



May 6, 2022
L-2022-072
10 CFR 50.36

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555-00001

Re: Turkey Point Unit 3
Docket No. 50-250
Steam Generator Tube Inspection Report

The attached Turkey Point Unit 3 Cycle 32 Refueling Outage Steam Generator Tube Inspection Report is submitted in accordance with Turkey Point Technical Specification, 6.9.1.8 and within 180 days after the initial entry to MODE 4 following completion of the inspections performed in accordance with Technical Specification 6.8.4.j, Steam Generator (SG) Program.

Should there be any questions, please contact Mr. Steve Catron, Nuclear Licensing & Regulatory Compliance Director at 561-304-6206.

Sincerely,

A handwritten signature in black ink, appearing to read 'Timothy Lesniak', is written over a horizontal line.

Timothy Lesniak
General Manager, Regulatory Affairs
Florida Power & Light Company

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cc: Regional Administrator, Region II, USNRC.
Senior Resident Inspector, USNRC, Turkey Point Plant

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Turkey Point Unit 3 (TP3-32)
Steam Generator Tube Inspection Report

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Turkey Point Unit 3
TP3-32 Steam Generator Tube Inspection Report

Introduction:

The enclosed Steam Generator Tube Inspection Report for Turkey Point Unit 3 is submitted for the inspection of the SGs during refueling outage 32 (hereafter referred to as the TP3-32 or EOC-31 inspection or outage), as required by Technical Specification section 6.9.1.8. Per the Turkey Point Unit 3 Technical Specification section 6.8.4.j, the TP3-32 SG inspection fell within the 4th ISI period. The prior inspection of the SGs was in TP3-29 (Spring 2017). The last SG inspection was originally scheduled to be in TP3-31 (Spring 2020); however, it was deferred by license amendment to TP3-32 due to circumstances related to the effects of the Covid-19 pandemic¹. The TP3-32 inspection was the final inspection of the SGs in the 4th ISI period as permitted by the license amendment. At unit shutdown for the TP3-32 inspection, the SGs had operated for approximately 31.5 EFPY since installation and 73.86 EFPY in the 4th ISI period. This included operation for approximately 16.66 EFPY, 16.46 EFPY and 16.35 EFPY, in the last 3 consecutive fuel cycles, respectively, since the last SG inspection (TP3-29). Initial entry into Mode 4 following completion of the TP3-32 inspection was made on November 10, 2021. References to past SG Reports for Turkey Point Unit 3 are provided in Appendix A along with a list of acronyms used in this report.

Turkey Point Unit 3 is a Westinghouse 3-loop PWR with Model 44F steam generators. The SGs are U-tube heat exchangers with tube bundles fabricated using thermally treated Alloy 600 tubing. Each SG contains 3,214 tubes arranged in 45 rows and 92 columns, in a square-pitch configuration. Nominal tube OD is 0.875 inches with a 0.050-inch nominal wall thickness. Each SG tube bundle is supported by one drilled-hole flow distribution baffle (FDB) and 6 quatrefoil, broached-hole tube support plates (TSPs) all fabricated from stainless steel. Two (2) sets of anti-vibration bars (AVBs) in the U-bends also provide tube bundle support. Rows 1-8 of tubing in each SG were stress relieved in the U-bend region after bending.

A. Scope of Inspections Performed on each SG

The TP3-32 inspection scope was selected to meet the requirements of plant Technical Specifications, NEI 97-06 Rev 3 and its referenced EPRI SGMP Guidelines. In addition, since Turkey Point plant has submitted a License Amendment Request² to adopt "Revised Frequencies for Steam Generator Tube Inspections" (TSTF-577 Rev 1) the SG inspection in TP3-32 is considered as the implementation outage to align the scope of the SG Program with TSTF-577 Rev 1 requirements. Unless otherwise noted, the TP3-32 base scope inspection in each SG was:

Primary-side:

- 100% full-length bobbin probe examination of all active tubes except U-bends of low row tubes.
- U-bends of low row tubes (rows 1 & 2) examined between the uppermost TSP in the HL and CL using the +Point™ probe.
- 100% of tubes in the HL tubesheet program examined using the array probe. The test extent was from the first broached TSP (designated 01H) to the tube-end (TEH).
 - Includes TTS peripheral tube exams in the HL for foreign object wear as well as all BLG /OXP indications in the tubesheet.

¹ Turkey Point Unit 3 - Issuance of Exigent Amendment No. 291 concerning the deferral of Steam Generator Inspections (NRC ADAMS Accession No. ML20104B527)

² Turkey Point Units 3 and 4, Improved Technical Specifications Conversion, Volume 16, Revision 0, Section 5.0, Administrative Controls (NRC ADAMS Accession Number ML21265A387).

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- TTS peripheral tube exams in the CL completed using the array probe for the 3 outermost tubes exposed to the annulus and all tubes in rows 1-3 along the no-tube lane. The test extent was from 01C to TEC.
- All “high stress” (minus 2-sigma) tubes were inspected with the +Point™ probe:
 - in the HL tubesheet section (TSH+3” to TEH), and
 - at all HL tube support structures and at the uppermost CL TSP.
- 100% of dings/dents >5V in the HL, U-bend and uppermost CL TSP using the +Point™ probe. The extent was from TSH to 06C inclusive.
 - All dings/dents <5V were examined with the bobbin probe.
- Various diagnostic/special interest exams using the +Point™ probe including all I-codes from bobbin and array probe exams, tubes in the vicinity of newly identified or prior PLPs and tubes adjacent to the locations of known foreign objects.
- Visual inspection of all mechanical and welded plugs.
- Visual inspection of all channel head bowl components and bowl scan everywhere within the channel head bowl with remote visual camera in both the HL and CL per Westinghouse NSAL 12-1 Rev 1, “Steam Generator Channel Head Degradation,” October 2017.

Secondary-side:

- Visual/cleanliness inspection at the TTS (annulus, no-tube lane) after upper bundle flush and sludge lancing at the TTS.
- Foreign object search and recovery (FOSAR) at the TTS including in-bundle exams.
- Upper-bundle visual inspection from the uppermost TSPs.
- Visual inspection of components of the Upper Internals including the feedwater ring & supports, J-tubes, and moisture separator components. UT thickness measurements were also obtained at select locations on the feedwater ring.

B. Degradation Mechanisms Found

The following degradation mechanisms were identified during the TP3-32 inspection:

- A single axially oriented (SAI), crack-like ODSCC indication was identified in the U-bend of a low row tube (R1C13) in SG-3A.
- Wear at AVB contact points.
- Wear at horizontal tube support structures (FDBs, TSPs).
- Freespan volumetric wear.

Inspection Expansion: This was the first occurrence of a crack-like indication from a tube in the SGs at Turkey Point Unit 3. Since all low row tubes (rows 1-2) were inspected as part of the base scope, a supplemental scope expansion was applied to a 50% sample of tubes in the U-bend of row 3 of SG-3A using the +Point™ probe. No additional occurrence of corrosion degradation was identified.

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C. NDE Techniques utilized for each Degradation Mechanism

Table 1a is the list of the EPRI ETSSs used for degradation detection during the TP3-32 SG ECT inspection.

Table 1a - NDE Detection Techniques for Degradation Mechanisms

Detection probe	ETSS used for Detection	Degradation Mechanism	Location / Applicability
Bobbin	I96041.1 Rev 6	Wear	AVB locations
	96004.1 Rev 13		Broached TSP locations
	27091.2 Rev 2		Foreign object wear (with/without part present)
	96005.2 Rev 9	Pitting	In the freespan and sludge pile
	I-28411 Rev 4	Axial ODSCC	At FDBs locations
	I-28412 R5, I-28413 R5		In the freespan
	I-28413 Rev 5		At broached TSPs
24013.1 R2, 10013.1 R1	At Dents/Dings ≤ 5V		
+Point™	I-28424 R4, I-28425 R4	Axial ODSCC	At Dents/Dings > 5V
	10411.1 R0, 10411.2 R0		All U-bends
	I28424 Rev 4		sludge pile/expansion transition
	20511.1 Rev 8	Axial PWSCC	At expansion transition
	I11524 Rev 0	Circ PWSCC	
	96511.1 Rev 16 96511.2 Rev 16	Axial/Circ PWSCC	In low row U-bends
	27901.1 Rev 1; 27902.1 Rev 2; 27903.1 Rev 1; 27904.1 Rev 2; 27905.1 Rev 2; 27906.1 Rev 1; 27907.1 Rev 2	Wear	Foreign object wear (with/without part present)
17901.1/ .3; 17902.1/ .3; 17903.1/ .3; 17904.1/ .3; 17905.1/ .3; 17906.1/ .3 [All Rev 0]			
Array	20400.1 Rev 5	Axial/Circ ODSCC	At expansion transition
	20500.1 Rev 4	Circ PWSCC	At expansion transitions / BLGs / OXPs
	20501.1 Rev 4	Axial PWSCC	

Table 1b is the list of the EPRI ETSSs used for degradation sizing based on the degradation mechanisms reported during the TP3-32 SG ECT inspection.

Table 1b - NDE Sizing Techniques for Degradation Mechanisms

Sizing probe	ETSS used for Sizing	Degradation Mechanism	Location / Applicability
Bobbin	I96041.1 Rev 6	Wear	AVB locations
+Point™	10908.4 Rev 1		TSP and FDB locations
	96910.1 Rev 11		
Bobbin	96004.1 Rev 13		Just above or below TSP or FDB edges
+Point™	27905.1 Rev 2	Axial ODSCC	Foreign object wear (volumetric) at or slightly above TTS
	21998.1 Rev 4		U-bend
	28432.1 Rev. 2		

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D. Location, orientation (if linear), and measured sizes (if available) of service induced indications

Axial ODSCC: A crack-like indication of ODSCC was reported in the U-bend section of a low row tube (R1C13) in SG-3A. The flaw was identified as a single axially-oriented indication (SAI) using the +Point™ probe and was confirmed with the array and magnetically-biased +Point™ probes. The indication is located close to the CL bend tangent (06H+9.57") and at the intrados of the tube. Based on the location of this indication (low row U-bend), it was compared to operating experience (OE) in NRC Information Notice IN 2010-21: "Cracklike Indication in the U-bend region of a thermally treated Alloy 600 Steam Generator Tube". The tube did not exhibit the presence of a manufacturing indication similar to a Blairsville bump (as in the OE); however, the indication was coincident with a geometric signal in the tube, like a ding. The ECT indication response was considered a complex signal due to the presence of the ding-like signal. The indication had a voltage amplitude of 0.82V using the +Point probe. The axial length was 0.11 inches, and the maximum depth was 51%TW as sized by ETSS I28432.

Wear: Appendix B provides a listing, showing locations and measured sizes for the other mechanical tube wear indications reported during TP3-32. For AVB wear, the indication depth as measured by the bobbin probe is shown. For all other locations, the indication depth as measured by the +Point™ probe is shown.

E. Number of tubes plugged during the inspection outage for each degradation mechanism

Five (5) tubes were plugged based on the TP3-32 inspection; the tubes plugged for each degradation mechanism are summarized below in Table 2:

Table 2 – TP3-32 Tubes Plugged

SG	Tube	Degradation Mechanism	Notes
A	R1C13	Axial ODSCC (SAI) in low row U-bend	Met the 'plug-on-detection' Tech Spec criteria for plugging.
B	R18C87	Volumetric indication in the freespan	Preventively plugged due to a volumetric (VOL) indication reported at 02H+3.15".
C	R35C49	AVB Wear	Met the '≥40%TW' Tech Spec criterion for plugging at locations AV3 and AV4. Tube was stabilized as well.
	R33C43, R34C31	AVB Wear	Tubes had unusually high growth. Preventively plugged to provide additional margin until the next full-scope SG inspection.

F. Number and percentage of tubes plugged to date, and the effective plugging percentage in each steam generator

The number and percentage of SG tubes plugged to-date, and the effective plugging percentage in each SG are summarized in Table 3.

Table 3 - Tubes plugged to-date and effective plugging percentage

	SG-A	SG-B	SG-C	Total
Tubes Plugged	51	84	66	201
Percent Plugged	1.59%	2.61%	2.05%	2.08%

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G. Results of Condition Monitoring, including the results of tube pulls and in-situ testing

All indications found in TP3-32 satisfy the condition monitoring (CM) requirements of NEI 97-06 Rev 3 and Turkey Point Technical Specifications for structural and leakage integrity. No indication exceeded the structural limits. The tubes identified for plugging were screened against the in-situ test selection criteria contained in the EPRI SGMP Steam Generator In-Situ Pressure Test Guidelines Rev 5 and provided for Turkey Point Unit 3 conditions. None of the tubes identified for plugging met the requirements for in-situ pressure testing, and no tube pulls were performed.

1. The axial ODSCC tube indication in the low row U-bend (described in Section D of this report) was assessed for CM and for in-situ testing. A lookback review of prior +Point™ probe ECT inspection data (2017) showed a smaller size indication at this location. This was not reported then by the analysis groups - likely due to distortion by the geometric signal. The 2010 +Point™ probe inspection results showed an even smaller indication, distorted by the geometric signal. The 2004 +Point™ probe inspection data showed no evidence of tube wall degradation at this location. Line-by-line depth profiling was also completed for this indication using the guidance in ETSS 28432.1. The 95/50 predicted burst pressure exceeded 7,000 psi which is well above the 3xNODP pressure differential of 4,542 psi for Turkey Point Unit 3. The ODSCC indication fell below the screening limits for burst and leakage; therefore, structural integrity requirements were met.
2. The maximum observed AVB wear indication (48%TW) in TP3-32 was less than the CM limit lines for both burst and leakage requirements. The maximum wear indication depths at TSP and FDB locations were 19% and 17%, respectively. These indications fell well below their respective CM limit curves. The freespan volumetric wear indication identified in tube R18C87 (02H+3.15") in SG-3B had a depth of 23%TW and fell below the CM limit curve. No FO wear at the TTS was identified in TP3-32. Leakage potential for accident conditions for the small shallow indications is negligible. Therefore, wear at AVB, TSP and FDB locations, and the freespan volumetric indication met the acceptance criteria for burst and leakage integrity.
3. Channelhead Components Visual Inspection:
 - Tube Plug Inspection: During the inspection of tube plugs in TP3-32, all installed plugs were confirmed to be in their correct location. In addition, all plugs were found to be dry; no dripping plugs were identified. No degradation or visible signs of leakage were noted on the plugs during the visual inspection.
 - Other Channelhead Inspections: Visual inspection of various channelhead components were performed to identify degradation per guidance in Westinghouse NSAL 12-1 Rev 1, "Steam Generator Channel Head Degradation". Areas inspected include the divider plate-to-channelhead weld, the channelhead-to-tubesheet girth weld seam region, the divider plate, and all clad surfaces of the channelhead bowl and tubesheet. No degradation of the channelhead components was found.
4. Secondary-side Inspections and Maintenance:
 - A total of 266 lbs. of sludge was removed from the three SGs based on upper bundle flush and sludge lancing in TP3-32 (85, 110 and 71 lbs. in SGs A, B and C, respectively). The TTS locations of legacy FOs were visually inspected, and 4 newly-identified objects were removed during TTS FOSAR. Two of the FOs (small-grade wire in SG-B, piece of scaffold wire in SG-A) were in the inner bundle (kidney region) of the CL. The other 2 FOs (machine curl, flexitallic gasket) were found in the peripheral region in the HL of SG-C. No tube damage was visually observed in any SG during FOSAR activities. An evaluation is in place for all irretrievable FOs that have the potential to cause tube damage. Upper tube-bundle visual inspection performed on all SGs through the uppermost TSP revealed that the

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broached openings in the TSPs were not occluded. Pieces of scale were also observed on the TSPs. The inspection probe was lowered to other TSPs (through the flow slots) to as far as the 3rd TSP; this inspection revealed that the quatrefoil openings were free/clear of debris. No degradation was noted.

- Upper Internals Inspection: Visual inspections performed in all SGs (for erosion/corrosion, mechanical damage, foreign material and unusual conditions) included the moisture separators, swirl vanes, feedring and J-nozzles. No erosion or corrosion was noted on the separators or swirl vanes. A minimal amount of scouring was observed inside some of the J-tubes at the interface with the feedring; these have been noted previously and do not appear to have changed. The welds of all steam drum components were noted to be intact and no degradation was found.

H. Primary-to-secondary leakage rate observed in each SG during the previous cycle

No primary-to-secondary leakage was observed during the previous 3 fuel cycles (cycles 29, 30 and 31) since the last SG inspection.

I. Calculated accident induced leakage rate

As described in the H* alternate repair criteria (ARC) for the Turkey Point Plant³, the accident induced leakage rate from the portion of the tubes below 18.11 inches from the TTS is calculated from any observed normal operating leakage that cannot be attributed to a source other than the tubesheet expansion region. For Turkey Point Unit 3, the maximum operational primary-to-secondary leakage rate from the portion of the tubes below 18.11 inches from the top of the tubesheet is determined by multiplying any normal operating leakage by a factor of 1.82 to determine the accident induced leakage rate. Since no operational primary-to-secondary leakage has been observed (per section H of this report), the calculated accident induced leakage rate is zero.

J. Results of monitoring for tube axial displacement (slippage)

A condition for licensing H* was to monitor for tube slippage within the tubesheet region. Monitoring for tube slippage was completed during the TP3-32 inspections. No tube slippage was reported.

³ Turkey Point Nuclear Generating Station Unit Nos. 3 and 4 - Issuance of Amendments Regarding Permanent Alternate Repair Criteria for Steam Generator Tubes (TAC NOS. ME8515 and ME8516); ADAMS Accession No. ML12292A342

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APPENDIX A - Additional Information

SG Reports in the 4th ISI Period

EOC #	Outage	ADAMS Accession No.
EOC-28	TP3-29	ML17325A998
EOC-29	TP3-30	Skip
EOC-30	TP3-31	Skip (Covid-19, ML20095J926)

Abbreviations and Acronyms:

ARC	Alternate Repair Criteria	NEI	Nuclear Energy Institute
AVB	Anti Vibration Bar	NSAL	Nuclear Safety Advisory Letter
BAC	Baffle plate cold	OD	Outside Diameter
BAH	Baffle plate hot	EXP	Over-expansion
BLG	Bulge	PLP	Possible Loose Part
CL	Cold Leg	PWSCC	Primary Water SCC
CM	Condition Monitoring	SCC	Stress Corrosion Cracking
DNG	Ding	SG	Steam Generator
DNT	Dent	SGMP	SG Management Program
ECT	Eddy Current Testing	TEC	Tube End Cold
EFPM	Effective Full Power Months	TEH	Tube End Hot
EFPY	Effective Full Power Years	TS	Tubesheet
EPRI	Electric Power Research Institute	TSC	Tubesheet Cold
ETSS	Exam Technique Spec Sheet	TSH	Tubesheet Hot
FDB	Flow Distribution Baffle	TSP	Tube Support Plate
FO	Foreign Object	TTS	Top of Tube Sheet
FOSAR	Foreign Object Search and Retrieval	TW	Through Wall
HL	Hot Leg	VOL	Volumetric indication (used to report freespan wear in TP3-32)
ISPT	In-Situ Pressure Test		

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Appendix B – TP3-32 Listing of Wear Indications

Designation used for tube supports: TSP: 01H - 06H (HL); 01C - 06C (CL). FDB: BAH or BAC. AVBs: AV1 - AV4

Note: +Point™ probe %TW values shown in the "UTIL 1" field

SG-3A

Bobbin Wear at AVB's 20-100%

ROW	COL	VOLTS	IND	%TW	LOCATION
28	59	1.06	TWD	22	AV2 -0.05
30	52	0.97	TWD	21	AV3 -0.21
31	44	0.97	TWD	21	AV3 +0.36

Total Tubes : 3
Total Records: 3

Bobbin Wear at AVB's 1-19%

ROW	COL	VOLTS	IND	%TW	LOCATION
9	62	0.38	TWD	10	AV4 +0.00
22	44	0.26	TWD	11	AV3 -0.50
		0.37	TWD	14	AV4 -0.13
24	10	0.29	TWD	11	AV4 -0.11
24	40	0.24	TWD	10	AV1 +0.33
		0.24	TWD	10	AV2 -0.15
25	67	0.42	TWD	11	AV2 -0.33
28	59	0.37	TWD	10	AV1 -0.21
		0.65	TWD	15	AV3 -0.35
		0.40	TWD	10	AV4 -0.11
31	13	0.18	TWD	5	AV1 +0.32
31	41	0.33	TWD	9	AV4 -0.11
31	44	0.33	TWD	9	AV3 -0.33
32	42	0.39	TWD	15	AV3 -0.47
33	43	0.28	TWD	8	AV2 -0.02
34	31	0.40	TWD	14	AV2 +0.22
34	46	0.32	TWD	13	AV3 +0.17
35	61	0.77	TWD	17	AV1 +0.17
38	27	0.41	TWD	11	AV2 +0.24
38	65	0.88	TWD	19	AV3 -0.12

Total Tubes : 16
Total Records: 20

+Point Wear (WAR) At Broached Supports 1-100% TWD

ROW	COL	VOLTS	IND	%TW	LOCATION	UTIL 1
1	7	0.11	WAR		03C -0.59	5
		0.16	WAR		03C -0.59	10
4	11	0.20	WAR		04C -0.96	8
		0.22	WAR		04C -0.96	12
9	5	0.11	WAR		02H -0.80	4
		0.11	WAR		02H -0.80	8
9	6	0.20	WAR		02C +0.88	12
11	11	0.09	WAR		02H -0.69	4
		0.10	WAR		02H -0.69	8
12	19	0.32	WAR		03H -0.69	12
		0.37	WAR		03H -0.67	17
13	4	0.08	WAR		05H -0.69	3
		0.09	WAR		05H -0.69	7
14	4	0.34	WAR		06C -0.80	13
		0.37	WAR		06C -0.80	17
15	53	0.30	WAR		04C -0.35	11
23	10	0.15	WAR		03H -0.64	6
		0.17	WAR		03H -0.64	11
33	36	0.25	WAR		03H -0.61	10
		0.27	WAR		03H -0.72	14
36	23	0.28	WAR		05C -0.64	11
		0.29	WAR		05C -0.64	15
37	24	0.10	WAR		03H -0.88	4
		0.11	WAR		03H -0.88	8
37	35	0.24	WAR		05H -0.61	10
		0.29	WAR		05H -0.67	15

Total Tubes : 14
Total Records: 26

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Appendix B – TP3-32 Listing of Wear Indications

Designation used for tube supports: TSP: 01H - 06H (HL); 01C - 06C (CL). FDB: BAH or BAC. AVBs: AV1 - AV4

Note: +Point™ probe %TW values shown in the "UTIL 1" field

SG-3B

Bobbin Wear at AVB's 20-100%

ROW	COL	VOLTS	IND	%TW	LOCATION
30	42	1.14	TWD	26	AV2 +0.25
		1.43	TWD	30	AV3 +0.07
		1.11	TWD	25	AV4 -0.23
34	59	0.93	TWD	22	AV2 +0.14
35	48	1.31	TWD	30	AV2 +0.09
		0.91	TWD	23	AV3 -0.23
		1.07	TWD	24	AV3 +0.23

Total Tubes : 3
Total Records: 7

Bobbin Wear at AVB's 1-19%

ROW	COL	VOLTS	IND	%TW	LOCATION
17	31	0.42	TWD	8	AV3 -0.40
		0.23	TWD	5	AV4 -0.27
24	9	0.36	TWD	10	AV3 +0.04
26	20	0.61	TWD	16	AV4 +0.07
26	50	0.50	TWD	14	AV4 +0.00
30	42	0.58	TWD	16	AV1 +0.00
30	43	0.26	TWD	5	AV2 +0.13
32	27	0.43	TWD	12	AV2 +0.21
32	35	0.44	TWD	9	AV4 +0.00
34	20	0.46	TWD	9	AV3 -0.49
34	31	0.32	TWD	10	AV1 +0.04
		0.56	TWD	16	AV2 +0.18
		0.71	TWD	19	AV3 +0.37
		0.36	TWD	11	AV4 +0.00
34	33	0.62	TWD	17	AV3 -0.05
34	52	0.54	TWD	16	AV4 +0.00
34	53	1.18	TWD	18	AV1 +0.09
		1.31	TWD	19	AV2 -0.13
		0.60	TWD	10	AV3 -0.42
34	59	0.46	TWD	13	AV4 +0.00
		0.36	TWD	11	AV1 +0.15
34	73	0.54	TWD	14	AV2 +0.02
35	62	0.65	TWD	11	AV1 +0.00
		0.72	TWD	12	AV2 +0.51
36	46	0.36	TWD	10	AV1 +0.28
37	32	0.37	TWD	11	AV2 +0.30
40	47	0.56	TWD	10	AV3 -0.07
41	34	0.43	TWD	8	AV2 +0.09
42	53	0.41	TWD	8	AV3 -0.26
		0.50	TWD	9	AV3 +0.18
		0.44	TWD	8	AV4 -0.02
44	37	0.22	TWD	7	AV4 +0.19
		0.22	TWD	7	AV4 -0.11
45	46	0.60	TWD	16	AV2 +0.00

Total Tubes : 23
Total Records: 34

+Point Wear (WAR) At Broached Supports 1-100% TWD

ROW	COL	VOLTS	IND	%TW	LOCATION	UTIL 1
5	45	0.32	WAR		02C +0.61	14
		0.38	WAR		02C +0.61	17
5	87	0.13	WAR		03H -0.61	5
		0.11	WAR		03H -0.64	11
7	4	0.13	WAR		02C +0.40	7
		0.22	WAR		02C +0.40	12
13	77	0.12	WAR		02H -0.83	5
		0.12	WAR		02H -0.83	9
17	60	0.14	WAR		05H -0.64	6
		0.13	WAR		05H -0.64	9
18	60	0.30	WAR		05H -0.69	12
		0.36	WAR		05H -0.61	17
21	42	0.14	WAR		03C +0.61	7
		0.16	WAR		03C +0.61	10
21	85	0.23	WAR		02H -0.91	9
		0.24	WAR		02H -0.91	13
26	41	0.25	WAR		03C +0.59	12
		0.31	WAR		03C +0.59	15
27	70	0.24	WAR		03H -0.67	10
		0.32	WAR		03H -0.59	16
28	42	0.12	WAR		03C +0.64	6
		0.14	WAR		03C +0.64	9
29	41	0.06	WAR		03C +0.61	3
		0.09	WAR		03C +0.61	7
33	73	0.12	WAR		02H -0.69	5
		0.16	WAR		02H -0.69	10

+Point VOL (Volumetric) Indications

ROW	COL	VOLTS	IND	%TW	LOCATION	UTIL 1
18	87	0.24	VOL		02H +3.15	23

Total Tubes : 1
Total Records: 1

+Point Wear (WAR) At Baffle Plates 1-100% TWD

ROW	COL	VOLTS	IND	%TW	LOCATION	UTIL 1
42	44	0.33	WAR		BAH -0.40	14
		0.39	WAR		BAH -0.40	17
45	45	0.16	WAR		BAH -0.16	8

Total Tubes : 2
Total Records: 3

Enclosure

Appendix B – TP3-32 Listing of Wear Indications

Designation used for tube supports: TSP: 01H - 06H (HL); 01C - 06C (CL). FDB: BAH or BAC. AVBs: AV1 - AV4

Note: +Point™ probe %TW values shown in the "UTIL 1" field

SG-3C

Bobbin Wear at AVB's 20-100%

+Point Wear (WAR) At Broached Supports 1-100% TWD

ROW	COL	VOLTS	IND	%TW	LOCATION	ROW	COL	VOLTS	IND	%TW	LOCATION	UTIL 1
21	38	0.64	TWD	23	AV2 +0.27	5	68	0.26	WAR		03C -0.56	10
24	59	0.56	TWD	21	AV4 +0.28			0.30	WAR		03C -0.56	15
		0.58	TWD	22	AV1 +0.05	5	69	0.29	WAR		03C -0.67	11
24	63	0.84	TWD	20	AV3 -0.20			0.27	WAR		03C -0.61	14
26	58	0.94	TWD	29	AV1 +0.21	15	82	0.37	WAR		03H -0.93	16
		0.97	TWD	30	AV2 +0.16			0.41	WAR		03H -0.93	18
		0.78	TWD	26	AV3 -0.14	18	84	0.15	WAR		05H -0.56	7
28	48	1.38	TWD	26	AV2 +0.00			0.21	WAR		05H -0.56	12
30	31	0.72	TWD	25	AV2 +0.24	20	61	0.18	WAR		04H -0.72	8
		0.78	TWD	26	AV3 +0.05			0.21	WAR		04H -0.72	12
		0.65	TWD	24	AV1 -0.26	20	62	0.21	WAR		03H -0.77	10
30	61	0.87	TWD	28	AV2 +0.09			0.26	WAR		03H -0.77	14
33	32	1.67	TWD	30	AV3 +0.16	23	71	0.20	WAR		06H -0.67	9
33	43	1.16	TWD	32	AV2 +0.09			0.21	WAR		06H -0.67	12
		1.54	TWD	37	AV3 +0.07	24	70	0.36	WAR		03H -0.83	15
33	55	0.52	TWD	20	AV3 -0.16			0.40	WAR		03H -0.83	18
34	31	0.96	TWD	30	AV2 +0.14	27	21	0.25	WAR		02H -0.88	11
		1.59	TWD	37	AV3 -0.12			0.29	WAR		02H -0.88	15
34	41	0.92	TWD	21	AV1 +0.26	29	71	0.12	WAR		03H -0.80	6
		1.20	TWD	25	AV2 -0.07			0.13	WAR		03H -0.80	9
		1.29	TWD	26	AV3 -0.16	29	73	0.23	WAR		02H -0.75	11
		1.04	TWD	23	AV4 -0.11			0.27	WAR		02H -0.75	14
34	44	1.17	TWD	32	AV3 -0.16	32	19	0.12	WAR		03H -0.56	6
		0.78	TWD	26	AV4 +0.00	35	68	0.12	WAR		03H -0.72	6
34	52	0.78	TWD	26	AV3 -0.07			0.16	WAR		03H -0.72	10
35	35	0.56	TWD	21	AV4 +0.07	36	68	0.18	WAR		03H -0.67	9
		0.92	TWD	28	AV3 +0.00			0.23	WAR		03H -0.67	13
35	36	0.70	TWD	24	AV2 +0.00	38	34	0.25	WAR		03H -0.72	11
		0.63	TWD	23	AV3 +0.00			0.28	WAR		03H -0.72	14
35	49	3.20	TWD	46	AV3 -0.14	38	44	0.19	WAR		04H -0.67	9
		3.65	TWD	48	AV4 -0.05			0.23	WAR		04H -0.67	13
38	61	0.63	TWD	23	AV2 +0.12	38	56	0.41	WAR		04H -0.67	17
38	65	0.88	TWD	28	AV4 +0.00			0.44	WAR		04H -0.67	19
		0.69	TWD	25	AV3 +0.00	Total Tubes : 17						
		1.00	TWD	30	AV2 +0.12	Total Records: 33						
38	71	0.85	TWD	20	AV3 -0.12							
39	54	1.45	TWD	36	AV3 -0.12							
		1.07	TWD	31	AV4 +0.05							
39	55	0.49	TWD	20	AV2 +0.05							
40	25	1.67	TWD	30	AV3 -0.05							
		1.40	TWD	27	AV2 +0.26							
40	44	0.83	TWD	27	AV4 -0.11							
40	55	0.93	TWD	21	AV4 -0.09							
		1.30	TWD	25	AV3 +0.00							
42	35	0.90	TWD	20	AV4 -0.09							

Total Tubes : 26
Total Records: 45

Enclosure

Appendix B – TP3-32 Listing of Wear Indications

Designation used for tube supports: TSP: 01H - 06H (HL); 01C - 06C (CL). FDB: BAH or BAC. AVBs: AV1 - AV4

Note: +Point™ probe %TW values shown in the "UTIL 1" field

SG-3C

Bobbin Wear at AVB's 1-19%

ROW	COL	VOLTS	IND	%TW	LOCATION	ROW	COL	VOLTS	IND	%TW	LOCATION
13	39	0.23	TWD 7	AV3	-0.10	36	73	0.25	TWD 7	AV3	+0.14
18	26	0.24	TWD 12	AV2	-0.17	37	26	0.29	TWD 8	AV4	-0.18
		0.22	TWD 11	AV3	-0.50	37	27	0.26	TWD 8	AV3	-0.10
20	37	0.26	TWD 7	AV2	+0.04	37	28	0.55	TWD 14	AV3	-0.20
		0.31	TWD 9	AV3	-0.11			0.82	TWD 19	AV4	-0.02
21	38	0.39	TWD 17	AV3	-0.07	37	29	0.60	TWD 15	AV4	-0.27
21	62	0.28	TWD 8	AV1	-0.11	37	39	0.40	TWD 17	AV3	+0.00
		0.34	TWD 9	AV2	-0.05	38	25	0.34	TWD 15	AV3	-0.15
23	45	0.44	TWD 12	AV3	-0.09	38	27	0.23	TWD 11	AV4	-0.02
23	49	0.24	TWD 11	AV3	-0.11	38	50	0.26	TWD 12	AV2	+0.12
24	11	0.33	TWD 14	AV4	-0.21	38	59	0.19	TWD 9	AV2	+0.10
24	12	0.27	TWD 12	AV1	+0.11	38	61	0.45	TWD 18	AV1	+0.23
24	43	0.32	TWD 9	AV1	+0.17	38	63	0.41	TWD 11	AV2	+0.24
		0.42	TWD 12	AV2	+0.16	38	66	0.32	TWD 9	AV3	+0.05
24	57	0.40	TWD 11	AV2	-0.04			0.27	TWD 8	AV4	+0.02
24	59	0.47	TWD 19	AV3	+0.21	39	24	0.25	TWD 7	AV3	-0.02
		0.44	TWD 18	AV2	+0.07	39	28	0.22	TWD 7	AV4	-0.07
24	63	0.36	TWD 10	AV2	+0.27	39	68	0.18	TWD 9	AV2	+0.07
25	62	0.84	TWD 19	AV3	+0.23	40	28	0.27	TWD 13	AV3	+0.00
		0.68	TWD 16	AV2	+0.00			0.34	TWD 15	AV4	+0.05
26	49	0.21	TWD 6	AV3	-0.16	40	44	0.42	TWD 18	AV3	+0.05
26	82	0.18	TWD 9	AV3	-0.12	40	46	0.31	TWD 14	AV4	-0.14
27	83	0.18	TWD 6	AV2	+0.09	40	57	0.29	TWD 8	AV4	-0.21
28	12	0.28	TWD 13	AV1	+0.09			0.26	TWD 7	AV3	+0.09
28	48	0.57	TWD 14	AV3	+0.07	40	59	0.18	TWD 9	AV3	+0.00
		0.29	TWD 8	AV1	+0.04	42	31	0.79	TWD 19	AV3	-0.07
28	60	0.31	TWD 14	AV2	+0.00	42	35	0.33	TWD 9	AV3	-0.17
29	14	0.26	TWD 12	AV3	-0.05	42	43	0.35	TWD 10	AV1	+0.16
		0.23	TWD 11	AV2	+0.09	42	55	0.30	TWD 8	AV1	+0.22
30	18	0.28	TWD 13	AV3	-0.14	43	33	0.42	TWD 15	AV3	-0.25
		0.47	TWD 19	AV1	-0.07	43	34	0.31	TWD 9	AV3	-0.10
30	30	0.50	TWD 13	AV4	-0.05	43	35	0.47	TWD 19	AV3	-0.10
		0.31	TWD 9	AV3	-0.26	44	36	0.46	TWD 19	AV3	+0.00
		0.28	TWD 8	AV2	+0.00	44	37	0.35	TWD 10	AV3	+0.00
		0.34	TWD 9	AV1	+0.13						
30	43	0.32	TWD 9	AV1	+0.00						
		0.36	TWD 10	AV2	+0.02						
30	51	0.44	TWD 18	AV2	+0.23						
30	60	0.23	TWD 11	AV2	+0.00						
30	61	0.21	TWD 10	AV4	-0.19						
31	15	0.42	TWD 11	AV1	+0.20						
31	80	0.20	TWD 6	AV3	-0.21						
33	24	0.31	TWD 9	AV3	-0.34						
		0.32	TWD 9	AV4	-0.11						
33	28	0.49	TWD 13	AV3	-0.07						
33	31	0.27	TWD 8	AV2	+0.25						
		0.68	TWD 17	AV3	+0.05						
		0.23	TWD 7	AV4	-0.14						
33	32	0.72	TWD 17	AV2	+0.17						
		0.53	TWD 14	AV4	-0.02						
33	38	0.36	TWD 16	AV3	+0.04						
33	45	0.26	TWD 8	AV2	+0.07						
33	46	0.32	TWD 9	AV3	-0.19						
33	54	0.35	TWD 10	AV4	-0.14						
		0.25	TWD 7	AV3	+0.02						
33	55	0.27	TWD 13	AV4	-0.12						
33	63	0.32	TWD 9	AV4	-0.02						
33	74	0.19	TWD 6	AV4	-0.02						
34	32	0.33	TWD 15	AV3	-0.12						
34	38	0.23	TWD 7	AV3	-0.09						
		0.30	TWD 9	AV4	+0.07						
34	45	0.29	TWD 13	AV2	+0.07						
34	52	0.45	TWD 19	AV4	+0.23						
34	56	0.28	TWD 13	AV3	-0.10						
35	51	0.47	TWD 12	AV2	+0.16						
35	52	0.48	TWD 13	AV3	-0.17						
35	54	0.74	TWD 17	AV2	-0.37						
		0.34	TWD 9	AV1	+0.05						
35	57	0.30	TWD 14	AV2	+0.07						
36	54	0.25	TWD 12	AV2	-0.09						
36	56	0.22	TWD 11	AV3	-0.12						

Total Tubes : 81
Total Records: 105