



ENGINEERED PUMP SERVICES, INC.

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INSPECTION REPORT

CUSTOMER	: East Kentucky Power Cooperative	REPORT DATE	: 07/15/22
PLANT NAME	: Spurlock Station	REPORT NO.	: 56870-IR1
CITY/STATE	: Maysville, Kentucky	CUST. ORDER	: EKPC- 0000153973
EQUIPMENT	: 06x08x13 HDB-6	COPY	: Eddy Meek
SERVICE	: Boiler Feed	FILE	: 56870
MANF.	: Byron-Jackson	PAGE	: 1 of 4
SERIAL NO.	: Unit #1A		

The subject pump was pulled from service during the spring 2022 outage. The pump element was received at EPS-Wisconsin on 04/14/22 and was completely disassembled; for the most part, disassembly proceeded with no difficulty using only light heat and normal tools. The main exception to this was the balance sleeve which was incredibly difficult to remove. All parts were glass bead blasted clean with the exception of the shaft which was hand cleaned. Ultrasonic and magnetic particle testing was performed on the shaft, and all the impellers were magnetic particle testing. Overall, the pump is in good condition with light to moderate wear on the sealing surfaces and no real areas of concern. Generally speaking, there is moderate visual wear and only marginally excessive running clearances. Each component was visually and dimensionally inspected. The results of the inspection are as follows.

Shaft – Overall, the shaft is in good condition with only minor visible damage. There are light rubs on both ends from contact with the bearing covers, and it looks like the thrust collar nut lightly galled on the shaft. There is also light galling on the balance sleeve fit. Apart from this, there is no real damage to the shaft, and the breakdown grooves and impeller fits are in good condition. The total indicated runout of the shaft is .002" TIR or better which is very good for a shaft in this application. All critical fit turns measured to the expected design diameters.

Impeller Retaining Ring - Split - A few of the rings were damaged during disassembly. The remaining impeller retaining rings are in fair condition, and the 3rd stage had the appropriate 4 piece ring design.

1st Stage Shaft Sleeve - The shaft sleeve is in fair condition with light wear and washing on the sealing turn. The fit bore to the shaft measures close to design diameter but is lightly out of round and has some visual fretting.

BY: *Aaron Stull*

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Balance Sleeve – As mentioned above, the balance sleeve had galled to the shaft and had to be cut for removal. There is light wear and washing on the outer turn of this part

Impellers – As mentioned in the introduction of this report, most of the impellers have light to moderate grooving on the eye side and hub side seal turns. The as measured running clearances are all only marginally oversized and out of round. The seven impeller fit bores are all in good visual condition and have been previously chrome plated. Generally speaking, all interference fits to the shaft measure to design specifications. Magnetic particle analysis only picked up a few minor indications that were mostly cosmetic

Nut - Booster Impeller - The booster impeller nut is in good visual condition. The center impeller assembly is in very good visual and dimensional condition, so it was decided not to disassemble the nut from the sixth stage impeller.

Wear Rings - Case – The case rings are in fair visual and dimensional condition. All running clearances to the impeller are moderately oversized and out of round with some visible grooving wear. Several of the rings have also lightly “sprung” out of round at the outer fit to the volute casing.

Stage Pieces - Split – The split stage pieces are in very good condition with light visible wear and all critical dimensions measuring to the expected design values. Similar to the case rings, all running clearances are moderately oversized and out of round.

Volute Bushing - The volute bushing is in good condition with only light fretting on the fit bore to end head. The fit clearance to the volute casing and fit bore to the end head meet design specifications.

Volute Case – The volute case is in good condition with no visible damage and all critical dimensions measuring to the expected design values.

Hardware – The special socket head cap screws for the main volute joint are in good visual and dimensional condition.

Takeoff Tube – The takeoff tube on this pump had a special field modification that was required to address a length issue in the field. Essentially, it was a tube extension that was welded onto the existing tube. The modification worked well, and there is no evidence of damage at the weld joint.

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Digital Photographs:



Photo 1: Rotor Assembly As Received

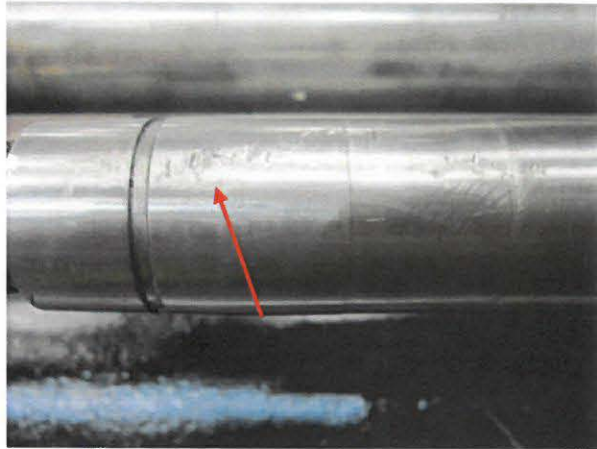


Photo 2: Shaft Gall At Thrust Collar Nut Fit



Photo 3: Shaft Gall At Balance Sleeve Fit



Photo 4: Shaft Wear From Bearing Covers



Photo 5: Field Modification Of Takeoff Tube

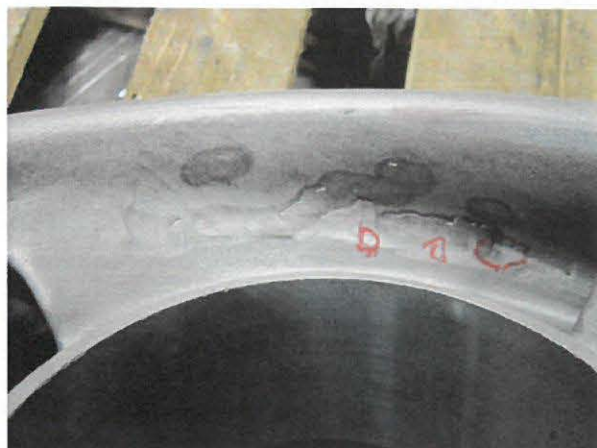


Photo 6: Previous weld repair on 1st Stage Impeller

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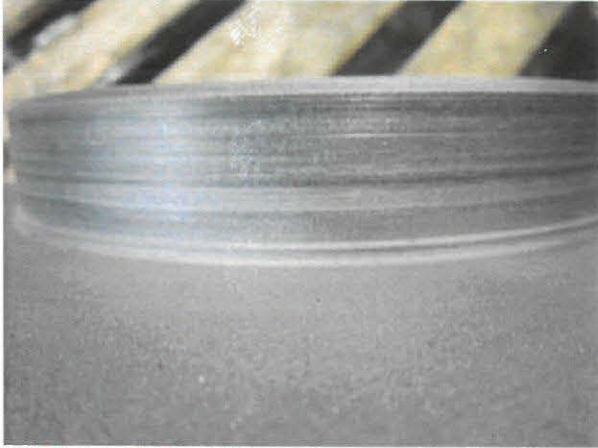


Photo 7: Typical Wear On Impeller Eye Turns

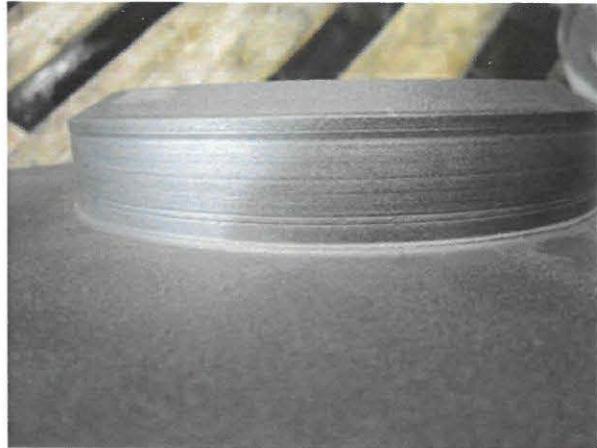


Photo 8: Typical Wear On Impeller Hub Turns

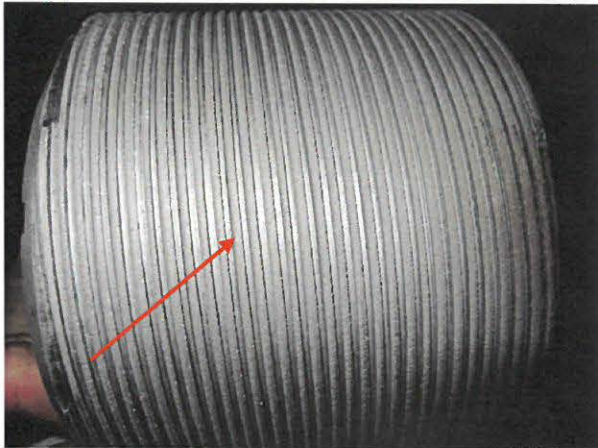


Photo 9: Light Wear On Balance Sleeve

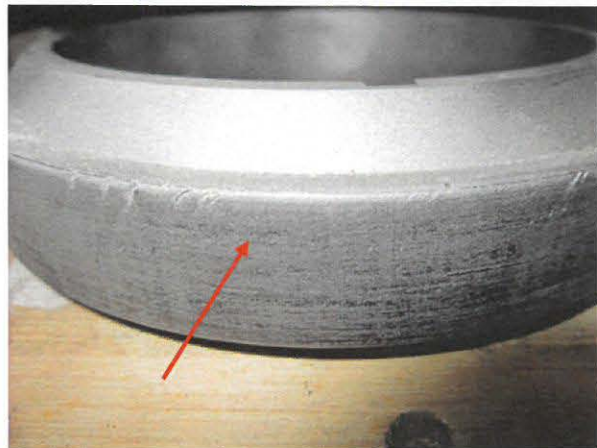


Photo 10: Light Wear On 1-2 Sleeve



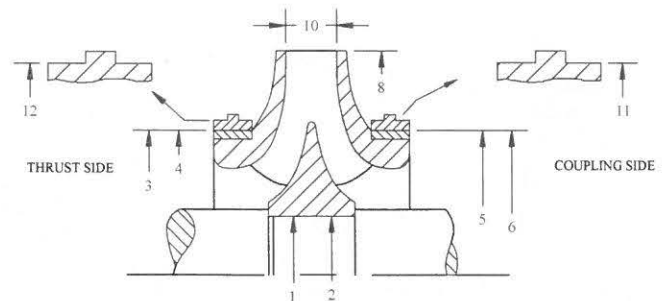
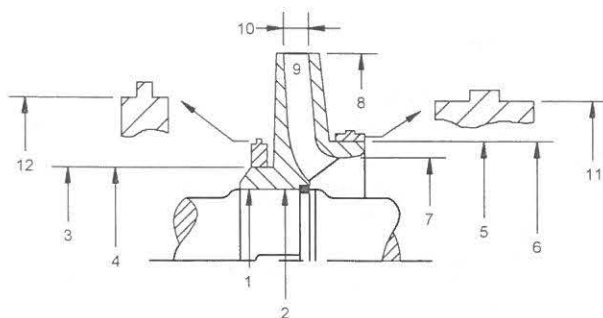
Photo 11: Typical Wear On Case Rings



Photo 12: Typical Wear On Stage Pieces

EPS JOB #	56870	CUSTOMER	EAST KENTUCKY POWER COOPERATIVE
PO #	EKPC-000015397	PLANT	SPURLOCK GENERATING STATION
INSP. BY	ACS	SERIAL #	UNIT #1
DATE	07/05/22		

LOC.	DESCRIPTION	STAGE 1		1ST STG. SLV.		STAGE 2		STAGE 3		STAGE 4		STAGE 5		STAGE 6		BOOSTER	
1	SHAFT DIAMETER AT IMPELLER	4.253	4.253	4.518	4.518	4.522	4.522	4.528	4.528	4.518	4.518	4.523	4.523	4.528	4.528	5.495	5.495
2	IMPELLER BORE DIAMETER	4.250	4.251	4.515	4.515	4.520	4.521	4.525	4.526	4.515	4.516	4.520	4.521	4.525	4.526	5.493	5.494
	FIT CLEARANCE	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.001)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.001)
3	IMPELLER HUB RING TURN	6.920	6.921	5.824	5.825	5.646	5.648	5.683	5.684	5.683	5.684	5.681	5.681	6.291	6.292	6.291	6.292
4	STAGE PIECE BORE	6.935	6.937	5.844	5.844	5.667	5.667	5.703	5.706	5.701	5.701	5.702	5.703	6.309	6.309	6.309	6.309
	RUNNING CLEARANCE	0.014	0.017	0.019	0.020	0.019	0.021	0.019	0.023	0.017	0.018	0.021	0.022	0.017	0.018	0.017	0.018
5	IMPELLER EYE RING TURN	7.029	7.030	N/A	N/A	6.993	6.994	7.029	7.029	7.031	7.031	7.030	7.031	7.029	7.030	7.295	7.295
6	CASING RING BORE	7.046	7.051	N/A	N/A	7.010	7.012	7.046	7.048	7.045	7.048	7.045	7.048	7.047	7.048	7.311	7.313
	RUNNING CLEARANCE	0.016	0.022	N/A	N/A	0.016	0.019	0.017	0.019	0.014	0.017	0.014	0.018	0.017	0.019	0.016	0.018
7	IMP. EYE DIA./ROTATION (*)	6.00	CCW	N/A	N/A	5.98	CW	6.13	CW	6.08	CCW	6.07	CCW	6.12	CCW	6.63	CW
8	IMP. MAJOR DIA. / VANE DIA.	9.61	Full	N/A	N/A	12.38	Full	12.36	Full	12.37	Full	12.36	Full	12.35	Full	10.99	Full
9	# OF VANES / B-VANE LENGTH	3	0.13	N/A	N/A	3	0.13	5	0.12	5	0.14	3	0.13	5	0.12	N/A	N/A
10	DISCHARGE PASSAGE WIDTH	1.58		N/A		1.22		0.78		0.81		1.18		0.83		N/A	
11	CASING RING FIT TURN	7.783	7.786	N/A	N/A	7.784	7.787	7.785	7.787	7.784	7.787	7.787	7.787	7.785	7.786	7.784	7.787
	CASING RING FIT BORE	7.786	7.787	N/A	N/A	7.787	7.787	7.787	7.788	7.786	7.787	7.786	7.787	7.787	7.787	7.787	7.788
	FIT CLEARANCE	0.000	0.004	N/A	N/A	0.000	0.003	0.000	0.003	(0.001)	0.003	(0.001)	0.000	0.001	0.002	0.000	0.004
12	STAGE PIECE FIT TURN	7.785	7.786	7.784	7.784	7.784	7.784	7.786	7.787	7.784	7.785	7.784	7.784	N/A	N/A	7.784	7.785
	STAGE PIECE FIT BORE	7.787	7.787	7.786	7.787	7.786	7.787	7.787	7.787	7.787	7.788	7.786	7.787	N/A	N/A	7.787	7.787
	FIT CLEARANCE	0.001	0.002	0.002	0.003	0.002	0.003	0.000	0.001	0.002	0.004	0.002	0.003	N/A	N/A	0.002	0.003
13	IMP. HUB RING HARDNESS (Rc)	35		30		35		35		35		35		N/A		35	
14	STAGE PIECE HARDNESS (Rc)	55		55		55		55		55		55		N/A		55	
15	IMP. EYE RING HARDNESS (Rc)	35		N/A		35		35		30		35		35		35	
16	CASING RING HARDNESS (Rc)	55		N/A		60		55		55		55		55		55	



1 ACS 07-07-22	UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES TOLERANCES:		ENGINEERED PUMP SERVICES, INC. MUKWONAGO, WISCONSIN					
	DECIMALS	ANGULAR						
	.X ± .1	± .25°	SIZE	PART NAME				
	.XX ± .01		A	INSPECTION - IMPELLERS				
.XXX ± .005		PART NO.	102-500-115-56870					
SURFACE ROUGHNESS 125/√		MATERIAL						
DRAWN BY SMG CHECKED BY ACS	SCALE	NTS	WEIGHT	LBS.	SHEET	1 OF 1	REV	1
REMOVE ALL BURRS AND SHARP EDGES .03 MAX RADIUS OR CHAMFER.								



Acuren Inspection Inc.

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Revision No: 0

MAGNETIC PARTICLE EXAMINATION REPORT

NDT, Inspection and Materials Engineering
A Rockwood Company

Customer: Engineered Pump Services - Mukwonago		Acuren Service Call #: 784230		Date: 06/02/2022	
Location / Address: 624 PERKINS DRIVE Mukwonago WI USA 53149		Customer Contact: Richard Laux		Contractor: N/A	
Part # / Drawing #: Impeller		Customer PO #: 3035101		Customer WO #: N/A	
Item Description: Casting		Stage of Manufacture: In Process-Prep			
Surface Condition: Media Blasted	Item Comment: N/A	Parts Inspected: 6	Accepted: 1	Rejected: 5	
NDE Procedure: MT-5 Rev. 3		Specification / Code: ASTM E 709-21		Acceptance Standard: CLIENT SPEC/NO LINEARS	
Material: N/A	Thickness: Various	Quantity: 6	Item Temp.: 70°F		
Technique: Wet - Fluorescent Cont.		Daily Yoke Verify:		Weight S/N	
Yoke: N/A					
Circular: Direct Contact: Yes Central Conductor: No Amps: 1800 DC Full					
Longitudinal: N/A					
Equipment Model/SN: V1-60 / 88001	Cal. Due Date: 06-Jul-2022	Medium - Mfg/Type/Color/Batch: Magnaflux 14am Fluorescent Green 21B008		Demagnetization Equipment: No N/A	
Blacklight Mfg/SN or White Light: REL Inc. N/A 12071631		Light Meter Mfg/SN: Gould - Bass DLM-1000 0915005A UV		Cal. Due Date: 2022-08-06	Intensity: 3000 $\mu\text{W}/\text{CM}^2$
Items	Quantity	Comments			Accept/Reject
N/A	1	No relevant indications found.			Accept
N/A	5	Rejected for linear indications 1/8" - 1".			Reject
N/A	6	Customer: EKPC Plant: Spurlock Pump: B-J 06x08x13 HDB-6 Job Number: 56870-01 Order Number: 3035101			Info Only
Item Condition / Item Preparation / Condition & Preparation Photo(s)					
Item Condition (Pre-Prep): Media Blasted			Item Preparation (Post-Prep): N/A		

High Temp: No	Wire Wheel: No	Other: N/A				Customer Contact: Richard Laux	
Per Diem:	Unit #:	# On Job:	Travel:	Hours:	Miles:	Hours Worked:	Total Hours:
ASSISTANT TECH NAME Nygaard, Lucas S.							

CLIENT REPRESENTATIVE		ACUREN INSPECTOR	
_____	_____		06/02/2022
Client Representative	Date	Padron, Anthony (Anthony) M.	Date
			II Inspection Level

Client acknowledges receipt and custody of the report or other work ("Deliverable"). Client agrees that it is responsible for assuring that acceptance standards, specifications and criteria in the Deliverable and Statement of Work ("SOW") are correct. Client acknowledges that Acuren is providing the Deliverable according to the SOW, and not any other standards.

REVIEWED BY	
	06/03/2022
Krueger, Drew (Drew) A.	Date

Client acknowledges that it is responsible for the failure of any items inspected to meet standards, and for remediation. Client has 15 business days following the date Acuren provides the Deliverable to inspect it, identify deficiencies in writing, and provide written rejection, or else the Deliverable will be deemed accepted. The Deliverable and other services provided by Acuren are governed by a Master Services Agreement ("MSA"). If the parties have not entered into an MSA, then the Deliverable and services are governed by the SOW and the "Acuren Standard Service Terms" (www.acuren.com/serviceterms) in effect when the services were ordered.



Acuren Inspection Inc.

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Revision No: 0

MAGNETIC PARTICLE EXAMINATION REPORT

NDT, Inspection and Materials Engineering
A Rockwood Company

Customer: Engineered Pump Services - Mukwonago		Acuren Service Call #: 784230		Date: 06/02/2022	
Location / Address: 624 PERKINS DRIVE Mukwonago WI USA 53149		Customer Contact: Richard Laux		Contractor: N/A	
Part # / Drawing #: Impeller		Customer PO #: 3035101		Customer WO #: N/A	
Item Description: Casting		Stage of Manufacture: In Process-Prep			
Surface Condition: Media Blasted	Item Comment: N/A	Parts Inspected: 6	Accepted: 1	Rejected: 5	
NDE Procedure: MT-5 Rev. 3		Specification / Code: ASTM E 709-21		Acceptance Standard: CLIENT SPEC/NO LINEARS	

Additional Photo(s)



Linears found on vane inlets and outlets



Linears found on vanes and keyway.



Linear found on vane outlet.

High Temp: No	Wire Wheel: No	Other: N/A				Customer Contact: Richard Laux	
Per Diem:	Unit #:	# On Job:	Travel:	Hours:	Miles:	Hours Worked:	Total Hours:
ASSISTANT TECH NAME		Nygard, Lucas S.					

CLIENT REPRESENTATIVE

ACUREN INSPECTOR

Client Representative _____ Date _____

[Signature]
Padron, Anthony (Anthony) M. _____ 06/02/2022 _____ II
Date Inspection Level

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REVIEWED BY
[Signature]
Krueger, Drew (Drew) A. _____ 06/03/2022 _____
Date

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ACUREN

This test is accredited and meet(s) the requirements of ISO/IEC 17025 as verified by the ANSI-ASQ National Accreditation Board/ANAB. Refer to certificate and scope of accreditation (L-2243 Milwaukee).

Acuren Inspection, Inc.
3710 North Richards Street
Milwaukee, Wisconsin 53212

Company: Acuren

Milwaukee

www.acuren.com

A Higher Level of Reliability

New Report #

Report Number: MIL380665

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ULTRASONIC EXAMINATION REPORT

CUSTOMER: Engineered Pump Services
ACUREN SERVICE CALL #: 784211
DATE: (MM/DD/YYYY) 05/23/2022

LOCATION/ADDRESS: 624 Perkins Dr., Mukwonago WI 53149
CUSTOMER CONTACT: Dean

PART # / DRAWING #: see below
CUSTOMER PO #: see below
CUSTOMER WO #: see below

ITEM DESCRIPTION: see below
STAGE OF MANUFACTURE: in Service
SURFACE CONDITION: Bare metal

SURFACE PREPARATION: Rag wipe
COMMENT:
PARTS INSPECTED: see below
ACCEPTED:
REJECTED:

NDE PROCEDURE REV. SPECIFICATION/CODE REV./EDITION ACCEPTANCE STANDARD
UT 2 REV 19 ASME SEC V 2017 client spec; no cracks, no linears

MATERIAL: Carbon Steel
THICKNESS: Varying in.
QUANTITY: see below
ITEM TEMP.: amb °F
CAL. BLK TEMP.: amb °F

TECHNIQUE: [x] Longitudinal [] Shearwave [] Other
TYPE OF EXAM: contact
COUPLANT TYPE: Sonix
BATCH NO.: 308-11

INSTRUMENT MANUFACTURER: Epoch
MODEL: 650
SERIAL NO.: 211398412
ANNUAL CAL. DUE DATE: 12/08/2022

TRANSDUCER: [x] Single [] Dual
FREQUENCY: 2.25 Mhz
WEDGE ANGLE: 0 degree
MANUFACTURER: panametrics
SERIAL NO.: 735218
SIZE: 0.5" diameter
MEASURED ANGLE: 0
DELAY: 0

CALIBRATION BLOCK: [] Curved [] Flat
TYPE: Back wall
MATERIAL: Same as part inspected
MANUFACTURER: NA
SN: NA

Table with 4 columns: Items, Quantity, Comments, Accept/Reject. Row 1: shaft, 1, Customer: EKPC, Plant: Spurlock, Pump: B-J 06x08x13 HDB-6, Job Number: 56870-01, Order Number: 3035115, Accept

Sensitivity Level: + 6dB
Calibration Time Check: 9
Calibration Time Initial: tm
Calibration Time Final: 3

[] High Temp
Wire Wheel: na
Other: na
Customer Contact: na

Per Diam: na
Unit #: na
No. on Job: na
Travel If Applicable: Hours: na Miles Total: na
Hours Worked: na to na and na to na
Total Hours: na

CLIENT REPRESENTATIVE: na
ACUREN INSPECTOR: Tim Mull
Print Name / Signature: Tim J, Mull
Date: 05/23/2022
Inspection Level: II

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