



ENGINE SYSTEMS, INC.

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October 4, 2002

U.S. Nuclear Regulator Commission
Document Control Desk
Mail Stop 0P1-17
Washington, DC 20555

Subject: 10CFR21 Reporting of Defects and Non-Compliance -
Engine Systems, Inc. Report No. 10CFR21-0085, Rev. 0

EMD Engine-Driven Water Pump Assemblies

Dear Sir:

The enclosed report addresses a reportable notification about EMD engine-driven water pump assemblies.

A copy of the report has also been sent to the NRC.

Please sign below, acknowledging receipt of this report, and return a copy to the attention of Document Control at the address above (or, fax to number 252/446-1134) within 10 working days after receipt.

Yours very truly,

ENGINE SYSTEMS, INC.

Susan Woolard
Document Control

Please let us know if ANY of your mailing information changes - name of recipient, name of company/facility, address, etc. Mark the changes on this acknowledgment form and send to us by mail or FAX to the number above.

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Report No. 10CFR21-0085
Rev. 0: October 04, 2002

**10CFR21 REPORTING OF DEFECTS
AND NON-COMPLIANCE**

COMPONENT: Engine Water Pumps
EMD P/N 40089540, 40089541, 40089881, 40089882

SYSTEM: EMD Emergency Diesel Generators

CONCLUSION: Reportable in accordance with 10CFR21.

Prepared By: *D. Glover* Date: 10/4/02
Engineering Manager

Approved By: *Michael Nading* Date: Oct 4, 2002
Quality Assurance Manager

ORIGINAL
When Stamped In Blue

REV	DATE	PAGE	DESCRIPTION

COMPONENT:

Engine Driven Water Pumps, EMD P/N 40089540, 40089541, 40089881, 40089882.

SUMMARY:

Engine Systems Inc. (ESI) has concluded its investigation of a condition reported with EMD engine-driven water pump assemblies. The condition identifies an occurrence wherein, following installation, a seal within the pump assembly prematurely fails resulting in the leakage of cooling water or lubricating oil from the weep hole on the water pump housing.

The issue was discovered by EMD as a result of field experience in the locomotive and marine applications.

DISCUSSION:

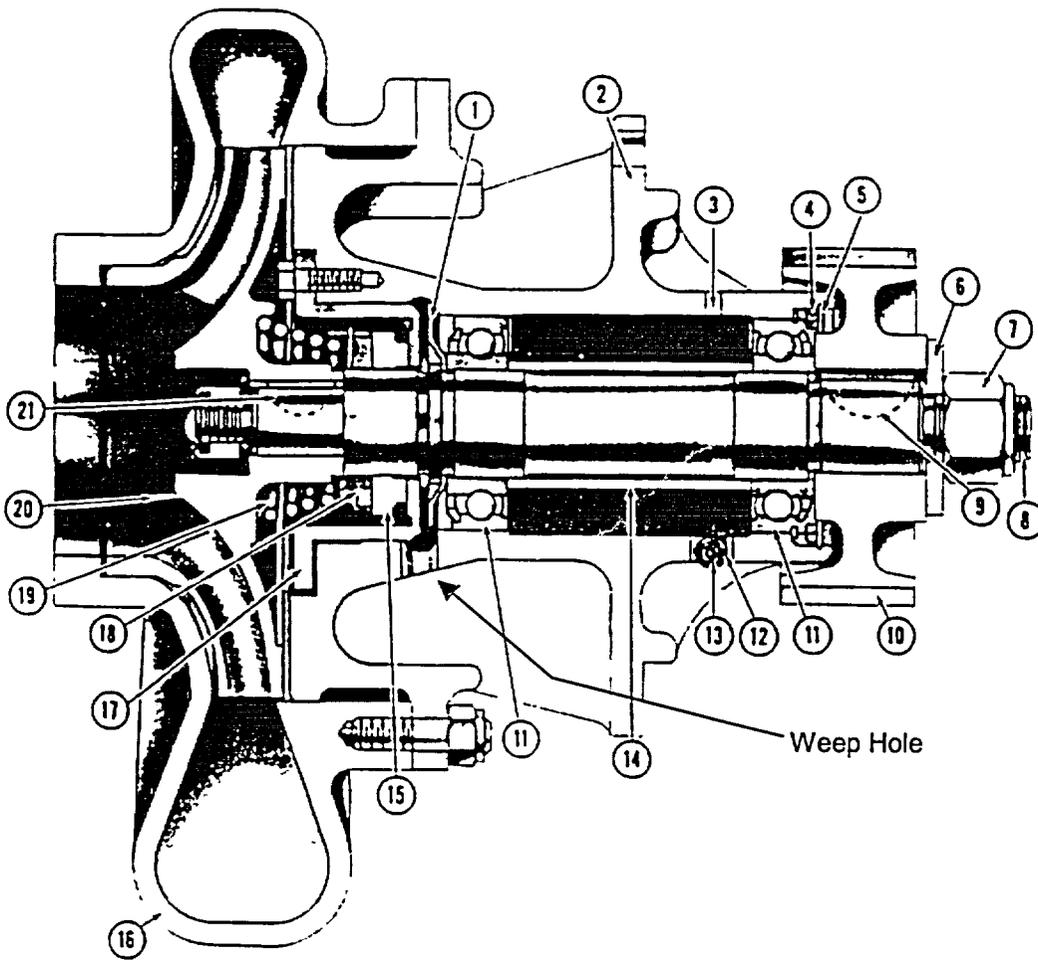
A cross-sectional view of the EMD standard water pump is shown in Figure 1 of this report.

The water pump impeller and shaft assembly is supported in the housing by two roller bearing assemblies, item 11. The bearings are lubricated by splashed engine lube oil entering through the inlet hole, item 3, located in the top of the drive end of the support housing. Oil exits the bearing cavity through the oil outlet hole, item 12, located in the bottom of the drive end of the support housing. The cooling water is sealed through a mechanical seal assembly located at the impeller end of the shaft assembly, items 15, 17, 18 & 19. The cavity between the bearings and mechanical seal contains a drilled passage (weep hole) to provide an external visual indication of leakage of water from the mechanical seal as well as to prevent water from contaminating the bearings and engine oil system.

In an effort to extend the service life of the water pump assemblies, EMD redesigned the bearings, shaft and support housing to utilize tapered roller bearings in lieu of spherical roller bearings. The tapered roller bearings were mounted as opposed pairs in a back-to-back arrangement. A seal was installed at the opposite-drive end of the shaft to prevent oil leakage into the cavity and out the weep hole. This modification was incorporated on all water pumps applicable to 16 & 20 cylinder EMD engines. The earlier design pumps utilizing spherical bearings were discontinued in April, 2000.

Through the locomotive and marine industry, EMD has found that the redesigned pumps are experiencing premature failures of the internal seals resulting in leakage via the weep hole. The primary leaking fluid is engine cooling water, however, leakage of lubricating oil from the bearing side is a possibility. The seals are failing as a result of an insufficient preload on the tapered roller bearings. Without adequate preload, there exists excessive clearance between the rollers and race. This clearance results in chattering of the rolling elements and relative movement of the shaft within the pump. The issue applies to the design of the pump assembly relating to establishing and maintaining adequate preload on the bearings during operation. The problem is not a result of incorrect assembly.

No failures have been reported of the bearings, drive gear or loss of function of the pump assembly.



- | | | |
|-------------------------|------------------------|--------------------------|
| 1 Water Slinger | 8 Water Pump Shaft | 15 Carbon Seal |
| 2 Support Housing | 9 Drive Gear Key | 16 Impeller Housing |
| 3 Oil Inlet | 10 Drive Gear | 17 Stationary Bushing |
| 4 Bearing Retainer Ring | 11 Bearing Assembly | 18 Outer Seal |
| 5 Snap Ring | 12 Oil Outlet | 19 Seal Retainer Spring |
| 6 Gear Retainer Washer | 13 Roll Pin And Spring | 20 Impeller |
| 7 Gear Retaining Nut | 14 Bearing Spacer | 21 Impeller Retainer Key |

FIGURE 1
Water Pump Cross Section

CONCLUSION:

Failure of the seals within the water pump as a result of this condition primarily results in a loss of engine coolant through the weep hole. Because nuclear applications often require extended operation with a minimal amount of maintenance while operating, this leakage, if left unattended, could compromise function of the emergency diesel generator set.

CUSTOMERS AFFECTED:

ESI has searched its historical data and has determined the following customers have purchased the water pump assemblies utilizing tapered roller bearings for safety-related applications:

CUSTOMER	SITE
Dominion Virginia Power Corp.	Surry Nuclear Power Plant
Entergy Operations	Arkansas One Nuclear Power Plant
Florida Power & Light Co.	St. Lucie Nuclear Power Plant
Florida Power & Light Co.	Turkey Point Nuclear Power Plant
Korea Hydro & Nuclear Power Co.	Kori II Nuclear Power Plant
Pooled Equipment Inventory Co.	N/A
Westinghouse Savannah River Co.	Savannah River Nuclear Plant
Wisconsin Public Service Corp.	Kewaunee Nuclear Power Plant

CORRECTIVE ACTION:

No method is available to indicate the condition of the seals within the water pump assembly. The service history of the pumps with tapered bearings has indicated the seal failures occur either immediately or prematurely after a low number of operating hours. It is for this reason that it is recommended to replace the tapered bearing pumps with the previous design units using standard roller bearings.

Perform an inspection of the weep hole of each water pump to determine if leakage is present.

Note:

It is not uncommon for the EMD water pump to leak a small amount of water from the weep hole when initially installed. After a small amount of run time, however, the sealing surfaces of the mechanical seal will mate and the leak should disappear.

Replace the tapered roller bearing water pump assemblies with standard roller bearing water pumps as identified below. Use the leakage rate (if present) as an indicator of the urgency of pump replacement. If no leakage is present, continue with monthly leak inspections and replace the pumps at the next available opportunity.

Tapered Bearing Pump P/N	Standard Roller Bearing Pump P/N	Application
40089540	40004234	16 & 20 Cylinder 645 engines, L/B, Left Hand Rotation
40089541	40004235	16 & 20 Cylinder 645 engines, R/B, Left Hand Rotation
40089881	8364237	16 & 20 Cylinder 645 engines, L/B, Right Hand Rotation
40089882	8364236	16 & 20 Cylinder 645 engines, R/B, Right Hand Rotation