



Date: October 28, 2024
 To: All Vendors
 Subject: Addendum #1

REFERENCE: P004-25 Substation Power Transformers & LTC Field Services to Remove, Dispose, and Retro-Fill Corrosive Oil

This Addendum forms part of the contract and clarifies, corrects or modifies original proposal document.

Question 1: What is the manufacturer make and model on the LTC's for all 3 Transformers from the Filter Plant and FM 802?

Answer 1: See table below:

Substation	BPUB XFMR	XFMR Mfg./Model	LTC Mfg./Model
Filter Plant	1	GE/Prolec	Reinhausen/RMV-II-1500-15
Filter Plant	2	GE/Prolec	Reinhausen/RMV-II-1500-15
FM 802	2	Kuhlman	Reinhausen/RMV-II-1500-15

Question 2: Please provide oil results showing corrosive sulfur results on Filter Plant T1 and T2 Main Tank, and LTC?

Answer 2: See attached test report.

Question 3: What is your required vacuum hold time from the Filter Plant?

Answer 3: It is expected for vendor to follow the transformer's manufacture recommendation and/or reference IEEE std. C57.93-2007 at a minimum.

Question 4: Are there any pictures of the leak from the FM 802 transformer?

Answer 4: There are no pictures available. BPUB Substation personnel suspects leak is internal.

Question 5: If board is cracked or gasket is leaking from the FM 802 transformer, do we need to do any repairs while onsite or in a separate trip to procure materials and equipment?

Answer 5: It is preferable to do it on site, however any repairs must be pre-approved the BPUB substation manager.

Question 6: Do you have a legible LTC nameplate picture and/or information including serial number?

Answer 6: See attached test report.

Question 7: What is the total number of operations on the LTC?

Answer 7: See table below:

Substation	B PUB XFMR	XFMR Mfg./Model	LTC Mfg./Model	Number of LTC Operations
Filter Plant	1	GE/Prolec	Reinhausen/RMV-II-1500-15	31700
Filter Plant	2	GE/Prolec	Reinhausen/RMV-II-1500-15	47336
FM 802	2	Kuhlman	Reinhausen/RMV-II-1500-15	44108

The signature of the company agent, for the acknowledgement of this addendum, shall be required. **Complete information below and return via e-mail to: hlopez@brownsville-pub.com.**

I hereby acknowledge receipt of this addendum.

Company: _____

Agent Name: _____

Agent Signature: _____

Address: _____

City: _____ **State:** _____ **Zip:** _____

Phone Number: _____ **E-mail address:** _____

If you have any further questions about the Proposal, call 956-983-6375.

BY: Hugo E. López
Purchasing

Fm 802

TZ

MR

REINHAUSEN
MANUFACTURING

ON LOAD TAP-CHANGER

VACUTAP®

TYPE: RMV-II 1500-15

NO.: C014854

BIL PHASE TO PHASE AND TO GROUND: 110 KILOVOLTS

MEETS STANDARD: IEC 60214-1989, ANSI C57.131-1995

MAX. RATED THROUGH CURRENT [AMPS]: 1500

MAX. AND MINIMUM OPERATING TEMPERATURES : 100°C/-25°C

WITHSTAND FULL VACUUM (+/- 15 PSI) | IT IS RECOMMENDED TO

EQUALIZE PRESSURE WHEN VACUUM PROCESS / FILLING MAIN TANK

INSTRUCTION MANUAL: TL 7002

OIL FILL: 268 GALS

DATE OF MANUFACTURE: DEC. 2002

THIS TAP CHANGER MAY BE COVERED BY ONE
OR MORE OF THE FOLLOWING US-PATENTS:
5,107,200; 5,128,605; 5,165,295 AND
5,266,759 - ALL DOHNAL ET AL.

WARNING

**MAXIMUM COMPRESSION
OF INSPECTION DOOR**



Customer 9554000 Brownsville Public Utilities
Sub-Name FILTER SUB

City Brownsville, TX
Unit No. T1

Location OUTDOOR/GROUND
Other

NAMEPLATE DATA

Manufacturer	GE PROLEC	Equipment Type	TRANSFORMER
Manufacture Date	12/1/2004	Transformer Class	ONAN/ONAF
Serial No.	G1407-01	Impedance %	9.55
KVA Rating	15,000	Phase/Cycle	3/60
High Voltage	138,000 D	Liquid Type	OIL
Low Voltage	12,470 Y	Gallons	6,625
Weight	142,100	Other Access	TOP INSPECTION PLATE

ADDITIONAL EQUIPMENT

Radiators	Yes	Conservator Tank	No
Fans	Yes	LTC Compartment	Yes
Water Cooled	No	Bushing Location	TOP
Oil Pumps	No	Breather	N2 SYSTEM
Top FPV (inch)	1.00 Valve	Hose Length (feet)	100
Bottom FPV (inch)	2.00 Valve	Service Online	Yes
InsulationType	55/65C	Power Available	Yes

VISUAL INSPECTION

DATE	LEVEL	SAMPLE TEMP	TOP TEMP	P/V	PAINT	LEAKS
06/07/22	NORMAL	30	43	1.00	FAIR	NONE
06/05/23						
06/06/23	NORMAL	36	52	2.50		NONE
06/24/24	NORMAL	32	49	1.50	GOOD	NONE

FIELD SERVICE

DATE	SERVICE
06/05/23	LTC MAINTENANCE
06/05/23	DRAIN XFMR
06/05/23	VACUUM FILL
06/05/23	REPLACED GASKETS

Additional Information 6/24/2024 9:06:00 AM CORROSIVE SULFUR (48 Hrs.@150C): CORROSIVE 4a

Reason Not Tested

LIQUID SCREEN TEST DATA

DATE	SERVICE	ACID	IFT	DIEL 877	DIEL 1816	GAP	COLOR	SP. GRAV.	VISUAL	SEDIMENT
06/25/18		0.020 AC	41.2 AC	45 AC			0.50 AC	0.880 AC	CLEAR AC	NONE AC
06/26/19		0.010 AC	41.1 AC	40 AC			0.50 AC	0.880 AC	CLEAR AC	NONE AC
06/22/20		0.010 AC	39.6 AC	45 AC			0.50 AC	0.890 AC	CLEAR AC	NONE AC
06/07/21		0.010 AC	38.2 AC	51 AC			0.50 AC	0.880 AC	CLEAR AC	NONE AC
06/07/22		0.010 AC	38.6 AC	49 AC			0.50 AC	0.888 AC	CLEAR AC	NONE AC
06/05/23	PROOF	0.020 AC	35.5 AC	57 AC			0.50 AC	0.882 AC	CLEAR AC	NONE AC
06/06/23		0.020 AC	39.0 AC	60 AC			0.50 AC	0.880 AC	CLEAR AC	NONE AC
06/24/24		0.020 AC	39.0 AC	48 AC			0.50 AC	0.886 AC	CLEAR AC	NONE AC

INHIBITOR CONTENT

DATE	PCT. BY WEIGHT
10/25/06	<0.02% UN
06/05/23	<0.02% UN

NOTE - THIS UNIT HAS A BLADDER OR CONTINUOUS N2 SYSTEM. THEREFORE, THE UNIT DOES NOT REQUIRE INHIBITED OIL. HOWEVER, HAVING INHIBITED OIL WILL PROVIDE ADDITIONAL PROTECTION AGAINST OIL OXIDATION IF THE CURRENT OIL PRESERVATION SYSTEM WERE TO EVER FAIL.

LIQUID POWER FACTOR

DATE	25 C	100 C
06/07/21	0.001 AC	0.092 AC
06/07/22	0.019 AC	0.301 AC
06/05/23	0.007 AC	0.183 AC
06/06/23	0.003 AC	0.144 AC
06/24/24	0.004 AC	0.139 AC

KEY TO ABBREVIATIONS: AC - ACCEPTABLE QU - QUESTIONABLE UN - UNACCEPTABLE RS - RESAMPLE

NOTE: * After a result indicates that the test or service was performed by an outside source.

Customer 9554000 Brownsville Public Utilities
Sub-Name FILTER SUB
Location OUTDOOR/GROUND

S/N G1407-01
Mfg. GE PROLEC
Unit No. T1

Gallons 6,625
KVA 15,000

High Volt. 138,000
Low Volt. 12,470

KARL FISCHER TESTING MOISTURE CONTENT EXPRESSED IN PPM

DATE	AVG.		PCT.		MOISTURE BY DRY	
	TEMP	PPM	SATURATION	AC	WEIGHT PCT.	
06/22/20	36	7	6.7	AC	0.67	
06/07/21	37	7	6.2	AC	0.59	
06/07/22	35	4	4.0	AC	0.40	
06/05/23		8	N/A	AC	N/A	
06/06/23	41	7	5.6	AC	0.48	
06/24/24	37	6	5.5	AC	0.53	

RECOMMENDATION RETEST 1 YEAR

The moisture content continues to be acceptable based on the equipment and liquid type. Continued normal monitoring is indicated.

FURAN ANALYSIS EXPRESSED IN PPB

DATE	5H2F	2FOL	2FAL	2ACF	5M2F	TOTAL
06/26/19	ND	ND	1	ND	ND	1
06/22/20	ND	ND	17	ND	ND	17
06/07/21	ND	ND	3	ND	ND	3
06/07/22	ND	ND	2	ND	ND	2
06/06/23	ND	ND	3	ND	ND	3
06/24/24	ND	ND	9	ND	ND	9

RECOMMENDATION RETEST 1 YEAR

NO DIAGNOSTIC CHANGES ARE NOTED IN FURAN LEVELS SINCE THE PREVIOUS ANALYSIS. THE CELLULOSIC INSULATION APPEARS TO BE IN GOOD CONDITION.

CALCULATED DP <800 **EST. LIFE REMAINING** <100%

GAS-IN-OIL ANALYSIS GAS CHROMATOGRAPHY EXPRESSED IN PPM

DATE	HYDROGEN	OXYGEN	NITROGEN	METHANE	CARBON		ETHANE	ETHYLENE	ACETYLENE	TOTAL COMBUST.	TOTAL GAS
					MONOXIDE	DIOXIDE					
06/26/19	ND	2,012	58,345	ND	5	67	ND	ND	ND	5	60,429
06/22/20	ND	1,438	87,824	1	9	111	3	ND	ND	13	89,386
06/07/21	ND	462	79,991	1	1	137	8	ND	ND	10	80,600
06/07/22	17	277	80,712	1	2	98	4	ND	ND	24	81,111
06/05/23	3	507	1,629	ND	1	23	ND	ND	ND	4	2,163
06/06/23	ND	186	57,582	1	2	96	3	5	ND	11	57,875
06/24/24	4	174	66,613	19	50	340	34	4	ND	111	67,238

RECOMMENDATION RETEST 1 YEAR

B-THE ANALYSIS OF THIS SAMPLE SHOWS NO SIGNIFICANT INCREASE IN THE COMBUSTIBLE GAS VOLUME. THIS INDICATES NORMAL OPERATION.

ICP METALS-IN-OIL EXPRESSED IN PPM

DATE	ALUMINUM	IRON	COPPER
06/02/05	<0.1	<0.03	<0.01
10/25/06	<0.1	<0.03	<0.01
05/20/11	<0.1	<0.03	<0.01
05/24/12	<0.1	<0.03	<0.01
05/01/13	<0.1	<0.03	0.04

RECOMMENDATION RETEST 1 YEAR

THERE HAS BEEN NO DIAGNOSTIC CHANGE SINCE THE PREVIOUS ANALYSIS. THESE DATA INDICATE NORMAL OPERATION.

PCB CONTENT EXPRESSED IN PPM

DATE	1242	1254	1260	OTHER	TOTAL
05/01/13	ND	ND	ND	ND	ND
06/22/20	ND	ND	ND	ND	ND
06/07/21	ND	ND	ND	ND	ND
06/07/22	2	ND	ND	ND	2
06/06/23	ND	ND	ND	ND	ND
06/24/24	ND	ND	ND	ND	ND

COLOR LABEL: Green **CLASS:** NON-PCB

Results in mg/kg
ND means None Detected
(<2 mg/kg per ASTM D4059)

Customer 9554000 Brownsville Public Utilities
Sub-Name FILTER SUB

City Brownsville, TX
Unit No. T1

Location OUTDOOR/GROUND
Other EQUIP: MOTC

NAMEPLATE DATA

Equipment Type LOAD TAP CHANGER **Liquid Type** OIL
Manufacturer REINHAUSEN **LTC Gallons** 268.00
Serial No. C015750 **Selector Gallons** 279.00
LTC Model No. **Transfer/Diverter Gallons**
LTC for TC No. 322

ADDITIONAL EQUIPMENT

Conservator Tank No
Silica Gel Yes
Breather FREE/DESICCA
Top FPV (inch) 0.50 Plug
Bottom FPV (inch) 1.00 Valve

VISUAL INSPECTION

DATE	LEVEL	SAMPLE TEMP	TOP TEMP	P/V	PAINT	Tap Counter Reading	LEAKS
06/07/22							
06/06/23	NORMAL	42				29516	NONE
10/10/23	NORMAL	30	45		FAIR	30644	NONE
06/24/24		35			FAIR	31354	NONE

FIELD SERVICE

DATE	SERVICE
06/05/23	LTC MAINTENANCE

Additional Information 6/24/2024 9:22:00 AM CORROSIVE SULFUR (48 Hrs.@150C): CORROSIVE 4a

Reason Not Tested

LIQUID SCREEN TEST DATA

DATE	SERVICE	ACID	IFT	DIEL 877	DIEL 1816	GAP	COLOR	SP. GRAV.	VISUAL	SEDIMENT
05/01/13		0.020 AC	40.7 AC	47 AC			0.50 AC	0.890 AC	CLEAR AC	NONE AC
06/25/18		0.020 AC	38.2 AC	44 AC			0.50 AC	0.885 AC	CLEAR AC	NONE AC
06/26/19		0.020 AC	39.0 AC	46 AC			0.50 AC	0.880 AC	CLEAR AC	NONE AC
06/22/20		0.010 AC	38.3 AC	41 AC			0.50 AC	0.890 AC	CLEAR AC	NONE AC
06/07/21		0.010 AC	37.4 AC	53 AC			0.50 AC	0.880 AC	CLEAR AC	NONE AC
06/07/22		0.020 AC	38.2 AC	60 AC			0.50 AC	0.890 AC	CLEAR AC	NONE AC
06/06/23		0.020 AC	37.0 AC	49 AC			0.50 AC	0.882 AC	CLEAR AC	NONE AC
06/24/24		0.010 AC	34.3 AC	31 AC			1.00 AC	0.888 AC	CLEAR AC	NONE AC

INHIBITOR CONTENT

DATE	PCT. BY WEIGHT
10/25/06	<0.02% UN

NOTE - STUDIES SHOW THAT A LEVEL OF 0.3% INHIBITOR IS OPTIMUM FOR PRESERVATION OF IN-SERVICE TRANSFORMER OILS. OILS WITH A LEVEL BELOW 0.08% ARE CONSIDERED TO BE UNINHIBITED.

LIQUID POWER FACTOR

DATE	25 C	100 C
05/24/12	0.011	0.237
05/01/13	0.019	0.343
06/25/18	0.025	0.475
06/26/19	0.012	0.253
06/07/21	0.001	0.208

KEY TO ABBREVIATIONS: AC - ACCEPTABLE QU - QUESTIONABLE UN - UNACCEPTABLE RS - RESAMPLE

NOTE: * After a result indicates that the test or service was performed by an outside source.

Customer 9554000 Brownsville Public Utilities
Sub-Name FILTER SUB
Location OUTDOOR/GROUND

S/N C015750
Mfg. REINHAUSEN
Unit No. T1

Gallons 268
KVA

High Volt.
Low Volt.

KARL FISCHER TESTING MOISTURE CONTENT EXPRESSED IN PPM

DATE	AVG. TEMP	PPM	PCT.		MOISTURE BY DRY
			SATURATION	AC	WEIGHT PCT.
06/26/19	35	31	N/A	AC	N/A
06/22/20	35	27	N/A	AC	N/A
06/07/21	38	32	N/A	AC	N/A
06/07/22	35	31	N/A	AC	N/A
06/06/23	47	33	N/A	AC	N/A
06/24/24	40	30	N/A	AC	N/A

RECOMMENDATION RETEST 1 YEAR

The moisture content continues to be acceptable based on the equipment and liquid type. Continued normal monitoring is indicated.

FURAN ANALYSIS EXPRESSED IN PPB

DATE	5H2F	2FOL	2FAL	2ACF	5M2F	TOTAL
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GAS-IN-OIL ANALYSIS GAS CHROMATOGRAPHY EXPRESSED IN PPM

DATE	HYDROGEN	OXYGEN	NITROGEN	METHANE	CARBON		ETHANE	ETHYLENE	ACETYLENE	TOTAL COMBUST.	TOTAL GAS
					MONOXIDE	DIOXIDE					
06/26/19	ND	36,880	75,586	2	7	785	ND	ND	ND	9	113,260
06/22/20	ND	32,719	71,442	2	6	610	ND	1	ND	9	104,780
06/07/21	ND	28,358	60,970	1	4	611	ND	1	ND	6	89,945
06/07/22	12	29,607	61,986	1	4	559	ND	ND	ND	17	92,169
06/06/23	ND	27,047	59,371	3	7	491	1	1	ND	12	86,921
06/24/24	ND	27,899	54,239	2	5	484	1	1	ND	9	82,631

RECOMMENDATION RETEST 1 YEAR

B-THE ANALYSIS OF THIS SAMPLE SHOWS NO SIGNIFICANT INCREASE IN THE COMBUSTIBLE GAS VOLUME. THIS INDICATES NORMAL OPERATION.

ICP METALS-IN-OIL EXPRESSED IN PPM

DATE	ALUMINUM	IRON	COPPER
06/02/05	<0.1	<0.03	0.05
10/25/06	<0.1	<0.03	0.05
06/25/18	<0.1	<0.03	<0.01
06/26/19	<0.1	<0.03	<0.01
06/22/20	<0.1	<0.03	0.01
06/07/21	<0.1	<0.03	<0.01

RECOMMENDATION

NO RECOMMENDATION IS POSSIBLE FOR THIS SAMPLE. WE ARE UNAWARE OF ANY PARAMETERS OR GUIDANCE THAT WOULD ENABLE US TO INTERPRET THESE RESULTS OR DETERMINE AN APPROPRIATE MONITORING SCHEDULE.

PCB CONTENT EXPRESSED IN PPM

DATE	1242	1254	1260	OTHER	TOTAL
06/22/20	ND	ND	ND	ND	ND
06/07/21	ND	ND	ND	ND	ND
06/07/22	ND	ND	ND	ND	ND

COLOR LABEL: Green **CLASS:** NON-PCB

Results in mg/kg
 ND means None Detected
 (<2 mg/kg per ASTM D4059)

Customer 9554000 Brownsville Public Utilities
Sub-Name FILTER SUB

City Brownsville, TX
Unit No. T-2

Location OUTDOOR/GROUND
Other

NAMEPLATE DATA

Manufacturer	GE PROLEC	Equipment Type	TRANSFORMER
Manufacture Date	10/1/2004	Transformer Class	ONAN/ONAF
Serial No.	G1406-02	Impedance %	9.68
KVA Rating	15,000	Phase/Cycle	3/60
High Voltage	138,000	Liquid Type	OIL
Low Voltage	12,470	Gallons	5,455
Weight	130,645	Other Access	TOP INSPECTION PLATE

ADDITIONAL EQUIPMENT

Radiators	Yes	Conservator Tank	No
Fans	Yes	LTC Compartment	Yes
Water Cooled	No	Bushing Location	TOP
Oil Pumps	No	Breather	N2 SYSTEM
Top FPV (inch)	1.00 Valve	Hose Length (feet)	200
Bottom FPV (inch)	2.00 Valve	Service Online	Yes
InsulationType	55/65C	Power Available	Yes

VISUAL INSPECTION

DATE	LEVEL	SAMPLE TEMP	TOP TEMP	P/V	PAINT	LEAKS
06/07/21	NORMAL	32	45	2.50	FAIR	NONE
06/07/22	NORMAL	31	44	2.00	FAIR	NONE
06/06/23	NORMAL	36	56	4.00		NONE
06/24/24	NORMAL	35	52	2.50	GOOD	NONE

FIELD SERVICE

DATE SERVICE

Additional Information 6/24/2024 10:09:00 AM CORROSIVE SULFUR (48 Hrs.@150C): CORROSIVE 4a

Reason Not Tested

LIQUID SCREEN TEST DATA

DATE	SERVICE	ACID	IFT	DIEL 877	DIEL 1816	GAP	COLOR	SP. GRAV.	VISUAL	SEDIMENT
06/25/18		0.020 AC	41.8 AC	46 AC			0.75 AC	0.890 AC	CLEAR AC	NONE AC
06/26/19		0.020 AC	41.3 AC	43 AC			0.75 AC	0.890 AC	CLEAR AC	NONE AC
06/22/20		0.020 AC	39.3 AC	45 AC			0.75 AC	0.890 AC	CLEAR AC	NONE AC
06/07/21		0.020 AC	38.8 AC	47 AC			1.00 AC	0.880 AC	CLEAR AC	NONE AC
06/07/22		0.020 AC	38.9 AC	51 AC			1.00 AC	0.888 AC	CLEAR AC	NONE AC
06/06/23		0.030 AC	38.9 AC	44 AC			1.00 AC	0.882 AC	CLEAR AC	NONE AC
06/24/24		0.020 AC	37.5 AC	54 AC			1.00 AC	0.888 AC	CLEAR AC	NONE AC

INHIBITOR CONTENT

DATE	PCT. BY WEIGHT
10/25/06	<0.02% UN

NOTE - THIS UNIT HAS A BLADDER OR CONTINUOUS N2 SYSTEM. THEREFORE, THE UNIT DOES NOT REQUIRE INHIBITED OIL. HOWEVER, HAVING INHIBITED OIL WILL PROVIDE ADDITIONAL PROTECTION AGAINST OIL OXIDATION IF THE CURRENT OIL PRESERVATION SYSTEM WERE TO EVER FAIL.

LIQUID POWER FACTOR

DATE	25 C	100 C
06/26/19	0.012 AC	0.274 AC
06/07/21	0.001 AC	0.128 AC
06/07/22	0.064 AC	1.320 AC
06/06/23	0.008 AC	0.180 AC
06/24/24	0.003 AC	0.470 AC

KEY TO ABBREVIATIONS: AC - ACCEPTABLE QU - QUESTIONABLE UN - UNACCEPTABLE RS - RESAMPLE

NOTE: * After a result indicates that the test or service was performed by an outside source.

Customer 9554000 Brownsville Public Utilities
Sub-Name FILTER SUB
Location OUTDOOR/GROUND

S/N G1406-02
Mfg. GE PROLEC
Unit No. T-2

Gallons 5,455
KVA 15,000
High Volt. 138,000
Low Volt. 12,470

KARL FISCHER TESTING MOISTURE CONTENT EXPRESSED IN PPM

DATE	AVG. TEMP	PPM	PCT. SATURATION	MOISTURE BY DRY WEIGHT PCT.
06/07/21	37	12	11.1 QU	1.07
06/07/22	36	3	2.4 AC	0.24
06/06/23	41	3	2.4 AC	0.20
06/24/24	40	5	4.1 AC	0.36

RECOMMENDATION RETEST 1 YEAR

The moisture content continues to be acceptable based on the equipment and liquid type. Continued normal monitoring is indicated.

FURAN ANALYSIS EXPRESSED IN PPB

DATE	5H2F	2FOL	2FAL	2ACF	5M2F	TOTAL
06/26/19	ND	ND	1	ND	ND	1
06/22/20	ND	ND	12	ND	ND	12
06/07/21	ND	ND	7	ND	ND	7
06/07/22	ND	ND	3	ND	ND	3
06/06/23	ND	ND	3	ND	ND	3
06/24/24	ND	ND	17	ND	ND	17

RECOMMENDATION RETEST 1 YEAR

NO DIAGNOSTIC CHANGES ARE NOTED IN FURAN LEVELS SINCE THE PREVIOUS ANALYSIS. THE CELLULOSIC INSULATION APPEARS TO BE IN GOOD CONDITION.

CALCULATED DP 800 **EST. LIFE REMAINING** 100%

GAS-IN-OIL ANALYSIS GAS CHROMATOGRAPHY EXPRESSED IN PPM

DATE	HYDROGEN	OXYGEN	NITROGEN	METHANE	CARBON MONOXIDE	CARBON DIOXIDE	ETHANE	ETHYLENE	ACETYLENE	TOTAL COMBUST.	TOTAL GAS
06/26/19	ND	467	98,213	6	62	2,429	12	1	ND	81	101,190
06/22/20	ND	814	86,546	5	47	2,119	10	2	ND	64	89,543
06/07/21	ND	670	84,757	3	26	1,844	8	2	ND	39	87,310
06/07/22	14	1,041	85,384	4	26	1,819	6	1	ND	51	88,295
06/06/23	ND	314	76,134	4	20	1,611	8	1	ND	33	78,092
06/24/24	ND	1,232	68,621	3	11	1,786	8	1	ND	23	71,662

RECOMMENDATION RETEST 1 YEAR

B-THE ANALYSIS OF THIS SAMPLE SHOWS NO SIGNIFICANT INCREASE IN THE COMBUSTIBLE GAS VOLUME. THIS INDICATES NORMAL OPERATION.

ICP METALS-IN-OIL EXPRESSED IN PPM

DATE	ALUMINUM	IRON	COPPER
06/02/05	<0.1	<0.03	<0.01
10/25/06	<0.1	<0.03	0.03
05/20/11	<0.1	<0.03	<0.01
05/24/12	<0.1	<0.03	<0.01
05/01/13	<0.1	<0.03	0.04

RECOMMENDATION RETEST 1 YEAR

THERE HAS BEEN NO DIAGNOSTIC CHANGE SINCE THE PREVIOUS ANALYSIS. THESE DATA INDICATE NORMAL OPERATION.

PCB CONTENT EXPRESSED IN PPM

DATE	1242	1254	1260	OTHER	TOTAL
05/01/13	ND	ND	ND	ND	ND
06/22/20	ND	ND	ND	ND	ND
06/07/21	ND	ND	ND	ND	ND
06/07/22	2	ND	ND	ND	2
06/06/23	ND	ND	ND	ND	ND
06/24/24	ND	ND	ND	ND	ND

COLOR LABEL: Green **CLASS:** NON-PCB

Results in mg/kg
 ND means None Detected
 (<2 mg/kg per ASTM D4059)

Customer 9554000 Brownsville Public Utilities
Sub-Name FILTER SUB

City Brownsville, TX
Unit No. T-2

Location OUTDOOR/ABOVE
Other EQUIP: MOTC 8 ft

NAMEPLATE DATA

Equipment Type LOAD TAP CHANGER
Manufacturer REINHAUSEN
Serial No. C015759
LTC Model No.
LTC for TC No. 324

Liquid Type OIL
LTC Gallons 268.00
Selector Gallons 279.00
Transfer/Diverter Gallons

ADDITIONAL EQUIPMENT

Conservator Tank No
Silica Gel Yes
Breather FREE/DESICCA
Top FPV (inch) 0.50 Plug
Bottom FPV (inch) 1.00 Valve

VISUAL INSPECTION

DATE	LEVEL	SAMPLE TEMP	TOP TEMP	P/V	PAINT	Tap Counter Reading	LEAKS
06/07/22	NORMAL	31	44		FAIR	41498	NONE
06/06/23	NORMAL	44					NONE
10/10/23	NORMAL	30	40		FAIR	44872	NONE
06/24/24	NORMAL	36			GOOD	46365	NONE

FIELD SERVICE

DATE SERVICE

Additional Information 6/24/2024 10:05:00 AM CORROSIVE SULFUR (48 Hrs.@150C): CORROSIVE 4a

Reason Not Tested

LIQUID SCREEN TEST DATA

DATE	SERVICE	ACID	IFT	DIEL 877	DIEL 1816	GAP	COLOR	SP. GRAV.	VISUAL	SEDIMENT
06/25/18		0.020 AC	40.2 AC	41 AC			0.75 AC	0.890 AC	CLEAR AC	NONE AC
06/26/19		0.010 AC	40.0 AC	47 AC			0.50 AC	0.880 AC	CLEAR AC	NONE AC
06/22/20		0.020 AC	38.6 AC	39 AC			0.75 AC	0.890 AC	CLEAR AC	NONE AC
06/07/21		0.010 AC	37.2 AC	58 AC			0.50 AC	0.880 AC	CLEAR AC	NONE AC
06/07/22		0.020 AC	39.2 AC	58 AC			0.50 AC	0.890 AC	CLEAR AC	NONE AC
06/06/23		0.020 AC	36.0 AC	52 AC			0.50 AC	0.882 AC	CLEAR AC	NONE AC
06/24/24		0.020 AC	33.4 AC	48 AC			0.50 AC	0.886 AC	CLEAR AC	NONE AC

INHIBITOR CONTENT

DATE	PCT. BY WEIGHT
10/25/06	<0.02% UN

NOTE - STUDIES SHOW THAT A LEVEL OF 0.3% INHIBITOR IS OPTIMUM FOR PRESERVATION OF IN-SERVICE TRANSFORMER OILS. OILS WITH A LEVEL BELOW 0.08% ARE CONSIDERED TO BE UNINHIBITED.

LIQUID POWER FACTOR

DATE	25 C	100 C
05/24/12	0.010	0.235
05/01/13	0.011	0.241
06/25/18	0.009	0.489
06/26/19	0.012	0.404
06/07/21	0.001	0.356

KEY TO ABBREVIATIONS: AC - ACCEPTABLE QU - QUESTIONABLE UN - UNACCEPTABLE RS - RESAMPLE

NOTE: * After a result indicates that the test or service was performed by an outside source.

Customer 9554000 Brownsville Public Utilities
Sub-Name FILTER SUB
Location OUTDOOR/ABOVE GROUND

S/N C015759
Mfg. REINHAUSEN
Unit No. T-2

Gallons 268
KVA

High Volt.
Low Volt.

KARL FISCHER TESTING MOISTURE CONTENT EXPRESSED IN PPM

DATE	AVG. TEMP	PPM	PCT.		MOISTURE BY DRY
			SATURATION	AC	WEIGHT PCT.
06/26/19	37	29	N/A	AC	N/A
06/22/20	36	27	N/A	AC	N/A
06/07/21	38	33	N/A	AC	N/A
06/07/22	36	30	N/A	AC	N/A
06/06/23	49	25	N/A	AC	N/A
06/24/24	41	32	N/A	AC	N/A

RECOMMENDATION RETEST 1 YEAR

The moisture content continues to be acceptable based on the equipment and liquid type. Continued normal monitoring is indicated.

FURAN ANALYSIS EXPRESSED IN PPB

DATE	5H2F	2FOL	2FAL	2ACF	5M2F	TOTAL
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GAS-IN-OIL ANALYSIS GAS CHROMATOGRAPHY EXPRESSED IN PPM

DATE	HYDROGEN	OXYGEN	NITROGEN	METHANE	CARBON		ETHANE	ETHYLENE	ACETYLENE	TOTAL COMBUST.	TOTAL GAS
					MONOXIDE	DIOXIDE					
06/26/19	ND	35,867	75,910	2	8	688	ND	1	ND	11	112,476
06/22/20	ND	30,524	69,787	3	12	611	3	4	ND	22	100,944
06/07/21	4	28,139	62,933	2	14	710	ND	1	ND	21	91,803
06/07/22	1	31,437	67,269	1	4	601	ND	1	ND	7	99,314
06/06/23	2	19,446	43,139	1	4	388	ND	1	ND	8	62,981
06/24/24	ND	27,037	56,789	2	9	508	1	1	ND	13	84,347

RECOMMENDATION RETEST 1 YEAR

B-THE ANALYSIS OF THIS SAMPLE SHOWS NO SIGNIFICANT INCREASE IN THE COMBUSTIBLE GAS VOLUME. THIS INDICATES NORMAL OPERATION.

ICP METALS-IN-OIL EXPRESSED IN PPM

DATE	ALUMINUM	IRON	COPPER
06/02/05	<0.1	<0.03	0.07
10/25/06	<0.1	<0.03	0.07
06/25/18	<0.1	<0.03	<0.01
06/26/19	<0.1	<0.03	<0.01
06/22/20	<0.1	0.07	0.04
06/07/21	<0.1	<0.03	<0.01

RECOMMENDATION

NO RECOMMENDATION IS POSSIBLE FOR THIS SAMPLE. WE ARE UNAWARE OF ANY PARAMETERS OR GUIDANCE THAT WOULD ENABLE US TO INTERPRET THESE RESULTS OR DETERMINE AN APPROPRIATE MONITORING SCHEDULE.

PCB CONTENT EXPRESSED IN PPM

DATE	1242	1254	1260	OTHER	TOTAL
06/22/20	ND	ND	ND	ND	ND
06/07/21	ND	ND	ND	ND	ND

COLOR LABEL: Green **CLASS:** NON-PCB

Results in mg/kg
 ND means None Detected
 (<2 mg/kg per ASTM D4059)

Customer 9554000 Brownsville Public Utilities
Sub-Name 802

City Brownsville, TX
Unit No. T2

Location OUTDOOR/GROUND
Other

NAMEPLATE DATA

Manufacturer	KUHLMAN	Equipment Type	TRANSFORMER
Manufacture Date	1/1/2003	Transformer Class	OA/FA/FA
Serial No.	322706-02-01	Impedance %	9.39
KVA Rating	150,000	Phase/Cycle	3/60
High Voltage	138,000 D	Liquid Type	OIL
Low Voltage	12,470 Y	Gallons	6,690
Weight	132,668	Other Access	TOP INSPECTION PLATE

ADDITIONAL EQUIPMENT

Radiators	Yes	Conservator Tank	No
Fans	Yes	LTC Compartment	Yes
Water Cooled	No	Bushing Location	TOP
Oil Pumps	No	Breather	N2 SYSTEM
Top FPV (inch)	1.00 Valve	Hose Length (feet)	100
Bottom FPV (inch)	2.00 Valve	Service Online	Yes
InsulationType	55/65C	Power Available	Yes

VISUAL INSPECTION

DATE	LEVEL	SAMPLE TEMP	TOP TEMP	P/V	PAINT	LEAKS
05/09/23	NORMAL		60	1.00		NONE
06/09/23	NORMAL	36	40	2.00		NONE
07/25/23	NORMAL	30	45	2.00	GOOD	NONE
06/24/24	LOW	38	50	2.00	GOOD	YES - top radiator flange

FIELD SERVICE

DATE	SERVICE
05/16/23	RETROFILL

Additional Information 6/24/2024 2:25:00 PM CORROSIVE SULFUR (48 Hrs.@150C): NON-CORROSIVE 1b

Reason Not Tested

LIQUID SCREEN TEST DATA

DATE	SERVICE	ACID	IFT	DIEL 877	DIEL 1816	GAP	COLOR	SP. GRAV.	VISUAL	SEDIMENT
06/27/19		0.030 AC	40.3 AC	41 AC			1.50 AC	0.890 AC	CLEAR AC	NONE AC
06/22/20		0.020 AC	40.0 AC	43 AC			1.50 AC	0.890 AC	CLEAR AC	NONE AC
06/07/21		0.020 AC	37.2 AC	31 AC			1.50 AC	0.880 AC	CLEAR AC	NONE AC
06/06/22		0.030 AC	34.2 AC	46 AC			1.00 AC	0.888 AC	CLEAR AC	NONE AC
05/09/23	PROOF	0.020 AC	43.1 AC	44 AC			1.00 AC	0.880 AC	CLEAR AC	NONE AC
06/09/23		0.020 AC	41.0 AC	49 AC			0.50 AC	0.875 AC	CLEAR AC	NONE AC
06/24/24		0.020 AC	40.5 AC	41 AC			0.50 AC	0.878 AC	CLEAR AC	NONE AC

INHIBITOR CONTENT

DATE	PCT. BY WEIGHT
10/25/06	0.08% UN
05/09/23	0.28% AC

NOTE - THIS UNIT HAS A BLADDER OR CONTINUOUS N2 SYSTEM. THEREFORE, THE UNIT DOES NOT REQUIRE INHIBITED OIL. HOWEVER, HAVING INHIBITED OIL WILL PROVIDE ADDITIONAL PROTECTION AGAINST OIL OXIDATION IF THE CURRENT OIL PRESERVATION SYSTEM WERE TO EVER FAIL.

LIQUID POWER FACTOR

DATE	25 C	100 C
06/06/22	0.055 AC	2.060 AC
05/09/23	0.028 AC	0.453 AC
06/09/23	0.009 AC	0.136 AC
06/24/24	0.001 AC	0.063 AC

KEY TO ABBREVIATIONS: AC - ACCEPTABLE QU - QUESTIONABLE UN - UNACCEPTABLE RS - RESAMPLE

NOTE: * After a result indicates that the test or service was performed by an outside source.

Customer 9554000 Brownsville Public Utilities
Sub-Name 802
Location OUTDOOR/GROUND

S/N 322706-02-01
Mfg. KUHLMAN
Unit No. T2

Gallons 6,690
KVA 150,000
High Volt. 138,000
Low Volt. 12,470

KARL FISCHER TESTING MOISTURE CONTENT EXPRESSED IN PPM

DATE	AVG. TEMP	PPM	PCT. SATURATION	MOISTURE BY DRY WEIGHT PCT.
06/22/20	38	9	8.0 QU	0.74
06/07/21	39	9	7.3 AC	0.65
06/06/22	33	3	3.2 AC	0.34
05/09/23	50	4	N/A AC	N/A
06/09/23	41	4	2.8 AC	0.24
06/24/24	43	3	2.2 AC	0.18

RECOMMENDATION RETEST 1 YEAR

The moisture content continues to be acceptable based on the equipment and liquid type. Continued normal monitoring is indicated.

FURAN ANALYSIS EXPRESSED IN PPB

DATE	5H2F	2FOL	2FAL	2ACF	5M2F	TOTAL
06/27/19	ND	ND	1	ND	ND	1
06/22/20	ND	ND	2	ND	ND	2
06/07/21	ND	ND	5	ND	ND	5
06/06/22	ND	ND	6	ND	ND	6
06/09/23	ND	ND	3	ND	ND	3
06/24/24	ND	ND	12	ND	ND	12

RECOMMENDATION RETEST 1 YEAR

NO DIAGNOSTIC CHANGES ARE NOTED IN FURAN LEVELS SINCE THE PREVIOUS ANALYSIS. THE CELLULOSIC INSULATION APPEARS TO BE IN GOOD CONDITION.

CALCULATED DP <800 **EST. LIFE REMAINING** <100%

GAS-IN-OIL ANALYSIS GAS CHROMATOGRAPHY EXPRESSED IN PPM

DATE	HYDROGEN	OXYGEN	NITROGEN	METHANE	CARBON MONOXIDE	CARBON DIOXIDE	ETHANE	ETHYLENE	ACETYLENE	TOTAL COMBUST.	TOTAL GAS
06/22/20	ND	1,932	79,861	2	81	2,524	1	1	ND	85	84,402
06/07/21	ND	1,146	78,352	2	57	2,406	ND	1	ND	60	81,964
06/06/22	ND	751	72,206	2	39	2,618	1	1	ND	43	75,618
05/09/23	3	6,305	14,950	ND	5	66	ND	ND	ND	8	21,329
06/09/23	ND	6,323	57,676	ND	7	218	ND	ND	ND	7	64,224
06/24/24	ND	4,791	68,671	1	31	751	ND	ND	ND	32	74,245

RECOMMENDATION RETEST 1 YEAR

B-THE ANALYSIS OF THIS SAMPLE SHOWS NO SIGNIFICANT INCREASE IN THE COMBUSTIBLE GAS VOLUME. THIS INDICATES NORMAL OPERATION.

ICP METALS-IN-OIL EXPRESSED IN PPM

DATE	ALUMINUM	IRON	COPPER
06/02/05	<0.1	<0.03	<0.01
10/25/06	<0.1	<0.03	<0.01
05/20/11	<0.1	<0.03	0.07
05/24/12	<0.1	<0.03	0.03
05/01/13	<0.1	<0.03	0.12

RECOMMENDATION RETEST 1 YEAR

THERE HAS BEEN NO DIAGNOSTIC CHANGE SINCE THE PREVIOUS ANALYSIS. THESE DATA INDICATE NORMAL OPERATION.

PCB CONTENT EXPRESSED IN PPM

DATE	1242	1254	1260	OTHER	TOTAL
05/01/13	ND	ND	ND	ND	ND
06/22/20	ND	ND	ND	ND	ND
06/07/21	ND	ND	ND	ND	ND
06/06/22	ND	ND	ND	ND	ND
06/09/23	ND	ND	ND	ND	ND
06/24/24	ND	ND	ND	ND	ND

COLOR LABEL: Green **CLASS:** NON-PCB

Results in mg/kg
ND means None Detected
 (<2 mg/kg per ASTM D4059)

Customer 9554000 Brownsville Public Utilities
Sub-Name 802

City Brownsville, TX
Unit No. T2

Location OUTDOOR/ABOVE
Other EQUIP: MOTC 10 ft

NAMEPLATE DATA

Equipment Type LOAD TAP CHANGER
Manufacturer
Serial No.
LTC Model No.
LTC for TC No. 316

Liquid Type OIL
LTC Gallons 268.00
Selector Gallons 280.00
Transfer/Diverter Gallons

ADDITIONAL EQUIPMENT

Conservator Tank No
Silica Gel Yes
Breather FREE/DESICCA
Top FPV (inch) 0.50 Plug
Bottom FPV (inch) 2.00 Valve

VISUAL INSPECTION

DATE	LEVEL	SAMPLE TEMP	TOP TEMP	P/V	PAINT	Tap Counter Reading	LEAKS
06/09/23	NORMAL	39	45			40524	NONE
07/25/23	NORMAL	30	45		GOOD	41017	NONE
10/10/23	NORMAL	30	45		FAIR	41722	NONE
06/24/24	NORMAL	40	50		GOOD	43192	NONE

FIELD SERVICE

DATE 05/16/23
SERVICE RETROFILL

Additional Information 6/24/2024 2:34:00 PM CORROSIVE SULFUR (48 Hrs.@150C): NON-CORROSIVE 1b

Reason Not Tested

LIQUID SCREEN TEST DATA

DATE	SERVICE	ACID	IFT	DIEL 877	DIEL 1816	GAP	COLOR	SP. GRAV.	VISUAL	SEDIMENT
06/07/21		0.030 AC	35.8 AC	28 QU			3.50 UN	0.880 AC	CLEAR AC	NONE AC
06/06/22		0.040 AC	34.2 AC	56 AC			3.50 UN	0.892 AC	CLEAR AC	NONE AC
05/11/23	PROOF	0.010 AC	38.8 AC	50 AC			1.00 AC	0.876 AC	CLEAR AC	NONE AC
06/09/23		0.020 AC	43.0 AC	45 AC			1.00 AC	0.880 AC	CLEAR AC	NONE AC
06/24/24		0.020 AC	39.5 AC	33 AC			0.50 AC	0.878 AC	CLEAR AC	NONE AC

INHIBITOR CONTENT

DATE	PCT. BY WEIGHT
10/25/06	<0.02% UN
05/11/23	0.25% AC

NOTE - STUDIES SHOW THAT A LEVEL OF 0.3% INHIBITOR IS OPTIMUM FOR PRESERVATION OF IN-SERVICE TRANSFORMER OILS. OILS WITH A LEVEL BELOW 0.08% ARE CONSIDERED TO BE UNINHIBITED.

LIQUID POWER FACTOR

DATE	25 C	100 C
05/01/13	0.018	0.426
06/25/18	0.075	1.850
06/27/19	0.040	0.762
06/07/21	0.001	0.476
05/11/23	0.018 AC	0.487 AC

KEY TO ABBREVIATIONS: AC - ACCEPTABLE QU - QUESTIONABLE UN - UNACCEPTABLE RS - RESAMPLE

NOTE: * After a result indicates that the test or service was performed by an outside source.

Customer 9554000 Brownsville Public Utilities
Sub-Name 802
Location OUTDOOR/ABOVE GROUND

S/N
Mfg.
Unit No. T2

Gallons 268
KVA

High Volt.
Low Volt.

KARL FISCHER TESTING MOISTURE CONTENT EXPRESSED IN PPM

DATE	AVG. TEMP	PPM	PCT.		MOISTURE BY DRY
			SATURATION	AC	WEIGHT PCT.
06/22/20	35	30	N/A	AC	N/A
06/07/21	41	36	N/A	QU	N/A
06/06/22	38	39	N/A	QU	N/A
05/11/23	40	6	N/A	AC	N/A
06/09/23	44	21	N/A	AC	N/A
06/24/24	45	16	N/A	AC	N/A

RECOMMENDATION RETEST 1 YEAR

The moisture content continues to be acceptable based on the equipment and liquid type. Continued normal monitoring is indicated.

FURAN ANALYSIS EXPRESSED IN PPB

DATE	5H2F	2FOL	2FAL	2ACF	5M2F	TOTAL
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GAS-IN-OIL ANALYSIS GAS CHROMATOGRAPHY EXPRESSED IN PPM

DATE	HYDROGEN	OXYGEN	NITROGEN	METHANE	CARBON		ETHANE	ETHYLENE	ACETYLENE	TOTAL COMBUST.	TOTAL GAS
					MONOXIDE	DIOXIDE					
06/22/20	ND	30,529	69,194	2	22	837	ND	1	ND	25	100,585
06/07/21	ND	27,130	59,338	2	13	1,228	ND	1	ND	16	87,712
06/06/22	ND	25,309	52,155	1	7	915	ND	ND	ND	8	78,387
05/11/23	ND	12,470	30,043	ND	13	55	ND	ND	ND	13	42,581
06/09/23	5	18,430	44,404	ND	19	178	ND	ND	ND	24	63,036
06/24/24	4	27,812	55,767	2	17	626	1	2	ND	26	84,231

RECOMMENDATION RETEST 1 YEAR

B-THE ANALYSIS OF THIS SAMPLE SHOWS NO SIGNIFICANT INCREASE IN THE COMBUSTIBLE GAS VOLUME. THIS INDICATES NORMAL OPERATION.

ICP METALS-IN-OIL EXPRESSED IN PPM

DATE	ALUMINUM	IRON	COPPER
06/02/05	<0.1	<0.03	0.43
10/25/06	<0.1	<0.03	0.25
06/25/18	<0.1	<0.03	0.05
06/27/19	<0.1	<0.03	0.06
06/22/20	<0.1	<0.03	0.04
06/07/21	<0.1	<0.03	0.04

RECOMMENDATION

NO RECOMMENDATION IS POSSIBLE FOR THIS SAMPLE. WE ARE UNAWARE OF ANY PARAMETERS OR GUIDANCE THAT WOULD ENABLE US TO INTERPRET THESE RESULTS OR DETERMINE AN APPROPRIATE MONITORING SCHEDULE.

PCB CONTENT EXPRESSED IN PPM

DATE	1242	1254	1260	OTHER	TOTAL
06/22/20	ND	ND	ND	ND	ND
06/07/21	ND	ND	ND	ND	ND
06/06/22	ND	ND	ND	ND	ND

COLOR LABEL: Green **CLASS:** NON-PCB

Results in mg/kg
 ND means None Detected
 (<2 mg/kg per ASTM D4059)