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AUTH.NAME AUTHOR AFFILIATION
FITZPATRICK,E. Indiana Michigan Power Co.
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SUBJECT: Provides response to GL 97-05, "SG Insp Techniques," for for Donald C Cook Nuclear Plant,Units 1 & 2.

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Indiana Michigan
Power Company
500 Circle Drive
Buchanan, MI 49107 1395

INDIANA MICHIGAN POWER

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Gentlemen:

Donald C. Cook Nuclear Plant Units 1 and 2
GENERIC LETTER GL 97-05
STEAM GENERATOR INSPECTION TECHNIQUES

This letter and the attachment provide our response to GL 97-05, "Steam Generator Inspection Techniques", as it applies to Cook Nuclear Plant.

Sincerely,

E E Fitzpatrick

E. E. Fitzpatrick
Vice President

SWORN TO AND SUBSCRIBED BEFORE ME
THIS 20th DAY OF March

Jan Watson
Notary Public

My Commission Expires February 10, 1999

/vlb

Attachment

c: J. A. Abramson
A. B. Beach
MDEQ - DW & RPD
NRC Resident Inspector
J. R. Sampson

1/1
A001

ADD: AL DROMERICK

ATTACHMENT TO AEP:NRC:1166AK

GENERIC LETTER 97-05
STEAM GENERATOR INSPECTION TECHNIQUES

INTRODUCTION

Generic letter (GL) 97-05 was issued to emphasize the importance of performing steam generator (SG) tube inservice inspections, using qualified techniques in accordance with the requirements of Appendix B to 10 CFR Part 50. Additionally, this GL requests specific information to determine whether the licensee is in conformance with their current licensing basis, given their SG tube inspection practices.

BACKGROUND

Periodic inspections and tests are performed to assess the condition of SG tubing regarding structural and leakage integrity, and conformance with plant technical specification (T/S) requirements. The T/Ss mandate removal from service or repair of any tube with degradation exceeding 40% of the nominal wall thickness. Degradation within the sleeved section of a tube cannot exceed 29% of the nominal wall thickness of the sleeve (applicable to unit 1 only). Eddy current inspection results are the primary technique used in making the percent throughwall assessment.

The underlying premise for a valid eddy current inspection is the application of qualified inspection techniques capable of reliably detecting and sizing SG tube degradation. The following discussion provides information regarding how these requirements have been implemented under our SG program.

COOK NUCLEAR PLANT SG PROGRAM

Inspection Practices

It is our practice to leave SG tube indications in service that are sized at less than the T/S throughwall value. Our practices are based on the application of appropriate, qualified depth sizing techniques.

If appropriate, qualified techniques are not available to depth size an indication, as determined by review of the EPRI "PWR Steam Generator Examination Guidelines", and confirmed by our lead level III analyst and SG project manager, the tube is repaired using the appropriate repair technique, e.g., sleeving, rerolling, or plugging.

During the unit 1 spring 1997 and unit 2 fall 1997 inspections, the following degradation types were left in service based on depth sizing:

Unit 1 - Fretting wear at anti-vibration bars (AVB)
- Wastage at cold leg support plates

Unit 2 - Fretting wear at broached support plates

In addition to the above, outside diameter stress corrosion cracking at support plates was found on unit 1. This degradation type was dispositioned by a voltage based alternate repair criteria (ARC) that is documented in NRC GL 95-05, and Cook Nuclear Plant's unit 1 plugging criteria document WCAP-13187. This ARC was approved for use on unit 1 by the NRC's SER dated March 13, 1997. Therefore, this submittal focuses on qualification of the

degradation types noted above that rely specifically on depth sizing and are not voltage based.

Technique Qualification Overview

Appendix H, "Performance Demonstration for Eddy Current Examination" of the EPRI "PWR Steam Generator Guidelines", provides guidance on the qualification of SG tubing examination techniques and equipment used to detect and size flaws.

For qualification purposes, test samples are used to evaluate detection and sizing capabilities. While pulled tube samples are preferred, fabricated samples may be used. If fabricated test samples are used, the samples are verified to produce signals similar to those being observed in the field in terms of signal characteristics, signal amplitude, and signal-to-noise ratio. Samples are examined to determine the actual throughwall defect measurements as part of the appendix H qualification process.

The procedures developed in accordance with appendix H specify the essential variables for each qualification process. These essential variables are associated with an individual instrument, probe, cable, or particular on-site equipment configuration. Certain techniques have undergone testing and review to qualify sizing performance. The sizing data set includes the detection data set for the technique, with additional requirements for number and composition of the grading units.

Application of EPRI qualification techniques to site-specific conditions on units 1 and 2 is based on equivalency evaluations performed by the SG eddy current inspection contractor. These evaluations indicate that the essential variables for sizing techniques employed on unit 1 and unit 2 meet or exceed those specified in the associated EPRI qualification process, and are, therefore, acceptable for use.

Depth Sizing Techniques

Unit 1 - Fretting wear at AVBs
Unit 1 - Wastage at cold leg support plates

Both AVB wear and wastage at cold leg support plates were detected during the 1997 full length (tube end hot - tube end cold) unit 1 SG tube examination. This examination was conducted using standard bobbin coil techniques. Depth sizing was provided based on data gathered by the 0.720" diameter bobbin coil probe. The examination was performed using the MIZ-30A digital acquisition system, and evaluated using Zetec Eddynet analysis software, version 3, patch 13. All bobbin coil examinations were evaluated by independent primary and secondary data analysis teams.

The bobbin examination technique sheet (ETSS) used by the unit 1 data analysts to detect and size AVB wear and wastage was developed using the essential variables for tubing, equipment, and analysis, with applicable equivalencies, as required by the EPRI guidelines and appendix H. Specifically, ETSS 96004 (wear) and 96001 (wastage) from appendix H, provided the basis for the bobbin coil ETSS used on unit 1. Both ETSS 96004 and 96001 were developed for alloy 600 tubing, consistent with the tubing material in the unit 1 SGs.

The essential variables described in ETSS 96004 were established by EPRI using electro discharge machining (EDM) laboratory samples. These samples were used to define detection and sizing of AVB wear using the bobbin coil technique. The calibration standards utilized at Cook Nuclear Plant contained the same sizes of artificial wear notches used by EPRI to develop an amplitude curve for sizing, and to confirm the capability of the bobbin coil to detect AVB wear.

The essential variables described in ETSS 96001 were established by EPRI using actual tube pull results and laboratory flaws. These samples were used to define detection and sizing for wastage at cold leg support plates using the bobbin coil technique. The calibration standards utilized at the plant contained the same sizes of ASME holes that were used by EPRI to develop a phase curve, and to confirm the capabilities of the bobbin coil to detect wastage at cold leg support plates.

A comparison of the essential variables for ETSS 96004 and 96001 was performed to provide assurance that their associated critical parameters were met by the site techniques. Additionally, a comparison was made to verify that the site-specific tubing conditions on unit 1 were similar in voltage and signal-to-noise ratio as the EPRI technique qualification data set(s).

Successful completion of these comparisons, summarized in table 1, demonstrates that the bobbin coil techniques used on unit 1 for sizing of AVB wear and wastage at cold leg support meet or exceed those specified in the EPRI qualification process. Because the techniques are considered equivalent, the associated root mean square error (RMSE) and correlation coefficient of the regression for the EPRI qualification data set(s) can be applied to the depth sizing of AVB wear and wastage at cold leg supports. Therefore, these processes were considered qualified for use on unit 1.

Unit 2 - Fretting Wear at Broached Support Plates

Fretting wear at broached support plates was detected during the 1997 full length (tube end hot - tube end cold) unit 2 SG tube examination. This examination was conducted using standard bobbin coil techniques. Depth sizing was provided based on data gathered by the 0.720" diameter bobbin coil probe. The examination was performed using the MIZ-30A digital acquisition system and evaluated using Zetec Eddynet analysis software, version 4, patch 17. All bobbin coil examinations were evaluated by a primary analyst and computer data screening.

The bobbin ETSS used by the unit 2 data analysts to detect and size wear at broached support plates was developed using the essential variables for tubing, equipment, and analysis, with applicable equivalencies, as required by the EPRI guidelines and appendix H. Specifically, ETSS 96004 (wear) from appendix H provided the basis for the bobbin coil ETSS used on unit 2.

The essential variables described in ETSS 96004 were established by EPRI using EDM laboratory samples. These samples were used to define the detection and sizing of tube wear using the bobbin coil technique. The calibration standards utilized at Cook Nuclear Plant contained the same sizes of artificial wear notches used by EPRI to develop an amplitude curve for sizing, and to confirm the capability of the bobbin coil to detect support plate wear.

A comparison of the essential variables for ETSS 96004 was performed to provide assurance that the critical parameters were met by the site technique. Note that ETSS 96004 is based on alloy 600 tubing, while the unit 2 SGs contain alloy 690 thermally treated tubing.. The tubing material difference was evaluated by our SG contractor, and found to be equivalent from the standpoint of technique qualification based on a review of the electrical resistivity parameters in the frequency range of interest. Similar comparisons and evaluations were made to account for other differences in the essential variables. Additionally, reviews were performed to verify that the site-specific tubing conditions on unit 2 were similar in voltage and signal-to-noise ratio as the EPRI technique qualification data set.

Successful completion of the aforementioned comparisons, summarized in table 1, demonstrates that the bobbin coil techniques used on unit 2 for the sizing of wear at broached support plates meets or exceeds that specified in the EPRI qualification process. Because the technique is considered equivalent, the associated RMSE and correlation coefficient of the regression for the EPRI qualification data set can be applied to the depth sizing of wastage at cold leg supports. Therefore, this process is considered qualified for use on unit 2.

CONCLUSIONS

Lab samples and the pulled tube sample that support the appendix H technique qualifications used during the last unit 1 and unit 2 refueling outages were evaluated against in-generator flaws, and found to be prototypical of the tubing at both units. The tubing essential variables for the flawed tubes in the applicable EPRI qualification data sets are similar in voltage and signal-to-noise ratio characteristics to the associated flaw types in the unit 1 and unit 2 SGs. The EPRI qualified techniques used to depth size wastage in the cold leg support plates, AVB wear, and broached support plate wear are applicable to Cook Nuclear Plant tubing. These techniques meet the RMSE values specified by EPRI qualification procedures for depth sizing and, therefore, provide an adequate basis for sizing of tube defects in the SGs.

Table 1

Degradation Mechanism & Exam Type	Site Qualified Technique	EPRI Tech.	POD	RMSE	Tech. Qualified for Detection	Tech. Qualified for Sizing	Site Tube Conditions Similar to Qual Data*	Successful Appendix H Essential Variable Review **
AVB Wear Bobbin Coil Unit 1	Same as EPRI Appendix H Qualified Technique	ETSS 96004	.83 60% TW @.90 CL	4.9% TW for flaws up to 50%	Yes	Yes	Yes	Yes
Wastage Bobbin Coil Unit 1	Same as EPRI Appendix H Qualified Technique	ETSS 96001	.82 50% TW @.90 CL	14.7 % TW	Yes	Yes	Yes	Yes
Wear (Broached SP) Bobbin Coil Unit 2	Same as EPRI Appendix H Qualified Technique	ETSS 96004	.83 60% TW @.90 CL	4.9 % TW for flaws up to 50%	Yes	Yes	Yes	Yes

Notes:

CL Confidence level
POD Probability of detection
RMSE Root mean square error
SP Support plate
TW Throughwall

* Voltage and signal-to-noise comparison.

** Parameters evaluated include: tubing, instrument, probe size and type, analog cable type and length, frequencies, drive voltage and gain, coil excitation modes, calibration method, minimum data (channels) to be recorded, method of data recording, digitizing rate, scan pattern, method of calibration (analysis), data review requirements (analysis) reporting requirements (analysis) and instrument (analysis).