



**Officer of the Watch**

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**MCA Orals  
Examination  
Revision: General  
Engineering  
Knowledge**

**1: What Interlocks are there on the Start Air System?**

An Interlock to prevent Fuel being Injected  
An Interlock on Turning Gear and  
An Interlock CCP System, pitch has to be on Zero before Starting Engine.

**2: Give a Shipboard use of Cupro-Nickel and the Properties that make it suitable for this use.**

Heat Exchanger Tubes.  
It has good corrosive qualities and very good heat transfer qualities.

**3: What is the First Indication of a Leaking Exhaust Valve?**

The First Indication of a Leaking Exhaust Valve is a rise of Exhaust Gas Temperature at the outlet of the Valve.

**4: What is the Purpose of a Volute Casing in a Turbo Charger?**

The purpose of a Volute Casing in a Turbo Charger is to change the Air Velocity in to Pressure. It also ensures a Constant Velocity of Air leaving the Turbo Charger by accommodating for the gradual increase in quantity of Air that builds up at the circumference of the Compressor.

**5: How is the Signal from the Bridge when the Helm is Moved Transmitted to the Hydraulic Rams in Steering Flat?**

When the Helm on the Bridge is moved, electrical impulses are produced. These impulses are transmitted via an amplifier or control unit to the Steering Flat. In the Steering Flat, these impulses are relayed to a servomotor (telemotor) which drives an adjusting gear and floating lever which puts the steering gear variable delivery pump on stroke, thus creating hydraulic pressure in the system which moves the Rams, thus moving the Tiller and Rudder.

The Pump is only required to deliver Oil when the Helm is moved i.e. once rudder has matched the Helm Angle, the Control Lever will put the Pump Off Stroke.

**6: What would you do in the Event of an Oil Spill?**

Raise the Alarm, Inform Bridge and Chief Engineer.

There should be a Set Drill for Oil Spills, which is practised regularly.

If possible contain the Spill on deck and start clean up procedures using appropriate Oil Spill Equipment.

If the Oil has Spilt into the Sea:- If in Port, Port Authorities should be informed. If at Sea, Coastguard should be informed.

The Time of Spill should be Recorded with the Place or Position of Ship at the Time of Spill along with Approximate quantity and Type of Oil.

Circumstances of Discharge or Escape would be Logged in Oil Record Book and Engine Room Log Book.

**7: Give a Shipboard use for Grey Cast Iron and the Properties that make it suitable for this use.**

Freshwater Pump Casings.

It has fairly good machining qualities and is also inexpensive.

**8: What is the Critical and Barred Range on an Engine?**

This is where the Speed of an Engine in rpm, at which the resonant condition occurs, and is referred to as Critical Speed.

The high stresses associated with resonant condition start to build up as Critical Speed is approached and do not come back to a safe value until speed is beyond Critical Speed.

The unsafe stresses either side of Critical Speed are known as Flank Stresses, this is known as the Barred Speed Range.

The Engine must not be continuously operated at speeds within the Barred Range.

**9: How many Starts do you require to get from an Air Receiver without Recharging?**

On a Reversible Engine: 12 Starts

On Engines with CPP Propellers: 6 Starts.

**10: What Fittings would you expect to find on a Start Air Receiver?**

Fittings found on a Receiver are: Safety Valve, Fusible Plug, Isolating Valve to Main Air Start System, Filling Valve from Compressor, Drain Valve, Valve to Control Air, Valve to Whistle, Pressure Gauge.

**11: What is the Purpose of a Fusible Plug on an Air Receiver and at what Temperature is it Designed to Melt?**

The purpose of the Fusible Plug is to act as a Safety Feature to Release Compressed Air from the Receiver in the event of a Fire in the Vicinity. The Fusible Plug is designed to melt at 150°C.

**12: What Steering Gear Checks would you do before Setting Sail?**

Prior to a Ship's departure from any Port, the Steering Gear should be tested to ensure satisfactory Operation. These Tests should include:

Operation of the Main Steering Gear

Operation of the Auxiliary Steering Gear or the use of the Second Pump which acts as the Auxiliary.

Operation of the Remote Control Systems from the Main Bridge Steering Positions.

Operation of Steering Gear using the Emergency Power Supply.

The Rudder Angle Indicator Reading with respect to the actual Rudder Angle should be checked.

The Alarms fitted to the Remote Control System and Steering Gear Power Units should be checked for Correct Operation.

Steering Gear Header Tank Level should be checked.

During these Tests, the Rudder should be moved through its Full Travel, in both Port and Starboard and the various equipment items, linkages, etc. visually inspected for damage or wear. The Communication System between Bridge and Steering Gear Compartment should also be Operated.

**13: What is the Function of the Condenser in a Refrigeration System?**

The function of a Condenser in a Refrigeration System is to condense and sub cool the refrigerant below Saturation Temperature.

**14: What is the correct method of Starting and Stopping a Centrifugal Pump?**

The correct way to Start and Stop a Centrifugal Pump is with the Discharge Valve from the Pump closed, i.e. less load on the Motor when Starting and Stopping.

**15: What is the purpose of Rocker Gear on an Engine?**

The purpose of the Rocker Gear is to operate the Inlet and Exhaust Valves on the Cylinder Head.

**16: What is the Primary Function of the Expansion Valve in a Refrigeration System?**

The Primary Function of an Expansion Valve in a Refrigeration System is to regulate the Flow of Refrigerant from the H P side to the L P side of the System.  
The pressure drop causes the Saturation Temperature to drop, enabling it to boil off at the Low Temperature of the Evaporator.

**17: Why is Overlap necessary on Air Start Valves?**

Overlap is necessary as if there was no Overlap it would be possible for the Engine to stop in a position where no Valves are Open, i.e. unable to Start.

**18: What is the Pressure of a Start Air Receiver?**

25-40 bar depending on the type of Engine.

**19: Where On Board a Ship would you find Information on the Carriage of Hazardous Substances?**

Information on the Carriage of Hazardous Substances would be found in the IMDG (International Maritime Dangerous Goods Code), which would normally be found on the Bridge.

**20: How is a Medium Speed Engine Reversed (without CPP)?**

In Medium Speed Diesel Engines, reversing is achieved by the use of Duplicate Cams for the Air Inlet Valves, Exhaust Valves and Fuel Pumps. Air Start Distributor Timing is also changed by means of Camshaft Movement or by a Directional Air Supply being admitted to the Start Air Distribution, to reposition Cams.

To engage correct Cams for Ahead and Astern Movements, the Camshaft slides axially in its Bearings. This movement is controlled by the Camshaft Reversing Gear, which is normally a Servo Piston. Motion of the Piston being directly transmitted to the Camshaft.

Note: In a Slow Speed, only Duplicate Fuel Cams required.

**21: What are the dangers of excessive lubrication in Start Air Compressors?**

There is a danger that excessive cylinder lubrication in Start Air Compressors could lead to explosions in Air Start Lines/Manifolds.

Excessive lubrication can lead to carry over with compressed air, being deposited in the Receiver then transferred to the Air Start Manifold, where a leaking Air Start Valve may allow hot gases from combustion into the Air Start Manifold, ignite the oil vapour, causing an explosion.

**22: Explain how you would Start an Air Compressor and Stop It (after overhaul)**

Check Oil Level in Crankcase.

Then ensure all drains are open, i.e. Intercooler Drains and also Unloaders.

Check Air Intake Filter is clean.

Ensure Oil Pressure Gauge is Open and that Air Pressure Gauges i.e. 1st and 2nd Stage, are Partially Open to stop Gauge Fluctuation.

If Water Cooled, check Valves are open and Cooling is supplied. Also check Header Tank.

Bar Machine Over by hand to see if it is Free to Turn.

Start the Machine, check there are no unusual Noises or Vibrations and Oil pressure is Correct.

Then close Drains and Unloader.

If all seem okay, run for 30 minutes, after which, it can be stopped, covers removed and bearings checked. If okay Machine can be Started on Automatic and run.

To Stop the Machine, always make sure the Machine is unloaded and Drains opened before stopping, unless Automatic Drains and Unloaders are Fitted.

**23: What are the Safety Devices fitted to an Air Compressor?**

Low Lub Oil Pressure Shut Down

High Air Temperature Shut Down

1st Stage Relief Valve

2nd Stage Relief Valve

A Fusible Plug is fitted after the 2nd Stage Cooler, Set at 120°C

If Water Cooled, a Jacket Water Safety Valve is fitted.

## 24: How would you prepare a Main Engine for Sea?

This may vary from Engine to Engine.

- Have a visual check all round the Engine.
- Start the Engine Lub Oil Pumps, engage Turning Gear and turn the Engine ensuring Indicator Cocks are open.
- Jacket Water Heating should be on ensuring the Engine is warmed through, Circulated by Circulating Pump.
- The Fuel Oil Booster Pumps should also be running, circulating Fuel around the System.
- Note: If manoeuvring on High Viscosity Fuel Oil, the Fuel should be heated and circulated around the Injectors to give the correct viscosity for the Grade of Fuel in use. Ensure Fuel Injectors are vented and primed.
- Drain any water from Air Start Receivers and Starting Air Manifold, also Control Systems.
- Check Jacket Heater Tank Level.
- Check all Oil Levels, Sump, Governor, Turbocharger, Cylinder Lub Oil Tank, Rocker Arm if on 4-stroke.
- Operate Cylinder lubricators by hand.
- Check Fuel Oil Service Tank, i.e. drain off water/sludge
- Disengage Turning Gear.
- Inform Bridge that you are about to Blow the Engine Over on Air - they will give you permission. Open Air Start Valve from Receiver.
- Once Engine is Blown Over on Air, close Indicator Cocks, start Jacket Water Pumps, shut off Jacket Heating and Circulating Pump.
- If two stroke Engine, start Auxiliary Blower.
- Inform Bridge you are ready to start Engine.
- Start Engine and Seawater Cooling Pump, have a good visual check around the Engine and check all parameters are correct.
- Inform Bridge that you are ready for Stand-by.

## 25: What is the Importance of "M" Notices?

"M" Notices are important as they convey very useful information such as:

Merchant Shipping Notices (MSNs): which will only be used to convey mandatory information, which must be complied with under British Legislation.

Merchant Guidance Notes (MGNs): which will provide advice and guidance to relevant parties in order to improve the Safety of Shipping and of Life at Sea.

Marine Information Notes (MINs): which will provide information to a more limited audience such as Training Establishments or Equipment Manufacturers.



**26: What is Uniflow Scavenging?**

With Uniflow Scavenging, the Incoming Air enters at the Lower End of the Cylinder and Leaves at the Top. The Outlet at the Top of the Cylinder being a Large Exhaust Valve. The advantage of Uniflow is the simple design of the Liner, plus it is the most efficient.

**27: What is the Maximum Compressed Air Temperature that should leave an Air Compressor?**

93°C

**28: What would you do if you had a High Chloride Level in the Boiler?**

To reduce the Chloride Level in the Boiler, the Boiler would be Blown Down, thus allowing Fresh Feed to the Boiler

**29: What is Loop Scavenging in a 2-Stroke Engine?**

Loop Scavenging is where the Incoming Air passes over the Piston Crown, then rises towards the Cylinder Head forcing Exhaust Gases down and out the Exhaust Ports, just above the Inlet Port. The advantage of Loop is that no Exhaust Valve is required.

**30: What are the Pipes, used for Pumping Fuel around the Ship, Protected by?**

Quick Closing Valves: which can be operated remotely. In most cases from the Bridge or a remote location from the Engine Room.

**31: How can Exhaust Valve Leakage be confirmed?**

Exhaust Valve Leakage can be confirmed by taking an Indicator Card, the Card should be taken with Fuel "On" and "Off" the Unit. If the Valve is leaking, the compression pressure and maximum pressure will be low.

**32: What would cause an Excessive High Pressure in a Refrigeration System?**

High Pressure could be caused by lack of Cooling or a Fouled Condenser or even Overcharge, but this is usually unlikely.

**33: Fresh Water supplied for Drinking and Culinary purposes must meet Specified Purity Standards. How is this achieved?**

These Standards are met by passing the Fresh Water through a Hypochlorinator where the Water is Sterilised by an excess dose of Chlorine provided as Hypochloride Tablets. It is then de-chlorinated in a Bed of Activated Carbon to remove excess Chlorine. Any Colour, Taste and Odour, which was present in the Water, will also be removed by the Carbon.

Another Method is to pass the Fresh Water through an Ultra Violet Steriliser.

**34: What is the Pressure between an Engine Fuel Pump and Injector?**

250-350 bar.

**35: What is the Regulation regarding use of Evaporators Inshore?**

Evaporators should not be used within 20 miles from Shore, due to risk of pollutants being taken into the Freshwater System.

**36: What is Cross Flow Scavenging**

In Cross Flow Scavenging, the Incoming Air is directed upwards, pushing the Exhaust Gases before it. The Exhaust Gases then travel down and out of the Exhaust Port. Advantage is no Exhaust Valve.

**37: Why is Simultaneous Injection of Fuel Oil and Starting Air into a Main Engine Cylinder Undesirable and How is it Prevented?**

Simultaneous Injection of Fuel and Starting Air into a Cylinder is Undesirable as it could lead to an Explosion in the Start Air System.

It is prevented by means of Interlock, which prevents Fuel being Injected when the Air Start Auto Valve is Open.

The Interlock Operates a Stop Solenoid, which keeps the Fuel Rack at Zero Position.

**38: After Stripping and Cleaning a Purifier, what do you have to make sure of on re-assembly?**

You have to make sure that the Mark on the Bowl Lock Ring lines up with the Mark on the Bowl.

Also if Vertical Shaft has been removed, that height of Shaft is correct.

**39: What is the Purpose of the Scum Valve on a Boiler?**

The Scum Valve on a Boiler is connected to a shallow dish positioned at the normal water level of the Boiler and enables the Blowing Down or Removal of Scum and Impurities from the Water Surface.

**40: Why does a Centrifugal Cargo Pump have a Relief Valve?**

A Centrifugal Cargo Pump requires a Relief Valve as the Working Pressure of the Pump has to tie in with the Working Pressure of the Cargo Pipework.