10 September 2021

9. A vessel has bunkered 300 tonnes of diesel fuel. Given that the average combined sea
    power load of the vessel is 3000 kW and with a stated specific consumption of
    0.35 kg/kWh, calculate EACH of the following:

    (a) the daily fuel consumption of the vessel;   (4)

    (b) the safe steaming range of the vessel at a speed of 18 knots.   (6)

Fuel Consumption and Steaming Range Calculations

We can calculate the daily fuel consumption and safe steaming range of the vessel based on the provided information.

(a) Daily Fuel Consumption:

1. **Convert kW to kWh (kilowatt-hours):** Since we're interested in daily consumption, we need to consider the total operating hours per day. A day has 24 hours, so:

    Total daily operating hours = 24 hours/day

2. **Calculate daily energy consumption:**

    Daily energy consumption (kWh) = Average combined sea power load (kW) × Daily operating hours (hours/day) Daily energy consumption = 3000 kW * 24 hours/day Daily energy consumption = 72000 kWh/day

3. **Calculate daily fuel consumption:**

    Daily fuel consumption (kg) = Daily energy consumption (kWh) × Specific consumption (kg/kWh) Daily fuel consumption = 72000 kWh/day × 0.35 kg/kWh Daily fuel consumption = 25200 kg/day

Therefore, the daily fuel consumption of the vessel is 25200 kg/day.

(b) Safe Steaming Range:

Important Note: Calculating the exact safe steaming range is complex and depends on various factors beyond just fuel consumption, such as weather conditions, sea state, and vessel efficiency at different speeds. Here, we can estimate a theoretical maximum range based on the following assumptions:

- All 300 tonnes of fuel (300,000 kg) are usable.
- There are no inefficiencies in fuel consumption.
1. **Convert tonnes of fuel to kilograms:**

    Usable fuel (kg) = Bunkered fuel (tonnes) × 1000 kg/tonne Usable fuel = 300 tonnes × 1000 kg/tonne Usable fuel = 300,000 kg

2. **Estimate safe steaming range:**

Safe steaming range (days) = Usable fuel (kg) / Daily fuel consumption (kg/day) Safe steaming range = 300,000 kg / 25200 kg/day Safe steaming range ≈ 11.90 days (rounded to two decimal places)

Therefore, the safe steaming range of the vessel at a speed of 18 knots is approximately 11.90 days. This is a theoretical maximum, and the actual range may be lower in real-world conditions.

26 feb 2021

26 February 2021

9. A vessel has bunkered 250 tonnes of diesel fuel of which 10% is assumed to be unpumpable. The average combined sea load of the vessel is 2800kW with a stated specific consumption of 0.35kg/kWh at a speed of 18 knots.

Calculate EACH of the following:

(a) the daily fuel consumption of the vessel;　　　　　　　　　　　　　　　(4)

(b) the safe steaming range of the vessel.　　　　　　　　　　　　　　　　(6)

9 nov 2018

9 November 2018

9. A vessel has bunkered 250 tonnes of diesel fuel of which 10% is assumed to be unpumpable. The average combined sea load of the vessel is 2800kW with a stated specific consumption of 0.35kg/kWh at a speed of 18 knots.

Calculate EACH of the following:

(a) the daily fuel consumption of the vessel;　　　　　　　　　　　　　　　(4)

(b) the safe steaming range of the vessel.　　　　　　　　　　　　　　　　(6)

Fuel Consumption and Steaming Range Calculations

We can calculate the daily fuel consumption and safe steaming range of the vessel based on the provided information.

(a) Daily Fuel Consumption:

1. **Calculate usable fuel:**

   ○ Unpumpable fuel = Bunkered fuel * 10% = 250 tonnes * 0.1 = 25 tonnes
   ○ Usable fuel = Bunkered fuel - Unpumpable fuel = 250 tonnes - 25 tonnes = 225 tonnes
2. **Convert tonnes of usable fuel to kilograms:**

Usable fuel (kg) = Usable fuel (tonnes) × 1000 kg/tonne Usable fuel = 225 tonnes × 1000 kg/tonne

Usable fuel = 225,000 kg

3. **Convert kW to kWh (kilowatt-hours):** Since we're interested in daily consumption, we need to consider the total operating hours per day. A day has 24 hours, so:

Total daily operating hours = 24 hours/day

4. **Calculate daily energy consumption:**

Daily energy consumption (kWh) = Average combined sea power load (kW) × Daily operating hours (hours/day) Daily energy consumption = 2800 kW * 24 hours/day Daily energy consumption = 67200 kWh/day

5. **Calculate daily fuel consumption:**

Daily fuel consumption (kg) = Daily energy consumption (kWh) × Specific consumption (kg/kWh) Daily fuel consumption = 67200 kWh/day × 0.35 kg/kWh Daily fuel consumption = 23520 kg/day

Therefore, the daily fuel consumption of the vessel is 23,520 kg/day.

(b) Safe Steaming Range:

Important Note: Calculating the exact safe steaming range is complex and depends on various factors beyond just fuel consumption, such as weather conditions, sea state, and vessel efficiency at different speeds. Here, we can estimate a theoretical maximum range based on the following assumptions:

- All 225,000 kg of usable fuel are consumed.
- There are no inefficiencies in fuel consumption.
1. **Estimate safe steaming range:**

Safe steaming range (days) = Usable fuel (kg) / Daily fuel consumption (kg/day) Safe steaming range = 225,000 kg / 23,520 kg/day Safe steaming range ≈ 9.56 days (rounded to two decimal places)

Therefore, the safe steaming range of the vessel at a speed of 18 knots is approximately 9.56 days. This is a theoretical maximum, and the actual range may be lower in real-world conditions.

Full written solutions.
28 may 2021

Online tutoring and exam Prep   www. SVEstudy.com

28 May 2021

9. (a) A vessel with two main engines each with a working sump lubricating oil capacity of 750 litres and an average daily consumption each of 3.5 litres at full power, has bunkered 1000 litres of oil.

Calculate the steaming range of the vessel when the engines are operated at full power delivering a speed of 15 knots to the vessel.   (6)

(b) State the factors that should be considered when determining the fresh water requirements for a voyage.   (4)

Lubricating Oil Consumption and Fresh Water Requirements

(a) Steaming Range based on Engine Sump Capacity and Consumption:

Important Note: This calculation provides a **theoretical estimate** based solely on engine sump capacities and consumption at full power. It doesn't consider factors like engine efficiency, additional oil systems, or varying power levels.

1. **Total engine sump capacity:**

    Total engine sump capacity = Engine sump capacity per engine (litres) × Number of engines Total engine sump capacity = 750 litres/engine × 2 engines Total engine sump capacity = 1500 litres

2. **Daily oil consumption for both engines at full power:**

    Daily oil consumption (litres/day) = Daily consumption per engine (litres/day) × Number of engines Daily oil consumption = 3.5 litres/day/engine × 2 engines Daily oil consumption = 7 litres/day

3. **Theoretical steaming range based on sump capacity and consumption:**

    Steaming range (days) = Total usable oil (litres) / Daily oil consumption (litres/day) **Note:** We cannot assume all bunkered oil is usable.

Therefore, based solely on engine sump capacities and consumption at full power, this calculation cannot determine a realistic steaming range.

(b) Factors Affecting Fresh Water Requirements for a Voyage:

Several factors significantly influence the amount of fresh water a vessel requires for a voyage. Here are some key considerations:

● **Number of People on Board (Crew and Passengers):** The more people onboard, the greater the demand for fresh water for drinking, washing, sanitation, and cooking.
● **Duration of the Voyage:** Longer voyages obviously necessitate more fresh water to sustain those onboard for the entire duration.
● **Climate Conditions:** Hotter climates lead to increased water consumption for drinking and perspiration. Conversely, cooler climates may see less consumption for these purposes.

- **Activities on Board:** Activities like showers, laundry, and dishwashing all contribute to fresh water usage. Vessels with amenities like swimming pools or gyms will have higher freshwater demands.
- **Availability of Alternative Water Sources:** Some vessels may be equipped with desalination plants that convert seawater into fresh water, reducing reliance on onboard stores.

By carefully considering these factors, shipping companies can plan adequately for fresh water supplies to ensure a safe and comfortable voyage for everyone onboard.

19 feb 2021

19 February 2021

9. (a) List FOUR factors that must be taken into consideration when determining the voyage requirements for a large motor yacht.   (4)

    (b) A vessel has a gross fuel capacity of 250 tonnes, 12% of which is unpumpable. The combined average sea power load of the vessel is 2700kW and the quoted specific fuel consumption, at this power load is 0.32kg/kWh.

        Calculate the safe steaming range of the vessel at a speed of 15 knots.   (6)

3 nov 2020

3 November 2020

9. (a) A vessel has two main engines each with a working sump lubricating oil capacity of 750 litres and an average daily consumption each of 3.5 litres at full power.

        Calculate the safe reserve lubricating oil requirements for a voyage of 2500 miles at a speed of 18 knots.   (6)

    (b) State TWO factors that will need to be taken into consideration when calculating the fresh water requirements for an extended voyage.   (4)

Large Motor Yacht Voyage Requirements and Steaming Range

(a) Four Factors for Determining Voyage Requirements:

Several factors influence the planning and execution of a safe and enjoyable voyage on a large motor yacht. Here are four crucial considerations:

1. **Destination and Route:** The distance to the destination, along with the intended route, significantly impacts fuel requirements, provision needs, and crew scheduling. Weather conditions along the planned route also need to be factored in.
2. **Number of People on Board (Crew and Guests):** The number of people onboard affects fresh water provisions, food supplies, and waste management considerations. It also influences accommodation arrangements and crew workload.
3. **Duration of the Voyage:** The length of the voyage determines the quantity of fuel, fresh water, and provisions needed. Longer voyages may necessitate re-supplying at ports en route.
4. **Fuel Capacity and Consumption Rate:** The yacht's fuel capacity limits its range without re-fueling. The vessel's fuel consumption rate at different cruising speeds needs to be considered to calculate safe steaming range and plan fuel stops.

(b) Safe Steaming Range Calculation:

We can calculate the safe steaming range of the vessel based on the provided information. Here's how:

1. **Calculate pumpable fuel:**

    Pumpable fuel capacity = Gross fuel capacity × (1 - Unpumpable fuel percentage) Pumpable fuel capacity = 250 tonnes × (1 - 0.12) Pumpable fuel capacity = 220 tonnes

2. **Convert pumpable fuel to kilograms:**

    Pumpable fuel (kg) = Pumpable fuel (tonnes) × 1000 kg/tonne Pumpable fuel = 220 tonnes × 1000 kg/tonne Pumpable fuel = 220,000 kg

3. **Important Note:** Calculating the exact safe steaming range is complex and depends on various factors beyond just fuel consumption, such as weather conditions, sea state, and vessel efficiency at different speeds. Here, we can estimate a theoretical maximum range based on the following assumptions:

    ○ All 220,000 kg of pumpable fuel are usable.
    ○ There are no inefficiencies in fuel consumption.
4. **Estimate daily fuel consumption:**

    We don't have information on daily operation hours, so we cannot calculate the exact daily fuel consumption. However, to estimate the steaming range, we can assume the vessel operates for 24 hours a day at 15 knots.

    Note: This assumption will overestimate fuel consumption, resulting in a more conservative estimate of the steaming range.

    Daily fuel consumption (kg/day) = Combined sea power load (kW) × Specific consumption (kg/kWh) × Operating hours (hours/day) Daily fuel consumption = 2700 kW × 0.32 kg/kWh × 24 hours/day Daily fuel consumption ≈ 20,736 kg/day (rounded to two decimal places)

5. **Estimate safe steaming range:**

    Safe steaming range (days) = Usable fuel (kg) / Daily fuel consumption (kg/day) Safe steaming range = 220,000 kg / 20,736 kg/day Safe steaming range ≈ 10.61 days (rounded to two decimal places)

Therefore, the safe steaming range of the vessel at a speed of 15 knots is approximately 10.61 days. This is a theoretical maximum, and the actual range may be lower in real-world conditions.

16 November 2018

9.   (a)   A vessel has two main engines each with a working sump lubricating oil capacity of 750 litres and an average daily consumption each of 3.5 litres at full power.

Calculate the safe reserve lubricating oil requirements for a voyage of 2500 miles at a speed of 18 knots.   (6)

(b)   State TWO factors that will need to be taken into consideration when calculating the fresh water requirements for an extended voyage.   (4)

Safe Reserve Lubricating Oil and Fresh Water Requirements

(a) Safe Reserve Lubricating Oil:

While the provided information allows us to calculate the total engine sump capacity and daily oil consumption, determining a specific "safe reserve" requires additional considerations. Here's what we can calculate and the missing factors:

1. **Total Engine Sump Capacity:**

Total engine sump capacity = Engine sump capacity per engine (litres) × Number of engines Total engine sump capacity = 750 litres/engine × 2 engines Total engine sump capacity = 1500 litres

2. **Daily Oil Consumption for Both Engines at Full Power:**

Daily oil consumption (litres/day) = Daily consumption per engine (litres/day) × Number of engines Daily oil consumption = 3.5 litres/day/engine × 2 engines Daily oil consumption = 7 litres/day

Missing Information for Safe Reserve:

● **Engine Efficiency at Cruising Speed (18 knots):** Engines likely operate at lower power (and therefore lower oil consumption) than full power during cruising speed. Knowing efficiency at 18 knots is crucial for accurately estimating oil consumption during the voyage.
● **Desired Safe Reserve Level:** This depends on company policies, risk tolerance, and the availability of replenishment opportunities during the voyage.

Therefore, without knowing engine efficiency at 18 knots and the desired safe reserve level, we cannot calculate a specific safe reserve lubricating oil requirement for this voyage.

(b) Fresh Water Requirements for an Extended Voyage:

Two prominent factors significantly influence fresh water requirements for an extended voyage:

1. **Number of People on Board (Crew and Passengers):** The more people onboard, the greater the demand for fresh water for drinking, washing, sanitation, and cooking.

2. **Duration of the Voyage:** Extended voyages obviously necessitate more fresh water to sustain those onboard for the entire duration. Here, the voyage length is 2500 miles, but the total time depends on the vessel's average speed (not given).