T.C.
MİLLÎ EĞİTİM BAKANLIĞI

DENİZCİLİK

TEKNİK YABANCI DİL 3
(GEMİ MAKİNELERİ-İNGİLİZCE)
222YDK060

Ankara, 2012

- Bu modül, mesleki ve teknik eğitim okul/kurumlarında uygulanan Çerçeve Öğretim Programlarında yer alan yeterlikleri kazandırmaya yönelik olarak öğrencilere rehberlik etmek amacıyla hazırlanmış bireysel öğrenme materyalidir.
- Millî Eğitim Bakanlığınca ücretsiz olarak verilmiştir.
- PARA İLE SATILMAZ.

CONTENTS

AÇIKLAMALAR

MODÜLÜN KODU	**222YDK060**
ALAN	**Denizcilik**
DAL/MESLEK	**Alan Ortak**
MODÜLÜN ADI	**Teknik Yabancı Dil 3 (Gemi Makineleri-İngilizce)**
MODÜLÜN TANIMI	Denizcilik alanında teknik İngilizcenin işlendiği öğrenme materyalidir.
SÜRE	40 / 32
ÖNKOŞUL	Ön Koşulu Yoktur.
YETERLİK	
MODÜLÜN AMACI	**Genel Amaç:** Öğrenciye, teknik İngilizce cümlelerini mesleğini yürütebilecek kadar, okuma, yazma, anlama ve kullanma yeterliğinde öğretilmesi amaçlanmaktadır. **Amaç:** **1.** Kazan Besleme sistemini tanır. **2.** Yardımcı makineleri tanır. **3.** Soğutma, klima ve havalandırma sistemlerini tanır.
EĞİTİM ÖĞRETİM ORTAMLARI VE DONANIMLARI	Sınıf ve gemi ortamında kullanılan çeşitli araç ve gereçler
ÖLÇME VE DEĞERLENDİRME	Her öğrenme faaliyeti sonunda verilen, boşluk doldurma soruları ve uygulama faaliyetleri ile kendinizi değerlendirebileceksiniz. Modül sonunda tüm konuları içeren bir testle kendinizi değerlendireceksiniz. Modül sonunda ise kazandığınız bilgi ve becerileri ölçmek amacıyla öğretmeniniz tarafından hazırlanacak ölçme araçları ile değerlendirileceksiniz.

INTRODUCTION

Dear Student;

Marine Vehicles are used in various areas such as defending, transportation and the need for these vehicles are increasing day by day in today's world which is getting smaller and smaller. So the amount of vehicles navigating over the seas is getting higher also. Knowledge of vocational terms is important not only in native language but also in other languages as well. This module enables you to reach the technical English you may in your field.

LEARNING ACTIVITY-1

AIM

You will learn basic machinery system of a ship.

SEARCH

- Visit a ship and observe its machinery.

1. FEED SYSTEMS

The feed system completes the cycle between boiler and turbine to enable the exhausted steam to return to the boiler as feed water. The feed system is made up of four basic items: the boiler, the turbine, the condenser and the feed pump. The boiler produces steam which is supplied to the turbine and finally exhausted as low-energy steam to the condenser. The condenser condenses the steam to water (condensate) which is then pumped into the boiler by the feed pump. Other items are incorporated into all practical feed systems, such as a drain tank to collect the condensate from the condenser and provide a suction head for the feed pump. A make-up feed tank will provide additional feed water to supplement losses or store surplus feed from the drain tank. In a system associated with an auxiliary boiler, as on a motor ship, the drain tank or hot well will be open to the atmosphere. Such a feed system is therefore referred to as 'open feed'. In high-pressure water tube boiler installations no part of the feed system is open to the atmosphere and it is known as 'closed feed'.

1.1. Open Feed System

An open feed system for an auxiliary boiler is shown in Figure 1.1. The exhaust steam from the various services is condensed in the condenser. The condenser is circulated by sea water and may operate at atmospheric pressure or under a small amount of vacuum. The condensate then drains under the action of gravity to the hot well and feed filter tank. Where the condenser is under an amount of vacuum, extraction pumps will be used to transfer the condensate to the hot well. The hot well will also receive drains from possibly contaminated systems, e.g. fuel oil heating system, oil tank heating, etc. These may arrive from a drain cooler or from an observation tank. An observation tank, where fitted, permits inspection of the drains and their discharge to the oily bilge if contaminated. The feed filter and hot well tank is arranged with internal baffles to bring about preliminary oil separation from any contaminated feed or drains. The feed water is then passed through charcoal or cloth filters to complete the cleaning process. Any overflow from the hot well passes to the feed water tank which provides additional feed water to the system when required. The hot well provides feed water to the main and auxiliary feed pump suctions. A feed heater may be fitted into the main feed line. This heater may be of the surface type, providing only heating,

or may be of the direct contact type which will de-aerate in addition. De-aeration is the removal of oxygen in feed water which can cause corrosion problems in the boiler. A feed regulator will control the feed water input to the boiler and maintain the correct water level in the drum. The system described above can only be said to be typical and numerous variations will no doubt be found, depending upon particular plant requirements.

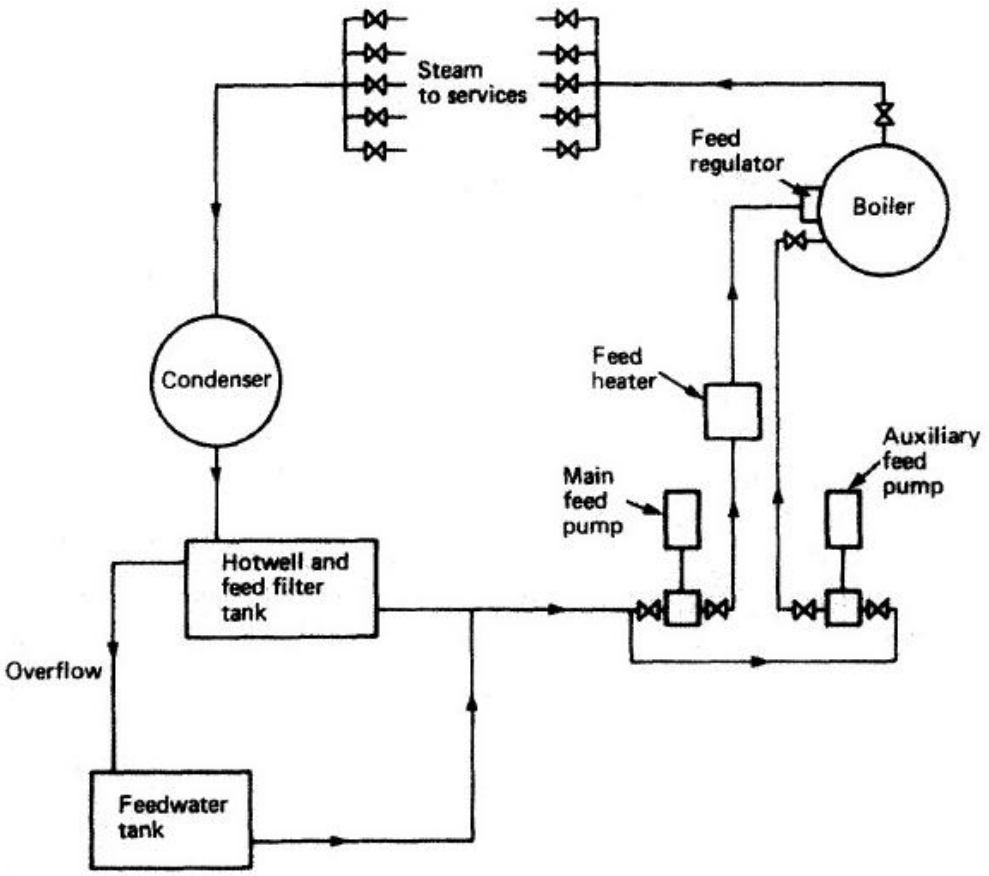

Figure 1.1 Open feed system diagram

1.2. Closed Feed System

A closed feed system for a high pressure water tube boiler supplying a main propulsion steam turbine is shown in Figure 1.2. The steam turbine will exhaust into the condenser which will be at a high vacuum. A regenerative type of condenser will be used which allows condensing of the steam with the minimum drop in temperature. The condensate is removed by an extraction pump and circulates through an air ejector. The condensate is heated in passing through the air ejector. The ejector removes air from the condenser using steam-ope rated ejectors. The condensate is now circulated through a gland steam condenser where it is further heated. In this heat exchanger the turbine gland steam is condensed and drains to the atmospheric drain tank. The condensate is now passed through a low-pressure heater which is supplied with bled steam from the turbine. All these various heat exchangers improve the plant efficiency by recovering heat, and the increased feed

water temperature assists in the de-aeration process. The de-aerator is a direct contact feed heater, i.e. the feed water and the heating steam actually mix. In addition to heating, any dissolved gases, particularly oxygen, are released from the feed water. The lower part of the de-aerator is a storage tank which supplies feed water to the main feed pumps, one of which will supply the boiler's requirements. The feed water passes to a high-pressure feed heater and then to the economizer and the boiler water drum. An atmospheric drain tank and a feed tank are present in the system to store surplus feed water and supply it when required. The drain tank collects the many drains in the system such as gland steam, air ejector steam, etc. A recirculating feed line is provided for low load and maneuvering operation to ensure an adequate flow of feed water through the air ejector and gland steam condenser the system described is only typical and variations to meet particular conditions will no doubt be found.

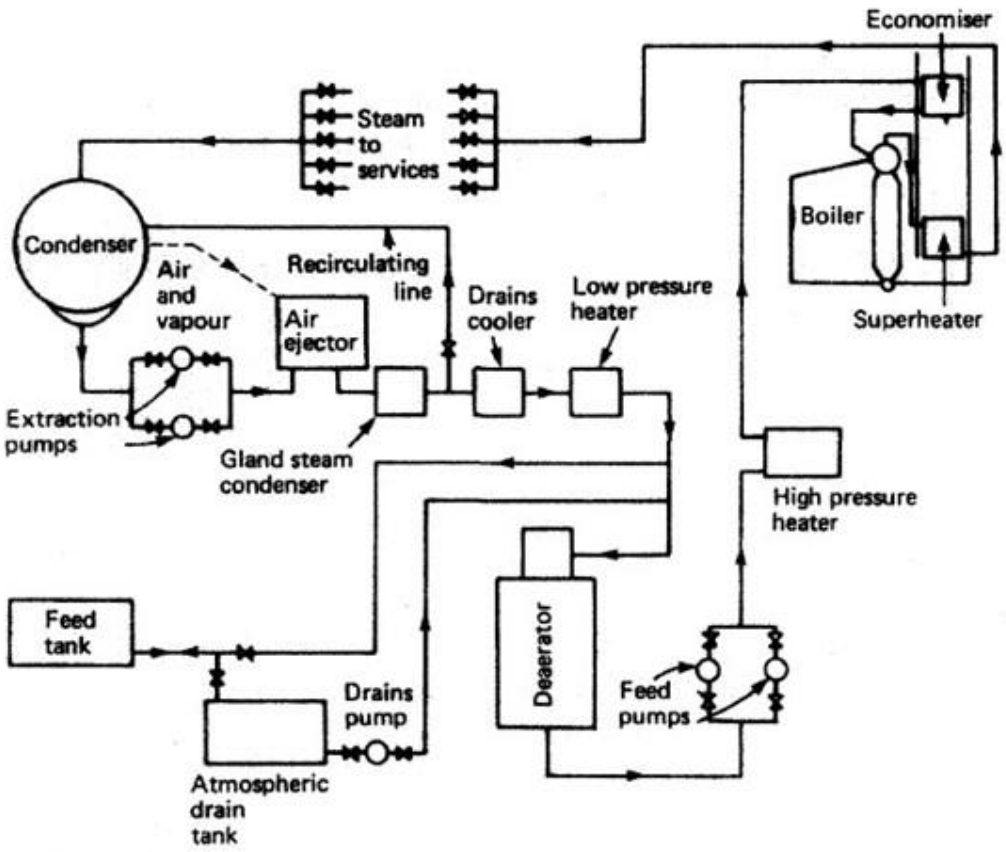

Figure 1.2 Closed feed system diagram

1.3. Auxiliary feed system

The arrangements for steam recovery from auxiliaries and ship services may form separate open or closed feed systems or be a part of the main feed system. Where, for instance, steam-driven deck auxiliaries are in use, a separate auxiliary condenser operating at about atmospheric pressure will condense the incoming steam (Figure 1.3). An extraction pump will supply the condensate to an air ejector which will return the feed water to the main system at a point between the gland steam condenser and the drains cooler. A recirculating line is provided for low-load operation and a level controller will maintain a condensate level in the condenser. Where contamination of the feed water may be a problem, a separate feed system for a steam-to-steam generator can be used (Figure 1.3). Low-pressure steam from the generator is supplied to the various services, such as fuel oil heating, and the drains are returned to the hot well. Feed pumps supply the feed to a feed heater, which also acts as a drains cooler for the heating steam supplied to the generator. From the feed heater, the feed water passes into the steam-to-steam generator. Packaged feed systems are also available from a number of manufacturers. With this arrangement the various system items are mounted on a common base or bedplate. The complete feed system may be packaged or a number of the items.

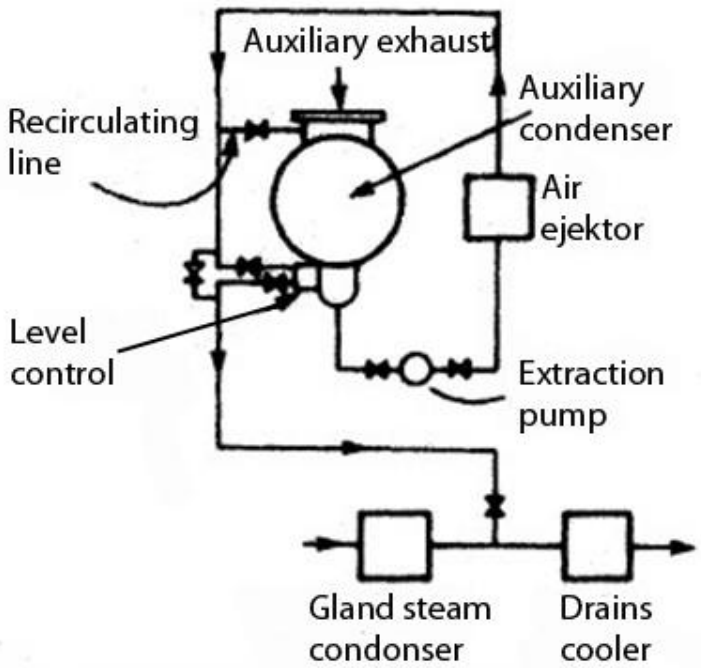

Figure 1.3 Auxiliary feed system diagrams

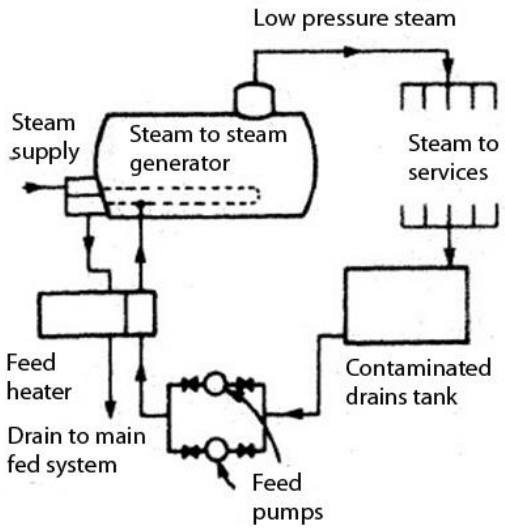

Figure 1.4 Feed system circulation

1.3.1. System Components

1.3.1.1. Condenser

The condenser is a heat exchanger which removes the latent heat from exhaust steam so that it condenses and can be pumped back into the boiler. This condensing should be achieved with the minimum of under-cooling, i.e. reduction of condensate temperature below the steam temperature. A condenser is also arranged so that gases and vapors from the condensing steam are removed. Main condensers associated with steam turbine propulsion machinery are of the regenerative type. In this arrangement some of the steam bypasses the tubes and enters the condensate sump as steam. The condensate is thus reheated to the same temperature as the steam, which increases the efficiency of the condenser. A central passage enables some of the steam to pass to the sump, where it condenses and heats the condensate. A baffle plate is arranged to direct the gases and vapors towards the air ejector. The many tubes are fitted between the tube plates at each end and tube support plates are arranged between. The tubes are circulated in two passes by sea water.

1.3.2. Extraction pump

The extraction pump is used to draw water from a condenser which is under vacuum the pump also provides the pressure to deliver the feed water to the de-aerator or feed pump inlet. Extraction pumps are usually of the vertical shaft, two stage, and centrifugal type, as described in Chapter 6. These pumps require a specified minimum suction head to operate and, usually, some condensate level control system in the condenser. The first-stage impeller receives water which is almost boiling at the high vacuum conditions present in the suction pipe. The water is then discharged at a slight positive pressure to the second-stage impeller which provides the necessary system pressure at outlet.

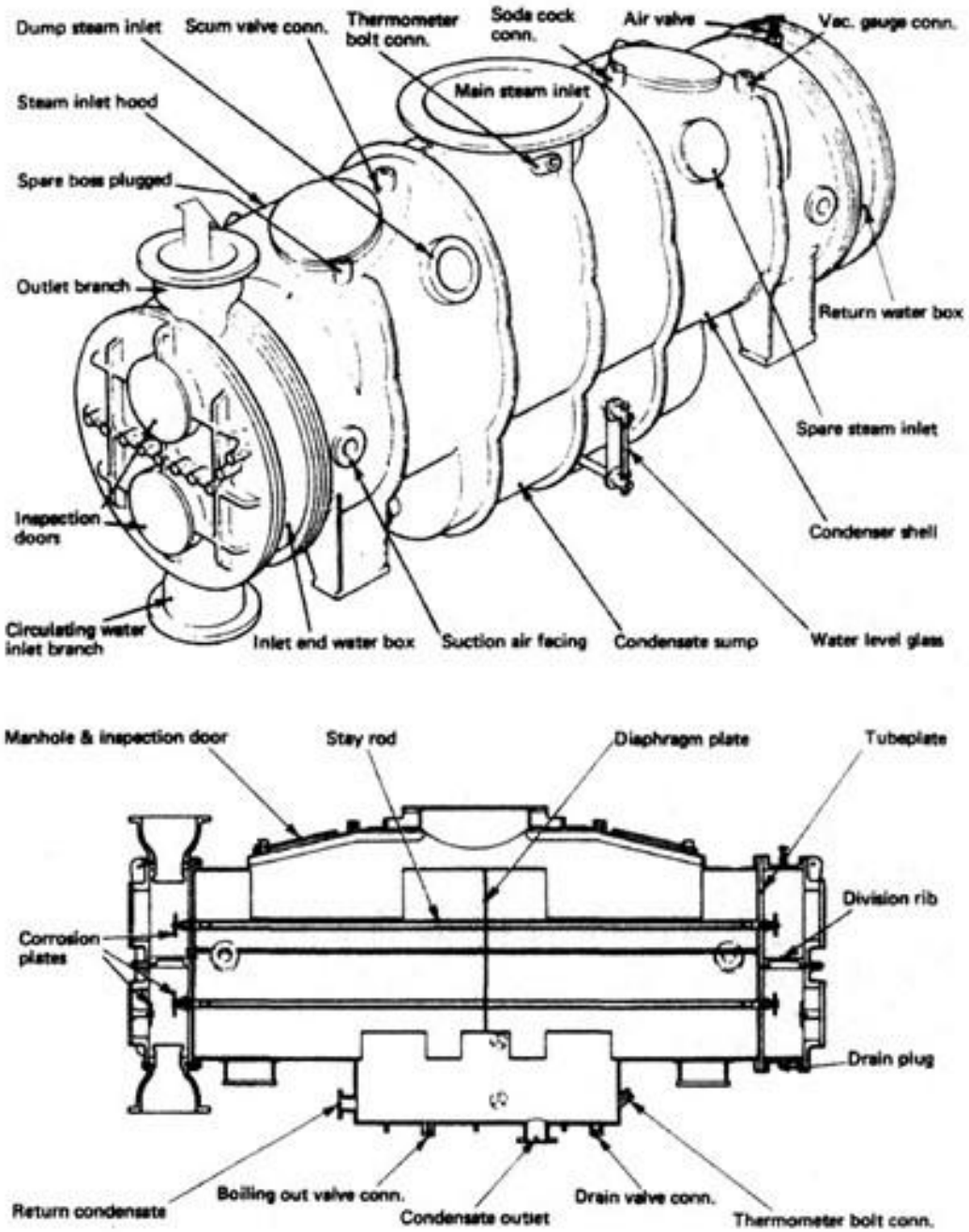

Figure 1.5 Cutaway of extraction pump

1.3.3. Air Ejector

The air ejector draws out the air and vapors which are released from the condensing steam in the condenser. If the air were not removed from the system it could cause corrosion problems in the boiler. Also, air present in the condenser would affect the condensing process and cause a back pressure in the condenser. The back pressure would increase the exhaust steam pressure and reduce the thermal efficiency of the plant.

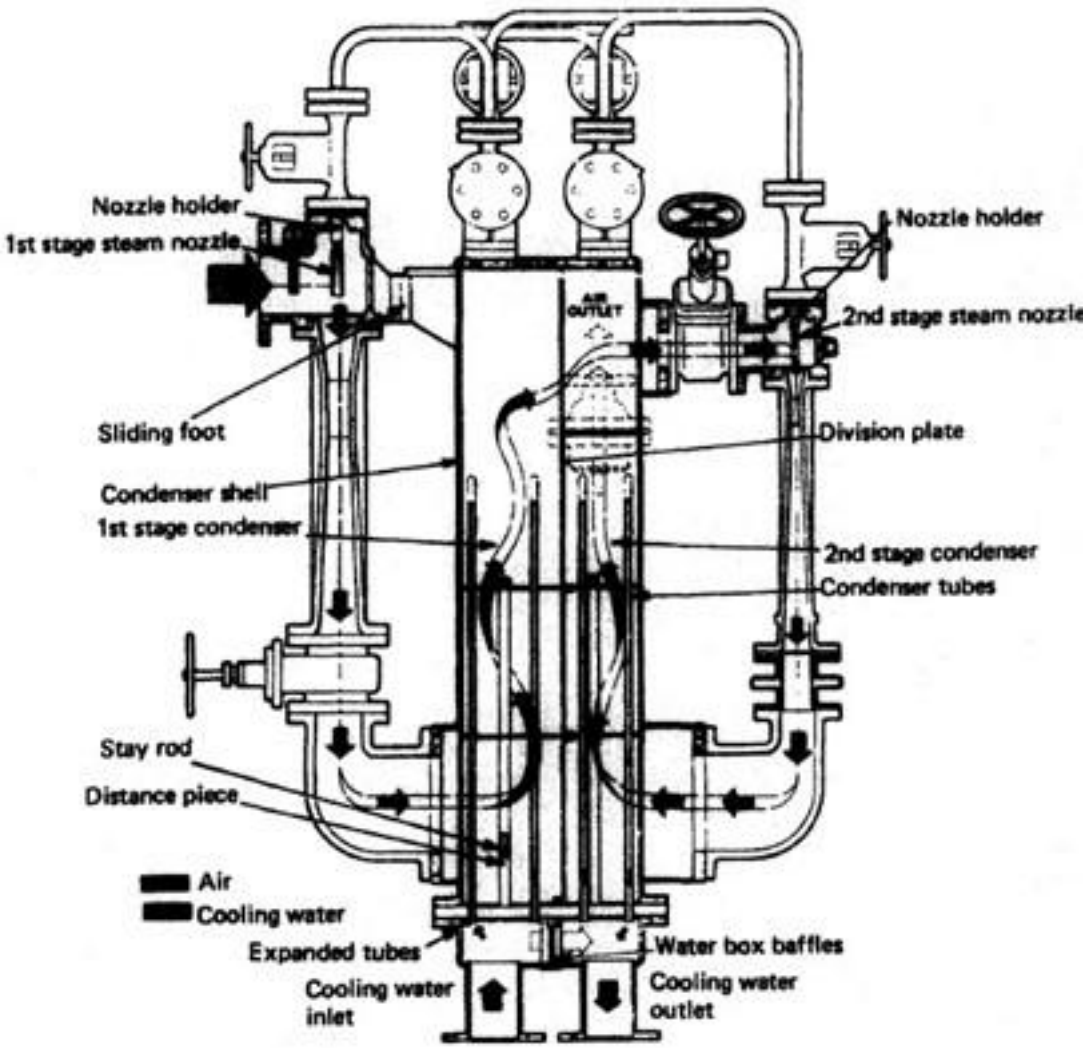

Figure 1.6 Air ejector

1.3.4. Heat Exchangers

The gland steam condenser drains cooler and low-pressure feed heater are all heat exchangers of the shell and tube type. Each is used in some particular way to recover heat from exhaust steam by heating the feed water which is circulated through the units. The gland steam condenser collects steam, vapor and air from the turbine gland steam system. These returns are cooled by the circulating feed water and the steam is condensed. The condensate is returned to the system via a loop seal or some form of steam trap and any air present is discharged into the atmosphere. The feed water passes through U-tubes within the shell of the unit.

1.3.5. De-aerator

The de-aerator completes the air and vapor removal process begun in the condenser. It also functions as a feed heater, but in this case operates by direct contact. The feed water is heated almost to the point of boiling, which releases all the dissolved gases which can then be vented off.

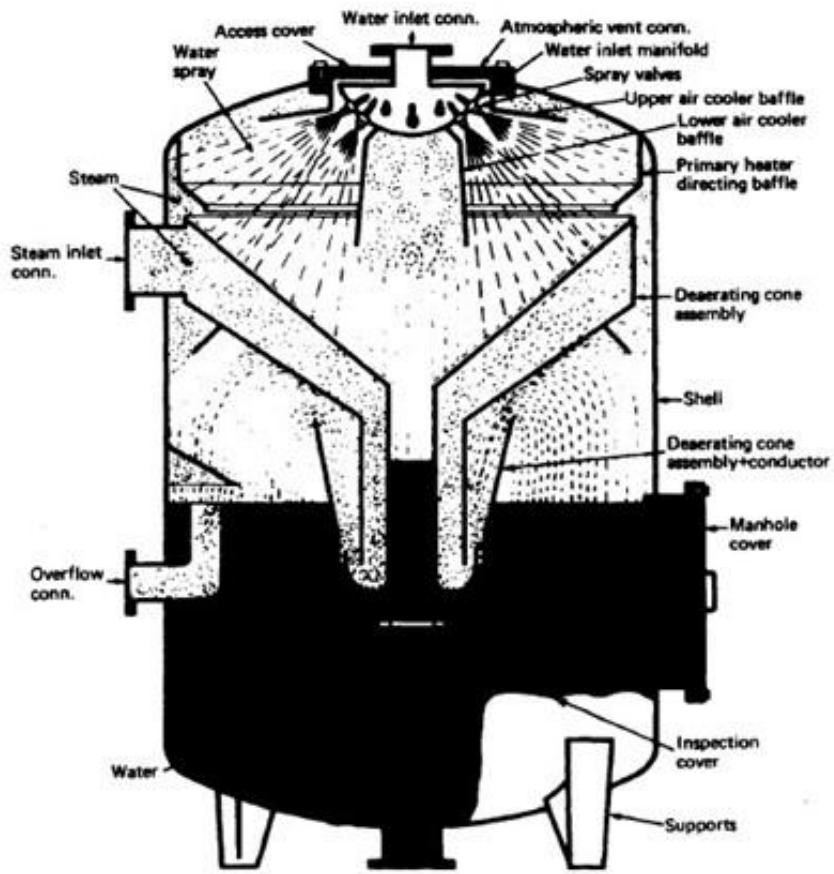

Figure 1.7 De-aerator

1.3.6. Feed Pump

The feed pump raises the feed water to a pressure high enough for it to enter the boiler. For auxiliary boilers, where small amounts of feed water are pumped, a steam-driven reciprocating positive displacement pump may be used. Another type of feed pump often used on package boiler installations is known as an 'electro feeder'. This is a multi-stage centrifugal pump driven by a constant- speed electric motor. The number of stages is determined by the feed quantity and discharge pressure.

APPLICATION ACTIVITY

- Use technical English about Ship Engineering technology.

Steps Of Process	Suggestions
➢ Translate the text below	➢ Use technical English dictionary.

If the system includes deck auxiliaries that are driven by steam, a separate auxiliary condenser operating at atmospheric pressure is used to condense the steam coming from the auxiliaries. The condensate thus formed is transferred to the air ejector with the help of extraction pumps. Any amount of dissolved oxygen is removed from the feed water and the temperature of the water is also raised. The air ejector supplies the condensate back to the system at a point somewhere between the gland steam condenser and the drains cooler.

CHECKLIST

If you have behaviors listed below, evaluate yourself putting (X) in “Yes” box for your earned skills within the scope of this activity otherwise put (X) in “No” box.

Evaluation Criteria	Yes	No
1. Can you remember feed systems’ names?		
2. Do you know feed systems’ functions?		
3. Can you pronounce feed systems’ names correctly?		

EVALUATION

Please review your “No" answers in the form at the end of the evaluation. If you do not find yourself enough, repeat learning activity. If you give all your answers "Yes" to all questions, pass to the "Measuring and Evaluation".

MEASURING AND EVALUATION

Complete these sentences.

1. The feed system completes

_____

2. The condenser is circulated by

_____

3. A closed feed system

_____

4. The arrangements for steam recovery

_____

5. The extraction pump is used to

_____

EVALUATION

Please compare the answers with the answer key. If you have wrong answers, you need to review the Learning Activity. If you give right answers to all questions, pass to the next learning activity

LEARNING ACTIVITY-2

AIM

You will learn a ship's auxiliary machinery.

SEARCH

- Visit a harbor and observe a ship's machinery

2. AUXILIARIES

Machinery, other than the main propulsion unit, is usually called 'auxiliary' even though without some auxiliaries the main machinery would not operate for long. The items considered are air compressors, heat exchangers, distillation equipment, oil/water separators, sewage treatment plants and incinerators.

2.1. Air Compressor

Compressed air has many uses on board ship, ranging from diesel engine starting to the cleaning of machinery during maintenance. The air pressures of 25 bar or more are usually provided in multi-stage machines. Here the air is compressed in the first stage, cooled and compressed to a higher pressure in the next stage, and so on. The two-stage crank machine is probably the most common.

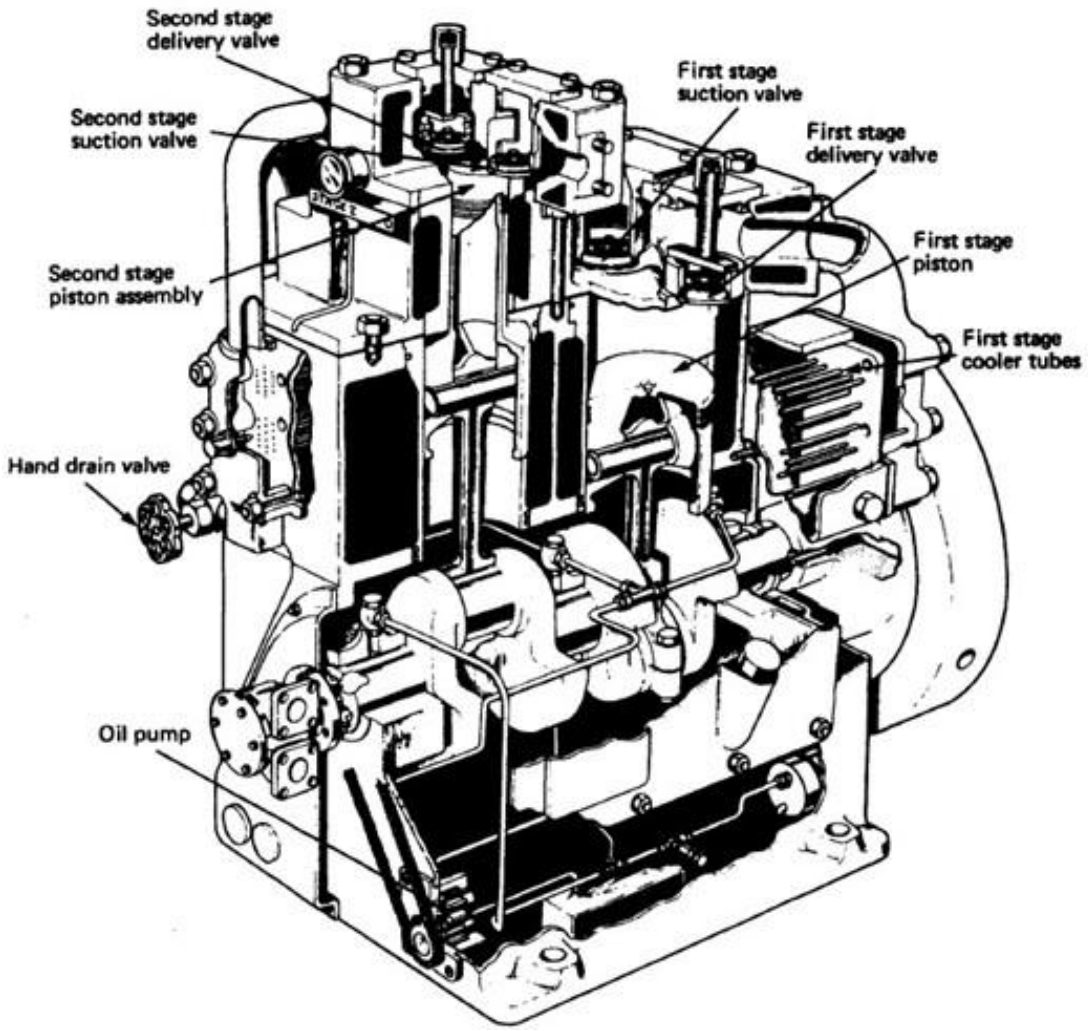

Figure 2.1 Air compressor

2.2. Heat Exchangers

Heat exchangers on board ship are mainly coolers where a hot liquid is cooled by sea water. There are some instances where liquid heating is required, such as heavy fuel oil heaters and sea water heaters for tank cleaning. Although being heat exchangers, the main condenser for a steam ship and the evaporator/distiller are dealt with separately.

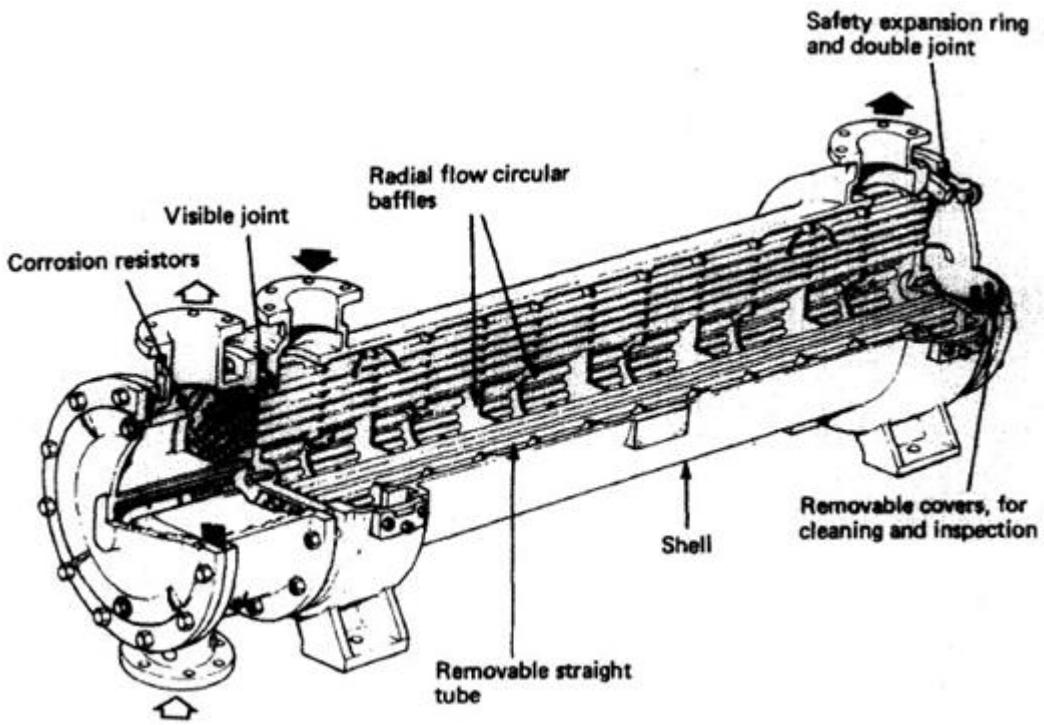

Figure 2.2 Heat exchanger

2.3. Distillation Systems

Distillation is the production of pure water from sea water by evaporation and re-condensing. Distilled water is produced as a result of evaporating sea water either by a boiling or a flash process. This evaporation enables the reduction of the 32000 parts per million of dissolved solids in sea water down to the one or two present in distilled water. The machine used is called an 'evaporator', although the word 'distiller' is also used.

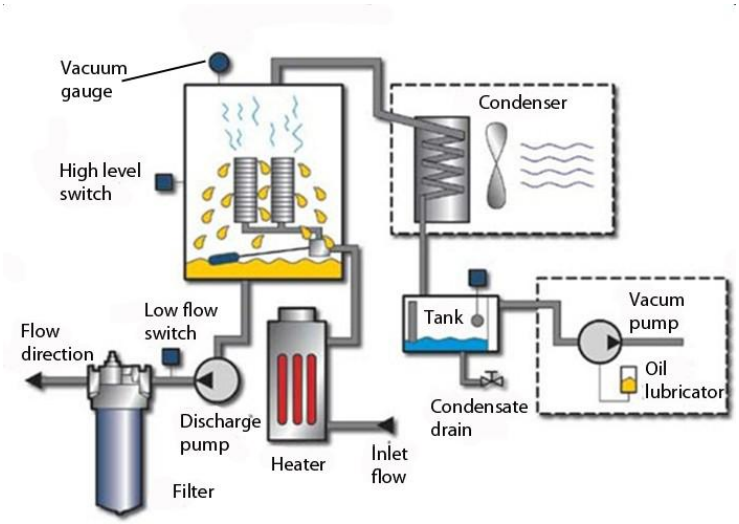

Figure 2.3 Distillation Systems

2.4. Oil/Water Separators

Oil/water separators are used to ensure that ships do not discharge oil when pumping out bilges, oil tanks or any oil-contaminated space. International legislation relating to oil pollution is becoming more and more stringent in the limits set for oil discharge. Clean water suitable for discharge is defined as that containing less than 15 parts per million of oil. Oil/water separators using the gravity system can only achieve 100 parts per million and must therefore be used in conjunction with some form of filter.

Figure 2.4 Oil/Water Separators

2.5. Sewage Treatment

The discharge of untreated sewage in controlled or territorial waters is usually banned by legislation. International legislation is in force to cover any sewage discharges within specified distances from land. As a result, and in order to meet certain standards all new ships have sewage treatment plants installed. Untreated sewage as a suspended solid is unsightly. In order to break down naturally, raw sewage must absorb oxygen. In excessive amounts it could reduce the oxygen content of the water to the point where fish and plant life would die. Pungent smells are also associated with sewage as a result of bacteria which produce hydrogen sulphide gas. Particular bacteria present in the human intestine known as E, coli are also to be found in sewage. The E. coli count in a measured sample of water indicates the amount of sewage present.

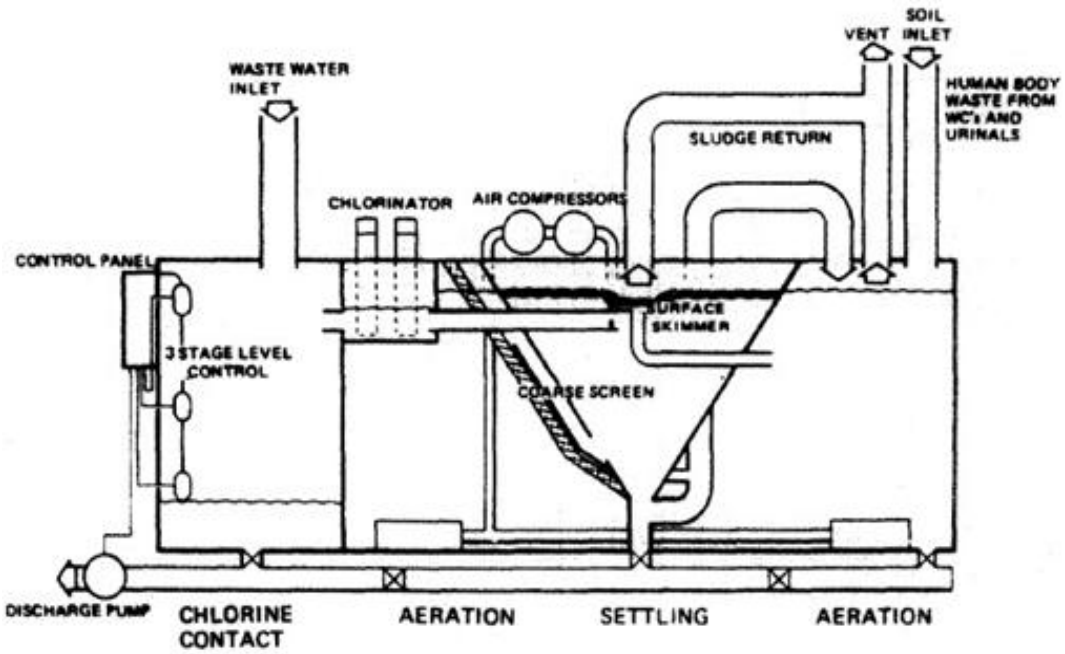

Figure 2.5 Sewage Treatment

2.6. Incinerator

Stricter legislation with regard to pollution of the sea, limits and, in some instances, completely bans the discharge of untreated waste water, sewage, waste oil and sludge. The ultimate situation of no discharge can be achieved by the use of a suitable incinerator. When used in conjunction with a sewage plant and with facilities for burning oil sludges, the incinerator forms a complete waste disposal package.

Figure 2.6 Incinerator

APPLICATION ACTIVITY

- **Use technical English about Ship Engineering technology.**

Steps Of Process	Suggestions
➢ Translate the text below	➢ Use technical English dictionary

Oil/water separators (OWS) can be costly to maintain, and if not properly managed, can pollute surface and ground water, and lead to costly violations. Have you taken steps to minimize the effects of your Oil/water separators on your budget and the environment? This fact sheet discusses the basic operation of Oil/water separators in handling vehicle and floor wash water, and techniques to improve Oil/water separators performance and reduce costs and liabilities

CHECKLIST

If you have behaviors listed below, evaluate yourself putting (X) in "Yes" box for your earned skills within the scope of this activity otherwise put (X) in "No" box.

Evaluation Criteria	Yes	No
1. Can you remember auxiliary units' names?		
2. Do you know auxiliary units' types?		
3. Can you pronounce auxiliary units' names correctly?		

EVALUATION

Please review your "No" answers in the form at the end of the evaluation. If you do not find yourself enough, repeat learning activity. If you give all your answers "Yes" to all questions, pass to the "Measuring and Evaluation".

MEASURING AND EVALUATION

Complete these sentences.

1. Machinery, other than the main propulsion unit, is usually called

_____

2. Heat exchangers on board ship are

_____

3. Distillation is the production of

_____

4. Oil/water separators are used to

_____

5. The discharge of untreated sewage

_____

EVALUATION

Please compare the answers with the answer key. If you have wrong answers, you need to review the Learning Activity. If you give right answers to all questions, pass to the next learning activity

LEARNING ACTIVITY-3

AIM

You will learn names of documents that used at ships.

SEARCH

- Visit a harbor and try to find out what kind of documents does a ship require.

3. REFRIGERATION, AIR CONDITIONING AND VENTILATION

Refrigeration is a process in which the temperature of a space or its contents is reduced to below that of their surroundings. Air conditioning is the control of temperature and humidity in a space together with the circulation, filtering and refreshing of the air. Ventilation is the circulation and refreshing of the air in a space without necessarily a change of temperature. With the exception of special processes, such as fish freezing, air is normally employed as the heat transfer medium. As a result fans and ducting are used for refrigeration, air conditioning and ventilation. The three processes are thus interlinked and all involve the provision of a suitable climate for men, machinery and cargo.

3.1. Refrigeration

Refrigeration of cargo spaces and storerooms employs a system of components to remove heat from the space being cooled. This heat is transferred to another body at a lower temperature. The cooling of air for air conditioning entails a similar process. The transfer of heat takes place in a simple system: firstly, in the evaporator where the lower temperature of the refrigerant cools the body of the space being cooled; and secondly, in the condenser where the refrigerant is cooled by air or water. The usual system employed for marine refrigeration plants is the vapour compression cycle,

Figure 3.1 Cooling units

3.2. Air Conditioning

Ships travel the world and are therefore subject to various climatic conditions. The crew of the ship must be provided with reasonable conditions in which to work regardless of the weather. Temperature alone is not a sufficient measure of conditions acceptable to the human body. Relative humidity in conjunction with temperature more truly determines the environment for human comfort. Relative humidity, expressed as a percentage, is the ratio of the water vapour pressure in the air tested, to the saturated vapour pressure of air at the same temperature. The fact that less water can be absorbed as air is cooled and more can be absorbed when it is heated is the major consideration in air conditioning system design. Other factors are the nearness of heat sources, exposure to sunlight, sources of cold and the insulation provided around the space. An air conditioning system aims to provide a comfortable working environment regardless of outside conditions. Satisfactory air treatment must involve a relatively 'closed' system where the air is circulated and returned. However, some air is 'consumed' by humans and some machinery so there is a requirement for renewal. Public rooms and accommodation will operate with a reduced percentage of air renewal since the conditioning cost of 100% renewal would be considerable. Galleys and sanitary spaces, for instance, must have 100% renewal, but here the air quantities and treatment costs will be much smaller. Systems may however be designed for 100% renewal of air although not necessarily operated in this way. Noise and vibration from equipment used in the system should be kept to a minimum to avoid a different kind of discomfort.

Figure 3.2 Air Conditioning

3.2.1. Ventilation

Ventilation is the provision of a supply of fresh untreated air through a space. Natural ventilation occurs when changes in temperature or air density cause circulation in the space. Mechanical or forced ventilation uses fans for a positive movement of large quantities of air. Natural ventilation is used for some small workshops and stores but is impractical for working areas where machinery is present or a number of people are employed. Forced ventilation may be used in cargo spaces where the movement of air removes moisture or avoids condensation, removes odours or gases, etc. The machinery space presents another area which requires ventilation. As a result of its large size and the fact that large volumes of air are consumed a treatment plant would be extremely costly to run. Ventilation is therefore provided in sufficient quantities for machinery air consumption and also to effect cooling.

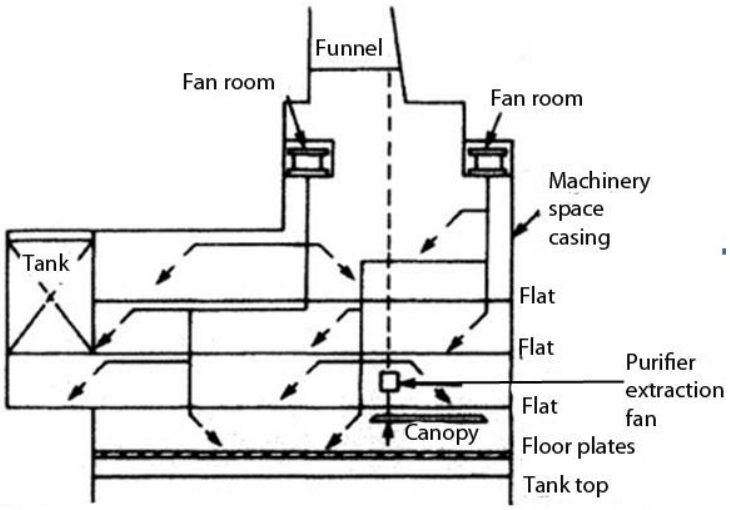

Figure 3.3 Ventilation diagram

APPLICATION ACTIVITY

- Use technical English about Ship Engineering technology.

Steps Of Process	Suggestions
➢ Translate the text below	➢ Use technical English dictionary.

In another sense, the term can refer to any form of cooling, heating, ventilation, or disinfection that modifies the condition of air. An air conditioner (often referred to as AC or air con.) is an appliance, system, or machine designed to change the air temperature and humidity within an area (used for cooling as well as heating depending on the air properties at a given time), typically using a refrigeration cycle but sometimes using evaporation, commonly for comfort cooling in buildings and motor vehicles.

CHECKLIST

If you have behaviors listed below, evaluate yourself putting (X) in "Yes" box for your earned skills within the scope of this activity otherwise put (X) in "No" box.

Evaluation Criteria	Yes	No
1. Can you remember refrigeration's function?		
2. Do you know air conditioning features?		
3. Can you pronounce cooling units' names correctly?		

EVALUATION

Please review your "No" answers in the form at the end of the evaluation. If you do not find yourself enough, repeat learning activity. If you give all your answers "Yes" to all questions, pass to the "Measuring and Evaluation".

MEASURING AND EVALUATION

Complete these sentences.

1. Refrigeration is a process

_____

2. Refrigeration of cargo spaces and storerooms employs

_____

3. The crew of the ship must be provided with

_____

4. Ventilation is the provision of

_____

5. Forced ventilation may be used in

_____

EVALUATION

Please review your “No" answers in the form at the end of the evaluation. If you do not find yourself enough, repeat learning activity. If you give all your answers "Yes" to all questions, pass to the "Measuring and Evaluation".

MODULE EVALUATION

Complete these sentences.

1. The feed system completes

_____

2. The condenser is circulated by

_____

3. A closed feed system

_____

4. The arrangements for steam recovery

_____

5. The extraction pump is used to

_____

6. Machinery, other than the main propulsion unit, is usually called

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7. Heat exchangers on board ship are

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8. Distillation is the production of

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9. Oil/water separators are used to

_____

10. The discharge of untreated sewage

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11. Refrigeration is a process

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12. Refrigeration of cargo spaces and storerooms employs

_____

13. The crew of the ship must be provided with

_____

14. Ventilation is the provision of

_____

15. Forced ventilation may be used in

_____

EVALUATION

Please compare the answers with the answer key. If you have wrong answers, you need to review the Learning Activity. If you give right answers to all questions.

ANSWER KEY

LEARNING ACTIVITY-1

1	the cycle between boiler and turbine to enable the exhausted steam to return to the boiler as feedwater.
2	sea water and may operate at atmospheric pressure or under a small amount of vacuum.
3	for a high pressure watertube boiler supplying a main propulsion steam turbine
4	auxiliaries and ship services may form separate open or closed feed sysems or be a part of the main feed system.
5	water from a condenser which is under vacuum.

LEARNING ACTIVITY-2

1	'auxiliary' even though without some auxiliaries the main machinery would not operate for long.
2	coolers where a hot liquid is cooled by sea water.
3	pure water from sea water by evaporation and re-condensing.
4	ensure that ships do not discharge oil when pumping out bilges, oil tanks or any oil-contaminated space.
5	in controlled or territorial waters is usually banned by legislation.

LEARNING ACTIVITY-3

1	in which the temperature of a space or its contents is reduced to below that of their surroundings.
2	employs a system of components to remove heat from the space being cooled.
3	reasonable conditions in which to work regardless of the weather.
4	of a supply of fresh untreated air through a space.
5	cargo spaces where the movement of air removes moisture or avoids condensation, removes odours or gases, etc

GENERAL REVISION

1	**the cycle between boiler and turbine to enable the exhausted steam to return to the boiler as feedwater.**
2	**sea water and may operate at atmospheric pressure or under a small amount of vacuum.**
3	**for a high pressure watertube boiler supplying a main propulsion steam turbine**
4	**auxiliaries and ship services may form separate open or closed feed sysems or be a part of the main feed system.**
5	**water from a condenser which is under vacuum.**
6	**'auxiliary' even though without some auxiliaries the main machinery would not operate for long.**
7	**coolers where a hot liquid is cooled by sea water.**
8	**pure water from sea water by evaporation and re-condensing.**
9	**ensure that ships do not discharge oil when pumping out bilges, oil tanks or any oil-contaminated space.**
10	**in controlled or territorial waters is usually banned by legislation.**
11	**in which the temperature of a space or its contents is reduced to below that of their surroundings.**
12	**employs a system of components to remove heat from the space being cooled.**
13	**reasonable conditions in which to work regardless of the weather.**
14	**of a supply of fresh untreated air through a space.**
15	**cargo spaces where the movement of air removes moisture or avoids condensation, removes odours or gases, etc**

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