



ENGINE SYSTEMS, INC.

175 Freight Road
Rocky Mount, NC 27804

Telephone: 252/977-2720
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July 9, 2021

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555-0001

Subject: 10CFR21 Reporting of Defects and Non-Compliance -
Engine Systems, Inc. Report No. 10CFR21-0131, Rev. 0

Zinc Anode (installed in heat exchanger P/N 1335BEM2P)

Dear Sir / Madam:

The enclosed report addresses a reportable notification on a zinc anode (installed in heat exchanger P/N 1335BEM2P).

A copy of the report has also been mailed to our affected nuclear customer.

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 Coordinator

IE19
NRR

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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RECEIVED: _____

DATE: _____



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Report No. **10CFR21-0131**
Rev. 0: 07/09/21

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

COMPONENT: Zinc Anode (installed in heat exchanger P/N 1335BEM2P)

SYSTEM: Emergency Diesel Generator

CONCLUSION: Reportable in Accordance With 10CFR21

Prepared By: Yu Lin
Engineering Manager

Date: 7/9/21

Reviewed By: Dan Poth
Quality Assurance Manager

Date: 7/9/21

REV	DATE	PAGE	DESCRIPTION
0	07/09/21		Initial issue.

Pursuant to 10 CFR 21.21(d)(4), ESI is presenting the required information as follows:

(i) Name and address of the individual or individuals informing the Commission.

<i>John Kriesel</i>	<i>Dan Roberts</i>
<i>Engineering Manager</i>	<i>Quality Manager</i>
<i>Engine Systems Inc.</i>	<i>Engine Systems Inc.</i>
<i>175 Freight Rd.</i>	<i>175 Freight Rd.</i>
<i>Rocky Mount, NC 27804</i>	<i>Rocky Mount, NC 27804</i>

(ii) Identification of the basic component supplied within the United States which fails to comply or contains a defect.

Zinc Anode (installed in heat exchanger P/N 1335BEM2P)

(iii) Identification of the firm supplying the basic component which fails to comply or contains a defect.

Engine Systems Inc. (ESI)

(iv) Nature of the defect or failure to comply and the safety hazard which is created or could be created by such defect or failure to comply.

Two instances of a loose or dislodged zinc anode (protector) were discovered in heat exchangers supplied by ESI. The anodes are installed in the cooling water enter/exit and return channels of the heat exchanger as shown in Figure 1 below:

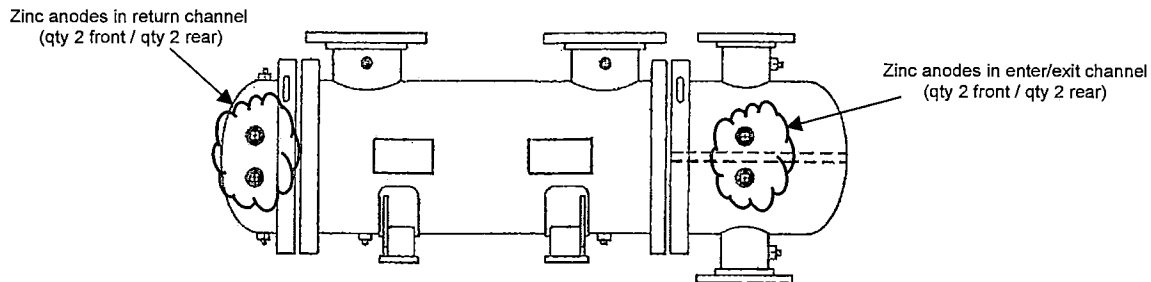


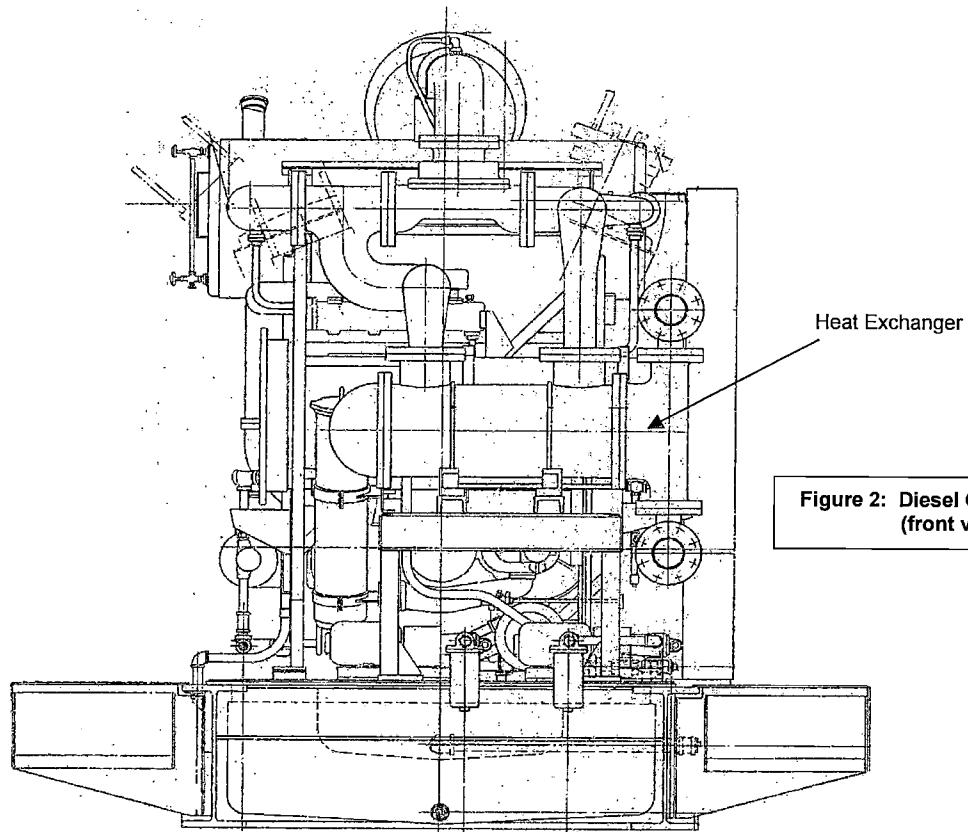
Figure 1: Heat Exchanger P/N 1335BEM2P

Each heat exchanger, P/N 1335BEM2P, contains qty 8 zinc anode assemblies that consist of a zinc rod threaded into a steel pipe plug. The zinc acts as a sacrificial anode to protect the pressure boundary metals from degradation due to galvanic corrosion. In the case of a loose or dislodged zinc anode, the zinc rod may become foreign material that remains trapped in the vessel, potentially impacting and damaging the tube ends where they project from the tube sheet. Alternatively, an anode located in the exit channel may be carried away from the heat exchanger and potentially damage downstream components.

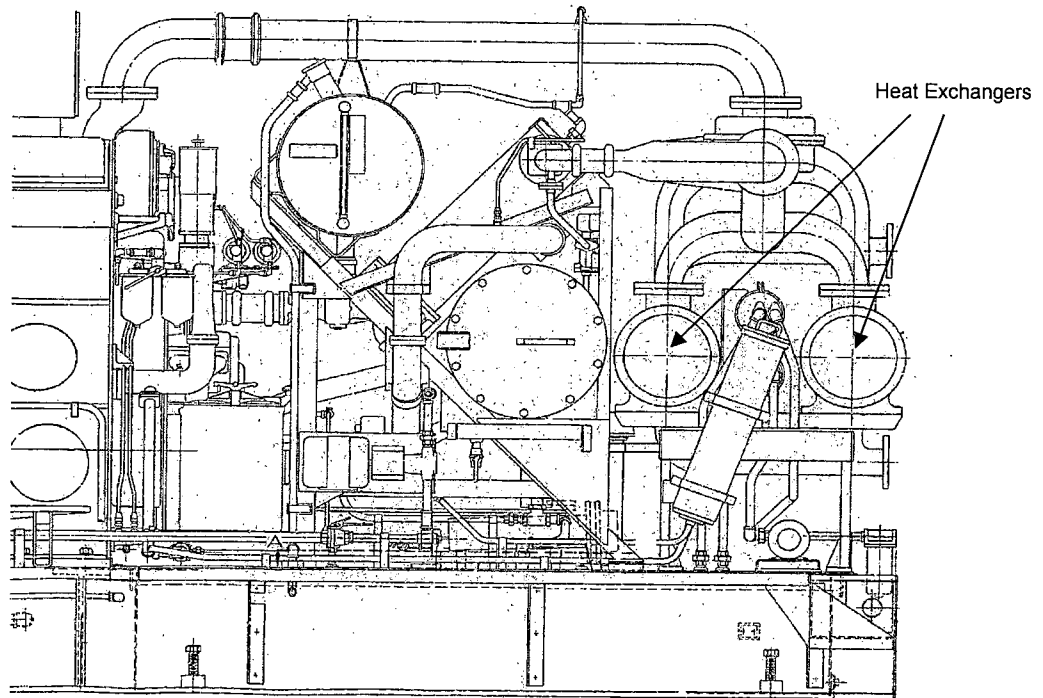
The heat exchanger provides cooling for the jacket water system of an EMD brand emergency diesel generator set (EDG), see Figures 2 and 3. Each EDG with uses qty 2 heat exchangers in parallel to transfer heat from the engine's jacket water to the station's raw water. Cooling of the jacket water is vital to operation of the EDG to maintain its safety-related function during an emergency event. While a dislodged anode is not expected to immediately impact operability of the heat exchanger, prolonged and repeated clattering within the vessel may damage tubes to the extent the tube-to-tubesheet pressure boundary is affected. This could impact ability to properly cool the EDG and result in failure of the EDG to perform during a safety-event.

(v) The date on which the information of such defect or failure to comply was obtained.

May 11, 2021



**Figure 2: Diesel Generator Skid
(front view)**



**Figure 3: Diesel Generator Skid
(side view)**

(vi) In the case of a basic component which contains a defect or fails to comply, the number and location of these components in use at, supplied for, being supplied for, or may be supplied for, manufactured, or being manufactured for one or more facilities or activities subject to the regulations in this part.

The extent of condition is limited to one part number supplied to one customer on the following orders:

Part Number	Customer	Customer PO Number	ESI Sales Order	Qty Shipped	C of C Date	Serial Numbers		
1335BEM2P	TVA - Browns Ferry Nuclear	1690 Rel# 00632	3004346	2	05/31/08	13640, 13641		
				2	06/05/08	13642, 13643		
				2	06/16/08	13644, 13645		
		1690 Rel# 00684	3004906	8	03/26/09	13684, 13685, 13686, 13687, 13688, 13689, 13690, 13691		
				827896	3014168	2	09/29/15	13825, 13826
				2399237	3016094	2	02/27/17	13847, 13848
				3426174	3017658	2	05/14/18	13881, 13882
				4760595	3019113	2	07/01/19	13906, 13907
				5225837	3019418	2	12/23/19	13918, 13919
				6247312	3020793	2	11/25/20	13946 ⁽¹⁾ , 13947 ⁽¹⁾
6460755	3021138	4	02/24/21	13950, 13951, 13952, 13953				

Note (1): Loose or dislodged zinc anodes were detected in these two serial numbers.

Table 1: ESI Supply History of Heat Exchanger P/N 1335BEM2P

(vii) The corrective action which has been, is being, or will be taken; the name of the individual or organization responsible for the action; and the length of time that has been or will be taken to complete the action.

For affected users:

- Heat exchangers installed:

It is recommended to perform an inspection to verify tightness at the zinc rod to pipe plug interface. The rod should be threaded into the pipe plug snug tight and, if required, may be tightened to a maximum of 15 ft-lbs.

If desired, the zinc rod may be removed and eliminated from the assembly leaving only the steel pipe plug. Inclusion of the zinc anode is not required for the EDG heat exchanger application at TVA-Browns Ferry.

- Heat exchangers in inventory (not-installed):

Prior to installation, perform an inspection to verify tightness at the zinc rod to pipe plug interface. As mentioned above, the rod may be tightened up to a maximum of 15 ft-lbs. If desired, the zinc rod may be removed and eliminated from the assembly leaving only the steel pipe plug.

For ESI:

The dedication report will be revised to include verification of tightness of the zinc rod to pipe plug. This will be completed by July 23, 2021.

(viii) Any advice related to the potential defect or failure to comply about the facility, activity, or basic component that has been, is being, or will be given to purchasers or licensees.

The urgency of the corrective action inspections listed above appears dependent on the installed time of the heat exchangers. Both instances of loose or dislodged anodes occurred within 2 to 3 months of operation (both heat exchangers were installed in March 2021 and issues were detected in May and June). Furthermore, neither ESI nor the heat exchanger manufacturer are aware of instances of loose anodes. For these reasons, this appears to be an infant mortality issue isolated to one batch of heat exchangers due to insufficient installed torque when the zinc anode was assembled.