CERTIFICATES OF COMPETENCY FOR ENGINEERS (YACHT)

EXAMINATIONS ADMINISTERED BY THE
SCOTTISH QUALIFICATIONS AUTHORITY
ON BEHALF OF THE
MARITIME AND COASTGUARD AGENCY

STCW 95 CHIEF ENGINEER (REG. III/3) – "YACHT 4"

057-02 OPERATIONAL PROCEDURES, BASIC HOTEL SERVICES AND SHIP CONSTRUCTION

FRIDAY, 26 SEPTEMBER 2008

1400 - 1600 hrs

Examination paper inserts:

Notes for the guidance of candidates:

1. Non-programmable calculators may be used. 2. All formulae used must be stated and the method of working and ALL intermediate steps must be made clear in the answer.

Materials to be supplied by examination centres

Candidate's examination workbook

OPERATIONAL PROCEDURES AND BASIC HOTEL SERVICES

Attempt ALL questions

Marks for each question are shown in brackets

1. With reference to the monitoring of biological treatment plants for correct operation, state the correct criteria for EACH of the following properties of the effluent:

(a) odour; (2)

The plant should emit a slightly earthy smell often described as a dirty dishwater smell. A rotten egg smell (hydrogen sulphide) indicates that the process has become anaerobic due to an insufficient supply of oxygen. (2)

(b) colour; (2)

The normal colour of the aerated floc should be a rich chocolate colour, whilst the liquid flowing over the weir into the final collection tank should be clear when viewed through the observation ports provided. (2)

(c) floc content; (2)

The floc content is a mixture of raw sewage and the organisms that feed upon it, the latter being the active floc. The floc content is the activated floc expressed as a percentage of the tank contents. This is measured at the intervals stipulated in the planned maintenance system, by taking a floc sample using either

(d) PH value;

A sample of effluent is taken from the settlement tank and tested for pH value, the normal value is pH 7.0. Values above or below this figure indicating alkaline or acidic content that will have a detrimental effect on the aerobic organisms and the plant will go anaerobic

(e) free chlorine content.

The correct level of chlorine present in the effluent discharge overboard is 5 ppm. A higher level will have a detrimental effect on marine life, whilst a lower level will be ineffectual in killing off the residual micro-organisms in the effluent. A Lovibond comparator should be used to ascertain the free chlorine content of the effluent being discharged from the chlorine contact tank

2. Describe, with the aid of a sketch, a silver ion sterilisation unit for fresh water. (10)

A silver ion sterilization utilizes a silver anode submerged in a vessel of water that is plumbed into the freshwater system. By applying a charge to the silver anode, silver is desolved into solution as the anode degrades. The concentration of silver should to achieve sterilization should be approximately .1ppm.

Attached to the silver anode is a current control device. If high volumes of water are to be treated, then only a portion of the total water should be diverted through the vessel. The voltage to the electrode could be turned up slightly as long as the overall concentration of silver does not exceed .08ppm for the domestic water supply

3. With reference to vapour compression refrigeration systems:

(a) state FOUR causes of overpressure that may cause the HP cut-out to operate; (4)

(b) state FOUR properties of a refrigerant oil; (4)

- poor cooling
- blocked evaporator (2)
- blocked expedition valve

- over charged gas pressure
- condenser blocked with air

(c) explain why the oil should be kept free of moisture and air.

. Oil that contains moisture or air will form sludge or varnish which may in turn cause damage to the system.

Water or moisture in the system will cause internal choking of the expansion valve with ice. This the oil is circulated with the refrigerant, the moisture/air held within the oil would eventually make it's way to all the components of the closed system.

4. With reference to air conditioning plants:

(a) explain the risk associated with adiabatic spray type humidifiers and the measures that should be taken to reduce the risk; (4)

The probability of legionella contamination in ships' air conditioning systems is uncertain. However opportunities are available for this to occur.

This type should **not** be installed in new ships unless special measures are taken to reduce the risk. In existing ships an effective moisture eliminator should be introduced if water carryover into the discharge air stream is found to occur. Regular maintenance and sterilisation of the water spray system is necessary. Modification of humidifier drains and circulating tank pipe suctions and drains should be considered if these are not sited in the bottom face of the unit or tank respectively.

(b) sketch a simple one room air handling unit fitted with humidifier sprays. (6)

Page 202 on doc 343

5. (a) List the FOUR items to be recorded in the oil record book in the case of accidental discharge of oil overboard. (4)

Time of occurrence.

Place or position of ship at time of occurrence.

Approximate quantity and type of oil. (4)
Circumstances of discharge or escape, general remarks

(b) List FOUR items to be recorded in the oil record book after automatic discharge overboard or disposal otherwise of bilge water which has accumulated in machinery spaces. (1)

Time and position of ship at which the system has been put into automatic mode of operation for discharge overboard. (1)

Time when the system has been put into automatic mode of operation for transfer of bilge water to holding tank (identify tank).

Time when the system has been put to manual operation.

Method of discharge overboard:

19.1 through equipment;
19.2 through equipment

(c) State the person responsible for signing off the following:

(i) each completed operation; duty master on watch

(ii) each completed page. Master of Vessel

6. (a) Explain the difference between *heeling* and *listing*, stating TWO causes of each. (6)

A ship is said to heel when it is inclined (or is leant over) by an ***external force*** to the ship. Typically such external forces, such as centrifugal force, are created by: (4)

- the action of the waves; or when an external forces present
- The vessel turning. Or where an internal force is present

A ship is said to list when it is inclined (or is leant over) by an ***internal force*** within the vessel.

Typical causes of list include:

- Uneven distribution of cargo;
- Moving cargo;
- Filling tanks, such as fuel or ballast tanks;
- Emptying tanks;
- Transferring the contents of tanks
- Flooding due to damage or grounding

(b) Explain the relationship between the speed of the vessel and angle of heel, explaining why it could be dangerous. The faster the vessel speed when turning, great the angle of heel on the ship

7. (a) Explain why smoke is dangerous to human life in a fire. Its toxic and displaces oxygen (2)

(b) Explain why opening a door into a compartment where a fire exists could be dangerous. Allowing oxygen inot space and flash back (4)

(c) Explain, with the aid of a sketch, how convection can cause a secondary fire. (4)

8. (a) With reference to atmospheric pollution:

(i) state the purpose of the Montreal Protocol; (3)

Once the effects of the CFC gases on the ozone layer were appreciated, leading industrialised nations negotiated a common policy to limit the use of these gases: The Montreal Protocol, as it is now known, was signed by 49 counties in September 1987 and the International Agreement which ***came into force in January, 1989*** imposed restrictions upon the manufacture of refrigerants, in particular those containing chlorine (2)

(ii) explain why chlorofluorocarbons (CFCs) and Hydrochlorofluorocarbons (HCFCs) are being replaced by Hydrofluorocarbons (HFCs). (1)

(b) State the MARPOL annex which refers to the prevention of atmospheric pollution from ships. Oil, noxticess, hazardous,sweage,carbage,air. (1)

(1)

(c) State the main pollutant gas produced when burning a hydrocarbon fuel.

CO2 (2)

(d) State how EACH of the following pollutants in an engine exhaust may be minimised:

(i) SOx;

(ii) NOx. The use of a catilic converter in cars. A exhaust cleaning system

9. Describe the immediate action that should be taken in the event of EACH of the following occurring, stating a possible consequence if the action is not carried out:

(a) a high pressure fuel leak on the main engine; rise the alarm, inform bridge of fuel shut off and declutched and shut down engine. (4)

(3)

(b) severe vibration from the main engine crankshaft; contact bridge asking them to slow down clutch out, wait 10 mins shut down engine. Wait another 30 mins before opening crank case doors. (3)

(c) high cooling water temperature alarm on generator engine. Inform bridge, change ships power to 2nd genest and shut down engine.

10. Explain, with the aid of a sketch, how a hydraulically operated stabiliser fin produces a stabilising effect as the vessel moves through the water. (10)

Page 144 on 343 notes