Marine Engine, Transmission & Generator Survey Report

Prepared by Endurance Marine Diesel Inc.

Client	Jeffrey Labowski
Vessel Name	Bunny's Toe
Location	Huntington Beach, CA
Survey Date	July 2026
Surveyor	Endurance Marine Diesel Inc.

SCOPE OF INSPECTION

A visual inspection and operational sea-trial evaluation were performed on the vessel's port and starboard propulsion engines, transmissions, and generator. Accessible machinery spaces and externally visible components were examined for evidence of leakage, corrosion, deterioration, improper installation, damaged hardware, prior repairs, hose and piping condition, wiring condition, mounting integrity, fluid level and condition, and other service-related concerns present at the time of survey.

The propulsion engines and transmissions were observed from startup through normal operating temperature and under sea-trial loading. Observations included starting characteristics, smoke and visible discharge, engine temperature, maximum-RPM attempt, turbocharger boost pressure, engine oil pressure, transmission pressure, vibration, shift operation, and general response under load. Injector fuel-consumption/return testing was performed on both main engines at idle while in gear.

The generator was visually inspected and operated under full vessel electrical load with normal ship's loads applied. Generator operation, cooling performance, exhaust discharge, visible leakage, and load-carrying ability were observed throughout the sea trial.

Laboratory oil analysis was performed on both main engines, both transmissions, and the generator. Oil samples were drawn and submitted for spectrographic analysis; results are reported separately upon receipt from the laboratory.

The inspection was limited to readily accessible and externally observable components. No internal engine, transmission, generator, cooler, turbocharger, or exhaust-component disassembly was performed unless specifically stated. No compression testing, pressure testing, or destructive testing was included in this report. This report documents conditions observed during the inspection and provides maintenance recommendations intended to support continued reliability and serviceability.

PROPULSION ENGINE INFORMATION

Port Propulsion System

Engine Manufacturer	Volvo Penta
Engine Model	D12D-DMP
Engine Family	6VPXM12.1DCA
Serial Number	1012612025
Rated Output	704 HP (525 kW) @ 2,300 RPM
Engine Hours	610 Hours
Transmission	ZF
Transmission Model	ZF325-1A
Transmission Serial Number	20075834

Starboard Propulsion System

Engine Manufacturer	Volvo Penta
Engine Model	D12D-DMP
Engine Family	6VPXM12.1DCA
Serial Number	1012611326
Rated Output	704 HP (525 kW) @ 2,300 RPM
Engine Hours	614 Hours
Transmission	ZF
Transmission Model	ZF325-1A
Transmission Serial Number	20075835

PORT MAIN PROPULSION ENGINE SURVEY

Manufacturer	Volvo Penta
Model	D12D-DMP
Engine Family	6VPXM12.1DCA
Serial Number	1012612025
Rated Output	704 HP (525 kW) @ 2,300 RPM
Engine Hours	610 Hours

Port Main Engine Visual Inspection

Cooling System

- Inboard-forward coolant housing appears to have been resealed, with excessive Hylomar sealant visible at the sealing base.
- Coolant pipe entering the front of the engine appears to have been resealed with excessive Hylomar sealant.
- Timing cover appears to have been resealed using the same sealant material.
- Coolant piping entering the coolant circulation pump is misaligned and has excessive sealant present at the connection.
- Rust and corrosion are present at the inboard coolant plate where coolant enters the engine block.
- Active coolant leakage is present aft of the inboard coolant plate, with corrosion damage at and around the apparent leak source.
- Corrosion products are visible extruding from the upper area of the same coolant plate assembly.
- Coolant level sight-glass fitting is corroded and leaking at its base.
- Coolant level in the reservoir was very low. Coolant condition appeared unsatisfactory, with a surface film and corrosion visible inside the reservoir housing.
- Coolant hose transitioning to a hard pipe at the thermostat housing is chafed and bulging at the swaged connection.
- Main raw-water intake hose from the through-hull is rubbing on the forward stringer, and the previous anti-chafe material is not present.
- Main seawater hose entering the raw-water pump is dry, cracking, and showing signs of leakage. The securing clamps are mismatched and misaligned.
- Raw-water outlet piping from the pump to the heat exchanger is misaligned, with corrosion present at the heat-exchanger seawater inlet connection.
- Active leakage is present at the aft end cap of the main heat exchanger, with corrosion and salt buildup visible at the housing.

- Auxiliary inspection opening adjacent to the aft heat-exchanger zinc is heavily corroded and has developed a pronounced corrosion bloom.
- Raw-water pump is actively leaking at both the mechanical seal and the seawater inlet elbow.
- Aftercooler shows evidence of previous removal and resealing, with excessive orange silicone extruding from the gasket base.
- Several charge-air pipe fasteners at the aftercooler are loose, and one fastener is completely backed out of the housing.
- Rust and corrosion damage are present on the outboard-forward engine area below the leaking raw-water pump.
- Heat-exchanger and cooling-system zinc replacement dates were not marked and could not be verified.
- Port main-engine sea strainer bowl is opaque, preventing a clear visual inspection of the interior, and should be cleaned and serviced.

Fuel System

- A large quantity of fuel was present in multiple compartments beneath the engine.
- Fuel hose entering the fuel-filter assembly is bulging and leaking.
- A substantial active fuel leak was observed from beneath and behind the aftercooler while the engine was running. Additional disassembly will be required to identify the exact source.
- Sediment is present on the Racor centrifuge assembly and in the bottom of the sight bowl.

Lubrication System

- Oil leakage is present at the engine oil-pan seam.
- Oil leakage is present at the main hard line entering the remote oil-filter housing.
- Oil drips are present at the coolant circulation-pump mounting area where it attaches to the timing cover and at the circulation-pump drain area.
- Oil leakage is present at the turbocharger drain.
- Oil leakage is present on the compressor-air side of the turbocharger and is dripping from the turbo housing.
- Engine oil level appeared correct at the time of inspection.

Exhaust and Turbocharger System

- Turbocharger drain hardware and surrounding components exhibit corrosion.
- Mixing elbow exhibits several pinholes and visible leakage.
- Mixing-elbow support hardware is loose.
- Exhaust heat blankets are improperly installed, and portions of the mounting hardware appear damaged.
- Soft coolant hose routed across the turbocharger area is chafed.
- Fiberglass exhaust coupling downstream of the mixing elbow, between the bellows hose and the 45-degree rubber fitting, is cracked and leaking.
- Several exhaust-system clamps are rusted and should be replaced.

- Evidence of a previous exhaust leak is present throughout the engine room. Black soot remains on the overhead, fuel tanks, walls, and multiple machinery surfaces.

Electrical and Wiring

- A current camshaft position sensor fault code was present during diagnostic scanning. The fault would not clear and remained current.
- Engine diagnostic connector has a non-Volvo repair consisting of three blue, non-marine, non-waterproof butt connectors wrapped with electrical tape.
- Wiring-harness P-clamp at the engine block is unsecured and missing mounting hardware.
- Auxiliary-alternator belt-cover mount is disconnected and misaligned.
- Auxiliary alternator exhibits corrosion and apparent salt exposure, and the electrical terminals are rusted.

Engine Mounts, Stringers, and General Condition

- Engine stringers and mounting areas exhibit extensive rust and corrosion damage fore and aft, both inboard and outboard.
- Coolant is present in the compartments beneath the engine in addition to the observed fuel accumulation.
- Loose hardware is present at the forward-inboard stringer and engine-mount area.
- Excessive orange silicone gasket material is extruding from the intake-manifold sealing area.
- No service dates were marked on the engine oil filters, fuel filters, or coolant filter.
- Main-engine drive belt condition appeared satisfactory at the time of inspection.

Shaft Seal and Related Components

- PSS shaft-seal water-feed line is weeping at the carbon housing and exhibits corrosion.
- PSS carbon housing is heavily corroded and produced a slight drip while operating at RPM.
- Clamps on the PSS water-feed line from the transmission cooler appear overtightened.

Transmission and Bellhousing

- Transmission oil level was at the low mark and required topping off.
- Transmission fluid appeared clean and satisfactory at the time of inspection.
- No leakage was observed at the transmission output-shaft seal.
- An active leak is present at the transmission pressure-sensor connection near the transmission cooler.
- No rear main-seal leak was confirmed. Moisture in the bellhousing area appears more consistent with fuel from the active leak above dripping onto the housing.

Port Main Engine Operational Inspection

The port Volvo Penta D12 engine started normally and cleared the light smoke observed at startup as operating temperature increased. Engine oil level appeared correct. The port engine reached approximately 185°F during the sea trial and did not exhibit an abnormal temperature rise. Turbocharger boost pressure and engine oil pressure appeared satisfactory, and no abnormal vibration was observed. Diagnostic scanning identified a current camshaft position sensor fault that would not clear and remained active.

During the maximum-RPM attempt, the port engine achieved approximately 2,050 RPM against a rated speed of 2,300 RPM. Injector fuel-consumption/return testing was completed at idle while in gear, and the port engine passed within the applicable specification. The active fuel leak beneath the aftercooler and the other fluid leaks noted above require correction before reliable extended operation can be confirmed.

PORT TRANSMISSION SURVEY

Manufacturer	ZF
Model	ZF325-1A
Serial Number	20075834

Port Transmission Inspection

- Transmission oil level was at the low mark and required topping off.
- Transmission fluid appeared clean and satisfactory at the time of inspection.
- No leakage was observed at the transmission output-shaft seal.
- An active leak is present at the transmission pressure-sensor connection near the transmission cooler.
- No rear main-seal leak was confirmed. Moisture in the bellhousing area appears more consistent with fuel from the active leak above dripping onto the housing.
- PSS shaft-seal water-feed line is weeping at the carbon housing and exhibits corrosion.
- PSS carbon housing is heavily corroded and produced a slight drip while operating at RPM.
- Clamps on the PSS water-feed line from the transmission cooler appear overtightened.

STARBOARD MAIN PROPULSION ENGINE SURVEY

Manufacturer	Volvo Penta
Model	D12D-DMP
Engine Family	6VPXM12.1DCA
Serial Number	1012611326
Rated Output	704 HP (525 kW) @ 2,300 RPM
Engine Hours	614 Hours

Starboard Main Engine Visual Inspection

Cooling System

- Moderate corrosion and buildup are present inside the coolant reservoir.
- Coolant level was low. The coolant appeared clear and did not appear milky or heavily contaminated.
- Coolant sight-glass fitting is corroded and leaking.
- Main raw-water intake hose has a slight kink and is rubbing on the inboard-forward stringer. Anti-chafe material is present but does not fully prevent contact.
- Raw-water pump has a slight active leak.
- Corrosion bloom is present at the raw-water inlet connection to the main heat exchanger.
- Evidence of prior corrosion-mitigation work is present at the aft heat-exchanger mounting area.
- The aft heat-exchanger end cap is beginning to develop corrosion bloom near the zinc and auxiliary inspection opening.
- Coolant is present in the aft bilge compartment beneath the transmission.
- Sea-strainer seawater outlet exhibits corrosion bloom.
- Starboard main-engine sea strainer bowl is opaque, preventing a clear visual inspection of the interior, and should be cleaned and serviced.
- Coolant hose leading to the front timing-cover assembly has a visible split near the hose clamp. The hose was not actively leaking at the time of inspection.
- Heat-exchanger and cooling-system zinc replacement dates were not marked and could not be verified.
- Coolant-filter service date was marked 12/14/2011 and appears substantially overdue for replacement.

Fuel System

- Oil leakage is present in the area of the low-pressure fuel-feed pump.
- Fuel-feed line is routed under excessive tension and is slightly kinked at one of the P-clamps securing it to the engine.
- Sediment is present on the Racor centrifuge assembly and in the bottom of the sight bowl.

Lubrication System

- Oil-fill and dipstick assembly is leaking at its connection to the engine block.
- Several areas of the engine oil pan exhibit active oil leakage.
- Oil residue is present at the transmission bellhousing seam.
- Active oil leakage is present at the turbocharger oil drain.
- Oil is present beneath the gearbox; however, it does not appear to originate from the transmission output seal and appears to be migrating downward from the turbocharger area.
- Oil is pushing through the turbocharger drain mounting area at the exhaust manifold.
- Oil seepage is present at the forward exhaust-manifold gasket area.
- Last oil service was marked 01/10/2025 at 607 engine hours. The engine had accumulated approximately six hours since that service marking.

Exhaust and Turbocharger System

- Active leakage is present at the mixing-elbow assembly.
- A large rust trail is present beneath the outboard-aft transmission area where mixing-elbow leakage has traveled onto the transmission and stringer.
- The underside of the gearbox exhibits rust and corrosion associated with the leakage above.
- Turbocharger charge-air pipe coupling is misaligned.
- Black soot is present beneath the turbocharger and around the charge-air pipe connection.
- Evidence of a previous exhaust leak is present on the Racor housing and multiple engine-room surfaces.

Electrical and Transmission Controls

- Multiple non-current fault codes were stored in the starboard engine control module. All codes cleared successfully and did not return during subsequent operation.
- Four-bolt inspection plate on top of the gearbox has a forward-inboard fastener damaged by rust and corrosion.
- Top of the gearbox beneath the shift solenoids exhibits rust and corrosion.
- Both shift solenoids exhibit surface rust and corrosion damage.

Engine Mounts, Stringers, and General Condition

- Engine mounts and stringers exhibit widespread rust and corrosion damage.
- Dirt, debris, and what appears to be hydraulic oil are present in the bilge beneath the engine.

Shaft Seal and Related Components

- Starboard PSS shaft-seal assembly appears somewhat better than the port assembly but still exhibits extensive exterior surface corrosion.
- PSS shaft seal produced a slight drip while static.

Transmission and Bellhousing

- No leakage was observed at the transmission output-shaft seal.
- Oil beneath the gearbox appears to be migrating from the turbocharger area rather than originating from the transmission.
- Gearbox inspection-cover hardware and shift-solenoid area exhibit corrosion damage.
- Transmission operating pressure was satisfactory during the sea trial.

Starboard Main Engine Operational Inspection

The starboard Volvo Penta D12 engine started normally and cleared the light smoke observed at startup as operating temperature increased. Turbocharger boost pressure, engine oil pressure, and transmission pressure appeared satisfactory, and no abnormal vibration was observed. Diagnostic scanning showed multiple non-current stored fault codes; all codes cleared successfully and did not return during subsequent operation.

During the maximum-RPM attempt, the starboard engine achieved approximately 2,200 RPM against a rated speed of 2,300 RPM. Engine temperature increased to approximately 194°F and continued climbing, and throttle was reduced before an over-temperature condition developed. Injector fuel-consumption/return

testing was completed at idle while in gear, and the starboard engine passed within the applicable specification.

STARBOARD TRANSMISSION SURVEY

Manufacturer	ZF
Model	ZF325-1A
Serial Number	20075835

Starboard Transmission Inspection

- No leakage was observed at the transmission output-shaft seal.
- Oil beneath the gearbox appears to be migrating from the turbocharger area rather than originating from the transmission.
- Gearbox inspection-cover hardware and shift-solenoid area exhibit corrosion damage.
- Transmission operating pressure was satisfactory during the sea trial.
- Starboard PSS shaft-seal assembly appears somewhat better than the port assembly but still exhibits extensive exterior surface corrosion.
- PSS shaft seal produced a slight drip while static.

GENERATOR SURVEY

Manufacturer	Kohler
Model	23EOZD
Rated Output	23 kW, 60 Hz
Serial Number	2132418
Hours	42 Hours
Last Service Noted	01/10/2025

Generator Visual Inspection

Starting and Battery System

- Positive and negative battery terminals appeared satisfactory.
- Generator wiring harness was intact and did not exhibit visible corrosion.

- Starter solenoid exhibits rust and corrosion, and the power terminals entering and leaving the solenoid are rusted.

Raw Water and Cooling System

- Coolant level in the overflow reservoir was low. Coolant level at the engine-mounted reservoir was satisfactory; however, coolant condition appeared dirty.
- Raw-water pump exhibits substantial corrosion and slight leakage at the mechanical seal.
- Raw-water pump drive belt was loose, with evidence of belt dust in the surrounding area.
- Saltwater is present beneath the turbocharger area and may be entering from a source above or external to the generator.
- Seawater pressure sensor is corroded and leaking.
- A one-inch hose coupler in the seawater/exhaust circuit contains multiple pinholes and is actively leaking, contributing to corrosion damage at the outboard-forward generator mount.

Exhaust System

- Metal exhaust outlet tube between the mixing elbow and the sound-enclosure through-port contains pinholes, and the securing clamps are damaged.
- Rust and corrosion are present beneath the manifold and heat-exchanger assembly and on top of the electrical box, consistent with saltwater leakage.
- Water-separator exhaust through-hull assembly is damaged, heavily corroded, and actively leaking.
- Operation of the exhaust through-hull valve was not attempted due to the external appearance and condition of the assembly.
- Sound enclosure exhibits rust and corrosion beneath the exhaust through-assembly.

Generator Pan, Mounts, and General Corrosion

- Generator engine pan is heavily rusted and damaged.
- Inboard and outboard aft generator mounts exhibit rust and corrosion damage.
- Outboard-forward mount exhibits rust and corrosion damage associated with the leaking hose coupler.
- Rust and debris are accumulated outboard and behind the generator.
- Last generator service was marked 01/10/2025.

Generator Operational Inspection

The Kohler 23EOZD generator was operated under full vessel load for the duration of the sea trial with all normal ship's electrical loads applied. The generator carried the applied load without shutdown, alarm, or other apparent operational issue. A rainbow sheen was observed on the water at startup and remained present throughout the approximately four-hour sea trial and at the conclusion of testing. The persistent sheen should be diagnosed to determine the source. Possible cylinder glazing associated with inactivity or prolonged low-load operation should be considered during further evaluation.

SEA TRIAL OPERATIONAL OBSERVATIONS

Both Volvo Penta D12 main engines started normally. Light smoke was observed during initial startup and cleared as the engines warmed. No continuing sheen attributable to the main engines was observed after full warmup.

Both engines reached normal operating temperature during the sea trial. The port engine stabilized at approximately 185°F. During the maximum-RPM attempt, the starboard engine temperature increased to approximately 194°F and continued climbing, and throttle was reduced before an over-temperature condition developed.

Neither engine achieved the rated 2,300 RPM. The port engine reached approximately 2,050 RPM, and the starboard engine reached approximately 2,200 RPM. The shortfall may be related to mechanical restriction, propulsion loading, vessel loading, or another performance issue and requires further diagnosis.

Turbocharger boost pressure, engine oil pressure, and transmission operating pressures appeared satisfactory during the sea trial. No abnormal engine vibration was felt or observed.

Injector fuel-consumption/return testing was performed on both main engines at idle while in gear. Both engines passed the test, and measured injector flow was within the applicable specification.

The generator remained online under full vessel electrical load for the duration of the sea trial and carried all applied ship's loads without shutdown or alarm. A persistent rainbow sheen remained visible on the water throughout generator operation.

FINDINGS

Port Main Engine Findings

01 Inboard-forward coolant housing appears to have been resealed, with excessive Hylomar sealant visible at the sealing base.

02 Coolant pipe entering the front of the engine appears to have been resealed with excessive Hylomar sealant.

03 Timing cover appears to have been resealed using the same sealant material.

04 Coolant piping entering the coolant circulation pump is misaligned and has excessive sealant present at the connection.

05 Rust and corrosion are present at the inboard coolant plate where coolant enters the engine block.

06 Active coolant leakage is present aft of the inboard coolant plate, with corrosion damage at and around the apparent leak source.

07 Corrosion products are visible extruding from the upper area of the same coolant plate assembly.

08 Coolant level sight-glass fitting is corroded and leaking at its base.

09 Coolant level in the reservoir was very low. Coolant condition appeared unsatisfactory, with a surface film and corrosion visible inside the reservoir housing.

10 Coolant hose transitioning to a hard pipe at the thermostat housing is chafed and bulging at the swaged connection.

11 Main raw-water intake hose from the through-hull is rubbing on the forward stringer, and the previous anti-chafe material is not present.

12 Main seawater hose entering the raw-water pump is dry, cracking, and showing signs of leakage. The securing clamps are mismatched and misaligned.

13 Raw-water outlet piping from the pump to the heat exchanger is misaligned, with corrosion present at the heat-exchanger seawater inlet connection.

14 Active leakage is present at the aft end cap of the main heat exchanger, with corrosion and salt buildup visible at the housing.

15 Auxiliary inspection opening adjacent to the aft heat-exchanger zinc is heavily corroded and has developed a pronounced corrosion bloom.

16 Raw-water pump is actively leaking at both the mechanical seal and the seawater inlet elbow.

17 Aftercooler shows evidence of previous removal and resealing, with excessive orange silicone extruding from the gasket base.

18 Several charge-air pipe fasteners at the aftercooler are loose, and one fastener is completely backed out of the housing.

19 Rust and corrosion damage are present on the outboard-forward engine area below the leaking raw-water pump.

20 Heat-exchanger and cooling-system zinc replacement dates were not marked and could not be verified.

21 Port main-engine sea strainer bowl is opaque, preventing a clear visual inspection of the interior, and should be cleaned and serviced.

22 A large quantity of fuel was present in multiple compartments beneath the engine.

23 Fuel hose entering the fuel-filter assembly is bulging and leaking.

24 A substantial active fuel leak was observed from beneath and behind the aftercooler while the engine was running. Additional disassembly will be required to identify the exact source.

25 Sediment is present on the Racor centrifuge assembly and in the bottom of the sight bowl.

26 Oil leakage is present at the engine oil-pan seam.

27 Oil leakage is present at the main hard line entering the remote oil-filter housing.

28 Oil drips are present at the coolant circulation-pump mounting area where it attaches to the timing cover and at the circulation-pump drain area.

29 Oil leakage is present at the turbocharger drain.

30 Oil leakage is present on the compressor-air side of the turbocharger and is dripping from the turbo housing.

31 Engine oil level appeared correct at the time of inspection.

32 Turbocharger drain hardware and surrounding components exhibit corrosion.

33 Mixing elbow exhibits several pinholes and visible leakage.

34 Mixing-elbow support hardware is loose.

35 Exhaust heat blankets are improperly installed, and portions of the mounting hardware appear damaged.

36 Soft coolant hose routed across the turbocharger area is chafed.

37 Fiberglass exhaust coupling downstream of the mixing elbow, between the bellows hose and the 45-degree rubber fitting, is cracked and leaking.

38 Several exhaust-system clamps are rusted and should be replaced.

39 Evidence of a previous exhaust leak is present throughout the engine room. Black soot remains on the overhead, fuel tanks, walls, and multiple machinery surfaces.

40 A current camshaft position sensor fault code was present during diagnostic scanning. The fault would not clear and remained current.

41 Engine diagnostic connector has a non-Volvo repair consisting of three blue, non-marine, non-waterproof butt connectors wrapped with electrical tape.

42 Wiring-harness P-clamp at the engine block is unsecured and missing mounting hardware.

43 Auxiliary-alternator belt-cover mount is disconnected and misaligned.

44 Auxiliary alternator exhibits corrosion and apparent salt exposure, and the electrical terminals are rusted.

45 Engine stringers and mounting areas exhibit extensive rust and corrosion damage fore and aft, both inboard and outboard.

46 Coolant is present in the compartments beneath the engine in addition to the observed fuel accumulation.

47 Loose hardware is present at the forward-inboard stringer and engine-mount area.

48 Excessive orange silicone gasket material is extruding from the intake-manifold sealing area.

49 No service dates were marked on the engine oil filters, fuel filters, or coolant filter.

50 Main-engine drive belt condition appeared satisfactory at the time of inspection.

Port Transmission and Shaft-Seal Findings

01 Transmission oil level was at the low mark and required topping off.

02 Transmission fluid appeared clean and satisfactory at the time of inspection.

03 No leakage was observed at the transmission output-shaft seal.

04 An active leak is present at the transmission pressure-sensor connection near the transmission cooler.

05 No rear main-seal leak was confirmed. Moisture in the bellhousing area appears more consistent with fuel from the active leak above dripping onto the housing.

06 PSS shaft-seal water-feed line is weeping at the carbon housing and exhibits corrosion.

07 PSS carbon housing is heavily corroded and produced a slight drip while operating at RPM.

08 Clamps on the PSS water-feed line from the transmission cooler appear overtightened.

Starboard Main Engine Findings

01 Moderate corrosion and buildup are present inside the coolant reservoir.

02 Coolant level was low. The coolant appeared clear and did not appear milky or heavily contaminated.

03 Coolant sight-glass fitting is corroded and leaking.

04 Main raw-water intake hose has a slight kink and is rubbing on the inboard-forward stringer. Anti-chafe material is present but does not fully prevent contact.

05 Raw-water pump has a slight active leak.

06 Corrosion bloom is present at the raw-water inlet connection to the main heat exchanger.

07 Evidence of prior corrosion-mitigation work is present at the aft heat-exchanger mounting area.

08 The aft heat-exchanger end cap is beginning to develop corrosion bloom near the zinc and auxiliary inspection opening.

09 Coolant is present in the aft bilge compartment beneath the transmission.

10 Sea-strainer seawater outlet exhibits corrosion bloom.

11 Starboard main-engine sea strainer bowl is opaque, preventing a clear visual inspection of the interior, and should be cleaned and serviced.

12 Coolant hose leading to the front timing-cover assembly has a visible split near the hose clamp. The hose was not actively leaking at the time of inspection.

13 Heat-exchanger and cooling-system zinc replacement dates were not marked and could not be verified.

14 Coolant-filter service date was marked 12/14/2011 and appears substantially overdue for replacement.

15 Oil leakage is present in the area of the low-pressure fuel-feed pump.

16 Fuel-feed line is routed under excessive tension and is slightly kinked at one of the P-clamps securing it to the engine.

17 Sediment is present on the Racor centrifuge assembly and in the bottom of the sight bowl.

18 Oil-fill and dipstick assembly is leaking at its connection to the engine block.

19 Several areas of the engine oil pan exhibit active oil leakage.

20 Oil residue is present at the transmission bellhousing seam.

21 Active oil leakage is present at the turbocharger oil drain.

22 Oil is present beneath the gearbox; however, it does not appear to originate from the transmission output seal and appears to be migrating downward from the turbocharger area.

23 Oil is pushing through the turbocharger drain mounting area at the exhaust manifold.

24 Oil seepage is present at the forward exhaust-manifold gasket area.

25 Last oil service was marked 01/10/2025 at 607 engine hours. The engine had accumulated approximately six hours since that service marking.

26 Active leakage is present at the mixing-elbow assembly.

27 A large rust trail is present beneath the outboard-aft transmission area where mixing-elbow leakage has traveled onto the transmission and stringer.

28 The underside of the gearbox exhibits rust and corrosion associated with the leakage above.

29 Turbocharger charge-air pipe coupling is misaligned.

30 Black soot is present beneath the turbocharger and around the charge-air pipe connection.

31 Evidence of a previous exhaust leak is present on the Racor housing and multiple engine-room surfaces.

32 Multiple non-current fault codes were stored in the starboard engine control module. All codes cleared successfully and did not return during subsequent operation.

33 Four-bolt inspection plate on top of the gearbox has a forward-inboard fastener damaged by rust and corrosion.

34 Top of the gearbox beneath the shift solenoids exhibits rust and corrosion.

35 Both shift solenoids exhibit surface rust and corrosion damage.

36 Engine mounts and stringers exhibit widespread rust and corrosion damage.

37 Dirt, debris, and what appears to be hydraulic oil are present in the bilge beneath the engine.

Starboard Transmission and Shaft-Seal Findings

01 No leakage was observed at the transmission output-shaft seal.

02 Oil beneath the gearbox appears to be migrating from the turbocharger area rather than originating from the transmission.

03 Gearbox inspection-cover hardware and shift-solenoid area exhibit corrosion damage.

04 Transmission operating pressure was satisfactory during the sea trial.

05 Starboard PSS shaft-seal assembly appears somewhat better than the port assembly but still exhibits extensive exterior surface corrosion.

06 PSS shaft seal produced a slight drip while static.

Generator Findings

01 Positive and negative battery terminals appeared satisfactory.

02 Generator wiring harness was intact and did not exhibit visible corrosion.

03 Starter solenoid exhibits rust and corrosion, and the power terminals entering and leaving the solenoid are rusted.

04 Coolant level in the overflow reservoir was low. Coolant level at the engine-mounted reservoir was satisfactory; however, coolant condition appeared dirty.

05 Raw-water pump exhibits substantial corrosion and slight leakage at the mechanical seal.

06 Raw-water pump drive belt was loose, with evidence of belt dust in the surrounding area.

07 Saltwater is present beneath the turbocharger area and may be entering from a source above or external to the generator.

08 Seawater pressure sensor is corroded and leaking.

09 A one-inch hose coupler in the seawater/exhaust circuit contains multiple pinholes and is actively leaking, contributing to corrosion damage at the outboard-forward generator mount.

10 Metal exhaust outlet tube between the mixing elbow and the sound-enclosure through-port contains pinholes, and the securing clamps are damaged.

11 Rust and corrosion are present beneath the manifold and heat-exchanger assembly and on top of the electrical box, consistent with saltwater leakage.

12 Water-separator exhaust through-hull assembly is damaged, heavily corroded, and actively leaking.

13 Operation of the exhaust through-hull valve was not attempted due to the external appearance and condition of the assembly.

14 Sound enclosure exhibits rust and corrosion beneath the exhaust through-assembly.

15 Generator engine pan is heavily rusted and damaged.

16 Inboard and outboard aft generator mounts exhibit rust and corrosion damage.

17 Outboard-forward mount exhibits rust and corrosion damage associated with the leaking hose coupler.

18 Rust and debris are accumulated outboard and behind the generator.

19 Last generator service was marked 01/10/2025.

20 Generator operated under full vessel electrical load throughout the sea trial without shutdown or alarm.

21 A rainbow sheen was present at startup and remained throughout generator operation and at the conclusion of the sea trial.

Sea Trial Findings

01 Both main engines started normally, and initial smoke cleared after warmup.

02 Port engine achieved approximately 2,050 RPM and starboard engine achieved approximately 2,200 RPM; neither engine achieved the rated 2,300 RPM.

03 Port engine temperature stabilized near 185°F during the sea trial.

04 During the maximum-RPM attempt, starboard engine temperature increased to approximately 194°F and continued climbing until throttle was reduced.

05 Turbocharger boost pressure, engine oil pressure, and transmission pressure appeared satisfactory.

06 No abnormal engine vibration was observed.

07 Injector fuel-consumption/return testing on both main engines was within specification.

08 Generator carried all applied ship's electrical loads for the approximately four-hour sea trial without shutdown or alarm.

09 A persistent rainbow sheen remained visible throughout generator operation.

RECOMMENDATIONS

Main Engine Recommendations

01 Replace both main-engine mixing elbows due to pinholes, active leakage, and associated corrosion damage.

02 Remove, clean, inspect, and pressure-test both engines' aftercoolers, heat exchangers, engine-oil coolers, and transmission coolers. Repair or replace any component that does not pass inspection or pressure testing.

03 Replace or rebuild the leaking raw-water pumps on both main engines. Correct leaking inlet elbows and inspect the surrounding components for secondary saltwater damage.

04 Disassemble and correct the port-engine coolant-housing, coolant-pipe, circulation-pump, and timing-cover sealing repairs. Remove excessive Hylomar, verify mating-surface condition, correctly align the piping, and reseal using the appropriate procedures and materials.

05 Repair the active port-engine coolant leak at the inboard coolant plate and inspect the plate, fasteners, sealing surface, and adjacent block area for corrosion damage.

06 Flush and service both closed-cooling systems. Clean the reservoirs, replace coolant as required, repair the leaking sight-glass fittings, and confirm proper coolant levels and condition after repairs.

07 Replace all damaged, split, chafed, bulging, dry, cracked, or leaking coolant and raw-water hoses. Correct hose routing, install proper marine-grade clamps, and restore effective anti-chafe protection at both main-engine intake hoses.

08 Repair the substantial port-engine fuel leak beneath the aftercooler before further extended operation. Additional disassembly should be performed to identify the exact source, and the bulging/leaking fuel-filter inlet hose should be replaced.

09 Clean and service both Racor assemblies and investigate the source of sediment found in the centrifuge assemblies and sight bowls.

10 Repair the identified engine-oil leaks, including oil-pan seams, remote oil-filter hard piping, oil-fill/dipstick connection, coolant circulation-pump/timing-cover area, turbocharger drains, turbocharger housing, and exhaust-manifold gasket areas as applicable.

11 Replace the cracked port fiberglass exhaust coupling and all rusted or damaged exhaust clamps. Correct mixing-elbow supports and reinstall or replace damaged exhaust heat-blanket mounting hardware.

12 Correct both charge-air piping issues. Re-align the starboard turbocharger coupling and secure all port aftercooler/charge-air fasteners to the proper specification.

13 Diagnose and correct the current port-engine camshaft position sensor fault. Inspect the sensor, wiring, connectors, timing reference, and related engine-control inputs, then clear the fault and verify that it does not return.

14 Retain a record of the starboard engine's cleared non-current fault codes and rescan the engine after repairs and during the follow-up sea trial to confirm that no codes return.

15 Remove the non-OEM diagnostic-port wiring repair and restore the port engine harness using proper sealed marine-grade connections or the correct Volvo Penta harness components.

16 Secure the loose port wiring-harness P-clamp, correct the auxiliary-alternator belt-cover mounting, and clean, inspect, or replace the salt-damaged auxiliary alternator and corroded terminals as required.

17 Clean, prepare, treat, and protect rust- and corrosion-damaged stringers, engine mounts, gearbox surfaces, and surrounding structures after all leak sources have been corrected.

18 Clean and service both opaque main-engine sea strainers. Verify unobstructed raw-water flow and inspect the seawater outlet connections for leakage or corrosion damage.

19 Replace both engines' zincs as required and establish clearly marked service dates for zincs, oil filters, fuel filters, and coolant filters. Replace the starboard coolant filter due to the 12/14/2011 service marking.

20 Diagnose the inability of both engines to achieve rated 2,300 RPM. Evaluation should include propulsion loading, propeller condition and pitch, hull loading, throttle command, charge-air restriction, exhaust restriction, fuel delivery, and cooling-system condition.

21 Diagnose the starboard temperature increase observed during the maximum-RPM attempt. Verify raw-water flow, cooler condition, thermostat operation, coolant circulation, coolant-system integrity, and vessel loading before repeating full-load testing.

22 Perform a follow-up sea trial after repairs to verify rated RPM, stable operating temperature, boost pressure, engine oil pressure, transmission pressure, exhaust condition, and absence of active fluid leaks.

Transmission and Shaft-Seal Recommendations

01 Repair the active port transmission pressure-sensor/cooler-area leak and verify the exact leak source after cleaning the area.

02 Set and verify both transmission oil levels after all repairs. Recheck the port transmission for leakage after the oil level is corrected.

03 Clean and inspect corrosion at the starboard gearbox inspection cover, shift solenoids, and lower housing. Replace damaged hardware and protect exposed surfaces.

04 Inspect and service both PSS shaft-seal assemblies. Correct the port water-feed-line weep, replace corroded or overtightened hardware and clamps as required, and verify that both seals remain dry at rest and under operating RPM.

05 Verify transmission engagement, pressure, temperature, and output-seal condition during the follow-up sea trial.

Generator Recommendations

01 Replace or rebuild the generator raw-water pump and adjust or replace the loose drive belt. Verify proper belt tension and raw-water flow after service.

02 Service the generator cooling system, including coolant replacement as required, reservoir cleaning, heat-exchanger inspection, and verification of stable operating temperature under load.

03 Replace the leaking seawater pressure sensor and repair the source of saltwater found beneath the turbocharger area.

04 Replace the pinholed one-inch hose coupler, damaged metal exhaust outlet tube, and damaged clamps between the mixing elbow and sound-enclosure outlet.

05 Repair or replace the damaged and leaking water-separator exhaust through-hull assembly. Inspect and safely exercise the valve only after its condition has been properly evaluated.

06 Clean, prepare, treat, and protect corrosion on the generator pan, motor mounts, electrical-box area, and sound enclosure. Replace structurally compromised pan or mounting components as required.

07 Clean and inspect the starter solenoid and power terminals. Replace components that remain damaged or unreliable after cleaning and testing.

08 Diagnose the persistent rainbow sheen observed throughout generator operation. Evaluation should include fuel and oil leakage, exhaust discharge, injector condition, cylinder sealing, and possible cylinder glazing from inactivity or prolonged low-load operation.

09 Following repairs, perform a full generator load test using all normal ship's loads and confirm voltage, frequency, cooling performance, exhaust discharge condition, and stable operation without alarms.

OVERALL CONDITION ASSESSMENT

Based upon the visual inspection and operational sea-trial evaluation performed, the propulsion engines, transmissions, and generator aboard Bunny's Toe rational during the survey; however, numerous maintenance and reliability items were identified.

Both Volvo Penta D12 main engines started normally, developed satisfactory observed oil, boost, and transmission pressures, and did not exhibit abnormal vibration. Injector fuel-flow testing was within specification on both engines. Diagnostic scanning identified a current port-engine camshaft position sensor fault that would not clear. Multiple non-current codes stored in the starboard engine cleared successfully and did not return during subsequent operation. Neither engine achieved its rated 2,300 RPM, with the port reaching approximately 2,050 RPM and the starboard reaching approximately 2,200 RPM. In addition, the starboard operating temperature increased to approximately 194°F and continued climbing during the maximum-RPM attempt. These diagnostic and performance concerns require further evaluation before full-load reliability can be confirmed.

The port engine has a substantial active fuel leak beneath the aftercooler, multiple coolant and oil leaks, a leaking raw-water pump, deteriorated mixing elbow and exhaust components, extensive corrosion, and several previous repairs that require correction. The starboard engine also has active oil, coolant, raw-water, and mixing-elbow leaks, along with corrosion damage and cooling-system concerns. Both propulsion systems would benefit from comprehensive baseline cooling-system, fuel-system, exhaust-system, and corrosion-control service.

The Kohler 23EOZD generator carried all normal ship's electrical loads for the duration of the survey and sea trial without shutdown or alarm. The unit nevertheless has raw-water, exhaust, corrosion, and mounting deficiencies, and a persistent rainbow sheen remained on the water throughout operation. The source of the sheen should be diagnosed, including evaluation for leakage, combustion-related discharge, and possible cylinder glazing associated with inactivity or prolonged low-load operation.

Overall, corrective maintenance is recommended before reliable extended operation can be confirmed. The findings in this report should be treated as maintenance and reliability priorities intended to stop active leakage, prevent secondary damage, restore proper cooling and exhaust integrity, and establish a dependable service baseline for the vessel's machinery.

DISCLAIMER

This report reflects the observed condition of the machinery at the time of inspection and sea trial only. Hidden defects, future failures, internal component conditions, and inaccessible areas cannot be determined without disassembly or extended testing.

This inspection is not intended to serve as a warranty or guarantee of future performance, reliability, or service life. The findings and recommendations contained herein are based solely upon conditions observed during the inspection and operating conditions encountered on the survey date.

The sea trial represents a limited operational evaluation under the vessel loading, environmental conditions, and duration available at the time of inspection. The precise source of the port fuel leak beneath the aftercooler and other concealed conditions will require additional disassembly and diagnosis.

Respectfully Submitted,

Todd Hockensmith

PRESIDENT · ENDURANCE MARINE DIESEL INC.

2424 Hoover Ave, Suite Q · National City, CA 91950

619-552-2150 · todd@emarinediesel.com · **emarinediesel.com**