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Page 1 of 1

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Transducer Abrasion Test Results in Support of Ultrasonic Inspection of Double-Shell Tanks

C. E. Jensen
CH2M Hill Hanford Group Inc.
Richland, WA 99352
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Abstract: Identification of questionable ultrasonic data on 241-AN-105 lead to suggestions that the ultrasonic transducers were not properly installed causing excessive wear. This report documents the testing to validate the source of the improper data as being transducer wear. The results of the testing indicated that the wear influenced the data results and subsequently the analysis of the corrosion on the subject DST.

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TRANSDUCER ABRASION TEST IN SUPPORT OF DOUBLE-SHELL TANKS

C.E. Jensen

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Transducer Abrasion Test Results in Support of Ultrasonic Inspection of Double-Shell Tanks

March 2003

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TERMS

COGEMA Engineering	COGEMA Engineering Corporation
DST	double-shell tank
FY	fiscal year
UT	Ultrasonic Testing

EXECUTIVE SUMMARY

Background

Through fiscal year (FY) 1999, ultrasonic testing (UT) examination of six double-shell tanks (DST) was completed to meet the integrity requirements of Washington Administrative Code, Chapter 173-303, Dangerous Waste Regulations. A comparison of the results of the UT inspections performed on DST 241-AN-105 in early FY 1999 with the results of a reexamination in late FY 2002 revealed inconsistencies in the data, suggesting that the FY 1999 data from that tank was questionable. A reevaluation of the original FY 1999 data resulted in the conclusion that an improper equipment setup contributed to excessive transducer wear which resulted in erroneous wall thickness measurements in some areas of DST 241-AN-105. A transducer abrasion test was conducted to investigate the validity of this conclusion.

Methodology

The transducer abrasion test consisted of a single vertical 14.7 inch wide by 88 inch long scan down Plate #2 of DST 241-AP-101. Two new transducers, positioned side by side, were used for the scan: one positioned per the normal setup, being slightly recessed below the wear face of the holder, allowing the holder to ride the tank wall surface (the "normal test" setup); and one positioned in its holder so that it protruded from the end of the holder, allowing the transducer to contact the tank wall surface (the "wear test" setup). The examination investigated the effects of transducer wear on tank wall thickness measurements. Equipment normally used to inspect the DSTs, similar to that used to perform routine inspections of oil tanks and large pipelines, was used to perform the transducer abrasion test.

Results

The overall wear across the face of the "wear test" transducer was 0.020 to 0.038 inches, compared with no measurable wear (<0.001 inches) on the "normal test" transducer. The difference between the "wear test" transducer average wall thickness measurement and the "normal test" transducer average wall thickness measurement at the end of an 84 inch scan down Plate #2 was approximately -0.020 inches. This represents the amount of average wall thickness error attributed to transducer wear.

Conclusions

The results of the transducer abrasion test verified that a significant portion of the error observed in the FY 1999 inspection of DST 241-AN-105 could be attributed to transducer wear caused by allowing the transducer to ride on the tank wall surface. The additional discrepancies in the data may have been caused by different wear rates due to differences in test setup parameters and tank wall conditions. Finally, part of the error may have been the result of inappropriate adjustments in the transducer prior to calibration check, resulting in questions regarding the validity of the FY 1999 DST 241-AN-105 ultrasonic thickness mapping data.

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TRANSDUCER ABRASION TEST RESULTS IN SUPPORT OF ULTRASONIC INSPECTION OF DOUBLE-SHELL TANKS

1.0 INTRODUCTION

Through fiscal year (FY) 1999, ultrasonic testing (UT) examination of six double-shell tanks (DST) was completed to meet the integrity requirements of Washington Administrative Code, Chapter 173-303, Dangerous Waste Regulations. The results of the UT inspections performed on DST 241-AN-105 in early FY 1999 indicated that there was unexpected wall thinning and corrosion on the inner wall of Plates #1 and #2 of the primary tank (*Final Results of Double-Shell Tank 241-AN-105 Ultrasonic Inspection,* Jensen 1999). The Inspection Review Panel evaluated the wall thinning, and recommended that DST 241-AN-105 be reexamined after three years to establish an estimated corrosion rate (Internal letter 74700-99-CEJ-037, "Inspection Review Panel Evaluation of Tank 241-AN-105, Wall Thinning", Hopkins 1999).

The reexamination of DST 241-AN-105 was performed in the final quarter of FY 2002. The results of this second UT inspection were not consistent with the results from the first inspection: the vertical wall scans did not confirm the presence of wall thinning on Plates #1 and #2 – in fact, the new FY 2002 wall thickness values were greater than nominal and generally greater than those from the first inspection in FY 1999 (*Supplemental Ultrasonic Inspection Results for Double-Shell Tank 241-AN-105 – FY 2002*, Jensen 2003). This inconsistency with the earlier results prompted a reevaluation of the original FY 1999 data (Attachment 4 of Jensen 2003). One of the conclusions from the reevaluation stated that an improper equipment setup contributed to excessive transducer wear which resulted in the "thinner than actual thickness measurements" (i.e., when the transducer delay tip wears down, the equipment computer setup will read this as plate thinning). To investigate the validity of this conclusion by demonstrating the effect of transducer wear on apparent plate thickness and also quantifying the effects of transducer wear on apparent tank wall thickness measurements, a transducer abrasion test was conducted, which is the topic of this report.

2.0 METHODOLOGY

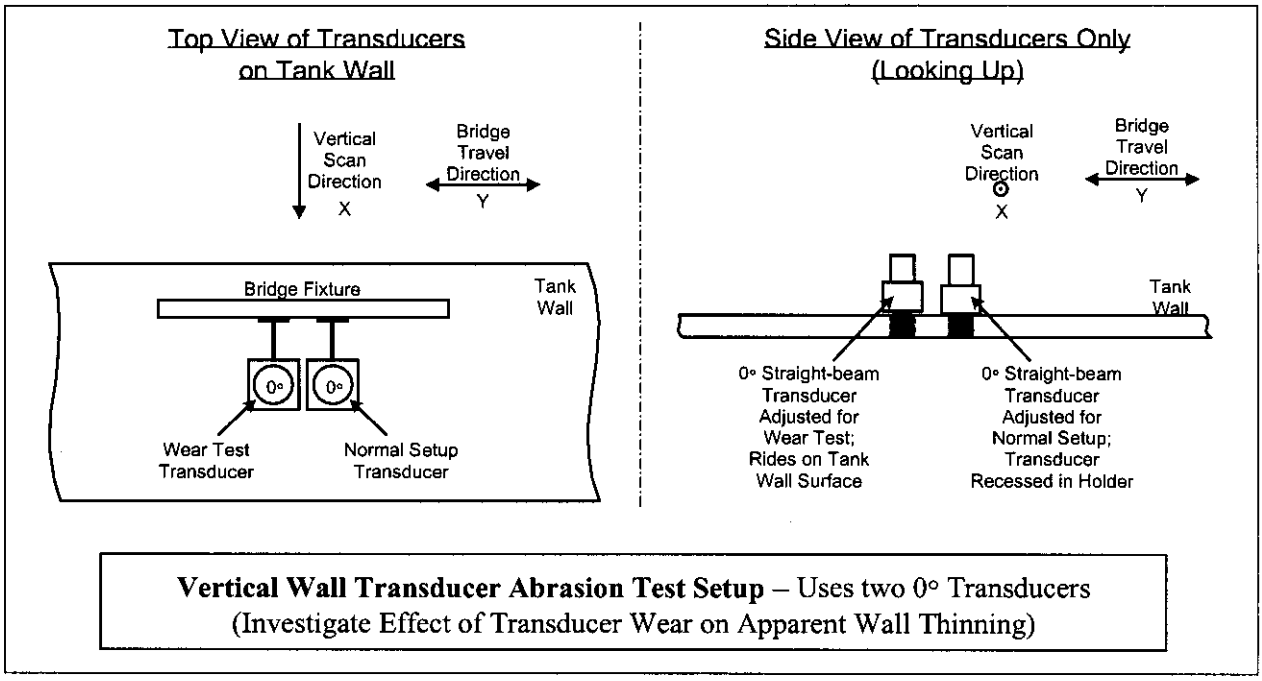
The services of COGEMA Engineering Corporation (COGEMA Engineering) were retained to perform the UT inspections and transducer abrasion test, and report the test results. The tests were performed with UT equipment provided by CH2M HILL Hanford Group, Inc. The COGEMA Engineering procedure that establishes the method, equipment and requirements for the UT measurements and flaw detection is *Automated Ultrasonic Examination for Corrosion and Cracking*, COGEMA-SVUT-INS-007.3, Rev. 1 (Attachment 1 of Jensen 2003).

Equipment normally used to inspect the DSTs is similar to that used to perform routine inspections of oil tanks and large pipelines, and was used to perform the transducer abrasion test. The UT sensors (straight beam transducers), as is normally done, were mounted on a remote-controlled crawler that used magnetic wheels to affix itself and move about on the tank walls. The entire UT inspection system consists of the UT crawler with its traveling bridge and transducers, an overview camera, a side-view camera, the data acquisition control center, the

riser enclosure, and the crawler deployment tool. Details of these components and examination setups can be found in the UT inspection reports (Jensen 1999 and Jensen 2003).

For the transducer abrasion test, a single vertical scan down a tank wall plate was performed. Two new transducers and two new holders were used for the scan. One transducer was positioned per the normal setup, being slightly recessed below the wear face of the holder, allowing the holder to ride the tank wall surface (the "normal test" setup). The second transducer, located 1.5 inches (center-to-center) from the first transducer, was positioned in its holder so that it protruded from the end of the holder, allowing the transducer to contact the tank wall surface (the "wear test" setup). This examination setup is illustrated in Figure 2-1.

Figure 2-1. Schematic of UT Setup for Vertical Wall Transducer Abrasion Test



Other than the transducer abrasion test setup, all data collection and analysis were conducted in accordance with the COGEMA Engineering procedure *Automated Ultrasonic Examination For Corrosion And Cracking*, COGEMA-SVUT-INS-007.3, Rev. 1.

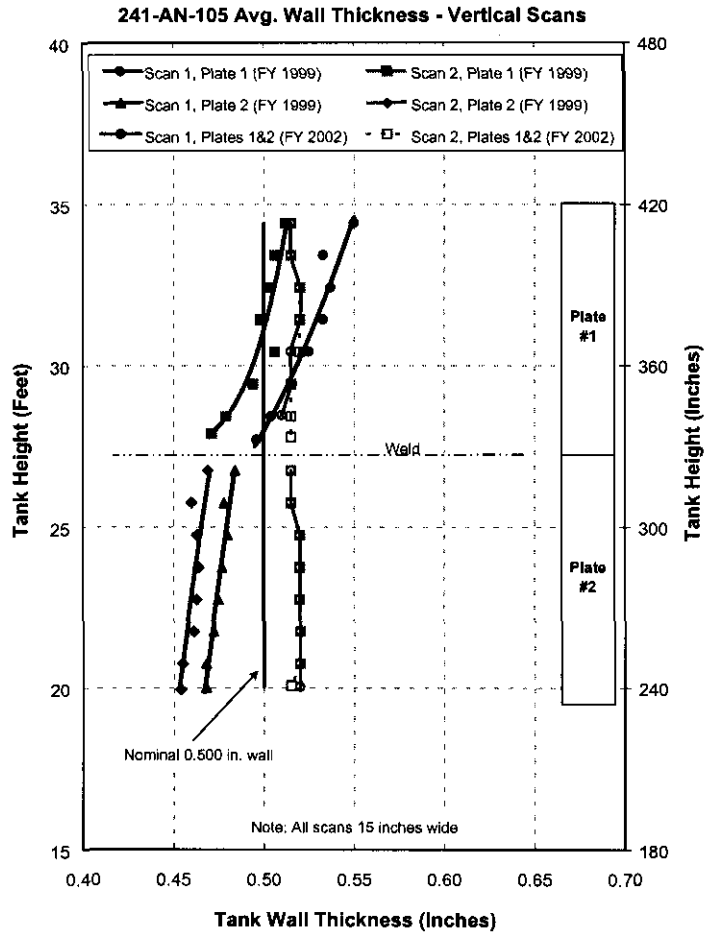
3.0 RESULTS AND DISCUSSION

The previous UT data from the tank wall measurements and the recent UT data from the transducer abrasion test measurements were collected and examined by COGEMA Engineering's Limited Level II certified inspector and Level III certified inspector. The UT data were interpreted by the Level III inspector.

The FY 1999 and FY 2002 UT inspections on DST 241-AN-105 were made at several locations on the primary wall plates and welds. The questionable results concerned Plates #1 and #2, each

approximately 92 inches tall and 0.5 inch nominal thickness. The raw data sheets and summary data tables for the original examination and the reexamination are in the respective UT inspection reports (Jensen 1999 and Jensen 2003). Figure 3-1 shows the results of those DST 241-AN-105 vertical scans of the primary tank wall encompassing Plates #1 and #2.

Figure 3-1. Vertical Scan Data Average Wall Thickness (FY 1999 & FY 2002)



The wall thickness measurements plotted on Figure 3-1 are typically the averages of all data collected over 12 inch long by 15 inch wide scan areas. Exceptions were the last points of each plate scan, which were averaged over approximately 1 to 7 inch long scans, depending on the overall plate scan lengths (ranging from approximately 85 to 91 inches for the FY 1999 and FY 2002 scans discussed in this report). Scans 1 and 2 are adjacent to each other. Both scans on a given plate were on the same piece of steel (not separated by a vertical weld).

The inconsistencies in the Figure 3-1 data are apparent:

- The FY 1999 measurements would be expected to be greater than or at least statistically equal to the FY 2002 measurements (i.e., the present wall thickness should not be greater than the plate thickness measurements of FY 1999).

- The two FY 1999 vertical scan measurements were self-inconsistent with the average reported wall thickness, offset from scan 1 and scan 2, and varying by as much as 0.038 inch at the same elevation.

- The FY 2002 plate thickness did not show any plate thinning as elevation decreased.

In addition, three FY 1999 horizontal scan measurements across Plate #2 were inconsistent with the corresponding FY 1999 intersecting vertical scan measurements. The vertical wall thickness measurements were less than 0.480 inch while the horizontal measurements were greater than 0.520 inch. The FY 2002 intersecting vertical and horizontal scan wall thickness measurements were self-consistent. Both the vertical and horizontal wall thicknesses averaged between 0.516 and 0.519 inch. (Jensen 2003).

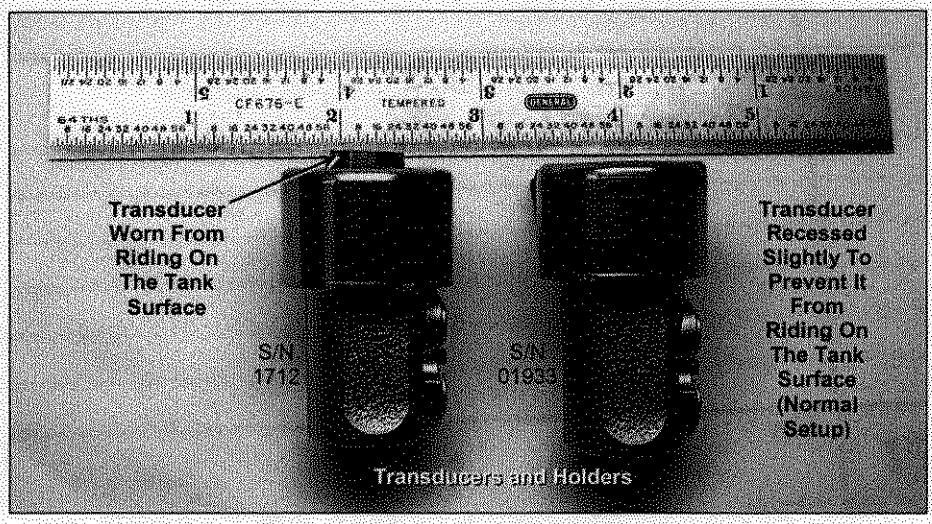
The discrepancies in the FY 1999 measurements prompted a review of the data and data collection technique used in FY 1999. The review was conducted by W. H. Nelson, COGEMA Engineering's Level III certified inspector and by J. B. Elder, Level III certified independent reviewer (Attachment 4 of Jensen 2003).

They concluded that some of the data collected by the UT Level II inspector in FY 1999 was outside the procedural tolerance. There were indications that the Level II inspector was incorrectly setting the transducer to ride on the tank wall surface instead of allowing the holder to ride the surface. This improper setup, they concluded, allowed the transducer to wear excessively, causing the system to give apparent progressively thinner than actual thickness measurements.

This conclusion was the basis for conducting the transducer abrasion test. The transducer abrasion test was completed in January 2003 in DST 241-AP-101. This tank was chosen as a matter of convenience. The specific tank was inconsequential since the examination was investigating apparent wall thickness changes as a function of transducer wear, and not absolute tank wall thickness of a particular tank. Plate #2 below Riser 031 in DST 241-AP-101 (also approximately 92 inches tall and 0.5 inch nominal thickness) was scanned once vertically using two side-by-side transducers. One transducer was set up to allow the wear face of its holder to contact the tank wall surface (the normal setup), while the other transducer was set up to allow the transducer to contact the surface.

The overall length of the "wear test" transducer/holder assembly was 1.868 inches before the test and 1.848 inches after the test. There was also an additional 0.018 inches of angled wear across the transducer face. The overall wear across the transducer was therefore 0.020 to 0.038 inches. This compares with no measurable wear (<0.001 inches) on the "normal test" transducer face as measured before and after the test, and only a few mils of normal wear on the wear face of the transducer holder. A photograph of the two transducer assemblies following the test is shown in Figure 3-2.

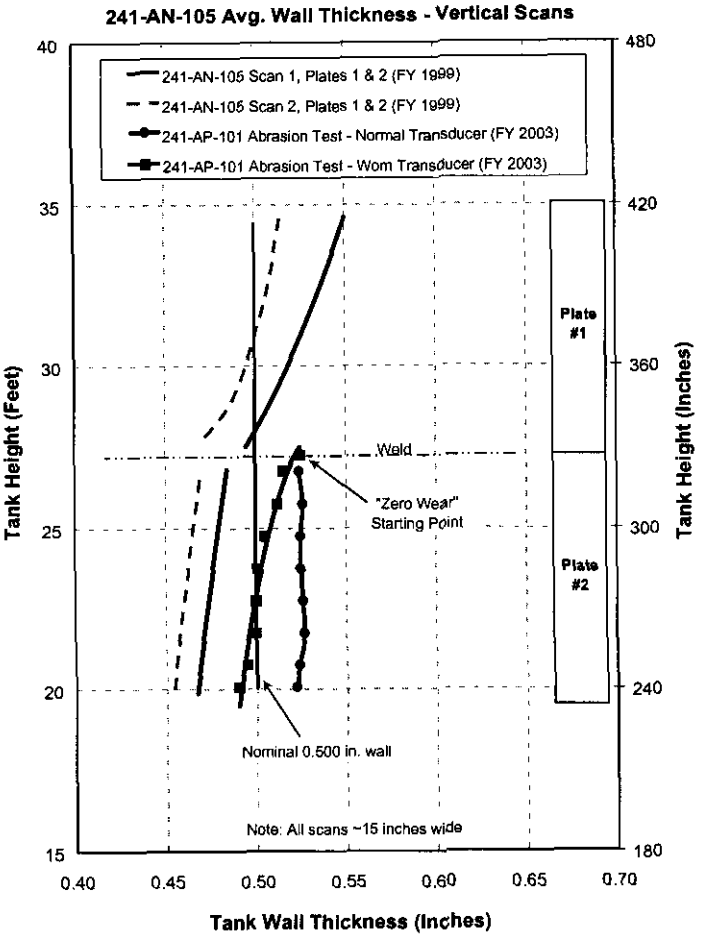
Figure 3-2. Side View of Transducer Assemblies Used in Transducer Abrasion Test



The calibration sheet for the abrasion test transducers and the UT data report sheets are included in Appendix A. The data were interpreted by COGEMA Engineering's Level III certified inspector, and also examined by J. B. Elder, Level III certified Nondestructive Examination Inspector. Mr. Elder independently evaluated the data and concurred with COGEMA Engineering's interpretation (Appendix A).

The results of the test scans, along with the earlier questionable FY 1999 results for DST 241-AN-105, are illustrated in Figure 3-3. Note that the starting wall thickness value as measured by the "wear test" transducer was 0.525 inches. This value was <u>not</u> an average over a 12 inch long scan, and is designated as the "Zero Wear" point in Figure 3-3. However, when correlating the transducer abrasion test results with the FY 1999 results, the starting wall thickness values for all plate scans were determined from the averages of the data collected over the first 12 inch long scans. For the transducer abrasion test, this was 0.515 inches. In addition, since the final full 12 inch long scan ends at 84 inches for all plates, the remaining shorter scan segments (varying from approximately 1 to 7 inches) were not included when comparing the transducer abrasion test data with the FY 1999 data.

Figure 3-3. Transducer Abrasion Test Average Wall Thickness Measurements



A summary of the transducer abrasion test results is given in Table 3-1.

Table 3-1. Summary of Transducer Abrasion Test Results

Scan Description	Transducer S/N	Test Type	Starting Wall Thickness	Starting Average Wall Thickness (0 - 12 inch scan)	Ending Average Wall Thickness (72 - 84 inch scan)	[Ending – Starting] Wall Thickness Difference	Worn Transducer Differential
Tank 241-AP-101, Riser 031, 14.7 inch Wide Vertical Scan Down Plate #2	01933	Normal	Wall thickness nearly constant, averaging 0.525 inches over 84 inch scan			0.00 in	–
	1712	Wear	0.525 in	0.515 in	0.495 in	-0.030 in (1) -0.020 in (2)	-0.030 in (1) -0.020 in (2)

(1) Based on the "Starting Wall Thickness" value.

(2) Based on the "Starting Average Wall Thickness" value.

The average difference between the "wear test" transducer wall measurement and the "normal test" transducer wall measurement at the end of the Plate #2 scan was approximately -0.030 inches, based on the initial value of 0.525 inches. When only the starting and ending 12 inch scan averages are considered, as is the case for actual scan data, then the average difference decreased to -0.020 inches since an average of -0.010 inches of error evidently occurred during the first 12 inch scan. This value of -0.030 inches (or -0.020 inches perceived) represents the amount of average wall thickness error occurring during the first 84 inches of the vertical scan of Plate #2 in DST 241-AP-101 that is attributed to transducer wear.

Table 3-2 shows the starting and ending wall thickness measurements for Plates # 1 and #2 for the DST 241-AN-105 FY 1999 and FY 2002 data that were plotted in Figure 3-1. All vertical wall scans were 84 inches in length.

Table 3-2. Plates # 1 and #2 Wall Thickness Data for DST 241-AN-105 (FY 1999 and FY 2002)

Scan Description			Starting Average Wall Thickness (0 - 12 inch scan)	Ending Average Wall Thickness (72 - 84 inch scan)	[Ending – Starting] Difference
DST 241-AN-105 (FY 1999) [1]	Scan 1	Plate #1	0.550 in	0.504 in	-0.046 in
		Plate #2	0.484 in	0.468 in	-0.016 in
	Scan 2	Plate #1	0.512 in	0.479 in	-0.033 in
		Plate #2	0.469 in	0.455 in	-0.014 in
DST 241-AN-105 (FY 2002) [2]	Scan 1	Plate #1	0.515 in	0.510 in	-0.005 in
		Plate #2	0.515 in	0.520 in	+0.005 in
	Scan 2	Plate #1	0.515 in	0.515 in	0.000 in
		Plate #2	0.515 in	0.520 in	+0.005 in

[1] FY 1999 data considered questionable.
[2] FY 2002 data considered good.

The FY 1999 results from Table 3-2 indicate that there was between -0.014 inches and -0.046 inches differences in measured average wall thicknesses between the start and end of the four 84 inch scans from FY 1999. The actual wall thickness values at the start and end of scans 1 and 2 should have been approximately the same since the more recent FY 2002 data showed approximately the same starting and ending wall measurement values for the same scan locations (Figure 3-1 and Table 3-2).

Although the transducer abrasion test confirms that excessive probe wear causes results similar to those obtained in DST 241-AN-105 in FY 1999, the "-0.020 inch" (or "-0.030 inch") value can not be directly applied to that data. Figure 3-3 and Table 3-2 shows that there are differences in the measurement error for different scans. Some of the differences between the actual error and the error predicted by the transducer abrasion test are probably due to differences in test setup parameters (e.g., scan rate or transducer spring force) and tank wall conditions (e.g., surface roughness). Also, as stated in the review of the FY 1999 data and data collection technique (Attachment 4 of Jensen 2003), there were indications that the transducer may have

been adjusted prior to calibration check. This would also have contributed to some error in reported wall thickness values, and may also be related to other unexplained behavior pertaining to the FY 1999 curves for DST 241-AN-105.

Examination of the FY 1999 results for DST 241-AN-105 in Figure 3-3 shows that the curves representing the two scans are continuous across Plates #1 and #2 (the Plate #2 data continues approximately where the Plate #1 data leaves off). However, as seen in Figure 3-3 and in Table 3-2, Plate #1 experienced more than twice the apparent wall thinning as Plate #2. Possible factors that could have contributed to these variations include: rougher surface condition on Plate #1 compared to Plate #2; repositioning of the transducer in the holder when the crawler was driven across the horizontal weld between Plates #1 and #2; improper adjustments to the transducer and equipment setup prior to calibration checks; and questionable calibration practices.

Referring to the calibration sheet for the transducer abrasion test (Appendix A), the first and third columns under "Calibration Checks" represent the "normal test" transducer pre- and post-scan calibrations, while the second and fourth columns represent the "wear test" transducer calibrations. Note the significant changes in the "wear test" transducer post-scan calibration values in the fourth column. This is indicative of a transducer that has just generated erroneous data. However, the calibration sheet for the three days that the two FY 1999 scans were performed on Plates #1 and #2 showed nearly identical pre- and post-scan calibration values, indicating nothing out of the ordinary.

According to the data report sheets for the FY 1999 data (Attachment 2 of Jensen 1999), Scan 1 for Plates #1 and #2 was performed on two consecutive days, but Scan 2 for both plates was performed on the same day. Since pre-scan and post-scan calibration checks are performed daily, there were no calibration checks performed between the Scan 2 / Plate #1 and Scan 2 / Plate #2 inspections. But, the post-scan calibration check at the conclusion of the Scan 1 / Plate #1 inspection should have indicated that the end-of-test wall thickness values were in error. In fact, all post-scan calibration checks should have indicated that the wall thickness values were in error; and all pre-scan calibration checks, if performed properly, should have resulted in similar, accurate initial wall thickness values. Regardless of the lack of atypical information on the FY 1999 calibration sheet, the FY 2002 results and the transducer abrasion test demonstrate that the FY 1999 results for DST 241-AN-105 are erroneous.

4.0 CONCLUSIONS

A transducer abrasion test was performed to investigate the effects of transducer wear on tank wall thickness measurements. The results of the test verified that a significant portion of the error observed in the FY 1999 inspection of DST 241-AN-105 could be attributed to transducer wear caused by allowing the transducer to ride on the tank wall surface. The additional discrepancies in the data may have been caused by different wear rates due to differences in test setup parameters and tank wall conditions. Finally, part of the error may have been the result of inappropriate adjustments in the transducer prior to calibration check. Examination of the calibration sheets resulted in questions regarding the validity of the DST 241-AN-105 FY 1999 thickness mapping data.

5.0 REFERENCES

Hopkins, H. R., 1999, "Inspection Review Panel Evaluation of Tank 241-AN-105, Wall Thinning" (internal letter 74700-99-CEJ-037 from Plant Engineering to D. I. Allen, August 24, 1999), Lockheed Martin Hanford Corporation, Richland, Washington.

Jensen, C. E., 1999, *Final Results of Double-Shell Tank 241-AN-105 Ultrasonic Inspection*, HNF-4816, Rev. 0, Lockheed Martin Hanford Corporation, Richland, Washington.

Jensen, C. E., 2003, *Supplemental Ultrasonic Inspection Results for Double-Shell Tank 241-AN-105 – FY 2002*, RPP-13259, Rev. 0, CH2M HILL Hanford Group, Inc., Richland, Washington.

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APPENDIX A

COGEMA "AUTOMATED ULTRASONIC THICKNESS CALIBRATION AND DATA REPORT" SHEETS

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APPENDIX A

COGEMA "AUTOMATED ULTRASONIC THICKNESS CALIBRATION AND DATA REPORT" SHEETS

4/00

AUTOMATED ULTRASONIC THICKNESS DATA REPORT

Riser# 31

LOCATION: 200 E TANK FARM	SYSTEM: PSP-4	EXAM START: 1/2/03 0830	EXAM END: 15:50	JOB #: 03-41
COMPONENT ID: TRANSDUCER WEAR TEST		EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED		NOM. THICKNESS: .500 -
CONFIGURATION: PLATE	TO	CALIBRATED RANGE: .3" TO 1.0"		TEMP: AMB °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 88.4		REF. LEVEL CORRECTION (TRANS. CORR): Ø DB		
PROCEDURE: COGEMA-SVUT-SNS-007.3	REV: 1	MATERIAL TYPE: ☐ SS ☒ CS OTHER ____		CONDITION
FILE NAME/ITEM#: WEAR TEST		TRANSDUCER: ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE ____		
X_0 REF. POINT (L_0): 1" BELOW HORZ. WELD	Y_0 REF. POINT (W_0): ℄ OF 24" RISER	SCAN WIDTH: 14.7"		

PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	MAX. THK.
0-12					.524"	.515"		.530"
12-24					.526"	.520"		.530"
24-36					.525"	.521"		.530"
36-48					.525"	.520"		.530"
48-60					.526"	.511"		.530"
60-72					.527"	.522"		.530"
72-84					.524"	.517"		.530"
84-88.4					.522"	.508"		.530"
SUMMARY								

REMARKS

Examiner	Analyst	Reviewer	Page
W D Purdy	[signature]	(N1)	
Level II Date 1/2/03	Level VI Date 1/15/03	Level ___ Date ___	___ of ___

P-Scan Limited II

PROBE #1

(N1) SEE ATTACHED LETTER FROM J.B. ELDER

4/00

AUTOMATED ULTRASONIC THICKNESS DATA REPORT

RESER #31

LOCATION: 200E TANK FARM	SYSTEM: PSP-4	EXAM START: 1/2/03 08:15	EXAM END: 15:55	JOB #: 03-41
COMPONENT ID: TRANSDUCER WEAR TEST		EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED		NOM. THICKNESS: .500"
CONFIGURATION: TO PLATE		CALIBRATED RANGE: .3" TO 1.0"		TEMP: AMB °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 88.4		REF. LEVEL CORRECTION (TRANS. CORR): 0 DB		
PROCEDURE: CO-GEMA-SNUT-ENS-007.3	REV: 1	MATERIAL TYPE: ☐ SS ☒ CS OTHER ____		CONDITION:
FILE NAME/ITEM#: WEAR TEST		TRANSDUCER: ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE ____		
X_0 REF. POINT (L_0): 1" BELOW HORZ. WELD	Y_0 REF. POINT (W_0): ℄ OF 24" RESER.	SCAN WIDTH: 14.7"		

PART #/ INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	MAX. THK.
0-12					.515"	.506"		.530"
12-24					.512"	.500"		.525"
24-36					.505"	.489"		.522"
36-48					.501"	.485"		.520"
48-60					.500"	.483"		.517"
60-72					.500"	.491"		.515"
72-84					.495"	.486"		.510"
84-88.4					.490"	.470"		.502"
SUMMARY								

REMARKS

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W D Purdy	[signature]	(N1)	
Level II Date 1/2/03	Level III Date 1/15/03	Level ___ Date ___	___ of ___
P-SCAN LEMPERED II			

Probe # 2

(N1) SEE ATTACHED LETTER FROM J. B. ELDER

4/00

AUTOMATED ULTRASONIC THICKNESS CALIBRATION SHEET

Riser 31

LOCATION: AP-101	SYSTEM: 200EAST DST	CALIBRATION BLOCK: Step Block 584-99-30-145	
PROCEDURE: COGEMA-SVUT-INS-007.3 Rev 1		THICKNESS: .3 - 1.0"	MATERIAL: C/S.
UT SYSTEM: PSP-4	SERIAL #: 206	REFERENCE BLOCK	
SOFTWARE VERSION	REV.	THICKNESS	MATERIAL: N/A
LINEARITY DUE DATE: 1-17-03		REFERENCE BLOCK TEMP °F	PYRO SN: N/A
SCANNER TYPE: AWS-5d	SERIAL #	COUPLANT: H2O	BATCH #: N/A
SCANNER CABLE: COAX		CABLE LENGTH: 80 FT	CABLE #
SIGNAL CABLE: COAX		CABLE LENGTH: 80 FT	CABLE #

CHANNEL	TRANSDUCER MAKE	MODEL	FREQ. MHZ	SIZE	SERIAL #	GATE EVAL METHOD	ANGLE	WEDGE TYPE	IMAGE
1	KB	MSEB	5	8x2mm	0A33		Ø		
2	KB	MSEB	5	8x2mm	1712		Ø		
3									
4									

INITIAL CALIBRATION		CALIBRATION CHECKS							
DATE		1/2/03	1/2/03	1/2/03	1/2/03				
TIME		08:10	08:15	15:50	15:55				
REFLECTOR		.3-1.0"	.3-1.0"	.3-1.0"	.3-1.0"				
CH. 1	THK.1	.304	.304	.304	.287				
	THK. 2	.999/0dB	.999/0dB	.999/0dB	.976/-8dB				
CH. 2	THK.1	.304	.304	.304	.284				
	THK. 2	.999/0dB	.999/0dB	.999/0dB	.987/-7dB				
CH. 3	THK.1	.304	.304	.304	.289				
	THK. 2	.999/0dB	.999/0dB	.999/0dB	.981/-7dB				
CH. 4	THK.1								
	THK. 2								
FILE #									
EXAMINER									

REMARKS

Wear Test

Examiner: W D Purdy	Examiner: Wesley H Nee	Reviewer: Wesley H Nee	Page ___ of ___
Level II Date 1/2/03	Level III Date 1/14/03	Level III Date 1/21/03	
P-Scan Limited			

P.O. Box 360
Jackson, SC. 29831
706.829.1245
email: jbndt @ yahoo.com

January 29th. 2003

Mr. Daron Tate
COGEMA Engineering Corp.
2425 Stevens Center
Richland, WA. 99352

Regarding 1998 AN 105 Thickness Mapping Data.

This letter is to certify that I have analyzed the P-scan automated ultrasonic data from the ultrasonic transducer wear test performed on Hanford waste tank AP 101. The data was collected by Mr. Purdy on January 2nd, 2003. The review included analysis of data from 2 transducers set up to collect data from the same area of tank wall simultaneously. One transducer was set up correctly and used as control data. The other transducer was set in the holder to allow the transducer to ride the surface, instead of the probe holder wear face, to simulate the set up used in 1998 for some of the AN 105 thickness mapping data.

The data from the control transducer shows that the average thickness of the plate that was scanned is within a few thousandths of an inch at the top and bottom of the scan area. The data from the probe that was allowed to ride the surface indicated a steady decrease in thickness from the top to the bottom of the scan area. At the bottom of the scan area, the worn transducer readings were over twenty-thousandths below the actual thickness as indicated by the control data. The indicated decrease in thickness was due to the excessive wear of the transducer.

This test confirms the explanation provided in the December, 2002 Independent Review and Comparison of Ultrasonic Data from Hanford Waste Tank 241-AN-105.

Sincerely,

James B. Elder
ASNT UT Level III

CC: Mr. W. H. Nelson - COGEMA