GPU Nuclear

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November 30, 1994
C321-94-2335

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Dear Sir:

Subject: Oyster Creek Nuclear Generating Station
Docket No. 50-219
Voluntary Licensee Event Report 94-005, Revision 1

Enclosed is Voluntary Licensee Event Report 94-005, Revision 1. Changes have been indicated by a bar in the right hand margin.

If you should have any questions or require further information, please contact Mr. Terry Sensue, Oyster Creek Licensing Engineer at 609-971-4680.

Sincerely yours,

John J. Barton
Vice President and Director
Oyster Creek

JJB/TS/jc
cc: Administrator, Region 1
Senior NRC Resident Inspector
Oyster Creek NRC Project Engineer

IE22

NRC FORM 366N
(5-92)

LICENSEE EVENT REPORT (LER)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED BY OMB NO. 3150-0104
EXPIRES 5/31/95

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Oyster Creek, Unit 1	05000219	1 OF 5

TITLE (4)
CASTING DEFECTS DISCOVERED ON OVERHEAD CRANE FLEX COUPLINGS

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
03	08	94	94	005	1	11	30	94	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	N
POWER LEVEL (10)	100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	X OTHER
20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	Voluntary Report
20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
TERRY SENSUE - LICENSING ENGINEER	609-971-4680

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO				

ABSTRACT (16))

On March 8, 1994, during an inspection it was discovered that the Turbine Building overhead 150 ton crane main hoist motor to gear box flex coupling exhibited casting defects and a through wall hole. On May 6, 1994, during an inspection it was discovered that the Reactor Building overhead 100 ton crane main hoist motor to gear box flex coupling exhibited casting defects and a crack. GPUN decided to voluntarily report these conditions.

The main hoist motor to gear box flex couplings have been installed on the overhead cranes since initial plant startup. Radiographic examination showed that the casting defects were shrinkage cavities. Subsequent sectioning of the defects showed the indications to be a lack of fusion defect that was part of the shrinkage cavity formed during solidification of the casting during fabrication.

Since the overhead crane meets NUREG-0612 requirements and no historical record of failure exists for the flex coupling, this condition is considered to have low safety significance.

The main hoist motor to gear box flex couplings have been replaced on both overhead cranes.

DATE OF DISCOVERY

The condition was discovered on March 8, 1994, for the Turbine Building overhead 150 ton crane (CRN). The condition was discovered on May 6, 1994 for the Reactor Building overhead 100 ton crane. It was decided on May 10, 1994 to voluntarily report these conditions.

IDENTIFICATION OF OCCURRENCE

During an inspection of the Turbine Building overhead crane, it was observed that the main hoist motor to gear box flex coupling (CPLG) exhibited casting defects and a through wall hole. During a subsequent inspection of the Reactor Building overhead crane, it was observed that the main hoist motor to gear box flex coupling exhibited casting defects and a crack.

CONDITIONS PRIOR TO DISCOVERY

At the time of each discovery, the plant was in the RUN mode at 100% power with reactor coolant temperature at 525°F and reactor pressure at 1020 psig. The reactor has been in all plant modes since the initial plant startup when the main hoist motor to gear box flex couplings have been installed on both the overhead cranes.

DESCRIPTION OF OCCURRENCE

While conducting an inspection as part of an upgrade to our Turbine Building overhead crane, it was discovered by visual examination and by using x-ray testing that the main hoist (150 ton rating) motor to gear box flex coupling had casting defects and a through wall hole. The driver flex coupling contained a through wall hole originating from a casting defect. An inspection of the auxiliary hoist (50 ton rating) motor to gear box flex coupling did not exhibit any casting defects.

A decision was made to perform an inspection of the other two, Reactor Building and Heater Bay, overhead cranes to identify any similar indications. During the inspection of the Reactor Building overhead crane, it was discovered by visual examination and by using magnetic particle testing that the main hoist (100 ton rating) motor to gear box flex coupling had casting defects and a crack. The driver flex coupling contained the crack originating from the same casting defect and extending from both sides of the defect. An inspection of the auxiliary hoist (5 ton rating) motor to gear box flex coupling did not exhibit any casting defects.

DESCRIPTION OF OCCURRENCE (Cont'd.)

An inspection of the Heater Bay overhead crane (a single hoist with a 25 ton rating) motor to gear box flex coupling did not exhibit any casting defects.

The Turbine Building, Reactor Building, and Heater Bay overhead cranes were all considered operable before performing this inspection. The main hoist for each overhead crane was declared inoperable until its inspections and/or required repairs were completed. The driver flex couplings are carbon steel castings which are machined to meet each crane's specifications. On May 12, 1994, the vendor was notified of the observed conditions of the two main hoist motor to gear box flex couplings. The vendor responded that there is no record of failure in their history for these components.

APPARENT CAUSE OF DISCOVERY

Both the Turbine Building and Reactor Building overhead crane main hoist motor to gear box flex couplings were sent to the GPU system laboratories for failure analysis. A radiographic examination showed that the casting defects are shrinkage cavities. Subsequent sectioning of the defects showed the indications to be a lack of fusion defect that was part of the shrinkage cavity formed during solidification of the casting during fabrication. It is important to note that shrinkage cavities act as stress risers from which cracking can start.

For the Reactor Building crane coupling, the fracture surface did contain areas where the surface had oxidized indicating that a portion of the crack path had been present for some time. Further into the material, the fracture path was fresh in appearance, indicating the overload induced by personnel when removing the coupling from the crane. The mode of propagation was not clear as to whether it was fatigue or tensile overload. Due to the nature of the material the crack tended to follow the graphite flakes in the micro-structure making fatigue marking identification impossible. Fatigue would indicate that the crack was propagating during the entire service life of the unit. Tensile overload would suggest that the crack "popped" into existence early in life and remained inactive since then, or some mechanical incident caused the crack to initiate sometime during service (but early enough to allow the crack faces to oxidize). More exact dating of the crack based upon oxide thickness was not possible.

ANALYSIS OF OCCURRENCE AND SAFETY SIGNIFICANCE

The Turbine Building and Heater Bay overhead cranes have been reviewed for conformance with NUREG-0612 criteria. These handling systems have been excluded from this criteria since a load drop from these cranes would not affect the safe shutdown of the reactor.

The Reactor Building overhead crane was designed and fabricated to the specifications in EOCI-61, "Specifications for Electric Overhead Traveling Cranes - 1961," and the design has been compared to CMAA-70/1975 and ANSI B30.2-1968 and found acceptable under the requirements of NUREG-0612.

The probability of the main hoist motor to gear box flex coupling failing is unknown. The crack initiating from the shrinkage cavity would, in all likelihood, not have initiated in the absence of the defect. No crack-like indications were observed that were not related to what was later identified as the casting defect. That is, the casting defect had indications propagating off of it along the fillet radius of the hub/flange juncture, but no cracking was observed in the fillet away from the casting defect. If the cracking were unrelated to the defect, then there should be cracking elsewhere along the fillet on the outer radius of the hub.

In the unlikely event that the flex coupling would fail, the consequences of a load drop have been addressed in GPUN's responses to NUREG-0612 submitted to the NRC. The NRC approved GPUN's responses as discussed in Safety Evaluation Report, "Control of Heavy Loads - Phase 1" dated 6/21/83. The discovery of the crack does not change the analyses which support meeting NUREG-0612.

Also, since no historical record of failure exists for the flex coupling, this condition is considered to have low safety significance.

CORRECTIVE ACTION

Both the Turbine Building and Reactor Building overhead crane main hoist motor to gear box flex couplings were replaced with a carbon steel machined coupling to meet the crane's specifications. The replacement parts satisfactorily passed inspections before being installed. Quality Assurance requirements have been added to the Purchasing database for these couplings. Radiographic (RT) inspection capable of detecting casting defects will be required prior to purchase.

Also, our maintenance program for crane inspections was reviewed and it was determined that no further improvements were necessary based on the results of the failure analysis.

SIMILAR EVENTS

None

COMPONENT DATA

Manufacturer: Whiting Corporation
Model: S10433R - Reactor Building Crane Driver Coupling
S23539U - Turbine Building Crane Driver Coupling