

A Practical Course for Engineers Working on Board Ships



# 《轮机英语》

## Marine Engineering English



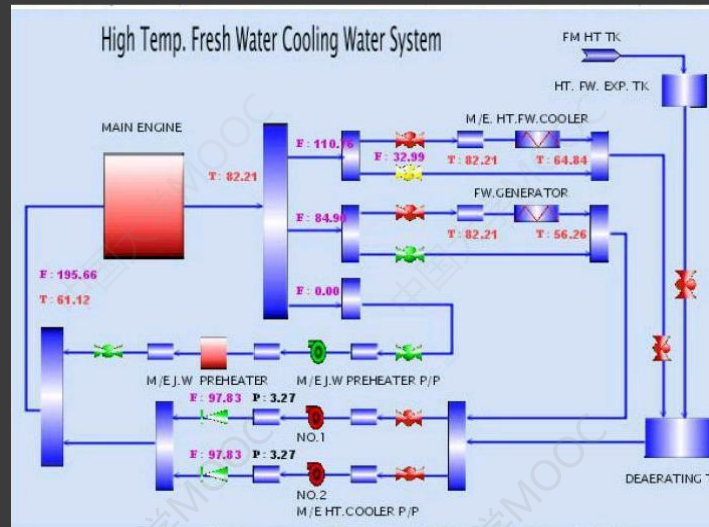
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# Lesson 7

## Cooling Water System



## Learning Objectives:

1. Grasp some useful words and expressions in the whole text.
2. After studying the lesson, he or she will have a better understanding of Cooling Water System

# part 1

## New Words and Expressions





## Lesson 7 Cooling Water System | New Words and Expressions

sensitive	a. 敏感的, 灵敏的
hardness	n. 硬度
thermostatically	ad. 恒温地
proportion	n. 比例
accumulation	n. 积累, 积聚
install	v. 安装
blank off	n. 堵死
preheat	v. 预热
hazard	n. 危险
heat exchanger	热交换器
overboard valve	出海阀
thermal expansion	热膨胀
venting tank	放气箱
3-way valve	三通阀

# part 2

## Text Analysis





The cooling of low-speed **marine** diesel engine is a consideration **of great importance**. Engine cooling is important for several reasons.

船用的  
非常重要

发动机的冷却非常重要，有多个原因。。。。



The strength of engine **materials** decreases with higher temperature, therefore, cooling is necessary to **regulate** the temperature to a level that will ensure the **material strength** required.

材料

调节

发动机材料的强度。。。。





The **viscosity** of lube oil is **sensitive** to temperature, and at elevated temperatures the lube oil will break down with a resulting loss of lubricating **properties**.

粘度  
敏感的  
(传感器)  
特性

粘度对温度很敏感，温度过高导致丧失润滑功能



Additionally, cooling of the **scavenging** air is necessary because highly **dense** air required for degrees of **supercharging**.

扫气  
密度  
增压

冷却对保持高的空气密度很重要，从而维持必要的增压度。



Water is the **cooling medium** commonly used on board ships. There are usually two kinds of cooling water, **fresh water** and sea water.

冷却介质

淡水

水是船上常用的冷却介质。。。



At higher temperature levels, **sea water** has **unsatisfactory corrosive** and **hardness** properties, consequently, it is only usable at lower temperature level, e. g., to cool lube oil coolers, air coolers.

海水  
严重腐蚀  
硬度

海水腐蚀性强，硬度高，不适合高温情况



Fresh water, with a low hardness and a **corrosion-preventive additive**, is used at the higher temperature levels. Engine jackets are always cooled with fresh water. The fresh water is in turn cooled by means of a sea water-fresh water **heat exchanger**, the **fresh water cooler**.

防腐蚀添加剂

热交换器  
淡水冷却器

淡水硬度低，且有防腐蚀添加剂，可用于较高温度的冷却。。。



Two separate cooling water systems are normally provided, one for the circulation of the fresh water and the other for the **circulation** of the sea water.

循环

淡水冷却系统和海水冷却系统



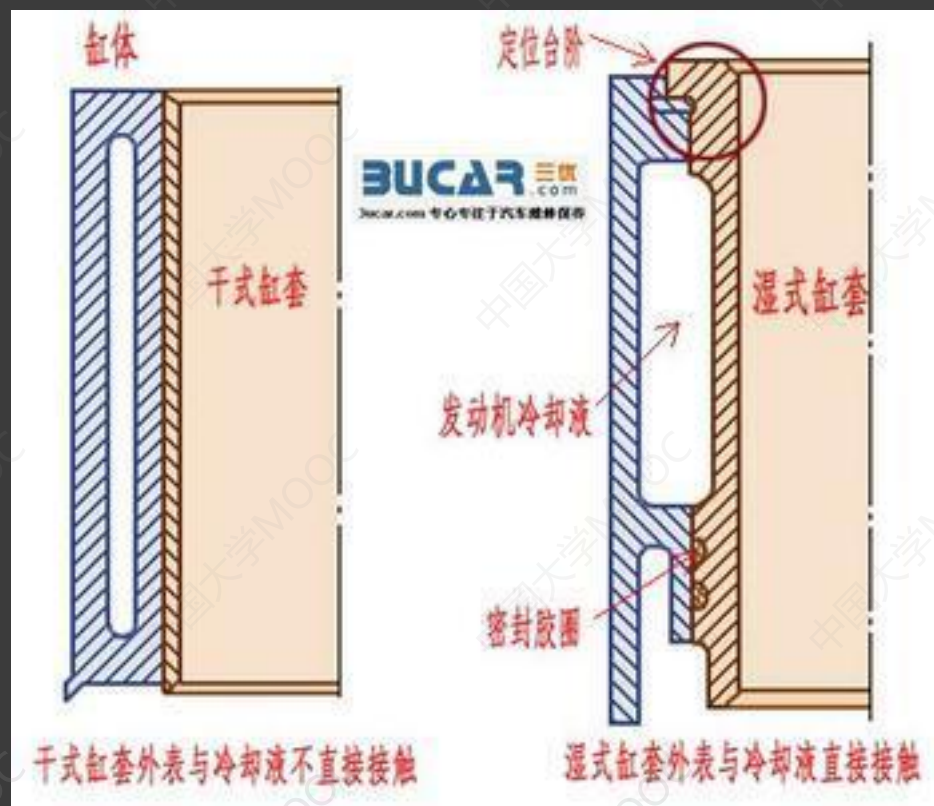
The fresh water cooling system is a **closed cooling system**, in which the fresh water first passes the fresh water cooler, where it is cooled by sea water, and then is circulated through the **cooling water jackets** of the main engine by fresh water pump to cool cylinder **liners**, cylinder heads and **exhaust valves**.

闭式系统

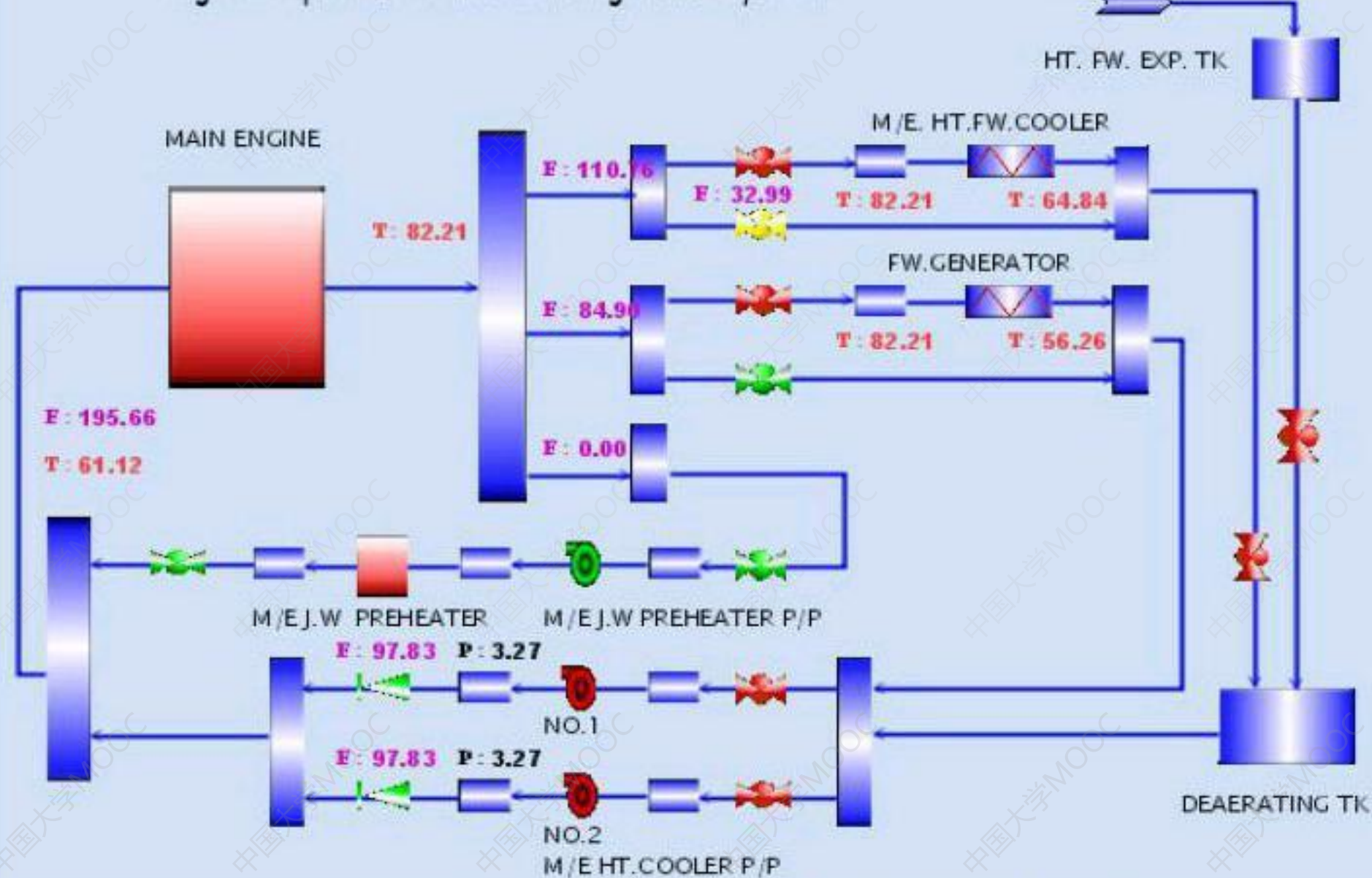
冷却水套

气缸套

淡水循环是闭式系统









At the highest position of the system an **expansion tank** has been provided to take up the difference in the water **volume** due to changes of temperature.

膨胀水柜

容积

膨胀水柜位于最高的位置



The **thermostatically controlled 3-way** valve, which is connected to the inlet of the fresh water cooler by means of a **by pass pipe**, has usually been installed at the outlet of the fresh water cooler

恒温控制  
的三通阀

旁通管

温度的调节



to mix cooled and un-cooled fresh water in such **proportions** that the temperature of outlet water from the main engine is **maintained** at  $80^{\circ}$  C.

比例  
保持

调节冷却的，和未被冷却的水的比例



To prevent air **accumulation** in the system, a **venting tank** also has been inserted in the pipelines.

集聚  
放气柜

放气柜，放掉系统中的空气



## Lesson 7 Cooling Water System | Text

The sea water is circulated in **an open system**, in which it is drawn up from the sea by the sea water pump, then the water flows through the lube oil cooler, where after it is divided into two separate branches: one through the adjustable valve directly to main engine air coolers and the other to the camshaft lube oil cooler and the fresh water cooler. The sea water from the above-mentioned two branches is later mixed again, and then it is discharged overboard.

开式系统

了解即可



This system has normally been provided with a 3-way **regulating valve** before the overboard valve. It is used to **adjust** the temperature at the inlet of sea water pump. If the temperature drops below a set value, the regulating valve will **open for the return flow to the sea water pump suction piping.**

调节阀  
调节

调节阀将开大回水到泵的吸入口的流量。



Between the seawater and fresh water systems there are **blank-off** connecting pipes. These connections can be used in case of fresh water system **failure**, thus allowing the main engine to be cooled with sea water.

盲板，堵住

故障

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应急情况





The fresh water cooling system can also make it possible to use the cooling water from the **auxiliary engines** to **preheat** the main engine before starting.

辅助发动机  
预热

用辅机的冷却水为主机暖缸



Oil is sometimes used as the **coolant** because of its **advantage** that it does not cause corrosion to metals **compared with** water.

冷却介质  
优势  
对比，比较

(润滑) 油也被用作冷却介质，因为优点：



The common example is the cooling of pistons. Owing to the high temperature at which they operate,

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油冷活塞



there is a hazard of **high-temperature corrosion**, at the same time the high operating temperature of the piston results in a considerable **thermal expansion** and can create adverse conditions for the **piston rings**.

高温腐蚀

热膨胀

活塞环

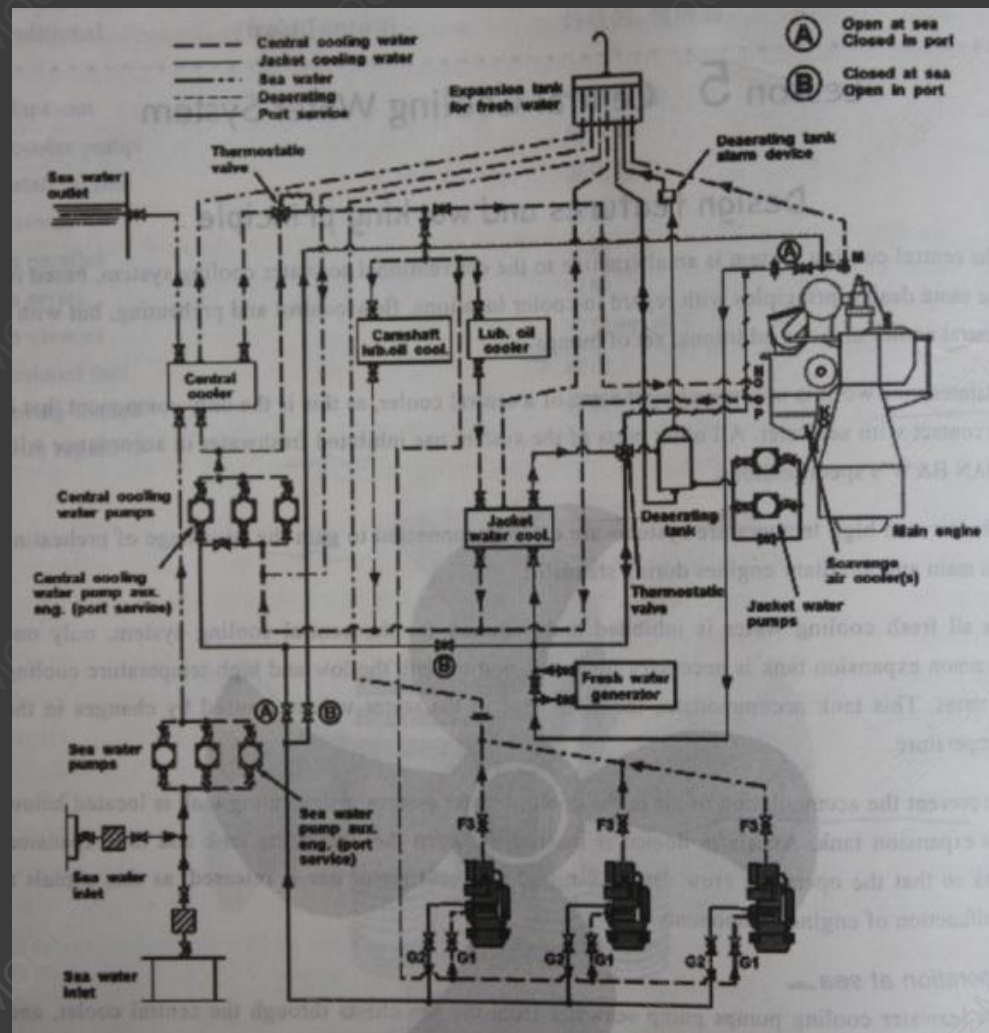
活塞的工作条件很恶劣。。。。



Since water **leakage** within the engine can cause corrosion, oil is usually used as the coolant to cool the piston in replace of the water.

泄漏

水的泄漏会造成腐蚀，所以常用油冷活塞



***part 3***

# ***Exercise & Examination***



**1. Which of the following statements is true concerning an oil cooler?**

- A. The oil temperature is less than the cooling water temperature.**
- B. The oil pressure is less than the cooling water pressure.**
- C. The oil pressure is greater than the cooling water pressure.**
- D. The oil flow control valve is always installed in the oil input line.**

描述

C

油冷却器中,油压比冷却水的压力要大。





## Lesson 7 Cooling Water System | Exercise

2. Cylinders of marine diesel engines are normally cooled by\_\_\_\_\_.

- A. sea water
- B. fine mineral oil
- C. **sanitary water**
- D. fresh water

卫生水

D

船用柴油机的气缸一般都用淡水冷却。



3. Because the circulating water is in a **closed loop**, \_\_\_\_\_ is installed to cater for expansion and contraction of the water at different conditions of operation.

- A. an expansion joint
- B. a drain tank
- C. a head tank
- D. a contraction tank

闭式循环

E

因为循环水是闭式的,所以安装高位水箱以满足不同工况下冷却水的膨胀与收缩



## Lesson 7 Cooling Water System | Exercise

4. The **expansion tank** in a diesel engine closed freshwater cooling system is located at\_\_\_\_\_.

- A. the highest point in the system
- B. the lowest point in the system
- C. near the floor
- D. plate level or near the tank top level

膨胀水箱

A

柴油机闭式冷却系统中,膨胀水箱位于系统的最高位置。



5. In a **central cooling system**, used in some modern ships, sea water is supplied to cool \_\_\_\_\_ which will circulate to other **individual** cooler, greatly reducing the corrosion problems.

- A. fresh water
- B. sea water
- C. cooling oil
- D. emulsion

A

中央冷却系统

单独的

一些现代化船舶上应用的中央冷却系统,海水用来冷却淡水,而淡水再循环到其他独立的冷却器,这样一来大大地减少了腐蚀问题。



## Lesson 7 Cooling Water System | Exercise

6. A diesel engine cooling water system with a pH factor of 3.0 indicates a condition of\_\_\_\_\_.

- A. slight acidity
- B. slight alkalinity
- C. excessive **alkalinity**
- D. excessive **acidity**

碱性

酸性

**D**

柴油机冷却水PH值为3,则表明过度酸性



## Lesson 7 Cooling Water System | Exercise

7. In order to maintain a constant outlet water temperature of 80-85° C from the engine, a **three-way valve** is installed \_\_\_\_\_. 三通阀

- A. at the jacket cooler outlet to control the flux through the engine
- B. at the jacket cooler outlet to control the flux through the cooler
- C. at the engine outlet to control the flux through the engine
- D. at the engine inlet to control the flux through the engine 为了使

**B**

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柴油机冷却水出口温度维持在恒定的80-85°C,缸套水冷却器出口安装有一个三通阀以控制冷却器的通流量。



## Lesson 7 Cooling Water System | Exercise

8. As to the low speed diesel engine, if you want to change the **coolant** flow for a certain cylinder, you can **regulate** \_\_\_\_\_.

- A. the inlet valve
- B. the outlet valve
- C. both the inlet valve and the outlet valve
- D. the pump inlet valve

冷却介质

调节

B

对于低速柴油机,如果要想改变某个缸的冷却剂流量,可以调节出口阀的开度。



9. As to the **piston cooling**, of the following, which statement is not true?

- A. Because the piston is exposed to very high temperature, it must be cooled.
- B. The lower the piston cooling temperature is, the better it is.
- C. Both water and lube oil can be used as coolant.
- D. One of the piston cooling methods is vibration cooling, with better effect.

活塞冷却

E

对于活塞冷却,“活塞冷却温度越低,则越好”的说法显然是错误的。





## Lesson 7 Cooling Water System | Exercise

10. In more **recent years**, \_\_\_\_\_ **heat exchangers** have frequently been employed for jacket water and oil cooling.

- A. shell and tube type
- B. plate type
- C. coil type
- D. conical disc type

**B**

近年来

热交换器

近年来,板式热交换器已广泛用作缸套冷却器和油冷器。



11. **Failure** to ensure proper **venting** of the cooling system of a diesel engine can result in\_\_\_\_\_.

- A. excessive air charge density
- B. priming in the expansion tank
- C. failure of raw water pump shaft seals
- D. local overheating and/or internal corrosion

**D**

失效、故障

透气

如果柴油机冷却系统不能保证良好的透气,将产生局部过热、内部腐蚀等现象。



12. **Cavitation erosion** in the cooling water system of a diesel engine usually occurs at the pump **impeller**, and on the waterside of the\_\_\_\_\_.

- A. fuel nozzle holders
- B. exhaust valve guides
- C. engine cylinder liners
- D. low temperature and a low viscosity

穴蚀

叶轮

C

柴油机冷却系统中的气穴腐蚀容易发生在泵的叶轮上和发动机气缸套的水侧。