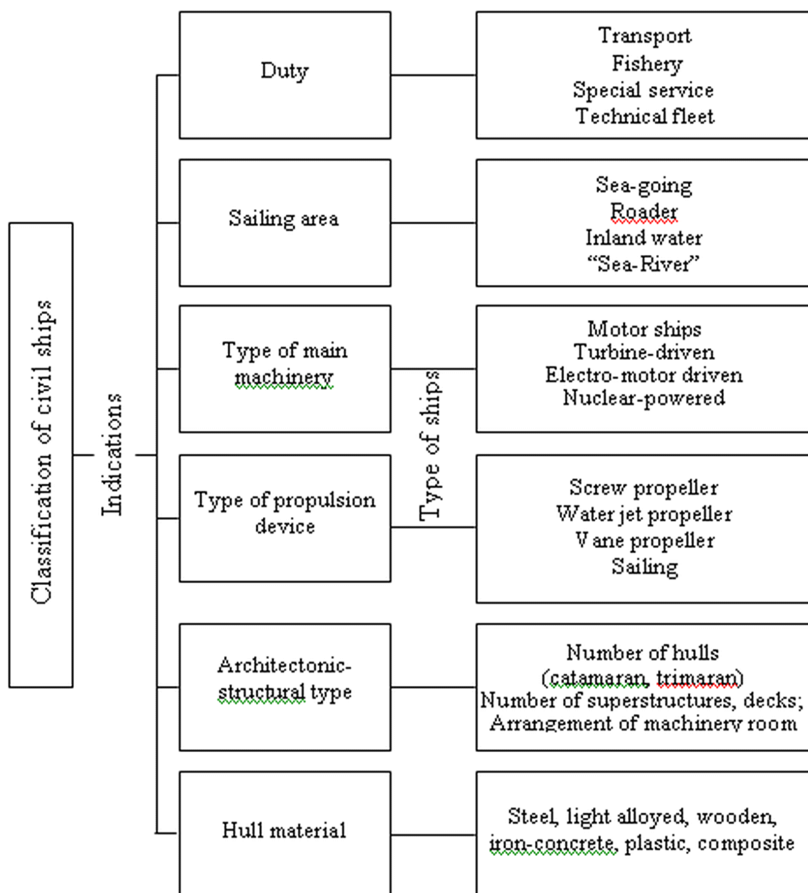
According to the last principle all civil ships can be divided into transport, fishing ships, special service and technical fleet ships. Transport ships can carry passengers and cargo. In international law any ship with space for more than 12 passengers is a passenger ship. These ships range from ferries with passenger accommodation to luxurious cruise ships which carry more than 2000 passengers around the world. Passenger liners are employed on regular routes according to a fixed schedule. Nowadays the number of passenger vessels has been greatly reduced because of competition from air transport. The group of fishery ships includes fishing (fish-catching) ships " trawlers, seiners, etc., " floating fishery mother ships or factories for processing the catch and for supplying service to the crews of fishing ships. There are fish searching and fishery research ships as well.

The group of special ships consists of auxiliary or service ships. Among them are ice-breakers, used for keeping open a navigable passage through ice; tugs used for towing or assisting vessels at sea; fire-fighting ships fitted with fire-fighting equipment for assisting vessels against damage by fire; rescue (salvage) ships fitted with special equipment for salving stranded vessels and for towing. Referred to special service ships are research ships, medical and training ones. Technical fleet includes the facilities which allow performing technical maintenance of various ships, port industry and waterways. Among them are dredgers used for deepening channels and harbors, floating cranes, floating workshops, cable-layers, floating docks. Technical facilities for developing the continental shelf and World Ocean include drilling rigs, drilling ships, pipe-layers.

Task 3. Answer the following questions:

1. What are the main indications of ships classification?
2. Into what groups can all sea-going ships be divided according to their duties?
3. What types of ships are included into the fishery group?
4. What types of ships are referred to special ones?

Task 4. Study the diagram of ship classification:



Task 5. Fill in the blanks. Make use of the appropriate words from the text and diagram:

1. Transport ships can carry _____ and _____.
2. Passenger liners are employed on _____ routes according to a _____.

3. The number of passenger vessels has been reduced because of _____ from air transport.

4. The fishery ships include fishery floating mother ships for _____ the catch.

5. Icebreakers keep open a _____ through ice.

6. Technical fleet includes _____ to perform technical _____ of various ships.

7. Architectonic-structural type indicates the number of _____, _____ and _____.

8. Screw propeller, water jet and vane propellers are _____.

Task 6. Get started studying the types of ships with the definitions of their duties:

Types of ship	Definition	Translation
	Container ship The type of ship is designed to carry standard-sizes containers in cargo holds and deck cargo.	Контейнеровоз
	Bulk Carrier(Bulker) This type of ship carries cargo such as iron ore, grain, etc. that is loaded in bulk not in containers.	Навалювальне
	Ro-ro ship This type of ship carries cars, buses and trucks.	Накатне

Types of ship	Definition	Translation
	Multi-purpose vessel The type of ship carries different general cargoes, containers, etc.	Багатоцільове
	General Cargo Ship She carries different packed cargoes on the deck and different cargoes in holds.	Судно для перевезення генеральних вантажів
	Reefer This type of ship carries different cooled fruit, vegetables, frozen meat, fish, etc.	Рефрижератор
	Chemical Tanker This type of ship carries different chemical in liquid form in tanks.	Хімовоз
	Oil Tanker This type of ship carries crude oil in huge tanks.	Нафтоналивне
	Tanker (Product Tanker) This type of ship carries different oil products.	Танкер-продуктовоз

Types of ship	Definition	Translation
	Passenger Ship (Cruise Liner) Such ships usually carry passengers.	Пасажирське
	Tug (Tug Boat) Tug boats pull ships or push them ahead in ports.	Буксир
	Fishing vessel This ship catches different types of fish in seas and oceans.	Риболовецьке

UNIT 3. MAIN MARINE ENGINES

Task 1. Learn the following words:

power plant	електростанція
nuclear	ядерний
combustion	горіння
piston	поршень
stroke	такт
cylinder	циліндр
crankshaft	колінчастий вал
output	випускний
fuel	паливо
power	енергія
steam	пари
turbine	турбіна
shaft	вал
rotate	обертатися

Task 2. Read the text:

Ships are large, complex vehicles which must be self-sustaining in their environment for long periods with a high degree of reliability. A ship is the product of two main areas of skill, those of the naval architect and the marine engineer. The naval architect is concerned with the hull, its structure, form, habitability, and ability to endure its environment. The marine engineer is responsible for the various systems which propel and operate the ship. More specifically, this means the machinery required for propulsion, steering, anchoring and ship securing, cargo handling, air conditioning, power generation and its distribution.

There are four main types of marine engine: the diesel engine, the steam turbine, the gas turbine and the marine nuclear plant. Each type of engine has its own particular application.

A diesel engine is a ship's reciprocating machine, the internal combustion engine. To understand how a diesel engine works imagine

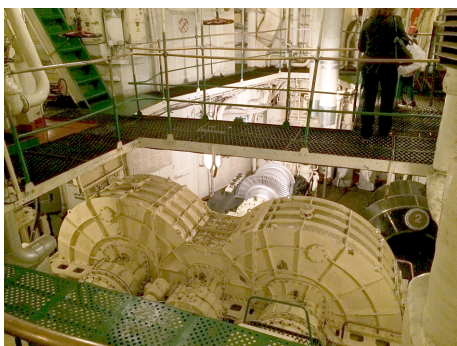
the piston just near the top of its upstroke. All access from the outer air is closed but a given volume of air has been drawn in and trapped in between the bottom of the cylinder top and the top of the piston. Air is compressed and it heats. At the point of maximum compression a needle valve in the cylinder head opens, a spray of fuel enters. An explosion takes place and the piston is driven down the cylinder. Working via the piston rod, crosshead and connecting rod, it rotates the crankshaft. No diesel engine is a single cylinder engine, there may be as many as twelve driving one crankshaft, but each cylinder is self-sufficient in operation.

The diesel engine is started by means of compressed air admitted into the cylinder at high pressure via a special starting valve. There are two main types of diesel engines: one is the two-cycle and the other is the four-cycle. The power output of a modern marine diesel engine is about 40,000 brake horse power (bhp). This is now expressed in kilowatts. Large diesel engines, which have cylinders near 3 ft in diameter, turn at the relatively small speed of about 108 r.p.m. 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 larger merchant vessels are being powered by medium-speed diesel engines. These operate between 150 and 450 r.p.m., 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.

The steam turbine has until recently been the first choice for very large power main propulsion units. Its advantages of little or no vibration, low weight, minimum space requirements and low maintenance costs are considerable. 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



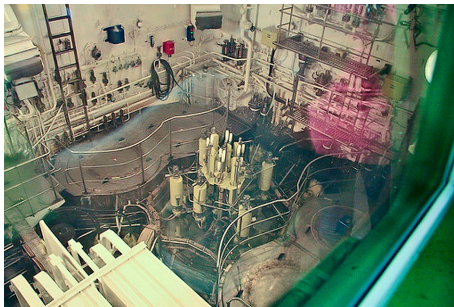
them more attractive as an alternative to diesel power in ships. They are 50 per cent lighter and on very large tankers some of the steam can be used to drive the large cargo oil pumps. Turbines are often used in container ships, which travel at high speeds.

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 removed for maintenance. It is also suitable for complete automation. The gas turbine efficiency being low, its main advantage is its small weight and size which makes a gas turbine installation very attractive for naval applications. Most of

modern warships of about to 5,000 ton displacement are powered with gas turbines usually combined with diesel engines. Gas turbines are easier to start and reliable in operation. However, the use of astern gas turbines is a rather complex problem; therefore ships powered with main gas turbine units are equipped with either controllable pitch propellers (c.p.p.) or other reversing gears.



Nuclear power in ships has mainly been confined to naval vessels, particularly to submarines. But this form of power can be used more in merchant ships as oil fuels become more expensive.



The atomic ice-breakers opened new possibilities in exploring the northern areas. They can sail for a long time without refueling. A nuclear-powered ship differs 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.

Task 3. Answer the following questions:

1. What main types of marine engine can be found at sea today?
2. Why must the propeller shaft rotate at a relatively slow speed?
3. What is the difference between steam and gas turbine?
4. Is the nuclear power used in merchant ships?

Task 4. Get started studying the diagram:

The classification of engines into four engine categories.

Category I: High-speed four-stroke engines with up to 100kW shaft power.

The number of revolutions (RPM) normally lies between 1500 and 3000 revolutions per minute (rpm).

The fuel is diesel oil.

Category II: High-speed four-stroke engines with a shaft power between 100 and 5000 kW.

The RPM normally lies between 960 and 2100 revolutions per minute.

The fuel is diesel oil.

Category III: Medium-speed four-stroke engines with a shaft power between 500 and 30,000 kW.

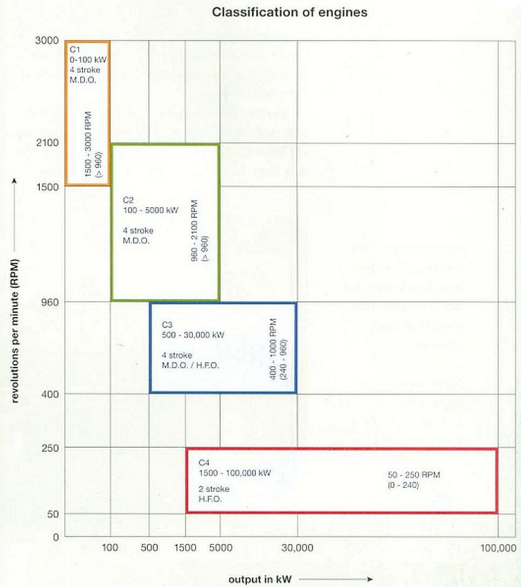
The RPM normally lies between 400 and 1000 revolutions per minute.

The fuel is heavy oil.

Category IV: Low-speed two-stroke crosshead engines with a shaft power of 1500 up to 100,000 kW and RPM between 50 and 250 revolutions per minute.

The fuel is heavy oil.

Different categories could of course overlap in some cases.



Task 5. Arrange the words below into the pairs of synonyms:

restrict
self-sustained
output
plant
navy
conventional
combustion
(to) power
remove
maintenance
power

produce
drive
energy
traditional
opposite
service
installation
limit
warships
investigate
burning

reverse
general
explore

independent
take-off
output

Task 6. Study the table below showing the basic units of the SI system and their symbols:

Quantity	Unit	Symbol
length	metre	m
mass	kilogramme	kg
time	second	s
electric current	ampere	A
luminous intensity	candela	cd
temperature	kelvin	K
plane angle	radian	r
solid angle	steradian	sr

Task 7. Complete the following table:

Quantity	Unit	Symbol
area	square metre	
volume	cubic metre	
velocity	metre per second	
acceleration	metre per second second	
density	kilogramme per cubic metre	
momentum	kilogramme metre per second	
angular velocity	radian per second	

UNIT 4. THE TWO-STROKE DIESEL ENGINE

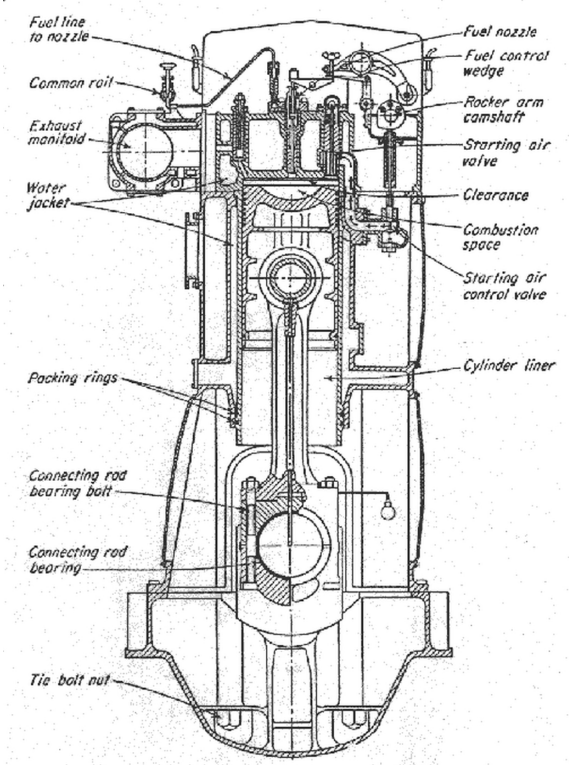
Task 1. Learn the following words:

scavenging	продувка
recharging	перезаряджання
to occur	траплятися
sequence of events	порядок дій
to substitute	змінити
to arrange	встановлювати
exhaust manifold	випускний колектор
to store	зберігати
to take cover	покриття
to rush it	кинутися до
to incline	відхиляти
whirling motion	вихровий рух
disadvantage	недолік
while	в той час, як
still	все ще
partially	частково
below	нижче
to increase	збільшити
to provide (with)	забезпечити

Task 2. Read the text:

Two-cycle, single-acting Diesel engines are also used for propulsion of ships. They provide one power-stroke per revolution, while a double-acting 2-stroke cycle engine develops power on every stroke. A two-cycle engine develops twice as much power as a four-cycle engine with the same size and number of cylinders. Since the four operations, i.e. suction, compression, firing (ignition and expansion), and exhaust, have to be completed during two strokes of the piston, more than one operation must be performed per stroke. This complicates the engine. The piston is made to control the admission of air and release of the exhaust gases by covering and

uncovering ports or passages in the cylinder walls through which the air and gases pass. These ports, scavenging and exhaust, are placed instead of air inlet valves and exhaust valves. The exhaust ports are located in the bottom of the cylinder and scavenging ports may be placed at the same level or lower than exhaust ones. The fresh air-charge is pumped into the cylinder at low pressure by means of a scavenging pump or a low pressure scavenging air compressor, which may be driven either by the engine itself, or by a separate auxiliary engine or electric motor. This air not only provides the air charge necessary for the proper combustion of the fuel but assists in clearing the burnt gases rapidly out of the cylinder.



Task 3. Translate into Ukrainian:

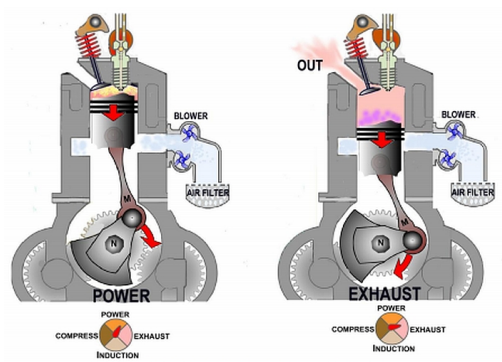
compression occurs, upstroke (down stroke) of the piston, during the latter part of the down stroke, to be made possible by substituting opposite sides of the cylinder, in some designs, on the same side, low pressure scavenging air receiver, to be slightly higher, to be still closed, with the result that, to be inclined upward, to direct, to be positioned tangentially, to be partially open (closed), valve-controlled scavenging ports, no exhaust gas can flow out, however, pressure-controlled valve, to drop below that in the receiver, mean effective pressure.

Task 4. Supply the words given below into the following sentences:

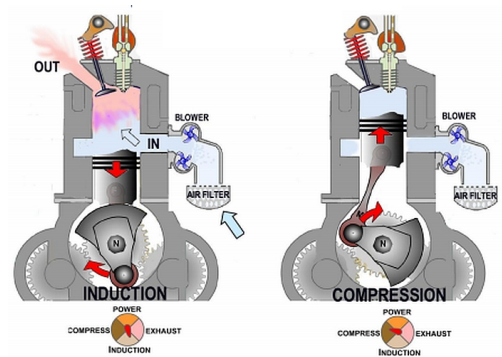
Scavenging ports, whirling motion, exhaust manifold, low-pressure compressor, to fill, tangentially, to direct, the top of the cylinder.

1. There are ... instead of inlet valves.
2. In a two-stroke engine ... occurs on the first stroke, upstroke.
3. The exhaust ports are connected with ...
4. Scavenging ports are in communication with ...
5. The cylinder is ... air at a pressure slightly above atmospheric.
6. ... are inclined upward ... the air toward ...
7. Scavenging ports are positioned ... to give the air ...

Task 5. Tell about 2-cycle engines:



THE DIESEL 2 STROKE WORK CYCLE



UNIT 5. THE FOUR – CYCLE DIESEL ENGINE

Task 1. Learn the following words:

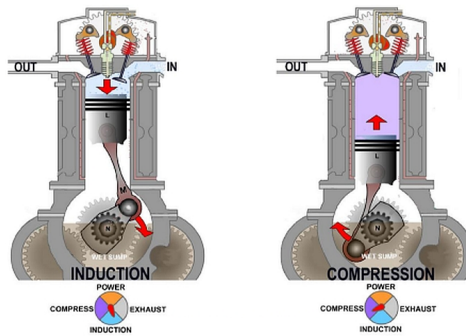
internal combustion engine	двигун внутрішнього згорання
stroke	такт
revolution	обертання
single – acting	одноразовий
double – acting	подвійна дія
to require	вимагати
to intake	приймати
to draw up	розробляти
inlet valve	впускний клапан
cam	кулачок
upward stroke	хід (поршня) вгору
downward stroke	хід (поршня) вниз
to compress	стискати
clearance volume	робочий об'єм циліндра
to reach	досягнути
fuel injection valve	форсунка
combustion chamber	камера згорання
to ignite	запалюватися
exhaust valve	випускний клапан
combustion products	продукти горіння
except	за винятком
expansion	розширення

Task 2. Read the text:

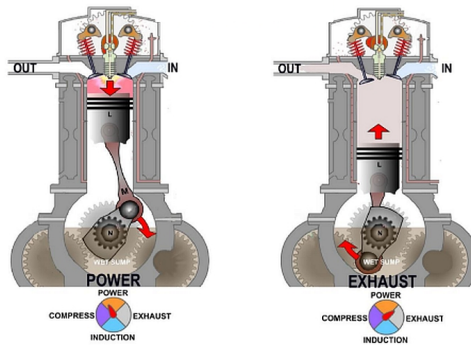
Any internal combustion engine has a four – stroke cycle or a two – stroke cycle, according to whether it receives a working impulse on the piston every other revolution or every revolution. These two terms are commonly abbreviated to 4 – cycle and 2 – cycle, and engines of either type may be single acting or double acting.

In the four – stroke cycle, or, as it is commonly called, the four – cycle engine, four strokes of the piston, or two revolutions

of the shaft, are required to complete the cycle. As the piston moves down on its suction or intake stroke, a charge of pure air containing the necessary oxygen for combustion is drawn in through the inlet valve in the cylinder head. The inlet valve was opened mechanically by a cam at the end of the previous upward stroke. After the piston has completed the suction stroke, the inlet valve closes, and the piston starts on an upward stroke, called compression stroke, compressing the charge of pure air into the inlet valve closes, and the piston starts on an upward stroke, called compression stroke, compressing the charge of pure air into the clearance volume to a pressure of between 350 and 450 lb. per sq. in. About the time that the piston reaches the end of its upward stroke, the fuel injection valve opens for a short period, and finely atomized fuel oil is sprayed in the combustion space under high, pressure. Because of the heat compression, the fuel oil is ignited and burns generating heat. The piston has now started downward on its third stroke, and the hot gases generated by the combustion of the oil expand and force the piston downward on its working or power stroke. Near the end of the working stroke the exhaust valve in the cylinder head opens, part of the gases escape, and the pressure in the cylinder drops approximately to the atmospheric. The piston now starts up on its exhaust stroke, and all the products of combustion except those contained in the clearance volume are forced out through the open exhaust valve. The exhaust valve now closes, and the cycle is repeated.



THE 4 STROKE WORK CYCLE



Task 3. Answer the following questions:

1. How many strokes of the piston are necessary to complete the cycle in the 4 – cycle engine?
2. Name the four strokes of the piston.
3. What valves must be closed during compression stroke? Why?
4. What is the action of the expanded gas?
5. Tell about the pressure and temperature during compression.
6. What takes place when the exhaust valve opens?
7. What happens after the exhaust valve closes?

Task 4. Translate into Ukrainian:

according to; whether it receives a working impulse; every other revolution; engines of either type; as it is commonly called; single acting engine; a charge of pure air; containing oxygen for combustion; previous stroke; about the time; open for a short period; because of; generating heat; generated by the combustion of the oil; to force the piston down; approximately to the atmospheric; except those contained in; are forced out through the valve.

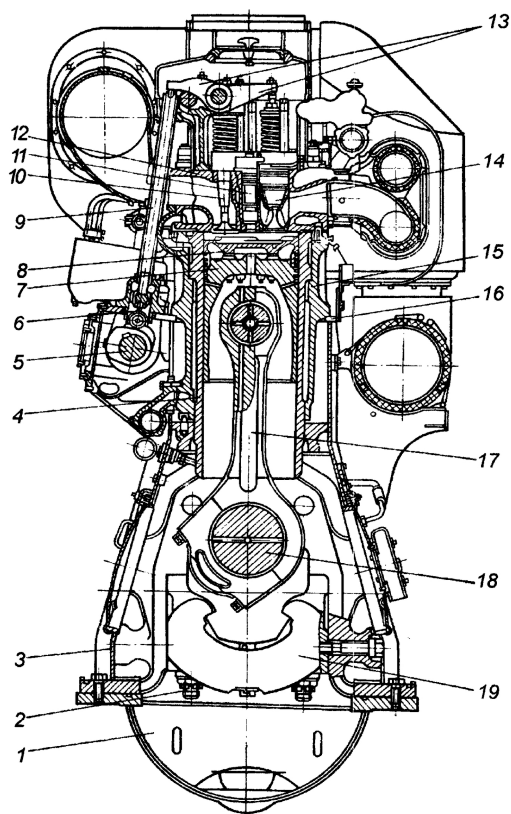
Task 5. Find English equivalent to the following Ukrainian words and word combinations:

4 – 2-тактний двигун, кожен оберт колінчастого вала, такти – всмоктування, стиснення, горіння і розширення, хід поршня вгору (вниз), тиск і температура, падати, атмосферний тиск, камера згоряння, форсунка, цикл повторюється, продукти горіння, виштовхувати через відкритий випускний клапан, засмоктується через відкритий впускний клапан.

Task 6. Complete sentences according to the content of the text:

1. Two revolutions of the shaft are required ...
2. A charge of pure air is draw in ...
3. The piston starts on an upward stroke ...
4. The piston compresses the charge ...
5. At the end of compression stroke ...
6. Finally atomized fuel oil is sprayed ...
7. The fuel is ignited ...
8. The exhaust valve in the cylinder head ...
9. All the products of combustion ...

Task 7. Here is the diagram of a four–stroke diesel engine. Cover over the diagram above and then see if you can name the parts 1–19 indicated:



<i>1</i>	<i>10</i>
<i>2</i>	<i>11</i>
<i>3</i>	<i>12</i>
<i>4</i>	<i>13</i>
<i>5</i>	<i>14</i>
<i>6</i>	<i>15</i>
<i>7</i>	<i>16</i>
<i>8</i>	<i>17</i>
<i>9</i>	<i>18</i>
	<i>19</i>

UNIT 6.AUXILIARY MACHINERY

Task 1. Learn the following words:

auxiliary	допоміжний
supply	подавати
propel	просунути
distillation	дистиляція
sewage	стічні води
shafting	вал
thrust shaft	упорний вал
intermediate shaft	проміжний вал
propeller shaft	гребний вал
windlass	брашпиль
pump	насос
winch	лебідка
shipboard	борт судна
bilge	днище (судна)
trim	порядок

Task 2. Read the text:

All marine machinery falls under two heads: that which is responsible for the driving of the ship's propeller, and that which supplies the requirements of the machinery. All machinery and devices which form the non-propulsive equipment is auxiliary machinery.

The auxiliary machinery is used to serve the main engine and the necessities of the ship. It includes diesel generator, a boiler, a refrigerating installation, compressors, separators, evaporators, pumps and other units to carry out a number of functions. These functions may be summarized as follows.

To supply the needs of the main engines and boilers. Air compressors are used to supply compressed air for starting engines. Coolers are used for cooling either oil or water. Water for the boilers is also heated before being admitted into the boiler by feed water heaters. This increases the efficiency of the boiler.

To keep the ship dry and trimmed. This is done through the bilge and ballast piping systems. The former removes water which has gathered in machinery, cargo and other spaces. The latter pumps water into and out of ballast tanks. In general cargo ships, these systems are usually interconnected and served by the same pumps. In tankers and other bulk carriers, these systems are entirely separate, because these ships may need to ballast at 12,000 tons/hour and therefore need larger pumps.

To supply domestic needs such as fresh water from distillation plant, sanitation from sewage plant and heating and ventilation from heaters and air conditioners.

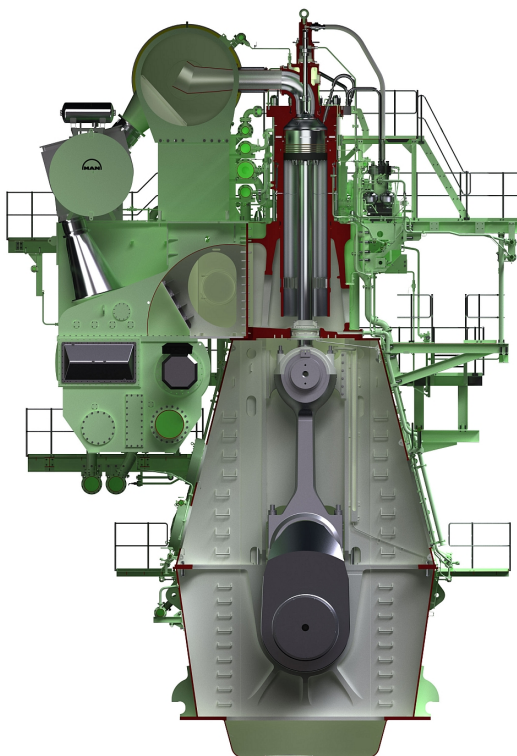
To apply the main power of the engines for propulsion and maneuvering. The engine power is transmitted to the propeller by a line of steel shafting. This is made up of the thrust shaft, intermediate shafts and the propeller shaft. Steering gear is also necessary to operate the rudder for maneuvering.

To supply the ship with electric power and lighting. This is done by steam or diesel power generators.

To moor the ship and handle cargo. Deck machinery is extensive and varied. It can be divided into anchor handling machinery – windlass and capstans, mooring machinery – winches and capstans and cargo handling machinery – winches and cranes. It also includes cargo oil pumps.

To provide for safety. Firefighting and fire detection equipment, lifeboat engines and launching gear are also included.

No type of machinery fitted to a ship, is self-sufficient. In addition to the large number of auxiliaries needed for the operation of the main machinery, most of which are now operated electrically, electricity is playing such an important part in shipboard life to-day, that, even if it is needed for every other purpose requiring mechanical operation. Therefore, all ships have power-generating stations.



Task 3. Answer the following questions:

1. What two groups is all marine machinery divided into?
2. What is auxiliary machinery used for?
3. What are the main functions of auxiliaries?
4. Why do all ships have power-generating stations?

Task 4. Give the other words of the same root for the words below. Find them in the text and translate the sentences in which they are used:

require, summarize, cool, feed, heat, distillate, electrical, propulsion, domestic, sanitation, separate, supply, evaporate, trim.

Task 5. For the words given in (a) find the synonyms given in (b):

a)	b)
supply	need
propel	between
heat	provide
trimmed	means
sewage	demand
intermediately	drive
shipboard	waste
summary	balanced
device	perform
require	hotness
necessity	collect
carry out	home
gather	completely
entirely	brief
domestic	on board

Task 6. Match the terms in the box with the definitions given below. Then find in the text the sentences in which these terms are used and translate them into Ukrainian:

boiler, pump, shaft, shafting, propeller shaft, thrust
shaft, intermediate shaft, bilge, device, windlass,
capstan, sewage plant

- 1) a special form of winch used to hoist anchors, house them safely and warp the ship when in harbor;
- 2) bar or rod joining parts of a machine or transmitting power;
- 3) the lower internal part of the hull adjacent to the keelson where the water collects;

- 4) the medium by which the motion of the engines is transmitted to the propeller screws;
- 5) a machine used on board a ship for rising anchor, lifting heavy weights or any other similar work;
- 6) the aftermost section of shafting which carries the propeller;
- 7) a machine (device) for forcing liquid, gas or air into, out of or through something;
- 8) one of the lengths of main drive shafts between the thrust bearing and the propeller shafts;
- 9) an installation for treatment or disposal of waste;
- 10) metal container in which water, etc. is heated;
- 11) the length of shafting which transmits the thrust of the propeller to the thrust bearing;
- 12) something invented or adapted for a special purpose.

Task 7. Fill in the blanks. Make use of the active vocabulary items and structures:

1. All ship machinery can be divided into main and _____ machinery.
2. Ballast piping system pumps water into and out of _____.
3. The auxiliary machinery is used to serve _____ and the necessities of the ship.
4. The engine power is transmitted to the propeller by _____.
5. Coolers are used for _____ either oil or water.
6. Deck machinery is divided into _____ machinery, _____ machinery and _____ machinery.
7. Bilge piping system removes water from machinery, _____ and other spaces.

UNIT 7. FUEL INJECTION SYSTEM

Task 1. Learn the following words:

to operate	працювати
intermittent	переривчастий
to be in general use	використовувати
fuel injection pump	паливний насос
nozzle	сопло
pump barrel	циліндр насоса
discharge valve	випускний клапан
keep (kept)	зберігати
amount	кількість
to mount	монтувати
to create	створювати
to deliver	доставити
to depend on	залежати від
to prevent	запобігати
as soon as	як тільки
bypass valve	байпасний клапан

Task 2. Read the text:

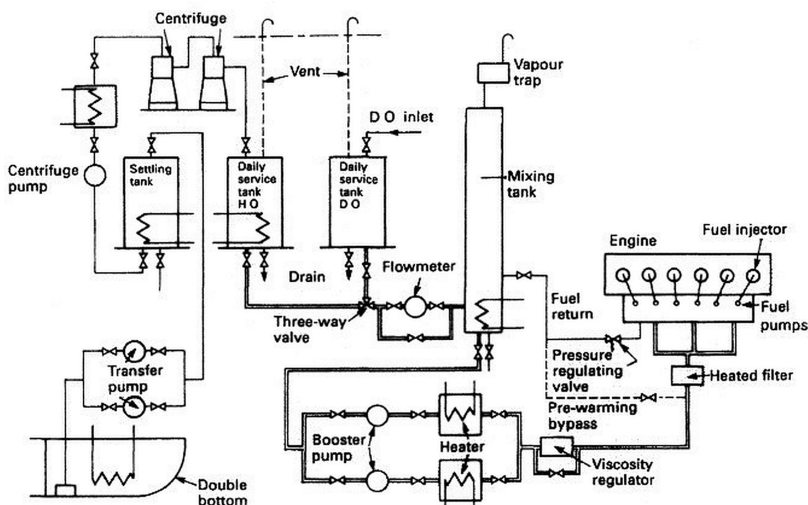
In an internal combustion engine the combustion process is rather complicated. All such engines operate with intermittent combustion. A charge of fuel is mixed with the air and ignited in the engine cylinder. For introducing the fuel charge into the cylinder if a Diesel engine fuel injection system is in general use.

Each cylinder has its own fuel injection pump connected directly through piping to the spray nozzle of the individual engine cylinder. In this system oil is drawn into the individual pump through the suction valve. When the nose of the fuel cam strikes the lower end of the pump plunger, the oil in the pump barrel is forced out through the discharge valve. The pipe- line is kept filled with oil, so when a new charge of oil enters the piping from the fuel pump, an equal amount is

pushed out of the pipe into the spray valve mounted in the cylinder head. This oil acts upon the surface created by the design of the spray valve needle. The oil then issues through openings into the engine cylinder.

The amount of oil the pump delivers to the engine is controlled by the governor – the particular type of control depends upon the pump design. On some, the pump stroke is varied to control the oil charge, on others a bypass valve allows part of the oil to flow back into the pump suction line.

The spray valve may have a spring – loaded differential needle which is lifted by the oil pressure as soon as the pump starts its delivery stroke. The fuel valve may also contain only a light check valve to prevent the cylinder gases passing through the valve; this is called an open nozzle.



Task 3. Answer the following questions:

1. What are the basic systems of introducing the fuel charge into the cylinder?

2. How long does combustion continue?
3. What can you tell about the time of introduction the fuel.
4. What is the amount of oil controlled by?
5. What can the spray valve have?

Task 4. Find English equivalents to Ukrainian words and word-combinations:

система впрыскування палива; процес змішування; складний; заряд; переривчастий; зазвичай використовується; свій (власний); форсунка; сопло; паливний кулачок; нижня частина; плунжер; байпасний клапан; виштовхувати.

Task 5. Form nouns from the verbs:

- a) to inject; to expand; to complicate; to vary; to create; to introduce; to introduce; to connect; to reduce; to ignite;
- b) to form; to charge; to issue; to control; to flow; to load; to start; to pass; to pump; to force; to use;
- c) compose sentences using both verbs and nouns.

Task 6. Ask as many questions as you can:

1. Combustion continues until the entire fuel charge has been burned.
2. Each cylinder has its own high pressure fuel pump connected to the spray nozzle.
3. Small-bore, high-speed engines require highly developed combustion chamber to pre-prepare the fuel charge.
4. Atomization and spreading of the fuel depend on the shape of the combustion space.

Task 7. Translate into English using the text:

1. Конструктори розробили багато систем впрыскування.
2. Існують 2 основні системи подання паливного заряду в циліндр дизельного двигуна.

3. Заряд палива змішується з повітрям та воздухом, запалюється в циліндрі двигуна.

4. Всі двигуни (ДВЗ) працюють з переривчастим згорянням палива.

5. Паливо надходить в індивідуальний насос через всмоктуючий клапан.

Task 8. Tell about fuel injection system.

UNIT 8. ENGINE LUBRICATION

Task 1. Learn the following words:

unit	одиниця
relative	відповідний
to apply	застосовувати
despite	незалежно від
to oxidize	окислити
past	після
to assemble	зібрати

Task 2. Read the text:

The purpose of lubrication is the maintenance of a film of lubricant between any two surfaces having relative motion. In the diesel engine there are two general types of surfaces – those inside the cylinders and those in the bearings. Mineral oils are mostly used as lubricant. This oil must be applied in small quantities for lubrication of the cylinders, but if it is used for bearing lubrication, the oil can be applied in any desired quantity and used repeatedly.

Cylinder Lubrication

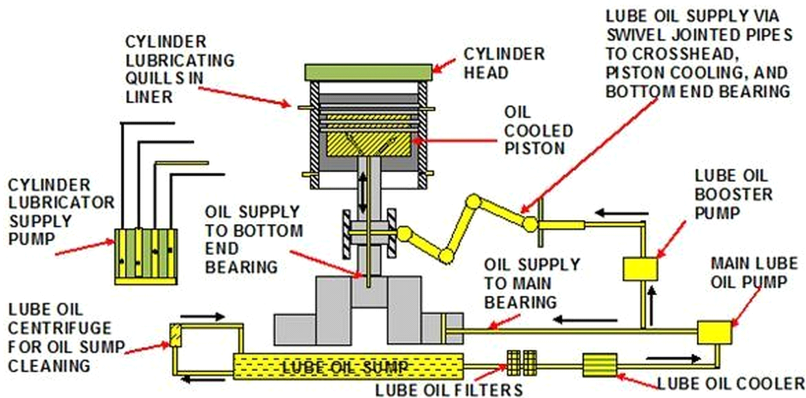
Cylinder lubrication has two purposes – to maintain the required film to separate the liner surface and the surfaces of the piston rings and to act as a seal to prevent gases from blowing past the rings. These things must be done despite high temperature of combustion and high pressure resulting from combustion. The first tends to oxidize or burn the oil and the second tends to squeeze it out from between the surfaces or force the combustion gases past the rings. The principal problem is to produce oil that will not break down and form carbon and gum- my lacquer that will cause the piston rings to stick or break.

The customary method of applying oil to the cylinder walls is by means of small pumps assembled in units of from 2 to 24, known as mechanical lubrications. The oil is supplied in measured quantities,

only enough to maintain a film and continuously replace that portion of the oil that is burnt or blown past the rings.

Bearing Lubrication

Bearing lubrication is effected by means of a pressure circulating system. A large amount of oil under pressure is forced through the bearings. In general, the system is made up of a sump from which a circulating pump draws oil and discharges it through the coolers and filters to a manifold which has a branch to each main bearing. Some of the oil flows out of the ends of the main bearings while the rest passes through an axial hole in the crankshaft to the crank-pin bearings. Here more oil is lost and the rest passes through axial holes in the connecting rods to the wristpin or crosshead bearings. From here all of the oil may be discharged from the bearings into the crankpin or a portion may be passed through pipes to the interior of the pistons for cooling purposes and then return to the sump.



Task 3. Answer the following questions:

1. Why is it necessary to lubricate the engine parts?
2. What oil is used for lubrication?
3. What mechanism supplies oil to the cylinder walls?

4. What lubrication system is used to oil bearings?
5. What quantity can oil be applied in when lubricating cylinder and bearings?
6. What way does oil pass to the crankpin bearings?
7. Why is it necessary to clean the oil before supplying it to the system?

Task 4. Translate the following words and word-combinations from English into Ukrainian:

a film of lubricant, to have relative motion, to separate, to act as a seal, to prevent gases from blowing, past the rings, to oxidize the oil, to squeeze the oil out, to apply oil, to assemble in units, measured quantity, is effected by, pressure circulating system, large amount, to force through, to draw and discharge, a manifold with a branch, axial hole, crankpin bearing, wristpin bearing, crosshead bearing, a portion of oil, to pass through the pipe, interior of the piston, a sump.

Task 5. Give English equivalents:

щоб змастити, підтримувати масляний шар, рухомі частини, система мастила під тиском, свердління отворів, передавати мастило до, стікати в картер, мокрий картер, надлишок мастила, сухий картер, запобігти утворенню смоло- та лако- подібного нагару, залипання кілець, нагнітати, мотильовий підшипник, шатунний підшипник.

Task 6. Translate into English:

1. Мастило запобігає зносу деталей двигуна.
2. Мастило циліндрів має 2 мети. Масляна плівка розділяє поверхні втулок і поршневих кілець. Вона запобігає прориву газів за кільцями.

3. Для змащення підшипників використовується циркуляційна система під тиском.

4. Циркуляційний насос втягує мастило і подає його через охолоджувачі та фільтри до трубопроводу.

5. Мастило подається до поршневого підшипника через отвір в шатуні.

6. Механічні лубрикатори подають мастило в невеликій кількості.

UNIT 9. ENGINE COOLING SYSTEM

Task 1. Learn the following words:

brake horsepower	ефективна потужність (у к.с.)
frictional heat	тепло при терті
rubbing surface	поверхня тертя
to remove	видалити
overheating	перегрів
breakdown	несправність
loss of strength	втрата міцності
excessive	надмірний
due to	завдяки
unequal	нерівномірний
jacket	сорочка
to transfer	передавати
cooler	охолоджувач
to absorb	поглинати
exhaust manifold	вихлопний колектор
water-to-water	водяний

Task 2. Read the text:

When fuel burns in the cylinders of a diesel engine only about one-third of the fuel's heat energy changes into mechanical energy and then leaves the engine in the form of brake horse- power. The rest of the heat shows up in hot exhaust gases, frictional heat of the rubbing surfaces and heating of the metal walls which form the combustion chamber, namely, the cylinder head and piston.

The cooling system job is to remove the unwanted heat from these parts so as to prevent:

1. Overheating and resulting breakdown of the lubricating oil film which separates the engine rubbing surfaces.
2. Overheating and resulting loss of strength of the metal itself.
3. Excessive stresses in or between the engine parts due to unequal temperature.

Cylinder heads and cylinders are generally provided with jackets through which cooling water is circulated. Pistons transfer their heat to the cylinder walls and to the lubricating oil. Many engines use oil coolers to remove the heat in the lubricating oil.

The heat balance of an engine and the amount of heat absorbed by the cooling water vary with the type of engine and the design of cylinders; exhaust manifold, pistons lubricating oil system and any other equipment which may be cooled directly or indirectly by the circulating water.

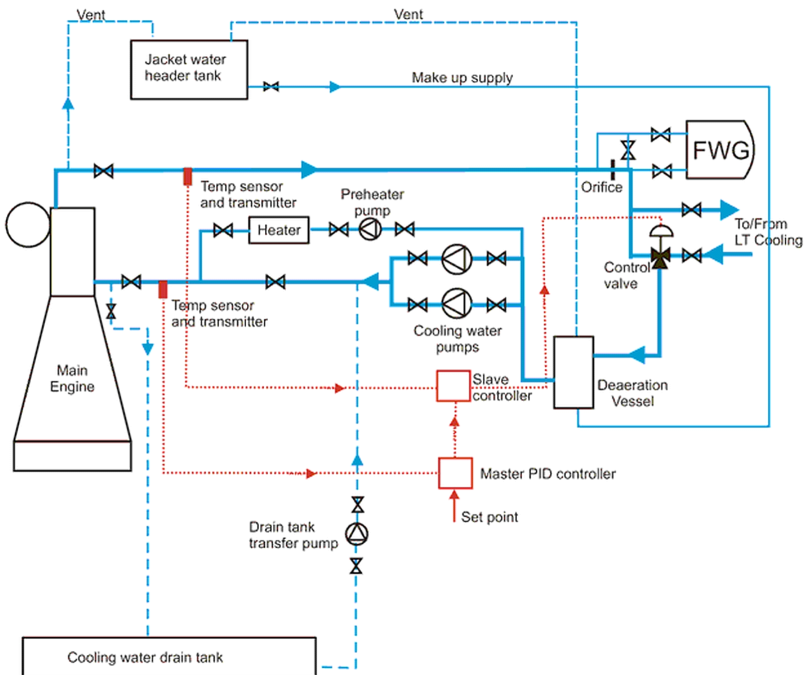
Closed Cooling System

In closed cooling systems the jacket water is re-circulated through closed heat exchangers. A heat exchanger is a device that transfers heat from one fluid to another. Thus, in closed systems, the same water remains in the system indefinitely and is re-cooled without exposure to air. The heat exchanger may be water-to-water (shell-and-tube type) or water-to-air (radiators and evaporative coolers). With water-to-water heat exchanger the secondary water may pass through only once if the supply is ample and there is no need to conserve it. Scale deposits are not as serious in heat exchangers can be easily cleaned.

In the radiator type of a closed system air blown by a fan cools water within the tubes of the radiator. The water is not exposed to the air and there is no evaporation.

Both salt and fresh water are used for cooling system. When a separate fresh-water system is employed, an extra fresh-water cooler and pump for circulating sea water through this cooler must be available. The advantages of the separate fresh-water system are that higher temperatures of the cooling water can be used; salt-water fittings are not necessary beyond the fresh-water cooler, muddy (dirt) and other objectionable over-board water cannot get into the engine jackets, main circulating-water piping and circulating-water pumps.

The temperature of the discharge from sea-water cooling systems shouldn't exceed 130°F, because higher temperatures lead to deposit of solids on the cooling surface. When fresh water is used for cooling, the discharge water temperature should not exceed 160°F to maintain efficiency the temperature of the cooling water shouldn't fall below 100°F. Under no account must a large amount of cold water be supplied suddenly into a hot engine. Such sudden cooling would cause unequal contraction of the structural and working parts, would crack cylinder heads and cylinders and lead to seizing of pistons.



Task 3. Answer the following questions:

1. In what form does mechanical energy leave the engine?
2. What's the cooling system's job?
3. What are cylinder heads and cylinders provided with?
4. Where do pistons transfer their heat?
5. What is the heat exchanger?
6. What types of heat exchangers do you know?
7. What should you know about the temperature of cooling water?
8. What can a large amount of cold water supplied into hot engine cause?

Task 4. Translate into Ukrainian defining the prefixes in the words:

unwanted, unequal, uncomfortable, indirectly, insufficient, indefinitely, incorrect, irregular, discharge, disconnect, remove, re-circulate, recover, reheat, re-cool.

Task 5. Combine the following words with the above and translate them into Ukrainian:

heat, heating, stress, conditions, cooling, water level, timing, supply, operation, combustion products, heat balance, as much heat as possible, cold water, circulating pump.

Task 6. Translate sentences paying attention to the Infinitive functions:

1. The cooling system job is to remove the undesirable heat from the moving parts of the engine.
2. Many engines use oil coolers to remove the heat in the lubricating oil.
3. To transfer heat from one fluid to another a heat exchanger is used.

4. Cooling is also provided for the exhaust manifold to prevent high temperatures.

5. The plant utilizes a heat exchanger to recover heat from exhaust gases.

Task 7. Translate sentences from Ukrainian into English:

1. Циліндрові кришки і циліндри зазвичай забезпечені сорочками.

2. Масляний холодильник використовують для видалення тепла з мастила.

3. Призначення системи охолодження – запобігти перегріву поверхонь тертя.

4. Тепловий баланс двигуна може змінюватися в залежності від типу двигуна і конструкції циліндрів, поршнів і системи змащення.

5. Теплообмінники можуть бути водяного і повітряного охолодження.

6. Охолодження прісною водою викликає менше відкладення осадків і накипу та зменшує корозію.

UNIT 10. TURBOCHARGING SYSTEM

Task 1. Learn the following words:

available	доступний
output	вихідна потужність
dimension	розмір
density	густина
turbocharging	турбонаддув
to equip	обладнати
normally aspirates engine	двигун без наддуву
in turn	у свою чергу
reciprocating pump	поршневий насос
stage	сходінка
resistance	опір
transmission	передача
to maneuver	маневрувати
pulse	пульсуючий
meet smb's requirements	відповідати вимогам

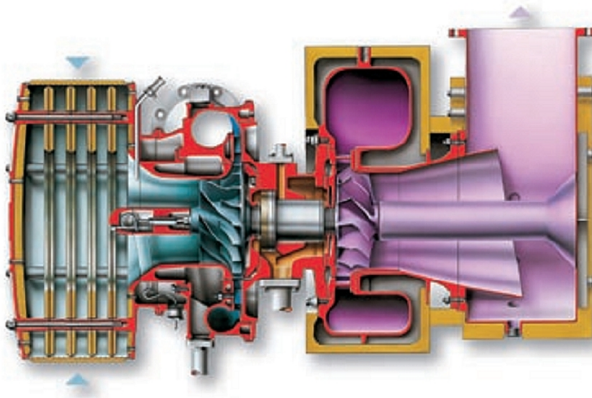
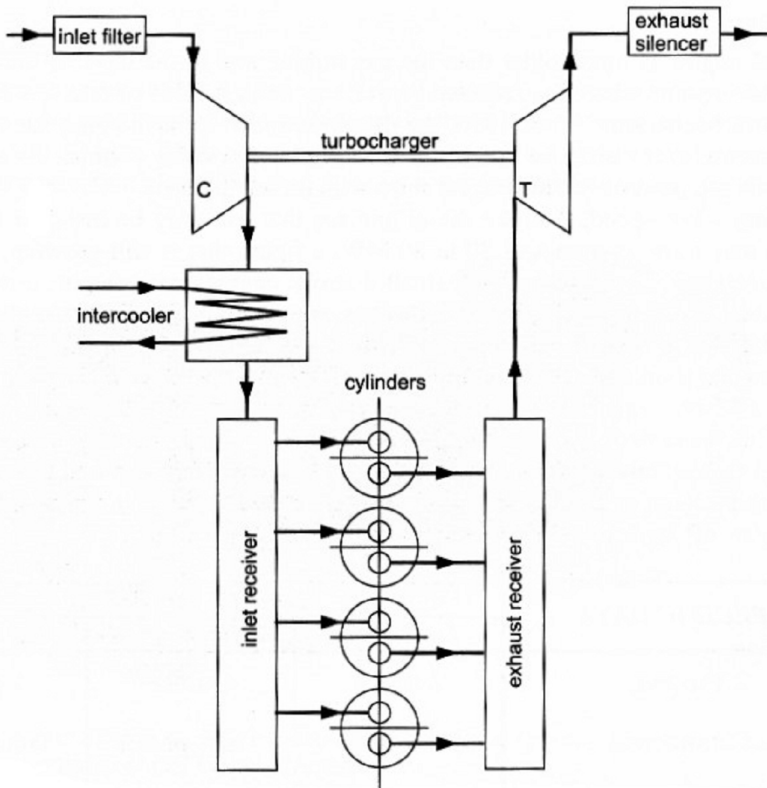
Task 2. Read the text:

To increase the available output of a diesel engine of given main dimensions the engine is connected with one or more exhaust-gas turbine-driven compressors and air coolers: an arrangement which is generally known as turbo charging. The only difference between an engine equipped in this manner and a normally aspirated engine is that the former operates at an increased pressure level. The exhaust gas drives a turbine which, in turn, drives a centrifugal compressor which increases the air pressure before the reciprocating scavenging air pumps. Since the density of scavenging air is increased by the pressure rise in the turbo-compressor and the subsequent cooling, a larger quantity of air by

weight is entrapped in the cylinder which, in turn, permits the combustion of a larger quantity of fuel and gives a higher available output. Each turbo-charger consists of a single stage or two-stage centrifugal compressor and axial turbine which are assembled on the same shaft. Rotation of the rotor depends on the engine load and scavenging resistance, since the unit is connected to the engine without any mechanical transmission. The turbo-charged engine is maneuvered in the same manner as a normally aspirated engine.

MAK engines use only pulse turbo charging and to meet this requirement cylinder numbers which permit good grouping of the turbocharger connections are employed. A distinction is made between three-pulse charging for 6–9 and 12 cylinder engines with cams specially timed for three-pulse mode and four-pulse charging for 8 and 16 cylinder engines with completely different timings for the four-pulse mode. The disadvantage of pulse charging for highly-supercharged engines compared with the constant pressure charging is the fact that during the full load the single-stage exhaust turbine can only utilize the lower part of the very high exhaust gas pressure wave. But this is the advantage at part load or reduced power. Pulse charging has a further advantage that the engine can adapt very quickly to sudden changes in load.

With exhaust gas turbo-charging it has proved possible to triple the power obtained from the swept volume of a diesel engine.



Task 3. Answer the following questions:

1. What is a purpose of supercharging?
2. What is a turbocharger?
3. What's the difference between normally aspirated engine and turbocharged engine?
4. What does the rotation of the rotor depend on?
5. What permits the combustion of a larger quantity of fuel?
6. What is the result of this combustion?
7. What is the disadvantage of the pulse turbo charging?

Task 4. Compose your own sentences with the words:
full load, drive, larger quantity, increase.

Task 5. Translate the following word-combinations into Ukrainian:

burning more fuel oil, at a pressure higher than atmosphere, exhaust-gas turbine-driven compressor, air cooler, is generally known, the only difference, normally aspirated engine, pressure level, reciprocating scavenging air compressor, by the pressure rise, subsequent cooling, larger quantity, higher output, single-stage, axial turbine, on the same shaft, depend on the load, scavenging resistance, transmission, to triple the power, swept volume.

Task 6. Give English equivalents to the Ukrainian words and expressions:

збільшити; потужність двигуна; турбонаддув; висока температура і тиск; вихлопні гази; турбокомпресор; повне навантаження; часткове навантаження; імпульсний; тиск повітря; під тиском; відцентровий; поршневий; сходинка; передача; таким же чином; повністю відрізняється; постійний тиск; використовувати; пристосуватися.

Task 7. Form adverbs using suffix –ly and translate into Ukrainian:

general, subsequent, main, normal, mechanical, special, complete, high, full, part, quick, sudden, independent, hard, different.

Task 8. Translate sentences paying attention to modal verbs and their equivalents:

1. The power output of any engine can be increased by burning more fuel in the cylinder.
2. The fuel pumps must have a definite phase relation to the engine crankshaft.
3. All engine parts may be removed and replaced easily.
4. The worn rings have to be replaced by new ones.
5. To burn more fuel more quantity of air should be supplied.
6. These valves were to be pressure tested.

Task 9. Translate from Ukrainian into English:

1. Наддув – це процес, за допомогою якого циліндр двигуна заряджається повітрям під тиском.
2. Двигун з наддувом працює на підвищеному рівні тиску.
3. Вихлопні гази приводять у рух турбіну.
4. Турбонаддув буває імпульсний і постійного тиску.
5. Перевага імпульсного наддування у тому, що двигун швидко пристосовується до несподіваних змін у навантаженні.

UNIT 11. AIR STARTING SYSTEM

Task 1. Learn the following words:

to admit	визнавати
to locate	розташовувати
convenient=comfortable	зручний
starting valve	пусковий клапан
because	тому, що
gear	прилад
chain	ланцюг
belt	ремінь
maintenance	обслуговування
vitaly essential	життєво важливий
attached	прикріплений
to eliminate	усувати
in accordance with	відповідно до
to be in use=to use	використовувати
to incorporate	об'єднуватися
pipe line	трубопровід

Task 2. Read the text:

Part I

Although all small engines and some fairly large ones used in connection with electric drive are started by electric motors? In connection with electric drive are started by electric motors, the method almost used for starting engines of more than 200 h. p. is by admitting air at 250 to 400 lb. pressure to the cylinders through timed valves. Air for this purpose is provided at any convenient point in the engine room and connected to the starting valves in the cylinder heads.

This compressor is of two-stage construction because of the lower pressure to be handled. In some cases the compressor is built into the engine but driven by gears, chains, or V-belts, and in most installations, especially of large engines, it is independently operated, usually by an

electric motor but in some cases by a separate auxiliary engine. Since the maintenance of an adequate supply starting air is vitally essential, the air compressors must be installed in duplicate. If an attached compressor is used, a small independent unit must be provided; if no attached compressor is used, two and sometimes three units are installed.

In order to eliminate the possibility of the compressor's not being started in time during extended periods maneuvering, automatic controls should be installed that will start and stop the compressors in accordance with pressure changes in the air tanks.

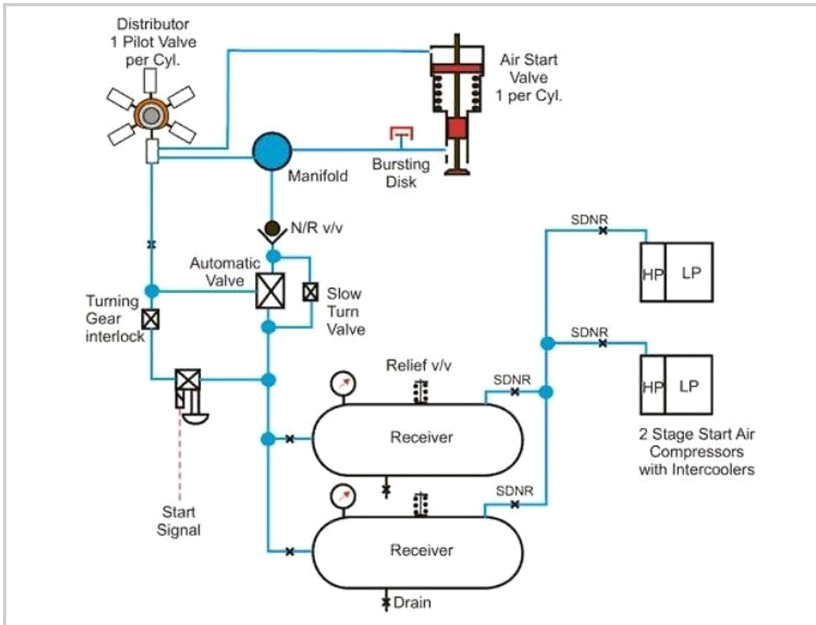
Part II

Although every air starting system uses timed valves in the cylinder heads for admitting air into the cylinders at the right point in the cycle, there are several different methods in use for operating these valves. In every case the air main leading from the tanks is connected to each starting valve, but air is turned into these lines only during the times when the valves are in operation.

In one arrangement the valves are operated by cams and levers, the levers being mounted on eccentric fulcrum bearings. Normally the rollers are held up clear of the cams but, when the eccentric bearings are rotated by the control gear, which at the same time operates to open the valve that admits air to the lines leading to the cylinders, the rollers drop onto the cams and the valves open and close in accordance with their timing under the influence of the cams and valve levers.

In another arrangement the starting valves in the heads are simply spring-loaded valves that open when air pressure in the valve body exceeds the spring pressure. Air is admitted to the valves at the right times by cam-operated control valves in a control unit at the operating station. In other designs the starting valve is operated by a piston in a cylinder incorporated in the valve body. Air is admitted to this cylinder

through a small pipe line leading to a timed pilot valve in the control unit at the operating station. In every case the maneuvering gear is arranged so that air from the tanks is automatically turned on when starting controls are moved to the start position, and cut off when they are moved to the run or stop position.



Task 3. Translate into Ukrainian:

Almost universally used, 200 h.p., at 250 lb. pressure, timed valves, to discharge air to tanks, at any convenient point, two-stage compressor, to be handled, to be driven by gears, v-belts, chains, a separate engine, an adequate supply of air, to be installed in duplicate, attached compressor, automatic controls, pressure changes, air main, leading to, arrangement, by cams and levers, eccentric fulcrum bearing, to hold up clear of the cams, control gear, to drop onto the cam,

simple spring-loaded valves, to exceed spring pressure, control unit, operating station, maneuvering gear, to be arranged so that, cut off, turn on, run position, stop position, to be in operation.

Task 4. Find English equivalents in the text:

запустити двигун; для цієї мети; зручне місце; машинне відділення; конструкція; через; більш низький тиск; у деяких випадках; вбудований; особливо; працює незалежно від двигуна; окремий; оскільки; життєво важливий; щоб; відповідно до; не дивлячись на те, що; в потрібний час; у кожному разі; у звичайному стані; не торкатися; в цей же час; відповідно до; у кожному разі; положення "пуск"; "робота"; "стоп".

Task 5. Complete the sentences:

1. This compressor is ... unit.
2. All the diesel engines are started by ...
3. The compressors can be driven ...
4. If an attached compressor is used ...
5. Automatic controls will start and stop the compressors ...
6. Timed valves in the cylinder heads are used for ...
7. The levers are mounted on ...
8. The air main is connected ...
9. Spring-loaded valves open when ...
10. The air starting valve is operated by ...
11. Air is admitted to ...
12. Starting controls are moved ... and cut off ...

Task 6. Read abbreviations in full and translate them into Ukrainian:

450 lbs, 2.100 h.p., b.h.p., 28 in, 64 psi, etc., i.e., 30°C, 100°F, cu. ft., H.P., L.P.

Task 7. Translate from Ukrainian into English:

1. Відкрийте нагнітальний клапан на циркуляційному насосі.
2. Перевірте тиск у ресивері пускового повітря.
3. Відкрийте вентелі на трубопроводі подачі палива.
4. Увімкніть насос охолоджуючої води.
5. Перевірте тиск мастила.
6. Прокачайте систему пускового повітря, щоб видалити вологу (воду) і змастити всі клапани системи.
7. Проверніть колінчастий вал двигуна на 1 оборот і переконайтеся, що всі рухомі частини працюють вільно.

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