

**THIELSCH ENGINEERING, INC.  
195 FRANCES AVENUE  
CRANSTON, RHODE ISLAND 02910**

SEPTEMBER 2019  
20% EDDY CURRENT INSPECTION OF  
FEEDWATER HEATER NO. 6  
UNIT NO. 2  
J.S. COOPER POWER PLANT  
EASTERN KENTUCKY POWER COOPERATIVE  
SOMERSET, KENTUCKY

Denys Jackson

October 1, 2019

Letter Report 16921

# THIELSCH

## ENGINEERING

# Unit 2 FWH 6

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## 20% Eddy Current Inspection

Technician: Denys Jackson, John Vance

September 26th, 27th 2019





## **Thielsch Engineering**

**1 South Ocean Blvd, Suite 204  
Boca Raton, FL 33432  
Office: 561-504-0153**

Sept. 28th, 2019

East Kentucky Power Cooperative  
Cooper Power Plant RD,  
Somerset, KY 42501  
Attn: Lance Hill

Dear Mr. Hill,

This report will detail the eddy current inspection performed on the Unit 2 feed water heater #6 at the East Kentucky Power cooperative Cooper Station in Somerset KY on September 26<sup>th</sup>, and 27<sup>th</sup>, 2019. The inspection covered 305 of the 1424 5/8" X 0.058" 304SS straight leg tubes.

Results of the inspection found no wall degradation on 303 tubes. It found 2 tubes with indications of <20% wall loss, and, noted that 2 tubes were mechanically plugged. Also of note, most of the tubes inspected had indications of metallic debris lose in the tubes. This debris probably occurred when the partition plate was cut in preparation for the inspection. Maintenance may want to thoroughly flush or blow these out before placing the heater back into operation.

Please see the attached map, pictures, screen-shots and report data for more detail of the inspection.

Thank you for the opportunity to work with you at the John Sherman Cooper Power Station. We look forward to working with you again in the future. If you have any questions regarding the inspection, please call anytime.

Sincerely,



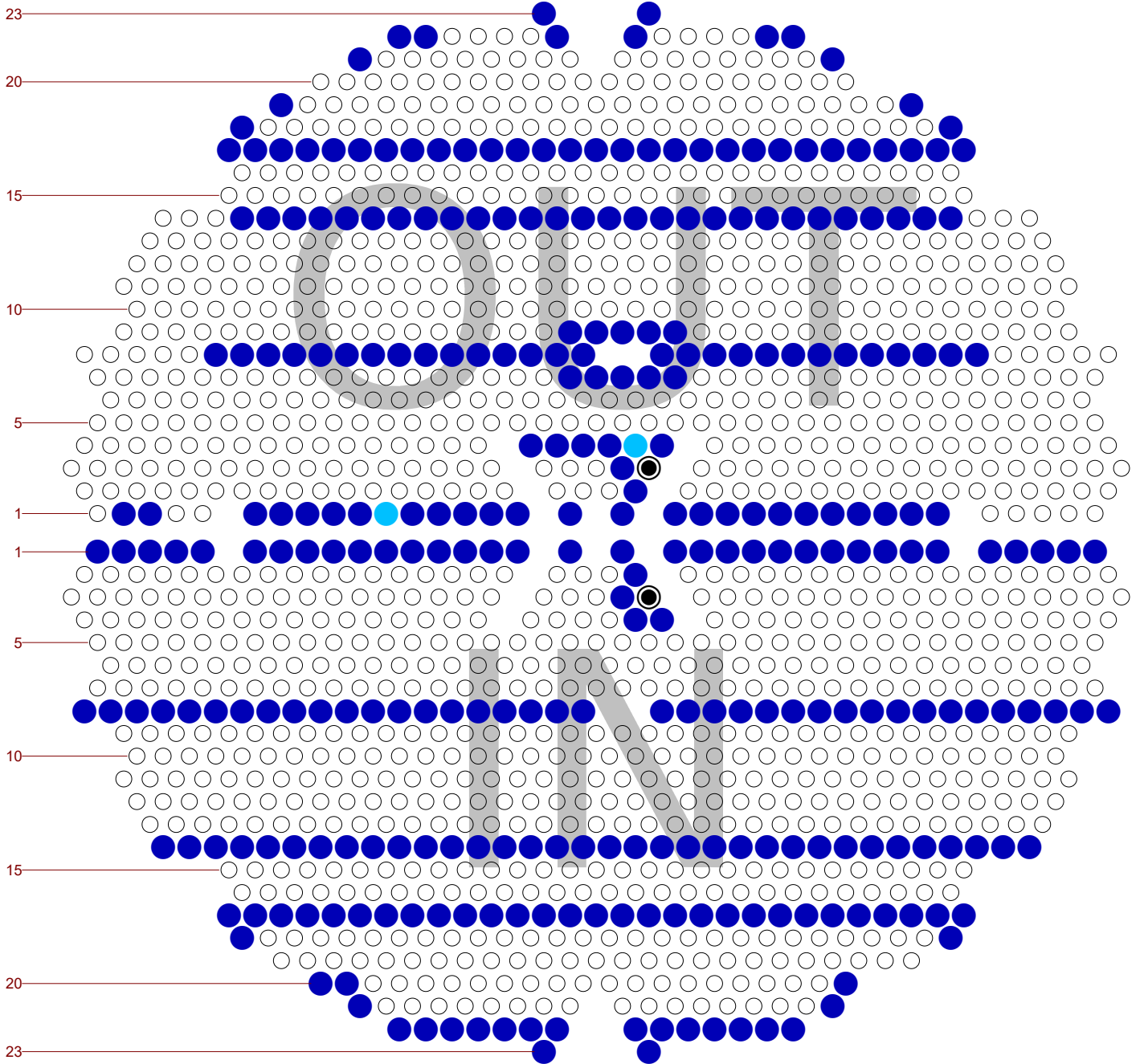
Denys Jackson  
ET IIA and IRIS Inspector

# Cooper Station Fall 2019

Unit 2 FWH 6

20% ET, 304 of 1424 Straight legs (712 Ubend Tubes)

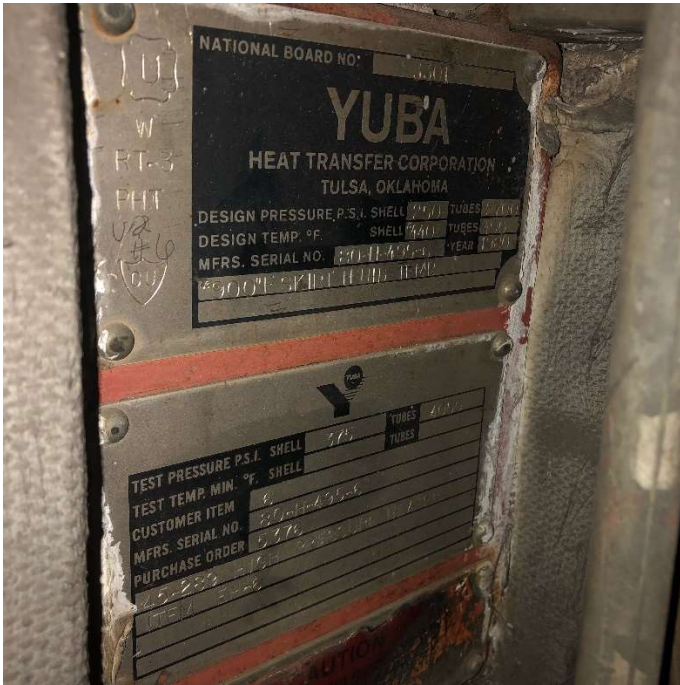
SS304 0.625" x 0.058" Wall



SYM	HITS	TUBES	VIS	TYPE	DESCRIPTION
●	303	303	303	QUERY	NDD (No Degredation Detected).gry
●	2	2	2	QUERY	1%-19% Indications.gry
●	2	2	2	QUERY	Plugged Tubes.gry
	307	307	307		

Model FWH (1,424 tubes)  
1,117 open tubes





TEST LINK BALANCE REF NULL HW NULL

IP Address: 192.1.6.46

Config Options Scope Waveform Freq Sweep Status

Sample Rate: 755 Num Chan: 8 Trigger: Internal

Config Options	Probe Options	AUX Chans
Continuous Mode <input type="checkbox"/>	Ghent/S10 <input type="checkbox"/>	Time <input type="checkbox"/>
32-bit Mode <input checked="" type="checkbox"/>	High Speed RPC <input type="checkbox"/>	Encoders <input type="checkbox"/>
Dynamic Gain <input checked="" type="checkbox"/>	Array Outputs <input type="checkbox"/>	RMS <input type="checkbox"/>
Internal Reference <input checked="" type="checkbox"/>	X-Probe Clock <input type="checkbox"/>	Gains <input type="checkbox"/>
Time Slew <input checked="" type="checkbox"/>		Sample Index <input type="checkbox"/>
Increment Caps <input type="checkbox"/>		Status & IO <input type="checkbox"/>
Auto Stop <input type="checkbox"/>		Sample Flags <input type="checkbox"/>
No Powerdown <input checked="" type="checkbox"/>		
Synch Outputs On <input type="checkbox"/>		

TIME SLOT	#	DRIVER		COMPENSATOR		COIL								
		FREQUENCY	DRIVE	PHASE	DRIVE	1	2	3	4	5	6	7	8	
1	1	180.000 KHz	100.00%	11.941°	84.56%	1	2							
2	1	90.000 KHz	100.00%	29.373°	68.63%	3	4							
3	1	45.000 KHz	100.00%	61.013°	47.68%	5	6							
4	1	23.000 KHz	100.00%	45.020°	31.48%	7	8							

SLOT	DELAY (µS)	INTEG (wave)	TIME (µS)	ENCODER				
				1	2	3	4	5
1	20	71	415					
2	20	36	421					
3	20	18	421					
4	20	1	64					

SLOT	COIL INPUT GAIN (dB)							
	1	2	3	4	5	6	7	8
1	14	8						
2	14	8						
3	14	8						
4	14	8						

COIL	DR1	DR3	BC	HN	RFT	CAP	NAME
1	DIP					B 4	
2	ABS					A 0	
3							
4							
5							
6							
7							
8							



Site

Owner: Cooper Power Station

Site Code: COOPER Unit: 1

Comp: FWH Model: FWH

Outage: Sept 2019 Date: 09/25/2019

Cal

Cal Num: 1 Disk: Leg: INLET

Material: SS304 ID: 0.051 OD: 0.625

Operators

Operator ID: 8747 Level: II

Operator ID: Level:

Standards

Type: ASME+ SN: EU014712

Type: SN:

Type: SN:

Probe

Model: 420 MF Vendor: Corestar

Ext Type: Vendor:

Head Size: 420 Head SN:

Shaft Length: 0 Shaft SN:

Ext Length: 0 Ref Head SN:

Slip SN: Ref Shaft SN:

Tester Config

IDX	TYPE	CHAN	FREQ	SPAN	Y/X	ROT	COIL	CTX
1	DATA32	1	180 KHz	40		0°	1 DIF	1
2	DATA32	2	180 KHz	40		0°	2 ABS	1
3	DATA32	3	90 KHz	40		0°	1 DIF	2
4	DATA32	4	90 KHz	40		0°	2 ABS	2
5	DATA32	5	45 KHz	40		0°	1 DIF	3
6	DATA32	6	45 KHz	40		0°	2 ABS	3
7	DATA32	7	23 KHz	40		0°	1 DIF	4
8	DATA32	8	23 KHz	40		0°	2 ABS	4

Config: Bobbin - Internal Ref

Auto Mode: Manual

Sample Rate: 755 Num Char: 8 Offset: 1,616

Acq Speed: 24.00 RPC RPM: Acq Dir: PULL

File

Source: CoreStar Samples: 17,640

Procedure: TGR-ASME-ET-01 2017 REVISION

Software: CoreStar EddyVision 8.1

Equipment

Tester: OMNI-200 SN: 1227-1207

Pusher: SN:

Fixture: SN:

Empty data area

File=3 SEC=0 ROW=999 TUB=999

TLIST	REPORT	COMPARE	HISTORY	SUMMARY	MESSAGE	SETUP	CURVE	AUTO LOC	OPTIONS	SCREENING	LOC	BEG	END	8747	PRI	F	
1	DSET 1	DSET 1	DSET 1	DSET=1 SEC=0 ROW=999 TUB=999			DSET=1 SEC=0 ROW=999 TUB=999			DSET=1 SEC=0 ROW=999 TUB=999							
7	CH 1V C1	MIX 1V C1	CH 6V C2	41	CH 1 180 KHz	75°	58	MIX 1 1:3	45°	115	CH 6 45 KHz	311°	TEST OPTIONS PLAN				
				G1			G5			G3			CAL SEC ROW TUB TIME				
				C1			C1			C2			1 -03:14				
				5.94 Vpp 40°			7.37 Vpp 40°			2.48 Vpp 192°			OBS PLG				
				DEG 100%			DEG 100%						TESTER OFF CONFIG				
				NDD DNT INR									ACQUIRE 24.00				
				FILE 3 1.0 pt/pix SIG VOLTS			FILE 3 1.0 pt/pix SIG VOLTS			FILE 3 1.0 pt/pix SIG VOLTS			Speed Pos				
													Cal Free				
													Samples				
													Acquired 338 of 338				
LINE	SEC	ROW	TUB	VOLTS	DEG	CODE	%	CH	LOCATION	EXTENT	ENTRY D SEC ROW TUB CNT						
1	1	1	2			NDD					1	A	0	1	1	1	
2	1	1	3			NDD					2	A	0	1	2	1	
3	1	1	4			NDD					3	A	0	1	3	1	
4	1	1	6			NDD					4	A	0	1	4	1	

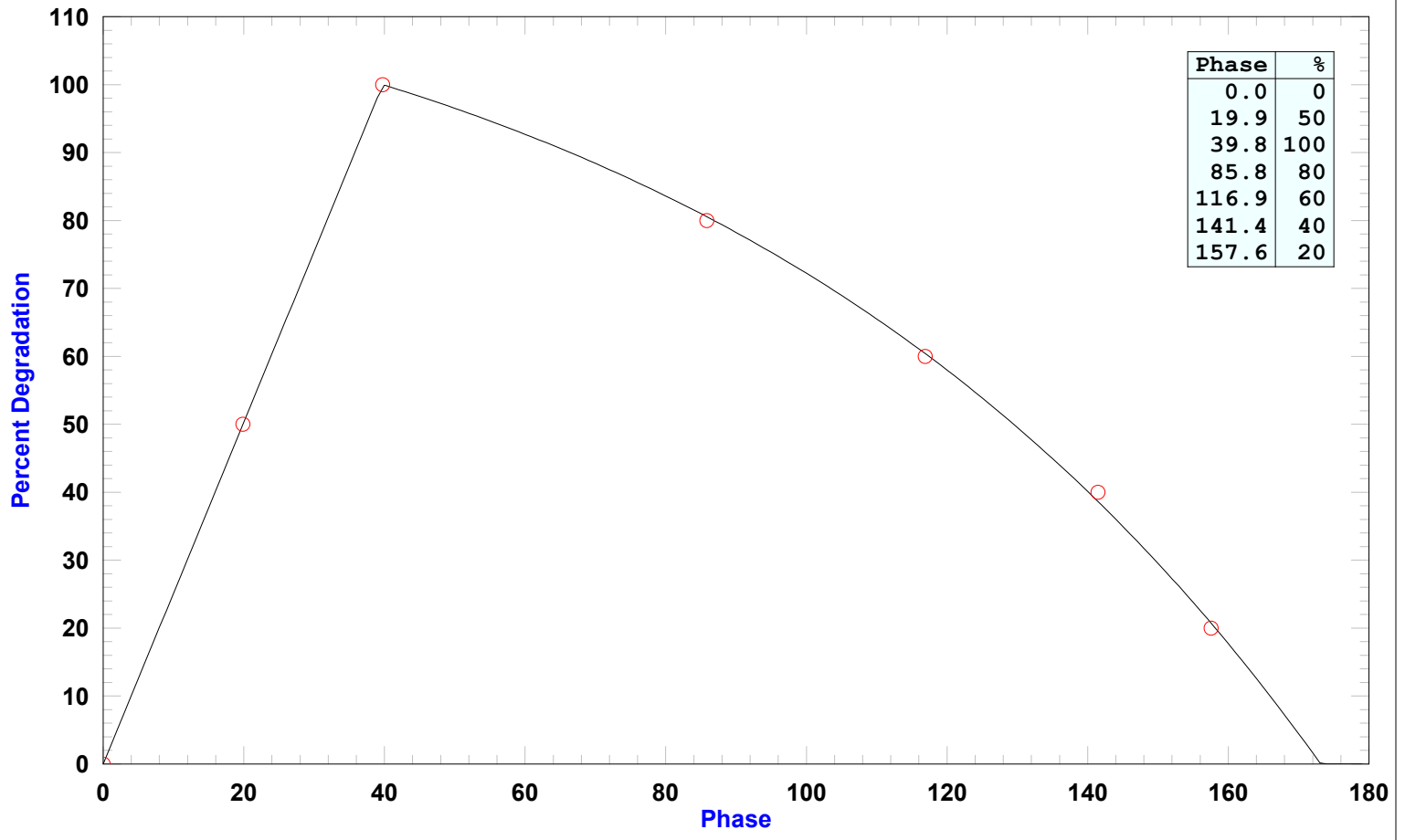
DSET 1 Mix Δt=0.000s

Speed ???

09/26/2019 20:48:45

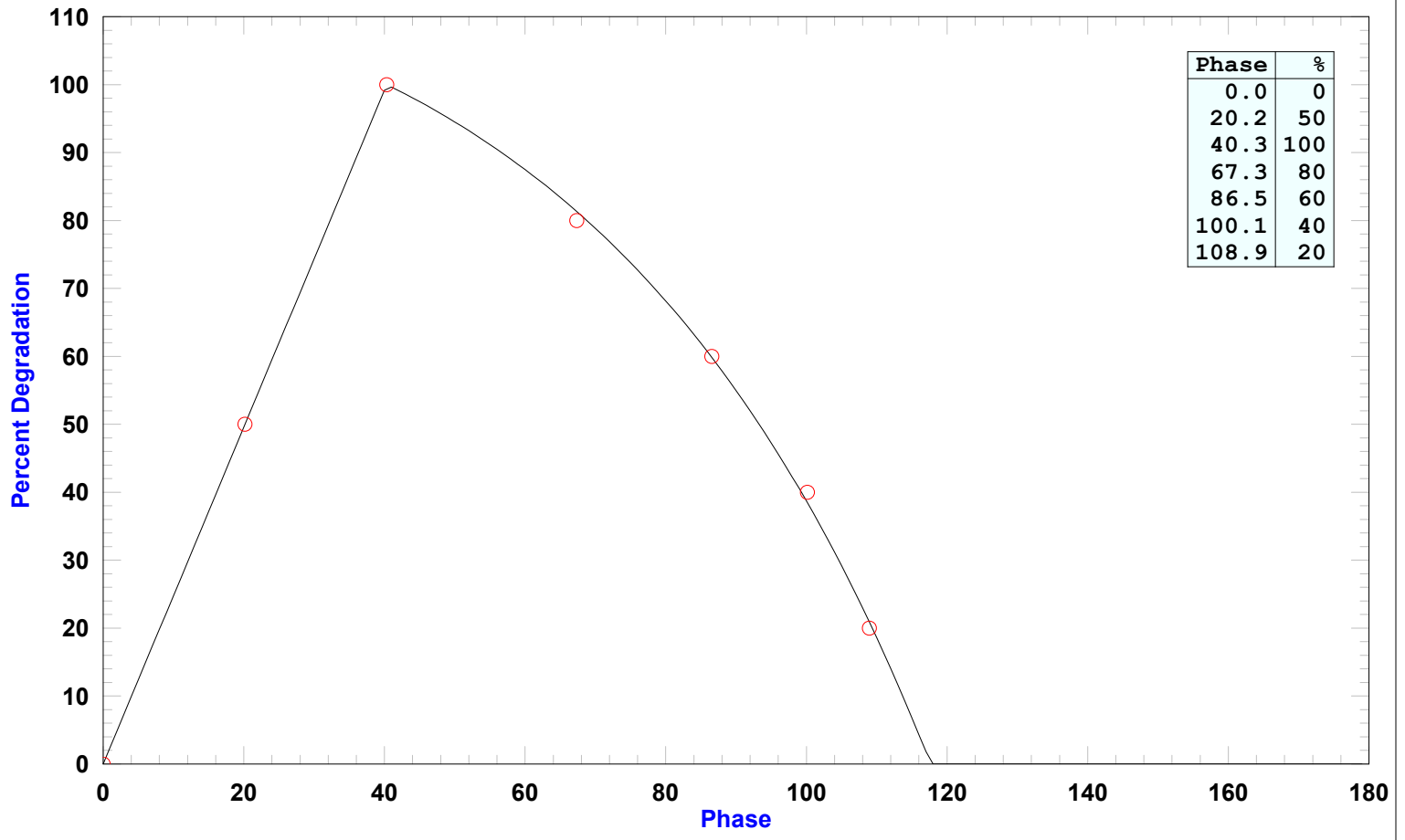


CH 1 180 KHz DEG Curve



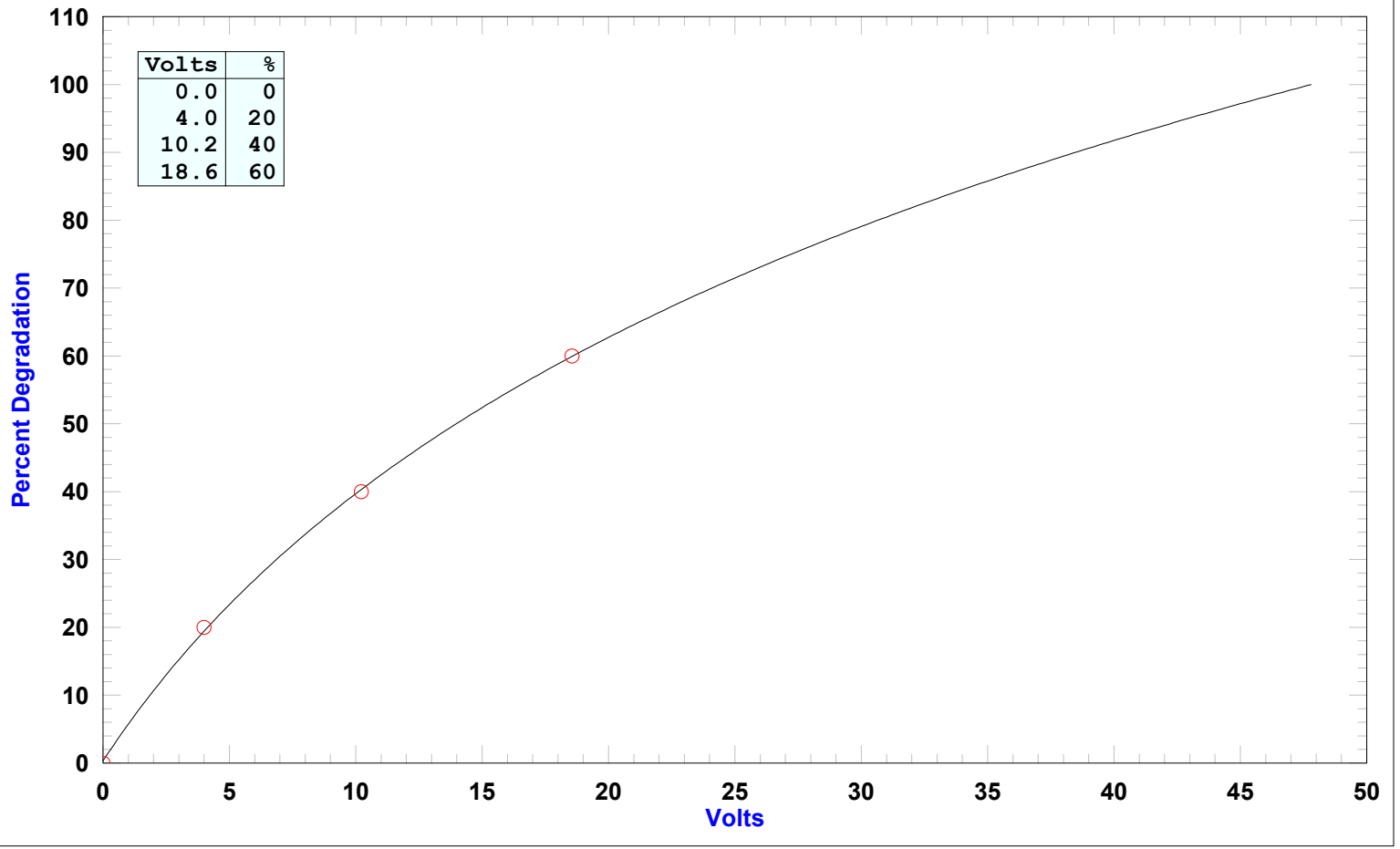
Phase	%	Phase	%	Phase	%	Phase	%	Phase	%	Phase	%
0.0	0	33.0	83	66.0	90	99.0	73	132.0	48	165.0	11
1.0	3	34.0	86	67.0	90	100.0	72	133.0	47	166.0	10
2.0	5	35.0	88	68.0	89	101.0	72	134.0	46	167.0	9
3.0	8	36.0	91	69.0	89	102.0	71	135.0	45	168.0	7
4.0	10	37.0	93	70.0	88	103.0	70	136.0	44	169.0	6
5.0	13	38.0	96	71.0	88	104.0	70	137.0	43	170.0	4
6.0	15	39.0	98	72.0	87	105.0	69	138.0	42	171.0	3
7.0	18	40.0	100	73.0	87	106.0	68	139.0	41	172.0	2
8.0	20	41.0	100	74.0	87	107.0	68	140.0	40	173.0	0
9.0	23	42.0	99	75.0	86	108.0	67	141.0	39	174.0	0
10.0	25	43.0	99	76.0	86	109.0	66	142.0	38	175.0	0
11.0	28	44.0	99	77.0	85	110.0	66	143.0	37	176.0	0
12.0	30	45.0	98	78.0	85	111.0	65	144.0	36	177.0	0
13.0	33	46.0	98	79.0	84	112.0	64	145.0	35	178.0	0
14.0	35	47.0	98	80.0	84	113.0	63	146.0	34	179.0	0
15.0	38	48.0	97	81.0	83	114.0	63	147.0	33		
16.0	40	49.0	97	82.0	83	115.0	62	148.0	32		
17.0	43	50.0	97	83.0	82	116.0	61	149.0	31		
18.0	45	51.0	96	84.0	82	117.0	60	150.0	30		
19.0	48	52.0	96	85.0	81	118.0	60	151.0	28		
20.0	50	53.0	95	86.0	80	119.0	59	152.0	27		
21.0	53	54.0	95	87.0	80	120.0	58	153.0	26		
22.0	55	55.0	95	88.0	79	121.0	57	154.0	25		
23.0	58	56.0	94	89.0	79	122.0	56	155.0	24		
24.0	60	57.0	94	90.0	78	123.0	56	156.0	23		
25.0	63	58.0	93	91.0	78	124.0	55	157.0	21		
26.0	65	59.0	93	92.0	77	125.0	54	158.0	20		
27.0	68	60.0	93	93.0	77	126.0	53	159.0	19		
28.0	70	61.0	92	94.0	76	127.0	52	160.0	18		
29.0	73	62.0	92	95.0	75	128.0	51	161.0	16		
30.0	75	63.0	91	96.0	75	129.0	50	162.0	15		
31.0	78	64.0	91	97.0	74	130.0	50	163.0	14		
32.0	80	65.0	91	98.0	73	131.0	49	164.0	13		

MIX 1 1:3 DEG Curve



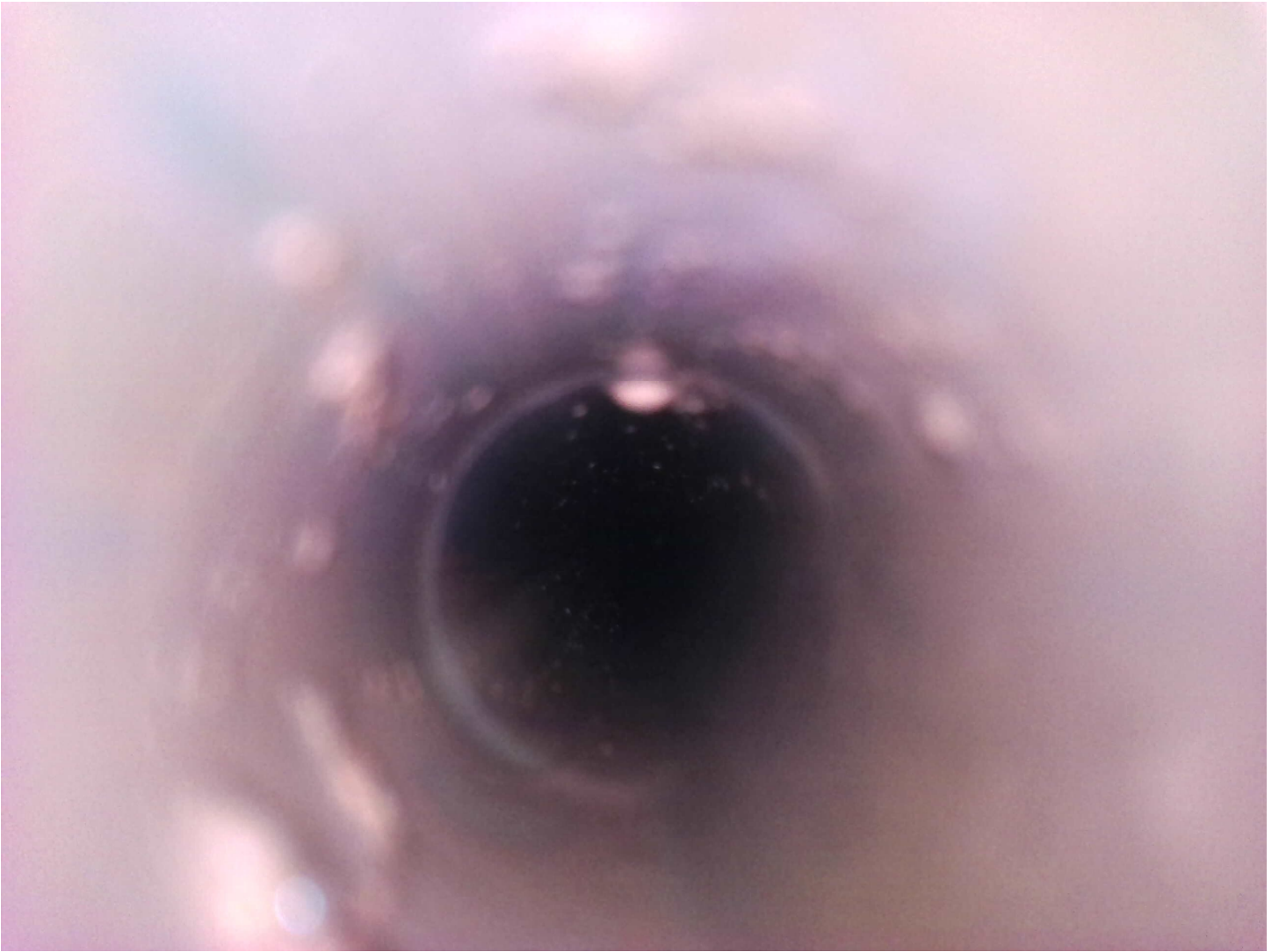
Phase	%	Phase	%	Phase	%	Phase	%	Phase	%	Phase	%
0.0	0	33.0	82	66.0	83	99.0	40	132.0	0	165.0	0
1.0	2	34.0	84	67.0	82	100.0	39	133.0	0	166.0	0
2.0	5	35.0	87	68.0	81	101.0	37	134.0	0	167.0	0
3.0	7	36.0	89	69.0	80	102.0	35	135.0	0	168.0	0
4.0	10	37.0	92	70.0	79	103.0	33	136.0	0	169.0	0
5.0	12	38.0	94	71.0	78	104.0	31	137.0	0	170.0	0
6.0	15	39.0	97	72.0	77	105.0	29	138.0	0	171.0	0
7.0	17	40.0	99	73.0	76	106.0	27	139.0	0	172.0	0
8.0	20	41.0	100	74.0	75	107.0	25	140.0	0	173.0	0
9.0	22	42.0	99	75.0	74	108.0	23	141.0	0	174.0	0
10.0	25	43.0	99	76.0	73	109.0	21	142.0	0	175.0	0
11.0	27	44.0	98	77.0	72	110.0	19	143.0	0	176.0	0
12.0	30	45.0	97	78.0	70	111.0	16	144.0	0	177.0	0
13.0	32	46.0	97	79.0	69	112.0	14	145.0	0	178.0	0
14.0	35	47.0	96	80.0	68	113.0	12	146.0	0	179.0	0
15.0	37	48.0	96	81.0	67	114.0	9	147.0	0		
16.0	40	49.0	95	82.0	66	115.0	7	148.0	0		
17.0	42	50.0	94	83.0	64	116.0	4	149.0	0		
18.0	45	51.0	94	84.0	63	117.0	2	150.0	0		
19.0	47	52.0	93	85.0	62	118.0	0	151.0	0		
20.0	50	53.0	93	86.0	61	119.0	0	152.0	0		
21.0	52	54.0	92	87.0	59	120.0	0	153.0	0		
22.0	55	55.0	91	88.0	58	121.0	0	154.0	0		
23.0	57	56.0	90	89.0	56	122.0	0	155.0	0		
24.0	60	57.0	90	90.0	55	123.0	0	156.0	0		
25.0	62	58.0	89	91.0	53	124.0	0	157.0	0		
26.0	64	59.0	88	92.0	52	125.0	0	158.0	0		
27.0	67	60.0	87	93.0	50	126.0	0	159.0	0		
28.0	69	61.0	87	94.0	49	127.0	0	160.0	0		
29.0	72	62.0	86	95.0	47	128.0	0	161.0	0		
30.0	74	63.0	85	96.0	46	129.0	0	162.0	0		
31.0	77	64.0	84	97.0	44	130.0	0	163.0	0		
32.0	79	65.0	83	98.0	42	131.0	0	164.0	0		

CH 6 45 KHz VOLT Curve



Volts	%	Volts	%	Volts	%	Volts	%	Volts	%	Volts	%	Volts	%	Volts	%	Volts	%
0.0	0	6.6	29	13.2	48	19.8	62	26.4	74	33.0	83	39.6	91	46.2	98		
0.2	1	6.8	30	13.4	49	20.0	63	26.6	74	33.2	83	39.8	92	46.4	99		
0.4	3	7.0	30	13.6	49	20.2	63	26.8	74	33.4	84	40.0	92	46.6	99		
0.6	4	7.2	31	13.8	50	20.4	63	27.0	75	33.6	84	40.2	92	46.8	99		
0.8	5	7.4	32	14.0	50	20.6	64	27.2	75	33.8	84	40.4	92	47.0	99		
1.0	6	7.6	32	14.2	51	20.8	64	27.4	75	34.0	84	40.6	92	47.2	99		
1.2	7	7.8	33	14.4	51	21.0	65	27.6	76	34.2	85	40.8	93	47.4	100		
1.4	8	8.0	34	14.6	51	21.2	65	27.8	76	34.4	85	41.0	93	47.6	100		
1.6	9	8.2	34	14.8	52	21.4	65	28.0	76	34.6	85	41.2	93	47.8	100		
1.8	10	8.4	35	15.0	52	21.6	66	28.2	76	34.8	86	41.4	93				
2.0	11	8.6	36	15.2	53	21.8	66	28.4	77	35.0	86	41.6	94				
2.2	12	8.8	36	15.4	53	22.0	66	28.6	77	35.2	86	41.8	94				
2.4	13	9.0	37	15.6	54	22.2	67	28.8	77	35.4	86	42.0	94				
2.6	13	9.2	37	15.8	54	22.4	67	29.0	78	35.6	87	42.2	94				
2.8	14	9.4	38	16.0	55	22.6	67	29.2	78	35.8	87	42.4	94				
3.0	15	9.6	39	16.2	55	22.8	68	29.4	78	36.0	87	42.6	95				
3.2	16	9.8	39	16.4	55	23.0	68	29.6	79	36.2	87	42.8	95				
3.4	17	10.0	40	16.6	56	23.2	68	29.8	79	36.4	88	43.0	95				
3.6	18	10.2	40	16.8	56	23.4	69	30.0	79	36.6	88	43.2	95				
3.8	19	10.4	41	17.0	57	23.6	69	30.2	79	36.8	88	43.4	95				
4.0	19	10.6	41	17.2	57	23.8	70	30.4	80	37.0	88	43.6	96				
4.2	20	10.8	42	17.4	58	24.0	70	30.6	80	37.2	88	43.8	96				
4.4	21	11.0	42	17.6	58	24.2	70	30.8	80	37.4	89	44.0	96				
4.6	22	11.2	43	17.8	58	24.4	71	31.0	80	37.6	89	44.2	96				
4.8	23	11.4	44	18.0	59	24.6	71	31.2	81	37.8	89	44.4	97				
5.0	23	11.6	44	18.2	59	24.8	71	31.4	81	38.0	89	44.6	97				
5.2	24	11.8	45	18.4	60	25.0	71	31.6	81	38.2	90	44.8	97				
5.4	25	12.0	45	18.6	60	25.2	72	31.8	82	38.4	90	45.0	97				
5.6	26	12.2	46	18.8	60	25.4	72	32.0	82	38.6	90	45.2	97				
5.8	26	12.4	46	19.0	61	25.6	72	32.2	82	38.8	90	45.4	98				
6.0	27	12.6	47	19.2	61	25.8	73	32.4	82	39.0	91	45.6	98				
6.2	28	12.8	47	19.4	62	26.0	73	32.6	83	39.2	91	45.8	98				
6.4	28	13.0	48	19.6	62	26.2	73	32.8	83	39.4	91	46.0	98				

Borescope Image of Tube with indications of debris: Inlet 1-26:





Screen shot: example of metallic debris found in tube.

File=31 SEC=1 ROW=1 TUB=26

TLIST	REPORT	COMPARE	HISTORY	SUMMARY	MESSAGE	SETUP	CURVE	AUTO LOC	OPTIONS	SCREENING	LOC	BEG	END	8747	PRI	F										
1	DSET 1	DSET 1	DSET 1	DSET=1 SEC=1 ROW=1 TUB=26				DSET=1 SEC=1 ROW=1 TUB=26				DSET=1 SEC=1 ROW=1 TUB=26				TEST OPTIONS		PLAN								
35	CH 1V C1	MIX 1V C1	CH 6V C2	47	CH 1 180 KHz				75°	35	CH 7 23 KHz				235°	136	CH 6 45 KHz				311°	CAL	SEC	ROW	TUB	TIME
				G1					C1	G4					C1	G3					C2	1	1	1	27	02:40
				13.05 Vpp 24°				ZQA	60%	5.29 Vpp 59°				4.11 Vpp 189°				TESTER OFF		CONFIG						
				NDD	DNT	INR										ACQUIRE		24.00								
				FILE 31	1.0 pt/pix	SIG	VOLTS					FILE 31	1.0 pt/pix	SIG	VOLTS	FILE 31	1.0 pt/pix	SIG	VOLTS	Speed	Pos					
				[Waveform traces with red markers]												Cal		39 MB	Free	371 GB	Cal					
				[Waveform traces with red markers]												Samples		18,440	Acquired		26 of 288					
LINE	SEC	ROW	TUB	VOLTS	DEG	CODE	%	CH	LOCATION	EXTENT							ENTRY	D	SEC	ROW	TUB	CNT				
*																	183	A	1	1	26	1				
																	184	A	1	1	27					
																	185	A	1	1	28					
																	186	A	1	1	29					
DSET 1 Mix Δt=0.002s										Speed ???					09/26/2019 09:44:17											



Screen shots of tubes with indications of minor erosion of tube wall.

File=156 SEC=OUT ROW=1 TUB=11

TLIST	REPORT	COMPARE	HISTORY	SUMMARY	MESSAGE	SETUP	CURVE	AUTO LOC	OPTIONS	SCREENING	LOC	BEG	END	8747	PRI	F	
1	DSET 1	DSET 1	DSET 1	DSET=1 SEC=OUT ROW=1 TUB=11			DSET=1 SEC=OUT ROW=1 TUB=11			DSET=1 SEC=OUT ROW=1 TUB=11			TEST OPTIONS PLAN				
48	CH 1V C1	MIX 1V C1	CH 6V C2	93	CH 1 180 KHz	75°	48	CH 7 23 KHz	235°	173	CH 6 45 KHz	311°	CAL SEC ROW TUB TIME				
				G1		C1	G4		C1	G3			1 IN 2 21 -46:05				
				0.32 Vvm DEG			0.45 Vvm			3.37 Vvm VOLT 17%			OBS PLG				
				NDD	DNT	INR							TESTER OFF CONFIG				
				FILE 156	17.8 pt/pix	SIG	VOLTS	FILE 156	17.8 pt/pix	SIG	VOLTS	FILE 156	17.8 pt/pix	SIG	VOLTS	ACQUIRE 24.00	
				Speed			Pos			Cal			Free				
				Samples													
				Acquired 339 of 339													
LINE	SEC	ROW	TUB	VOLTS	DEG	CODE	%	CH	LOCATION	EXTENT	ENTRY D SEC ROW TUB CNT						
154	OUT	1	11			PCNT	17%	6			336	A	IN	4	21	1	
155	OUT	1	12			NDD					337	A	IN	4	22	1	
156	OUT	1	13			NDD					338	A	IN	3	21	1	
157	OUT	1	14			NDD					339	A	IN	2	21	1	
DSET 1 Mix Δt=0.002s											Speed ???					09/28/2019 15:39:04	

File=347 SEC=OUT ROW=4 TUB=21

TLIST	REPORT	COMPARE	HISTORY	SUMMARY	MESSAGE	SETUP	CURVE	AUTO LOC	OPTIONS	SCREENING	LOC	BEG	END	8747	PRI	F	
1	DSET 1	DSET 1	DSET 1	DSET=1 SEC=OUT ROW=4 TUB=21			DSET=1 SEC=OUT ROW=4 TUB=21			DSET=1 SEC=OUT ROW=4 TUB=21			TEST OPTIONS PLAN				
42	CH 1V C1	MIX 1V C1	CH 6V C2	93	CH 1 180 KHz	75°	48	CH 7 23 KHz	235°	173	CH 6 45 KHz	311°	CAL SEC ROW TUB TIME				
				G1		C1	G4		C1	G3			1 IN 2 21 -46:05				
				0.08 Vvm DEG			0.03 Vvm			2.50 Vvm VOLT 13%			OBS PLG				
				NDD	DNT	INR							TESTER OFF CONFIG				
				FILE 347	17.8 pt/pix	SIG	VOLTS	FILE 347	17.8 pt/pix	SIG	VOLTS	FILE 347	17.8 pt/pix	SIG	VOLTS	ACQUIRE 24.00	
				Speed <input type="text"/> Pos <input type="text"/>			Cal <input type="text"/> Free <input type="text"/>			Samples <input type="text"/>							
				Acquired 339 of 339													
LINE	SEC	ROW	TUB	VOLTS	DEG	CODE	%	CH	LOCATION	EXTENT	ENTRY D SEC ROW TUB CNT						
342	OUT	4	21			PCNT	13%	6			336	A	IN	4	21	1	
343	OUT	4	22			NDD					337	A	IN	4	22	1	
344	OUT	3	21			NDD					338	A	IN	3	21	1	
345	OUT	2	21			NDD					339	A	IN	2	21	1	
DSET 1 Mix Δt=0.001s											Speed ???					09/28/2019 15:39:56	



LINE	SEC	ROW	TUB	VOLTS	DEG	CODE	%	CH	LOCATION	EXTENT
1					ANALYST	8747			II	09/26/19
2					ACQ END	1332				09/26/19
3					CAL	1				
4					CAL	1			COOPER	PRI
5					COMP	FWH 6		UNIT 2		
6					PROBE	420 MF				
7					ANALYST	8747			II	09/26/19
8					OPERATOR	8747			II	
9					ACQ START	0824				09/26/19
10										
11	IN	1	2			NDD				
12	IN	1	3			NDD				
13	IN	1	4			NDD				
14	IN	1	6			NDD				
15	IN	1	5			NDD				
16	IN	1	7			NDD				
17	IN	1	1			NDD				
18	IN	1	8			NDD				
19	IN	1	9			NDD				
20	IN	1	10			NDD				
21	IN	1	11			NDD				
22	IN	1	12			NDD				
23	IN	1	13			NDD				
24	IN	1	14			NDD				
25	IN	1	15			NDD				
26	IN	1	16			NDD				
27	IN	1	17			NDD				
28	IN	1	18			NDD				
29	IN	1	19			NDD				
30	IN	1	20			NDD				
31	IN	1	21			NDD				
32	IN	1	22			NDD				
33	IN	1	23			NDD				
34	IN	1	24			NDD				
35	IN	1	25			NDD				
36	IN	1	26			NDD				
37	IN	1	27			NDD				
38	IN	1	28			NDD				
39	IN	1	29			NDD				
40	IN	1	30			NDD				
41	IN	1	31			NDD				
42	IN	1	32			NDD				
43	IN	1	33			NDD				
44	IN	1	34			NDD				
45	IN	3	22			PLG				
46	OUT	3	22			PLG				
47	IN	8	1			NDD				
48	IN	8	2			NDD				
49	IN	8	3			NDD				
50	IN	8	4			NDD				
51	IN	8	5			NDD				
52	IN	8	6			NDD				
53	IN	8	7			NDD				
54	IN	8	8			NDD				
55	IN	8	9			NDD				
56	IN	8	10			NDD				
57	IN	8	11			NDD				
58	IN	8	12			NDD				
59	IN	8	13			NDD				
60	IN	8	14			NDD				
61	IN	8	15			NDD				
62	IN	8	16			NDD				
63	IN	8	17			NDD				
64	IN	8	18			NDD				
65	IN	8	19			NDD				
66	IN	8	20			NDD				

LINE	SEC	ROW	TUB	VOLTS	DEG	CODE	%	CH	LOCATION	EXTENT
67	IN	8	21			NDD				
68	IN	8	22			NDD				
69	IN	8	23			NDD				
70	IN	8	24			NDD				
71	IN	8	25			NDD				
72	IN	8	26			NDD				
73	IN	8	27			NDD				
74	IN	8	28			NDD				
75	IN	8	29			NDD				
76	IN	8	30			NDD				
77	IN	8	31			NDD				
78	IN	8	32			NDD				
79	IN	8	33			NDD				
80	IN	8	34			NDD				
81	IN	8	35			NDD				
82	IN	8	36			NDD				
83	IN	8	37			NDD				
84	IN	8	38			NDD				
85	IN	14	1			NDD				
86	IN	14	2			NDD				
87	IN	14	3			NDD				
88	IN	14	4			NDD				
89	IN	14	5			NDD				
90	IN	14	6			NDD				
91	IN	14	7			NDD				
92	IN	14	8			NDD				
93	IN	14	9			NDD				
94	IN	14	10			NDD				
95	IN	14	11			NDD				
96	IN	14	12			NDD				
97	IN	14	13			NDD				
98	IN	14	14			NDD				
99	IN	14	15			NDD				
100	IN	14	16			NDD				
101	IN	14	17			NDD				
102	IN	14	18			NDD				
103	IN	14	19			NDD				
104	IN	14	20			NDD				
105	IN	14	21			NDD				
106	IN	14	22			NDD				
107	IN	14	23			NDD				
108	IN	14	24			NDD				
109	IN	14	25			NDD				
110	IN	14	26			NDD				
111	IN	14	27			NDD				
112	IN	14	28			NDD				
113	IN	14	29			NDD				
114	IN	14	30			NDD				
115	IN	14	31			NDD				
116	IN	14	32			NDD				
117	IN	14	33			NDD				
118	IN	14	34			NDD				
119	IN	17	1			NDD				
120	IN	17	29			NDD				
121	IN	18	1			NDD				
122	IN	18	28			NDD				
123	IN	20	1			NDD				
124	IN	20	2			NDD				
125	IN	20	21			NDD				
126	IN	21	1			NDD				
127	IN	21	18			NDD				
128	IN	22	1			NDD				
129	IN	22	2			NDD				
130	IN	22	3			NDD				
131	IN	22	4			NDD				
132	IN	22	5			NDD				

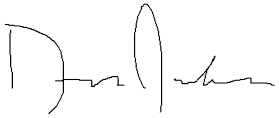
LINE	SEC	ROW	TUB	VOLTS	DEG	CODE	%	CH	LOCATION	EXTENT
133	IN	22	6			NDD				
134	IN	22	7			NDD				
135	IN	22	8			NDD				
136	IN	22	9			NDD				
137	IN	22	10			NDD				
138	IN	22	11			NDD				
139	IN	22	12			NDD				
140	IN	22	13			NDD				
141	IN	22	14			NDD				
142	IN	23	1			NDD				
143	IN	23	2			NDD				
144	OUT	1	1			OBS				
145	OUT	1	2			NDD				
146	OUT	1	3			NDD				
147	OUT	1	4			OBS				
148	OUT	1	5			OBS				
149	OUT	1	6			NDD				
150	OUT	1	7			NDD				
151	OUT	1	8			NDD				
152	OUT	1	9			NDD				
153	OUT	1	10			NDD				
154	OUT	1	11			PCNT	17%	6		
155	OUT	1	12			NDD				
156	OUT	1	13			NDD				
157	OUT	1	14			NDD				
158	OUT	1	15			NDD				
159	OUT	1	16			NDD				
160	OUT	1	17			NDD				
161	OUT	1	18			NDD				
162	OUT	1	19			NDD				
163	OUT	1	20			NDD				
164	OUT	1	21			NDD				
165	OUT	1	22			NDD				
166	OUT	1	23			NDD				
167	OUT	1	24			NDD				
168	OUT	1	25			NDD				
169	OUT	1	26			NDD				
170	OUT	1	27			NDD				
171	OUT	1	28			NDD				
172	OUT	1	29			NDD				
173	OUT	1	30			OBS				
174	OUT	1	31			OBS				
175	OUT	1	32			OBS				
176	OUT	1	33			OBS				
177	OUT	1	34			OBS				
178	OUT	8	1			OBS				
179	OUT	8	2			OBS				
180	OUT	8	3			OBS				
181	OUT	8	4			OBS				
182	OUT	8	5			OBS				
183	OUT	8	6			NDD				
184	OUT	8	7			NDD				
185	OUT	8	8			NDD				
186	OUT	8	9			NDD				
187	OUT	8	10			NDD				
188	OUT	8	11			NDD				
189	OUT	8	12			NDD				
190	OUT	8	13			NDD				
191	OUT	8	14			NDD				
192	OUT	8	15			NDD				
193	OUT	8	16			NDD				
194	OUT	8	17			NDD				
195	OUT	8	18			NDD				
196	OUT	8	19			NDD				
197	OUT	8	20			NDD				
198	OUT	8	21			NDD				

LINE	SEC	ROW	TUB	VOLTS	DEG	CODE	%	CH	LOCATION	EXTENT
199	OUT	8	22			NDD				
200	OUT	8	23			NDD				
201	OUT	8	24			NDD				
202	OUT	8	25			NDD				
203	OUT	8	26			NDD				
204	OUT	8	27			NDD				
205	OUT	8	28			NDD				
206	OUT	8	29			NDD				
207	OUT	8	30			NDD				
208	OUT	8	31			NDD				
209	OUT	8	32			NDD				
210	OUT	8	33			NDD				
211	OUT	8	34			OBS				
212	OUT	8	35			OBS				
213	OUT	8	36			OBS				
214	OUT	8	37			OBS				
215	OUT	8	38			OBS				
216	OUT	14	1			OBS				
217	OUT	14	2			OBS				
218	OUT	14	3			OBS				
219	OUT	14	4			NDD				
220	OUT	14	5			NDD				
221	OUT	14	6			NDD				
222	OUT	14	7			NDD				
223	OUT	14	8			NDD				
224	OUT	14	9			NDD				
225	OUT	14	10			NDD				
226	OUT	14	11			NDD				
227	OUT	14	12			NDD				
228	OUT	14	13			NDD				
229	OUT	14	14			NDD				
230	OUT	14	15			NDD				
231	OUT	14	16			NDD				
232	OUT	14	17			NDD				
233	OUT	14	18			NDD				
234	OUT	14	19			NDD				
235	OUT	14	20			NDD				
236	OUT	14	21			NDD				
237	OUT	14	22			NDD				
238	OUT	14	23			NDD				
239	OUT	14	24			NDD				
240	OUT	14	25			NDD				
241	OUT	14	26			NDD				
242	OUT	14	27			NDD				
243	OUT	14	28			NDD				
244	OUT	14	29			NDD				
245	OUT	14	30			NDD				
246	OUT	14	31			NDD				
247	OUT	14	32			OBS				
248	OUT	14	33			OBS				
249	OUT	14	34			OBS				
250	OUT	23	1			NDD				
251	OUT	23	2			NDD				
252	OUT	22	1			NDD				
253	OUT	22	2			NDD				
254	OUT	22	3			OBS				
255	OUT	22	4			OBS				
256	OUT	22	5			OBS				
257	OUT	22	6			OBS				
258	OUT	22	7			NDD				
259	OUT	22	8			NDD				
260	OUT	22	9			OBS				
261	OUT	22	10			OBS				
262	OUT	22	11			OBS				
263	OUT	22	12			OBS				
264	OUT	22	13			NDD				



LINE	SEC	ROW	TUB	VOLTS	DEG	CODE	%	CH	LOCATION	EXTENT
265	OUT	22	14			NDD				
266	OUT	21	1			NDD				
267	OUT	21	18			NDD				
268	OUT	19	1			NDD				
269	OUT	19	25			NDD				
270	OUT	18	1			NDD				
271	OUT	18	28			NDD				
272	OUT	17	1			NDD				
273	OUT	17	2			NDD				
274	OUT	17	3			NDD				
275	OUT	17	4			NDD				
276	OUT	17	5			NDD				
277	OUT	17	6			NDD				
278	OUT	17	7			NDD				
279	OUT	17	8			NDD				
280	OUT	17	9			NDD				
281	OUT	17	10			NDD				
282	OUT	17	11			NDD				
283	OUT	17	12			NDD				
284	OUT	17	13			NDD				
285	OUT	17	14			NDD				
286	OUT	17	15			NDD				
287	OUT	17	16			NDD				
288	OUT	17	17			NDD				
289	OUT	17	18			NDD				
290	OUT	17	19			NDD				
291	OUT	17	20			NDD				
292	OUT	17	21			NDD				
293	OUT	17	22			NDD				
294	OUT	17	23			NDD				
295	OUT	17	24			NDD				
296	OUT	17	25			NDD				
297	OUT	17	26			NDD				
298	OUT	17	27			NDD				
299	OUT	17	28			NDD				
300	OUT	17	29			NDD				
301	IN	17	2			NDD				
302	IN	17	3			NDD				
303	IN	17	4			NDD				
304	IN	17	5			NDD				
305	IN	17	6			NDD				
306	IN	17	7			NDD				
307	IN	17	8			NDD				
308	IN	17	9			NDD				
309	IN	17	10			NDD				
310	IN	17	11			NDD				
311	IN	17	12			NDD				
312	IN	17	13			NDD				
313	IN	17	14			NDD				
314	IN	17	15			NDD				
315	IN	17	16			NDD				
316	IN	17	17			NDD				
317	IN	17	18			NDD				
318	IN	17	19			NDD				
319	IN	17	20			NDD				
320	IN	17	21			NDD				
321	IN	17	22			NDD				
322	IN	17	23			NDD				
323	IN	17	24			NDD				
324	IN	17	25			NDD				
325	IN	17	26			NDD				
326	IN	17	27			NDD				
327	IN	17	28			NDD				
328	OUT	9	18			NDD				
329	OUT	9	19			NDD				
330	OUT	9	20			NDD				

LINE	SEC	ROW	TUB	VOLTS	DEG	CODE	%	CH	LOCATION	EXTENT
331	OUT	9	21			NDD				
332	OUT	9	22			NDD				
333	OUT	7	19			NDD				
334	OUT	7	20			NDD				
335	OUT	7	21			NDD				
336	OUT	7	22			NDD				
337	OUT	7	23			NDD				
338	OUT	4	17			NDD				
339	OUT	4	18			NDD				
340	OUT	4	19			NDD				
341	OUT	4	20			NDD				
342	OUT	4	21			PCNT	13%	6		
343	OUT	4	22			NDD				
344	OUT	3	21			NDD				
345	OUT	2	21			NDD				
346	IN	4	21			NDD				
347	IN	4	22			NDD				
348	IN	3	21			NDD				
349	IN	2	21			NDD				

Analyst  \_\_\_\_\_