U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-219/86-40

Docket No. 50-219

License No. DPR-16

Licensee: GPU Nuclear Corporation
P. O. Box 388
Forked River, NJ 08731

Facility Name: Oyster Creek Nuclear Generating Station

Inspection At: Forked River, New Jersey and Reading, Pennsylvania

Inspection Conducted: December 9-16, 1986

Inspectors: Robert A. McBrearty — Jan. 27 1987
R. A. McBrearty, Reactor Engineer — date

for Robert A. McBrearty — Jan. 27 1987
H. Kaplan, Reactor Engineer — date

Approved by: Jack Strosnider — 1/30/87
J. R. Strosnider, Chief, Materials & Processes Section — date

Inspection Summary: Inspection on December 9-16, 1986 (Report No.50-219/86-40)

Areas Inspected: A routine, unannounced inspection was conducted by two regional based inspectors of activities associated with drywell wall corrosion. The inspection included observations of UT in progress, review of the video tape of the licensee's visual inspection, review of ultrasonic thickness measurement results and the review of core sample analyses done at the GPU laboratory at Reading, PA.

Results: No violations were identified. Ultrasonic testing and analyses of core samples removed from the drywell appeared to be providing necessary information for evaluation of the drywell corrosion problem.

DETAILS

1. Persons Contacted

GPU Nuclear Corporation (GPUN)

M. Algair, NDE Level III
*T. Corrie, QC Manager - Oyster Creek
J. Catellesse, Technician
*J. DeBlasio, Manager, Plant Engineering
*P. Fiedler, Vice President, Oyster Creek
S. Fuller, OPS QA Manager
**W. Jeitner, Supervisor, Materials Engineering Laboratory
*J. Martin, Tech Functions Field Engineer
*M. Radvansky, Manager, Tech Functions, Oyster Creek
D. Rauft, Manager, Plant Engineering
*J. Rogers, Site Licensing
*G. Sevak, MC&F Production Project Engineer
*R. Smith, Plant Engineering
T. Snider, Manager, MC&F Production
J. Sullivan, Jr., Plant Operations Director
*R. Furner, QC Supervisor

General Electric Company

R. Joffe, Project Manager, UT Level III

U.S. Nuclear Regulatory Commission

*W. Bateman, Senior Resident Inspector
*J. Wechselberger, Resident Inspector

* Denotes those present at the exit meeting on December 11, 1986.
** Denotes those present at the exit meeting on December 16, 1986.

2. Drywell Wall Thinning

a. Ultrasonic Measurements

During the current outage, the licensee detected thinning of the outside surface of the drywell wall where the wall is cushioned by a layer of sand. The original thickness of the drywell wall in this area was specified as 1.154". A sampling plan to determine the extent of thinning was developed by the licensee beginning with two ultrasonic thickness readings in each vent pipe bay. This initial sample was expanded to four measurements in each bay, and then, for readings equal to or less than 0.900" the scope was further expanded to a 7"x7" grid over which measurements were made on 1" centers. Nine 7"x7" patches were measured in various bays. Additional grid pattern readings were made in areas of two bays where no thin wall

measurements were originally reported. A trench was cut in the concrete in bay 5 and in bay 17 to facilitate thickness measurements at the lower level where the sand was expected to be wet. The trench in bay 17 measured 18" wide x 39" deep from the top of the curb to 15" below floor level. A total of 329 measurements in bay 5 were made over a 6"x46" grid on 1" centers. The bay 17 measurements were made over a 6"x35" grid with a total of 252 readings on 1" centers. The results show one reading of 0.889", and the remaining readings greater than 0.900". The majority of the bay 17 readings were 1" or greater. Approximately 7% (23 readings) of the bay 5 readings fell below 0.900" with approximately 5% (15 readings) of the readings falling below 0.700". The low readings (less than 0.900") were scattered throughout the grid with no clustering of thin readings.

All readings on the 7"x7" grids equal to or less than 0.700" were re-examined with A-scan equipment to more clearly identify the cause of the low readings. Based on the re-examinations the low readings were attributed to laminar type reflectors which resulted in the low thickness readings made using the D-meter. The laminar type reflectors were identified in approximately five bays. A core sample which was removed from the wall in bay 5 (at location "A") confirmed the presence of non-metallic inclusions at depths coincident with the ultrasonic readings made at that location. An angle beam examination using a WSY-70 transducer was performed to distinguish between inclusions and thinned areas thereby providing information regarding the true condition of the wall. Additionally, welds in three bays were examined for the presence of cracking. In the absence of inclusions, the D-meter thickness measurements agreed with the angle beam results in areas exhibiting corrosion, and the welds were found to be free of indications.

Core samples were removed from the drywell wall at locations which were selected by the Technical Functions Group to include areas of suspected corrosion, laminations or inclusions, and also areas where the ultrasonic measurements indicated full wall thickness. Core locations were a minimum of 2" from a weld and 6" from any other core location. Samples of the sand exposed by core removal were taken for analysis. Micrometer measurements of removed cores were compared with ultrasonic measurements made prior to removal and confirmed the validity of the ultrasonic readings.

Personnel from the EPRI NDE Center at Charlotte, North Carolina performed UT scans independent of the licensee's effort and arrived at the same conclusions as the licensee regarding thinning and laminar type reflectors. The EPRI personnel were advised of the suspect area locations, but did not have access to the licensee's results at the time of their inspection.

The licensee contracted the General Electric Company to perform an ultrasonic baseline examination of selected degraded areas of the drywell wall using the Ultra Image III System, with the intent to monitor the areas in the future for further degradation.

b. Visual Inspection

A limited visual inspection using a small video camera was made by the licensee of the drywell wall outside surface in the area of the removed cores, and of the sand condition in those areas. The camera was inserted through the opening left by the core sample, and into the depression remaining from the removal of sand samples. Where possible the adjacent drywell wall outside surface was also inspected. The visual inspection confirmed, to the extent possible, the UT results regarding wall degradation and provide qualitative information regarding the relationship between the sand condition and the degree of wall degradation which was observed.

c. Metallurgical And Chemical Analyses

The inspectors reviewed the results of the licensee's metallurgical and chemical analysis of the drywell core sample and sand sample at the GPU laboratory in Reading, PA on December 16, 1986. The licensee presented preliminary results of their chemical analysis of the deposit found on the corroded surface of the core samples. Significant amounts of chlorine and lead were detected in some of the areas. The former evidently originated from the wet sand and the latter from the painted surfaces of the drywell. Because the licensee had not yet determined the metallurgical structure of the core samples, the inspector requested that a micro sample be prepared from a core sample exhibiting the worst corrosion.

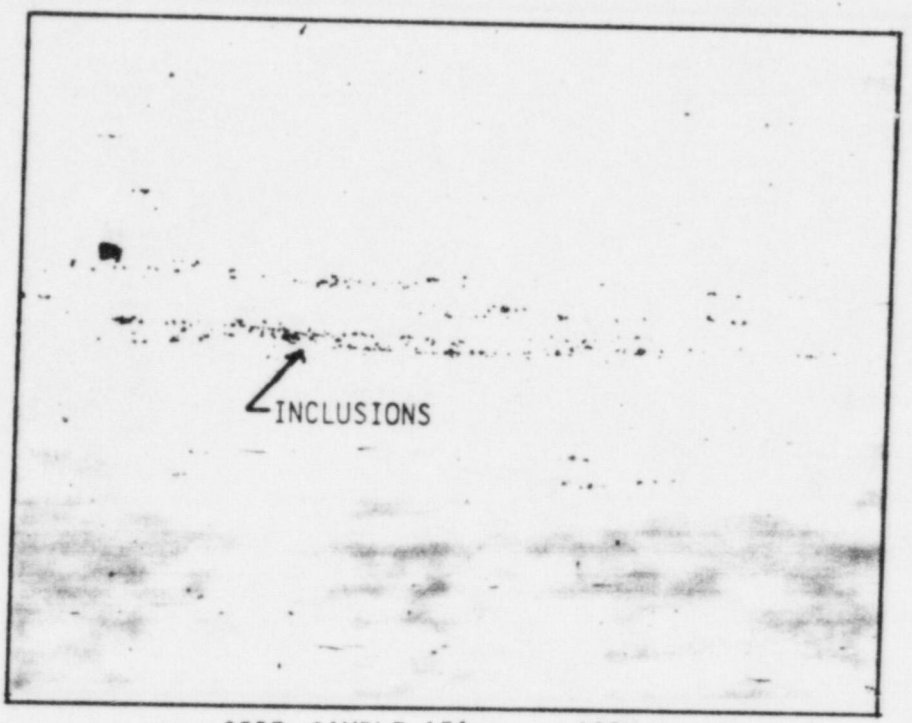
The core sample from which the microsample was prepared was identified as 19C. Microscopic examination revealed a well refined structure (Grain Size #7-#8) consisting of pearlite and ferrite. The structure is typical of SA 212 Gr B steel, the reported material specification, made to a fine grain practice. No metallurgical anomalies were observed at or away from the corroded surface. The corrosion appeared to be general corrosion with minor pitting ranging between .001 - .003". The inclusions were found to be minute and well distributed. The inspector examined a microsample from core sample 15A which contained segregated stringers of inclusions which were believed to be responsible for the ultrasonic indications in the initial testing of the drywell. Figure 1 is a photomicrograph showing these inclusions magnified 100 times. The inclusions appear to be alumina oxides. Physical measurements of the inclusions in the core sample correlated well with ultrasonic measurements of the locations of the inclusions thus supporting the hypothesis that the inclusions were the cause of the very low thickness measurements made using the D-meter.

Based on the inspectors' observation, review of licensee documentation, and discussions at the Reading, PA laboratory the inspectors concluded that the licensee was developing reliable data regarding

the extent and nature of the drywell thinning and developing an acceptable base line for reference in possible future inspections. Additionally, the inspector was satisfied that the presence of inclusion or other laminar type reflectors resulted in the D-meter low readings.

3.0 Exit Interview

The inspector met with licensee representatives (denoted in paragraph 1) at the conclusion of the onsite inspection on December 11, 1986 and the Reading laboratory on December 16, 1986. The inspector summarized the purpose and the scope of the inspection and the findings. At no time during this inspection was written material provided by the inspector to the licensee.



CORE SAMPLE 15A 100X

FIGURE 1 - shows inclusions believed to be responsible for ultrasonic indications. Inclusions appear to be alumna oxides.