

**Seagull CES
Test
Reviewer for
Engine Cooling
System**

A transducer can be used in a cooling water temperature control system. What do you understand by the term transducer?

- A device, that measures a physical characteristic and generates different physical output. ✓
- A device to compare measured value and set point.
- A device to measure control valve travel.
- A device to boost the controller output signal.

At which point does the jacket water normally enter the engine?

- At the bottom of the liner. ✓
- At the cylinder cover.
- At the turbocharger.
- At the top of the liner.

At which point in a diesel engine jacket cooling water system is the temperature normally measured for temperature control purposes?

- At the engine outlet. ✓
- At the outlet from the heat exchanger.
- At the header tank.
- At the engine inlet.

Bore cooling is a common design feature for the main components of a diesel engine. Why is bore cooling used?

- To allow intense cooling while maintaining component strength. ✓
- To make the components lighter.
- To prevent corrosion.
- To prevent scale formation.

Cavitation erosion leading to corrosion can be a problem with some diesel engine components. Which one of the following are the most likely to suffer this form of damage?

- Combustion side of cylinder liners.
- Water side of cylinder liners. ✓
- Piston crowns.
- Exhaust valves.

Central cooling systems are widely used on-board modern ships. What is the main reason for using such a system?

- To minimize the number of heat exchangers required.
- To minimize the amount of seawater pipework required. ✓
- To have the equipment in the middle of the engine room, to minimize damage in the event of collision.
- To allow all of the pipes to be the same length.

Choose from the options given the one, which correctly completes the following statement. Diesel engines need to be cooled in order to:

- Maintain component clearances and material properties. ✓
- Maximize engine efficiency.
- Minimize soot deposits.
- Minimize scale formation.

Chromate based corrosion inhibitors are not allowed as the cooling water treatment in some situations. In which of the following must alternatives be used?

- When the system includes a fresh water generator for producing potable water. ✓
- When the system includes a fresh water generator for producing boiler feed water.
- When the system doesn't include a fresh water generator.
- In a central cooling system.

Complete the following statement from the options given. The purpose of a deaerator, fitted in a diesel engine jacket water system, is to:

- Assist in the removal of air, gas and vapour from the system. ✓
- Fill up the header tank.
- Provide a positive suction head for the circulating pump.
- Generate a cocktail shaker effect.

Differential pressure cells are often fitted to a diesel engine jacket cooling water systems. What is the main purpose for fitting them in such a system?

- To monitor flow rate in the system. ✓
- To measure pressure drop across filters.
- To measure pressure rise across the circulating pump.
- To measure the level in the header tank.

Direct air cooling is used for some diesel engines. Which of the following duties are likely to have diesel engines, which are directly air cooled?

- Slow speed main propulsion.
- Main electrical generator.
- Medium speed main propulsion.
- Emergency electrical generator. ✓

Even when engine cooling systems are filled with fresh water treatment is still required. Why is this treatment still required?

- To reduce the alkalinity.
- To change the water colour.
- To reduce the total dissolved solids in the water.
- To prevent scale deposits and corrosion. ✓

From the options given, select all of those, which are commonly used to describe the fluid flow paths through a heat exchanger:

- Parallel flow. ✓
- Counter flow. ✓
- Down flow.
- Up flow.

How are the main and bottom end bearings cooled in a diesel engine?

- Heat is carried away by lubricating oil. ✓
- Fresh water cooled.
- Air cooled.
- Seawater cooled.

How are the pistons cooled on a four stroke trunk piston type diesel engine? There may be more, than one correct option:

- By passing lubricating oil up the connecting rod, and into the piston crown. ✓
- By lubricating oil splashed up from the crankcase. ✓
- By passing jacket water through them.
- With cylinder lubricating oil.

How do chemical corrosion inhibitors for engine cooling water systems generally work?

- The chemicals react with the metals in the system to form protective passive layers on the surface of components. ✓
- The chemicals react with the metals in the system to maintain the alkalinity of the water.
- The chemicals react with the metals in the system to create anodic and cathodic areas.
- The chemicals react with the metals in the system to prevent scale formation.

How is expansion of the tube stack accommodated for in a shell and tube type heat exchanger?

- Only one tube plate is clamped, the other is free to move longitudinally in the shell. ✓
- The tubes are loosely fitted in the tube plate.
- The heat exchanger is only fixed at one end.
- Non-expanding materials are used for the tubes.

How is the flow normally monitored in a piston cooling system?

- Sight glass and flow alarm in each return line. ✓
- Sight glass and flow alarm in each inlet line.
- Sight glass and flow alarm in the pump inlet.
- Sight glass and flow alarm in pump outlet.

How is the temperature of the *HT* circuit water controlled in a central cooling system?

- By mixing with water from the *LT* circuit, using a 3-way temperature control valve. ✓
- By mixing with water from the seawater circuit, using a 3-way temperature control valve.
- By passing it through the central coolers.
- By adding cold fresh water to the system header tank.

How is the temperature of the *HT* circuit controlled in a central cooling system?

- By using a 3-way diverter valve to direct flow through the central coolers. ✓
- By using a 3-way mixing valve to mix water from the *HT* and *LT* circuit.
- By using a 3-way mixing valve to mix water from the *LT* circuit with seawater.
- By using a 3-way diverter valve to recirculate the seawater.

How should the jacket water flow through the deaerator?

- With a rotational flow through the baffles. ✓
- Vertically upwards through the baffles.
- Vertically downwards through the baffles.
- From the center outwards through the baffles.

In some heat exchangers the tubes are fitted with fins. What is the purpose of these fins?

- To extend the heat transfer surface. ✓
- To strengthen the tubes.
- To direct the fluid flow.
- To slow down the fluid flow.

Jacket cooling water is sometimes used as the heating source for the fresh water generator. The main reason for this is to:

- Minimize the amount of sea water required as secondary coolant.
- Recover waste heat to improve overall plant efficiency. ✓
- Prevent fouling of the fresh water generator heat exchanger.
- Reduce the size of the jacket water cooler.

Many shell and tube heat exchangers are described as multi-pass types, where one of the fluids passes through the heat exchanger a number of times between entry and final exit. How are these multi-passes created?

- By using a number of tube stacks.
- By suitable division of the end covers. ✓
- By using diverter valves.
- By using recirculation valves.

Modern engine designs usually incorporate oil cooling of the pistons. Which of the following options is the main reason for this?

- Oil has a high specific capacity.
- To eliminate the risk of water contamination of the crankcase. ✓
- To reduce fouling of the cooling spaces.
- To help preheat the engine.

Only part of the heat released during combustion is converted to useful work. What happens to the rest of it? Select all applicable options:

It passes to exhaust.

It passes to the surrounding air.

It passes to the cooling water.

It is used to heat the fuel.

Problems can occur when operating a diesel engine, that is not adequately cooled. Select from the options given all those items, that can be affected:

Component clearances.

Pump seals and O-rings.

Lubricating oil condition.

Component material properties.

Temperature differentials can be used to help diagnose operating problems with heat exchangers. For a jacket water cooler, using seawater as the secondary coolant, which fault is indicated, when the seawater temperature differential is reduced and the jacket water outlet temperature higher than usual, but all other parameters are normal?

Scale deposits on the seawater side of the tubes.

Tube blockage.

Jacket water leakage into the seawater side.

Reduced seawater flow.

The piston rings and liner wall heat up during the operation of the diesel engine. Apart from the combustion process, what else causes these components to heat up?

Friction.

Cylinder lubricating oil.

Convection.

Jacket water.

The use of air cooling for large engines is normally limited due to which of the following?

Low specific heat capacity and density.

High potential to form scale on the heat transfer surfaces.

High cost.

Limited availability.

There, is usually, a minimum temperature, recommended by the engine manufacturer for sea water, used as a secondary coolant. Which of the following methods is the most common used to achieve this minimum temperature?

- Partial recirculation of the seawater. ✓
- Preheating the seawater, using electric heaters.
- Mixing steam with the seawater.
- Reduction of flow of the seawater.

Three way valves, used in diesel engine cooling water systems, can be arranged as either diverter or mixing valves. What is the normal port arrangement for a mixing valve?

- Two inlet and one outlet port. ✓
- One inlet and two outlet ports.
- Three inlet ports.
- One inlet, one outlet and a bypass port.

Wax element control valves are often used in diesel engine cooling water systems. How is the valve actuated?

- Expansion and contraction of the wax element moves the valve. ✓
- Water pressure on the wax element moves the valve.
- Water flow past the wax element moves the valve.
- The temperature of the wax is measured by a sensor, which outputs a signal to a controller.

What do you understand by the term primary fluid, when referring to diesel engine cooling systems?

- The coolant, that passes through the engine and is cooled in a heat exchanger. ✓
- The coolant, that passes through the heat exchanger to cool another fluid.
- The coolant, that is used to preheat the engine.
- The fluid, that is bled through the fuel injectors.

What form of treatment is a seawater cooling system normally treated with to avoid fouling by marine growth?

- Electro-chlorination. ✓
- Nitrite – borate based corrosion inhibitors.
- Chromate based inhibitors.
- Zinc anodes.

What is the approximate value for the specific heat capacity of fresh water?

- 4,2 kJ/kgK. ✓
- 42 kJ/kgK.
- 420 kJ/kgK.
- 1 kg/m³.

What is the main problem associated with using water to cool diesel engine pistons?

- Risk of leakage into the crankcase. ✓
- Specific heat capacity too low.
- Risk of cavitation erosion.
- Cocktail shaker effect cannot be achieved.

What is the main reason for cooling the charge air, supplied by the turbocharger?

- Increase the density of the air, entering the cylinder. ✓
- Reduce the temperature of the air, entering the cylinder.
- Heat up the seawater to feed the fresh water generator.
- Reduce the exhaust gas temperature.

What is the main reason for including a fresh water generator in the main engine jacket water cooling circuit?

- To increase the overall plant efficiency. ✓
- To allow a smaller jacket water cooler to be fitted.
- To reduce the number of pumps fitted.
- To help cool the jacket water.

What is the main reason for using central cooling systems on-board the ship?

- To allow the fresh water generator to be heated.
- To allow plate heat exchangers to be used.
- To avoid the need for seawater pipework.
- To minimize the amount of seawater pipework and so minimize maintenance requirements. ✓

What is the most common method, used for cooling fuel injection valves on large modern heavy fuel oil, burning 2 stroke diesel engines?

- Direct circulation of diesel oil.
- Direct circulation of seawater.
- Direct circulation of fresh water.
- Recirculation of heavy fuel oil. ✓

What is the most common method, used for testing the concentration of cooling water treatment in a cooling system?

- By tasting the water.
- By using a hydrometer.
- By litmus paper test.
- By colour comparator. ✓

What is the most common type of pump used in a diesel engine jacket water system?

- Reciprocating pump.
- Positive displacement pump.
- Multi stage centrifugal pump.
- Single stage centrifugal pump. ✓

What is the purpose of a controller in a cooling water temperature control system?

- To indicate the control valve position.
- To control the flow of the water in the system.
- To measure the temperature of the cooling water system.
- To compare the measured value with the set point and generate an output signal for the control valve actuator. ✓

What is the purpose of the diffuser ring, fitted to some centrifugal pumps?

- To help distribute the fluid inside the pump.
- It is fitted instead of an impeller.
- To accelerate the fluid in the pump.
- To convert the high velocity kinetic energy of the fluid to pressure energy. ✓

What would be a typical temperature for the *LT* circuit to be controlled at in a central cooling system?

- 50 °C.
- 10 °C.
- 80 °C.
- 37 °C. ✓

When describing heat exchangers, what does the term parallel flow mean?

- Both fluids have vertical flow paths.
- Both fluids flow in the same direction through the heat exchanger. ✓
- Both fluids have horizontal flow paths.
- Both fluids flow through the tubes.

When discussing diesel engine cooling water systems, the term “*cocktail shaker effect*” refers to the cooling mechanism for which of the following?

- Cylinder liner.
- Pistons. ✓
- Turbocharger.
- Fuel injection valves.

When would a split range control system normally be used in a diesel engine cooling system?

- When two jacket water coolers are fitted.
- When both heating and cooling of the system are required. ✓
- When the system is used for two engines.
- When the system is used for main and auxiliary engines.

When would it be most likely, that split range control would be used in a diesel engine cooling water system?

- When oil is used as the piston coolant.
- When heating and cooling of the system was required. ✓
- When seawater temperatures are low.
- When using jacket water to heat the fresh water generator.

Where would you find detailed information, relating to health and safety and environmental hazards, associated with cooling water system treatment chemicals?

- From the material safety data sheets. ✓
- On the packaging or container for the treatment.
- In the engine manual.
- From the delivery note.

Which of the following cooling water treatments are not allowed to be used, when the cooling water system includes a fresh water generator?

- Chromate based. ✓
- Nitrite-borate based.
- Silicate based.
- Soluble oil.

Which of the following equipment is normally cooled by the *LT* in a central cooling system? There may be more, than one correct option:

- Air compressors. ✓
- Diesel engine lubricating oil systems.
- Diesel engine cylinder liners and cylinder covers.
- Turbochargers.

Which of the following equipment is normally included in the *HT* of a central cooling system? There may be more, than one correct option:

- Main diesel engine cylinder liners and cylinder covers. ✓
- Auxiliary diesel engine cylinder liners and cylinder covers. ✓
- Fresh water generator. ✓
- Charge air coolers.

Which of the following options is the main purpose of a jacket cooling water system of a diesel engine?

- To maintain the temperature of the cylinder liner and cylinder cover within recommended limits. ✓
- To cool the turbocharger and exhaust valve cages.
- To allow preheating of the engine.
- To cool the engine lubricating oil.

Which of the following options is the reason for diesel engine components heating up during normal operation?

- Heat released during combustion and generated by friction. ✓
- Heat transferred from the jacket cooling water.
- Heat transferred from the circulation of lubricating oil.
- Heat transferred from the engine room.

Which of the following types of pumps would you normally expect to find, being used as the circulating pump in a diesel engine jacket cooling water system?

- Single stage centrifugal pump. ✓
- Multi-stage centrifugal pump.
- Variable delivery pump.
- Positive displacement pump.

Which of the following values would be a typical value for the specific heat capacity of a mineral oil?

- 4,0 kJ.
- 4,2 kJ/kgK.
- 2,0 kJ.
- 2,0 kJ/kgK. ✓

Which of the options given best describes a central cooling system?

- A system, which meets the ship's machinery cooling requirements using only sea water.
- A system, which meets the ship's machinery cooling requirements without using sea water.
- A system, situated in the middle of the engine room.
- A system, that provides the cooling requirements for all of the ship's machinery. ✓

Which of the options given describes the desired water quality for a diesel engine cooling water system?

- Slightly acidic with a high level of total dissolved solids.
- Slightly alkaline with a high level of total dissolved solids.
- Slightly acidic with a low level of total dissolved solids.
- Slightly alkaline with a low level of total dissolved solids. ✓

Why are the plates for plate type heat exchangers often made from stainless steel or titanium? More than one option could be correct:

- Good resistance to erosion. ✓
- Good resistance to corrosion. ✓
- They can be made thin to promote heat transfer. ✓
- They are strong even though they are thin. ✓

Why is a header tank fitted in a jacket cooling water system? There may be more than one correct answer:

- To accommodate expansion in the system. ✓
- To allow air and vapour to exit the system. ✓
- To provide a positive suction head for the circulating pump. ✓
- To allow the system to be drained.

Why is it necessary to preheat a diesel engine before the first start? Select all applicable options:

- To help ignite the fuel. ✓
- To minimize thermal stresses. ✓
- To stop any water leaks at the seal rings.
- To help cool the auxiliary engines.

Why is seawater rarely used as the primary coolant for a diesel engine jacket water system?

- There is a high risk of fouling and corrosion. ✓
- It is too cold.
- It may cause cracks in the components.
- It has a very low specific heat capacity.

Why is silicate usually added to nitrite-borate based cooling water treatment?

- To protect aluminium components in the system. ✓
- To protect against microbial problems.
- To protect steel and iron components in the system.
- To protect the pump seals.

Why would a U tube manometer normally be fitted to a diesel engine charge air cooler?

- To measure the pressure drop across the cooler. ✓
- To measure the atmospheric pressure in the engine room.
- To measure the pressure in the scavenge air manifold.
- To measure the output pressure of the turbocharger.