COMPLIANCE TEST REPORT
GLGT COMPRESSOR STATION 8
CRYSTAL FALLS, MI
COMBUSTION TURBINE NO. 802

December 2, 2021

TC Energy

TC Energy's Great Lakes Gas Transmission Partnership
Crystal Falls, MI
151 Oss Road
Crystal Falls, MI
Iron County
Permit: No. MI-ROP-N3760-2021

Prepared by:

Environmental Quality Management, Inc.
1280 Arrowhead Court
Suite 2
Crown Point, IN 46307
(219) 661-9900
www.eqm.com

PN: 050614.0099.047

January 2022

PREFACE

I, Karl Mast, do hereby certify that the source emissions testing conducted at TC Energy in Crystal Falls, MI was performed in accordance with the procedures set forth by the United States Environmental Protection Agency, and that the data and results submitted within this report are an exact representation of the testing.

Karl Mast
Test Supervisor

I, Karl Mast, do hereby attest that all work on this project was performed under my direct supervision, and that this report accurately and authentically presents the source emissions testing conducted at Great Lakes Gas Transmission's Crystal Falls Compressor Station in Crystal Falls, MI.

Karl Mast
Test Supervisor

SUMMARY

The compliance testing was performed on the Combustion Turbine No.802 system in accordance with the requirements of the Title 40, Code of Federal Regulations, Part 60, Subpart GG, §60.335(B)(2) and at ambient temperature greater than 0 °F. The results of the testing are detailed in the following tables.

EU-UNIT 802 Summary Results						
Parameter	**High**	**Mid- High**	**Mid- Low**	**Low**	**Average**	**Limit**
NO_x ppm @ 15% O_2	118.036	100.546	83.867	70.820	93.317	175.2
NO_x lb/hr	55.357	41.092	29.360	21.237	36.762	89
CO ppm @ 15% O_2	20.313	20.576	25.293	35.116	25.325	31.9
CO lb/hr	5.798	5.119	5.390	6.405	5.678	14.8

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1. INTRODUCTION

This report presents the results of the source emissions testing conducted by Environmental Quality Management, Inc. (EQM) for TC Energy's Great Lakes Gas Transmission (GLGT) at Crystal Falls compressor station, near Crystal Falls, MI, which is located in Iron County.

The primary purpose of this testing program was to conduct emissions testing to determine compliance with operating permit No. MI-ROP-N3760-2021 for Combustion EU-UNIT 802 Turbine (No. 802) at GLGT's gas compressor facility.

EQM's responsibility was to conduct the compliance testing for the O2, CO, and NOx emissions rates and perform data reduction for conformance evaluation. Great Lakes Gas Transmission's responsibility was to maintain process operating parameters and to assist in providing process operating data per compliance test requirements. Where screen prints from the plant may not contain some information that is required, the data was manually recorded and hand written or typed on the screen prints from the instruments that produce the information.

The following report provides information pertaining to TC Energy's process operations, and Compliance testing. The Compliance testing conducted on the Combustion Turbine No. 802 was performed on December 2, 2021, from 8:40 A.M. to 1:32 P.M.

The following requirements were specific for the testing program:

1. Equipment calibrations were performed, and calibration data provided.
2. Three (3) twenty (20) minute O_2, CO, and NOx test runs performed at the Combustion Turbine No. 802 at four (4) load conditions, with the highest load at maximum achievable horsepower considering pipeline conditions and ambient temperature pursuant to EPA, Title 40, Code of Federal Regulations, Part 60 Subpart GG.
3. Process manufacturing operations maintained at 100%-50% of capacities and production and fuel consumption rates recorded during the emissions testing periods.
4. All testing and analyses performed in accordance with current EPA test methodologies and analytical procedures for O_2 CO, and NOx emissions determinations.
5. Stratification was found to be less than 5% in the turbine exhaust.

The testing program was approved by and/or coordinated with Tyrah Lydia, TC Energy's GLGT. The emission testing was managed and performed by Karl Mast, Manager, Emission Measurement and Project Manager, EQM. The emission testing was not observed by MEGLE.

2. TEST RESULTS SUMMARY

The compliance testing was performed on the Combustion Turbine No. 802 system in accordance with the requirements of the Title 40, Code of Federal Regulations, Part 60, Subpart GG, §60.335(B)(2) and at ambient temperature greater than 0 °F. A summary of the test results provided below:

Table 1. EU-UNIT 802-Summary Results

Parameter	High	Mid- High	Mid- Low	Low	Average	Limit
NO_x ppm @ 15% O_2	118.036	100.546	83.867	70.820	93.317	175.2
NO_x lb/hr	55.357	41.092	29.360	21.237	36.762	89
CO ppm @ 15% O_2	20.313	20.576	25.293	35.116	25.325	31.9
CO lb/hr	5.798	5.119	5.390	6.405	5.678	14.8

Based on the information provided above, the Combustion Turbine No. 802 and met the acceptance criteria during the course of the testing. A complete list of performance parameters for each test run that was performed at the stack sampling locations can be found in Tables 2-11.

Additional testing information may be found in Appendix A.

Table 2. Operating Parameters and Ambient Conditions -High Load-Turbine No. 802

Run	1	2	3	
Date	12/02/21	12/02/21	12/02/21	
Time	8:40	9:01	9:22	
Engine Operating Conditions	High 802	High 802	High 802	Averages
Unit Horsepower from Control Panel	12,710.0	14,312.0	13,150.0	13,390.7
% Load	55.3	62.2	57.2	58.2
Unit Speed (rpm) CT/GG/GP/Jet	15,418.0	15,446.0	15,443.0	15,435.7
% CT Speed	93.7	93.9	93.9	93.8
Gas Compressor Speed (rpm) PT/Booster	5,830.0	5,866.0	5,873.0	5,856.3
% PT Speed	79.3	79.8	79.9	79.7
Turbine Exhaust Temp T5	1,350.0	1,351.0	1,351.0	1,350.7
Compressor Suction Pressure (PSIG)	750.0	749.0	748.0	749.0
Compressor Suction Temperature (°F)	44.0	44.0	46.0	44.7
Compressor Discharge Pressure (PSIG)	831.0	831.0	831.0	831.0
Compressor Discharge Temperature (°F)	77.0	82.0	81.0	80.0
Compressor Flow (MMSCF/D)	1164.0	1165.0	1174.0	1,167.7
Heat Rate (BTU(LHV)/HP-hr)	8,996.9	8,048.7	8,810.9	8,618.8
Ambient Conditions				
Ambient Temperature (°F)	42.50	43.20	42.20	42.63
Barometric Pressure (psi)	28.00	28.00	28.00	28.00
Ambient Relative Humidity (%)	81.00	81.00	81.00	81.00
Absolute Humidity (grains/LB)	17.00	17.46	16.80	17.09

Table 3. Emissions Concentrations, Calculated Mass Emissions/Calculated & Fuel Flows - High Load-Turbine No. 802

Run	1	2	3	
Date	12/02/21	12/02/21	12/02/21	
Time	8:40	9:01	9:22	
Emissions Concentrations & Calculated Mass Emissions	High 802	High 802	High 802	Averages
NO_x ppm (BIAS Corrected)	113.210	114.220	114.060	113.830
NO_X g/BHP-HR	1.944	1.752	1.942	1.880
NO_X LB/HR 89	54.484	55.278	56.310	55.357
NO_X (ppm @ 15% O_2) 175.2	116.977	117.814	119.318	118.036
NO_X (ppm @ 15% O_2, ISO)	82.610	83.129	84.296	83.345
NOx LB/MMBTU	0.431	0.434	0.439	0.435
NO_X Tons/Year	238.640	242.117	246.636	242.464
NO_X LB/SCF Fuel	4.513E-04	4.546E-04	4.604E-04	4.554E-04
NO_X LB/MMSCF Fuel	4.513E+02	4.546E+02	4.604E+02	455.425
CO ppm (BIAS Corrected)	19.940	19.410	19.420	19.590
CO g/BHP-HR	0.208	0.181	0.201	0.197
CO LB/HR 14.8	5.841	5.718	5.836	5.798
CO LB/MMBTU **	0.046	0.045	0.046	0.046
CO (ppm @ 15% O_2) 31.9	20.604	20.021	20.315	20.313
CO (ppm @ 15% O_2, ISO)	14.550	14.127	14.352	14.343
CO Tons/Year	25.586	25.045	25.561	25.397
CO LB/SCF Fuel	4.839E-05	4.702E-05	4.771E-05	4.771E-05
CO LB/MMSCF Fuel	48.390	47.021	47.713	47.708
% O_2 (BIAS Corrected)	15.190	15.180	15.260	15.210
Calculated Flows				
Fuel Flow - (SCFM)	2016.00	2030.83	2042.67	2029.83
Fuel Flow - (SCFH)	120,960	121,850	122,560	121,790
Exhaust Flow (LB/HR)	267,381.0	268,852.8	274,127.1	270,120
Exhaust Flow Method 19 (scfm)	67,043	67,419	68,773	67,745
BSAC, #/BHP-hr	23.17	20.69	22.97	22
Fuel Flow Measurements				
Fuel Flow From Screen(MSCFH)	120.96	121.85	122.56	121.79
** BASED ON FUEL SPECIFIC DRY F-FACTOR CALCULATION	Run 1	Run 2	Run 3	
* BASED ON CARBON BALANCE (STOICH. + O2) - A/F IS TOTAL MASS RATIO				

Table 4. Operating Parameters and Ambient Conditions – Mid-High Load-Turbine No. 802

Run	10	11	12	
Date	12/02/21	12/02/21	12/02/21	
Time	12:30	12:51	13:12	
Engine Operating Conditions	Mid High 802	Mid High 802	Mid High 802	Averages
Unit Horsepower from Control Panel	8,457.0	8,928.0	9,546.0	8,977.0
% Load	36.8	38.8	41.5	39.0
Unit Speed (rpm) CT/GG/GP/Jet	15,130.0	15,127.0	15,111.0	15,122.7
% CT Speed	92.0	92.0	91.9	91.9
Gas Compressor Speed (rpm) PT/Booster	5,476.0	5,477.0	5,475.0	5,476.0
% PT Speed	74.5	74.5	74.5	74.5
Turbine Exhaust Temp T5	1,277.0	1,270.0	1,268.0	1,271.7
Compressor Suction Pressure (PSIG)	780	777	776.0	777.7
Compressor Suction Temperature (°F)	45	43	45.0	44.3
Compressor Discharge Pressure (PSIG)	805	806	806.0	805.7
Compressor Discharge Temperature (°F)	68	68	69.0	68.3
Compressor Flow (MMSCF/D)	1159	1155	1147.0	1,153.7
Heat Rate (BTU(LHV)/HP-hr)	11,905.1	11,226.2	10,486.5	11,205.9
Ambient Conditions				
Ambient Temperature (°F)	42.0	40.5	40.30	40.93
Barometric Pressure (psi)	28.10	28.20	28.20	28.17
Ambient Relative Humidity (%)	85.0	85.0	85.00	85.00
Absolute Humidity (grains/LB)	17.44	16.39	16.27	16.70

Table 5. Emissions Concentrations, Calculated Mass Emissions/Calculated & Fuel Flows – Mid-High Load-Turbine No. 802

Run	10	11	12	
Date	12/02/21	12/02/21	12/02/21	
Time	12:30	12:51	13:12	
Emissions Concentrations & Calculated Mass Emissions	Mid High 802	Mid High 802	Mid High 802	Averages
NO_x ppm (BIAS Corrected)	90.263	90.270	90.090	90.208
NO_X g/BHP-HR	2.210	2.088	1.947	2.082
NO_X LB/HR 89	41.206	41.101	40.969	41.092
NO_X (ppm @ 15% O_2) 175.2	100.481	100.679	100.478	100.546
NO_X (ppm @ 15% O_2, ISO)	70.832	70.839	70.998	70.890
NOx LB/MMBTU	0.370	0.371	0.370	0.370
NO_X Tons/Year	180.483	180.023	179.444	179.984
NO_X LB/SCF Fuel	3.877E-04	3.885E-04	3.877E-04	3.879E-04
NO_X LB/MMSCF Fuel	3.877E+02	3.885E+02	3.877E+02	387.943
CO ppm (BIAS Corrected)	18.530	18.420	18.430	18.460
CO g/BHP-HR	0.276	0.259	0.242	0.259
CO LB/HR 14.8	5.149	5.105	5.102	5.119
CO LB/MMBTU **	0.046	0.046	0.046	0.046
CO (ppm @ 15% O_2) 31.9	20.628	20.544	20.555	20.576
CO (ppm @ 15% O_2, ISO)	14.581	14.521	14.533	14.545
CO Tons/Year	22.553	22.361	22.345	22.420
CO LB/SCF Fuel	4.845E-05	4.825E-05	4.828E-05	4.832E-05
CO LB/MMSCF Fuel	48.447	48.250	48.276	48.324
% O_2 (BIAS Corrected)	15.600	15.610	15.610	15.607
Calculated Flows				
Fuel Flow - (SCFM)	1775.00	1767.00	1764.83	1768.94
Fuel Flow - (SCFH)	106,500	106,020	105,890	106,137
Exhaust Flow (LB/HR)	253,156.4	252,587.8	252,292.4	252,679
Exhaust Flow Method 19 (scfm)	63,595	63,428	63,350	63,458
BSAC, #/BHP-hr	33.00	31.18	29.13	31
Fuel Flow Measurements				
Fuel Flow From Screen(MSCFH)	106.50	106.02	105.89	106.14
** BASED ON FUEL SPECIFIC DRY F-FACTOR CALCULATION	Run 10	Run 11	Run 12	
* BASED ON CARBON BALANCE (STOICH. + O2) - A/F IS TOTAL MASS RATIO				

Table 6. Operating Parameters and Ambient Conditions – Mid-Low Load-Turbine No. 802

Run	7	8	9	
Date	12/02/21	12/02/21	12/02/21	
Time	11:23	11:44	12:05	
Engine Operating Conditions	Mid Low 802	Mid Low 802	Mid Low 802	Averages
Unit Horsepower from Control Panel	7,771.0	7,372.0	7,116.0	7,419.7
% Load	33.8	32.1	30.9	32.3
Unit Speed (rpm) CT/GG/GP/Jet	14,804.0	14,829.0	14,828.0	14,820.3
% CT Speed	90.0	90.1	90.1	90.1
Gas Compressor Speed (rpm) PT/Booster	5,086.0	5,087.0	5,088.0	5,087.0
% PT Speed	69.2	69.2	69.2	69.2
Turbine Exhaust Temp T5	1,200.0	1,198.0	1,198.0	1,198.7
Compressor Suction Pressure (PSIG)	780.0	780.0	781	780.3
Compressor Suction Temperature (°F)	45.0	45.0	45	45.0
Compressor Discharge Pressure (PSIG)	804.0	804.0	804	804.0
Compressor Discharge Temperature (°F)	66.0	67.0	66	66.3
Compressor Flow (MMSCF/D)	1078.0	1066.0	1074	1,072.7
Heat Rate (BTU(LHV)/HP-hr)	11,035.1	11,667.0	12,096.0	11,599.4
Ambient Conditions				
Ambient Temperature (°F)	42.10	43.60	42.9	42.87
Barometric Pressure (psi)	28.10	28.10	28.10	28.10
Ambient Relative Humidity (%)	84.00	84.00	83.0	83.67
Absolute Humidity (grains/LB)	17.30	18.33	17.63	17.75

Table 7. Emissions Concentrations, Calculated Mass Emissions/Calculated & Fuel Flows – Mid-Low Load-Turbine No. 802

Run	7	8	9	
Date	12/02/21	12/02/21	12/02/21	
Time	11:23	11:44	12:05	
Emissions Concentrations & Calculated Mass Emissions	Mid Low 802	Mid Low 802	Mid Low 802	Averages
NO_x ppm (BIAS Corrected)	70.980	71.460	71.620	71.353
NO_X g/BHP-HR	1.687	1.810	1.896	1.798
NO_X LB/HR 89	28.908	29.423	29.748	29.360
NO_X (ppm @ 15% O_2) 175.2	82.763	83.987	84.851	83.867
NO_X (ppm @ 15% O_2, ISO)	58.391	59.493	59.718	59.201
NOx LB/MMBTU	0.305	0.309	0.312	0.309
NO_X Tons/Year	126.618	128.872	130.298	128.596
NO_X LB/SCF Fuel	3.193E-04	3.241E-04	3.274E-04	3.236E-04
NO_X LB/MMSCF Fuel	3.193E+02	3.241E+02	3.274E+02	323.588
CO ppm (BIAS Corrected)	21.640	21.460	21.460	21.520
CO g/BHP-HR	0.313	0.331	0.346	0.330
CO LB/HR 14.8	5.365	5.379	5.426	5.390
CO LB/MMBTU **	0.057	0.057	0.057	0.057
CO (ppm @ 15% O_2) 31.9	25.232	25.222	25.424	25.293
CO (ppm @ 15% O_2, ISO)	17.824	17.785	17.932	17.847
CO Tons/Year	23.498	23.558	23.765	23.607
CO LB/SCF Fuel	5.926E-05	5.924E-05	5.971E-05	5.940E-05
CO LB/MMSCF Fuel	59.261	59.237	59.712	59.403
% O_2 (BIAS Corrected)	15.840	15.880	15.920	15.880
Calculated Flows				
Fuel Flow - (SCFM)	1511.83	1516.33	1517.50	1515.22
Fuel Flow - (SCFH)	90,710	90,980	91,050	90,913
Exhaust Flow (LB/HR)	225,291.8	227,574.3	229,457.3	227,441
Exhaust Flow Method 19 (scfm)	56,735	57,358	57,863	57,319
BSAC, #/BHP-hr	32.03	34.13	35.67	34
Fuel Flow Measurements				
Fuel Flow From Screen(MSCFH)	90.71	90.98	91.05	90.91
** BASED ON FUEL SPECIFIC DRY F-FACTOR CALCULATION	Run 7	Run 8	Run 9	
* BASED ON CARBON BALANCE (STOICH. + O2)				
- A/F IS TOTAL MASS RATIO				

Table 8. Operating Parameters and Ambient Conditions- Low Load-Turbine No. 802

Run	4	5	6	
Date	12/02/21	12/02/21	12/02/21	
Time	10:15	10:36	10:57	
Engine Operating Conditions	Low 802	Low 802	Low 802	Averages
Unit Horsepower from Control Panel	5,846.0	5,822.0	6,136.0	5,934.7
% Load	25.4	25.3	26.7	25.8
Unit Speed (rpm) CT/GG/GP/Jet	14,470.0	14,473.0	14,462.0	14,468.3
% CT Speed	88.0	88.0	87.9	88.0
Gas Compressor Speed (rpm) PT/Booster	4,700.0	4,700.0	4,699.0	4,699.7
% PT Speed	63.9	63.9	63.9	63.9
Turbine Exhaust Temp T5	1,130.0	1,125.0	1,128.0	1,127.7
Compressor Suction Pressure (PSIG)	769.0	771.0	778.0	772.7
Compressor Suction Temperature (°F)	44.0	46.0	44.0	44.7
Compressor Discharge Pressure (PSIG)	811.0	810.0	804.0	808.3
Compressor Discharge Temperature (°F)	53	54.0	64.0	57.0
Compressor Flow (MMSCF/D)	953.0	953.0	972.0	959.3
Heat Rate (BTU(LHV)/HP-hr)	12,725.0	12,572.9	11,935.7	12,411.2
Ambient Conditions				
Ambient Temperature (°F)	42.10	42.40	42.50	42.33
Barometric Pressure (psi)	28.10	28.10	28.10	28.10
Ambient Relative Humidity (%)	84.00	81.00	81.00	82.00
Absolute Humidity (grains/LB)	17.30	16.87	16.94	17.04

Table 9. Emissions Concentrations, Calculated Mass Emissions/Calculated & Fuel Flows - Low Load-Turbine No. 802

Run	4	5	6	
Date	12/02/21	12/02/21	12/02/21	
Time	10:15	10:36	10:57	
Emissions Concentrations & Calculated Mass Emissions	Low 802	Low 802	Low 802	Averages
NO_X ppm (BIAS Corrected)	61.800	56.330	56.480	58.203
NO_X g/BHP-HR	1.725	1.612	1.537	1.625
NO_X LB/HR 89	22.230	20.687	20.796	21.237
NO_X (ppm @ 15% O_2) 175.2	73.364	69.384	69.714	70.820
NO_X (ppm @ 15% O_2, ISO)	51.823	48.910	49.137	49.957
NOx LB/MMBTU	0.270	0.255	0.257	0.261
NO_X Tons/Year	97.365	90.608	91.086	93.020
NO_X LB/SCF Fuel	2.831E-04	2.677E-04	2.690E-04	2.732E-04
NO_X LB/MMSCF Fuel	2.831E+02	2.677E+02	2.690E+02	273.250
CO ppm (BIAS Corrected)	26.100	30.160	30.150	28.803
CO g/BHP-HR	0.443	0.525	0.500	0.489
CO LB/HR 14.8	5.715	6.742	6.757	6.405
CO LB/MMBTU **	0.069	0.083	0.083	0.079
CO (ppm @ 15% O_2) 31.9	30.984	37.149	37.214	35.116
CO (ppm @ 15% O_2, ISO)	21.887	26.187	26.230	24.768
CO Tons/Year	25.030	29.530	29.598	28.053
CO LB/SCF Fuel	7.277E-05	8.725E-05	8.740E-05	8.247E-05
CO LB/MMSCF Fuel	72.769	87.249	87.402	82.473
% O_2 (BIAS Corrected)	15.930	16.110	16.120	16.053
Calculated Flows				
Fuel Flow - (SCFM)	1311.50	1290.50	1291.17	1297.72
Fuel Flow - (SCFH)	78,690	77,430	77,470	77,863
Exhaust Flow (LB/HR)	198,829.4	202,410.0	202,914.8	201,385
Exhaust Flow Method 19 (scfm)	50,109	51,159	51,293	50,854
BSAC, #/BHP-hr	37.60	38.53	36.65	38
Fuel Flow Measurements				
Fuel Flow From Screen(MSCFH)	78.69	77.43	77.47	77.86
** BASED ON FUEL SPECIFIC DRY F-FACTOR CALCULATION	Run 4	Run 5	Run 6	
* BASED ON CARBON BALANCE (STOICH. + O2) - A/F IS TOTAL MASS RATIO				

3. PROCESS DESCRIPTION

TC Energy's GLGT Crystal Falls Compressor Station is located in Crystal Falls, Michigan and operates a General Electric Model LM1600 stationary gas turbine, labeled EU-Unit 802, and burns only pipeline quality natural gas. The unit peak load HP rating is 23,000 at ISO conditions. The plant is located at 151 Oss Road, Crystal Falls, MI

The General Electric LM1600 gas turbine is a simple cycle, natural gas fired, split-shaft turbine. In a simple cycle turbine, filtered atmosphere air is first compressed by the axial flow compressor. The hot compressed air is then fired with natural gas in the combustor. The hot exhaust gases expand through two turbine stages. The gas producer (G.P.) turbine drives the axial flow air while the power turbine (P.T.) drives the centrifugal pipeline compressor. The pipeline gas compressor moves natural gas through the pipeline by compressing it from an initial "suction" state to a more compressed "discharge" state.

The following tables provide a summary of the production rates for the Turbine No. 802 during the test:

Table 10. Turbine No. 802 Production Data

Parameter	HP	CT	PT
High	13,390.7	15,435.7	5,856.3
Mid-High	8,977.0	15,122.7	5,476.0
Mdi-Low	7,419.7	14,820.3	5,087.0
Low	5,934.7	14,468.3	4,699.7
Rated	23,000	16,450	7,350

Table 11. Turbine No. 802-General Information

General Information

Date:	2-Dec-21
Company:	TC Energy
Station:	Crystal Falls
Unit:	802
Engine Type:	GE LMI 600

CT Rated RPM:	16450	RPM
PT Rated RPM:	7350	RPM
Rated BHP:	23000	BHP

Permit Limits

	ppm@15%	g/Bhp-Hr	lb/hr	TPY
NOx:	175.2		89	
CO:	31.9		14.8	
VOC:				
H2CO:				

Limits are actuallly listed as average values

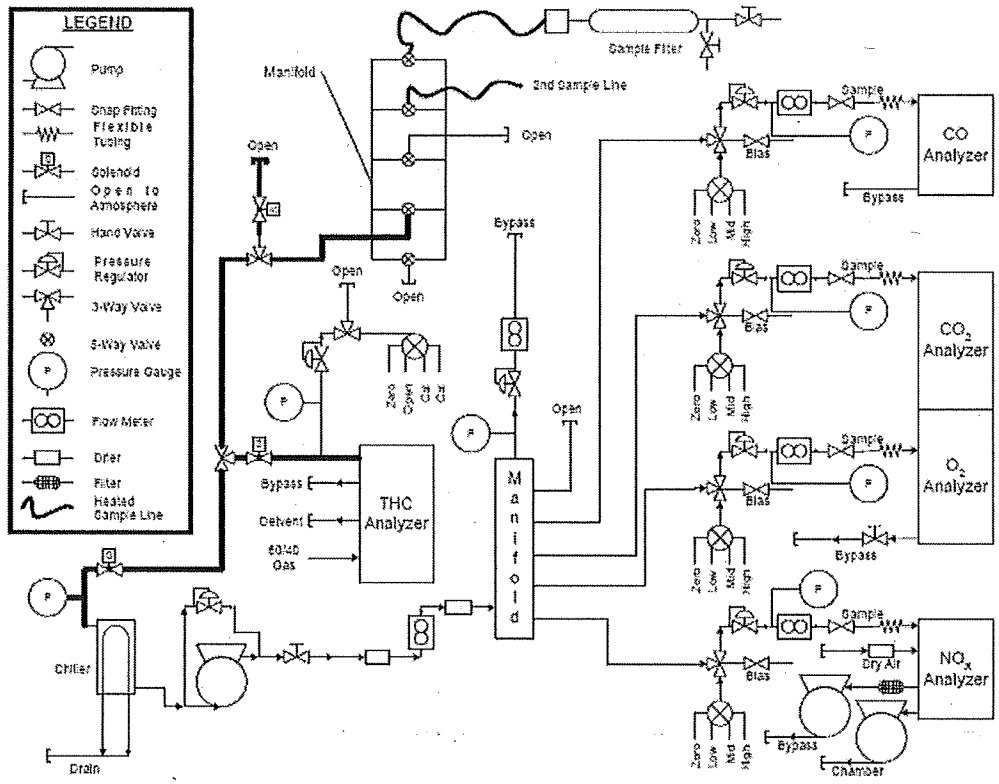
Fuel Gas Analysis

Constituent	Mole Percent
Nitrogen	0.527
Carbon Dioxide	0.657
Methane	93.002
Ethane	5.657
Propane	0.146
I-Butane	0.006
N-Butane	0.005
I-Pentane	0.001
N-Pentane	0.000
Hexane +	0.000
Total	100.00

Fuel Meter Type

Enter Type from List Below	2
Orifice Meter (upstream pressure tap):	1
Orifice Meter (downstream pressure tap):	2
Electronic Flow Meter (EFM):	3
Venturi (Nozzle) Meter:	4
Roots Meter w/ Accumulator:	5
Pipe I.D.:	3.068
Orifice I.D.:	1.5

Figure 1. Flow Schematic



Additional Information pertaining to the Fuel Flows may be found in Appendix B.

4. TEST PROCEDURES

EQM and EQM's affiliates and subcontractors use current U.S. EPA accepted testing methodologies in their Air Quality Programs as listed in the U.S. Code of Federal Regulations, Title 40, Part 60, Appendix A. For this testing program, the following specific methodologies were utilized:

- U.S. EPA Method 3A – Determination of Oxygen and Carbon Dioxide Concentrations in Emissions From Stationary Sources (Instrumental Analyzer Procedure)
- U.S. EPA Method 7E – Determination of Nitrogen Oxides Emissions From Stationary Sources (Instrumental Analyzer Procedure)
- U.S. EPA Method 10 – Determination of Carbon Monoxide Emissions From Stationary Sources (Instrumental Analyzer Procedure)
- U.S. EPA Method 19– Determination of Volumetric Flow Rate From Stationary Sources

USEPA Methods 3A, 7E, 10 and 19 were performed at the Exhaust Stack sampling location by continuously extracting a gas sample from the stack through a single point stainless steel sample probe. The extracted sample was pulled through a series of filters to remove any particulate matter. Directly after the probe, the sample was conditioned by a series of refrigeration dryers to remove moisture from the gas stream. After the refrigeration dryers, the sample was transported through a Teflon® line to the analyzers. The flow of the stack gas sample was regulated at a constant rate to minimize drift.

At the start of the day, each monitor was checked for calibration error by introducing zero, mid-range and high-range EPA Protocol 1 gases to the measurement system at a point upstream of the analyzers. In this report, the calibration error test is referred to as instrument calibration. The gas was injected into the sampling valve located at the outlet of the sampling probe. The bias test was conducted before and after each consecutive test run by introducing zero and upscale calibration gases for each monitor. The upscale calibration gases used for each monitor were the high calibration gases.

Measurement System Performance Specifications were as follows:

- Analyzer Calibration Error - Less than +/- 2% of the span of the zero, mid-range and high-range calibration gases.
- Sampling System Bias - Less than +/-5% of the span for the zero, mid-range and high-range calibration gases.
- Zero Drift - Less than +/-3% of the span over the period of each test run.
- Calibration Drift - Less than +/-3% of the span over the period of each set of runs.

Calculations that were used in this testing event for the Unit No. 802 are as follows:

Calibration Correction

$$C_{GAS} = (C_R - C_O)\frac{C_{MA}}{C_M - C_O}$$

Where:

C_{GAS}:	Corrected flue gas concentration (ppmvd)
C_R:	Flue gas concentration (ppmvd)
C_O:	Average of initial and final zero checks (ppmvd)
C_M:	Average of initial and final span checks (ppmvd)
C_{MA}:	Actual concentration of span gas (ppmvd)

EPA F-Factor

$$F_d = \frac{\left[\left(3.64 \cdot H_{Wt\%} \cdot 100\right) + \left(1.53 \cdot C_{Wt\%} \cdot 100\right)\right]}{\frac{GCV}{\rho_{FuelGas}}} \cdot 10^6 + \frac{\left[\left(0.14 \cdot N_{2Wt\%} \cdot 100\right) - \left(0.46 \cdot O_{2Wt\%} \cdot 100\right)\right]}{\frac{GCV}{\rho_{FuelGas}}} \cdot 10^6$$

Where:

F_d:	Fuel specific F-factor, dscf/MMBtu
$H_{Wt\%}$:	Hydrogen weight percent
$C_{Wt\%}$:	Carbon weight percent
$N_{2Wt\%}$:	Nitrogen weight percent
$O_{2Wt\%}$:	Oxygen weight percent
GCV:	Heating value of the fuel, BTU/dscf
$\rho_{Fuel\ Gas}$:	Density of the fuel gas, lb/scf

NO_x Corrected to 15% O_2

$$Em = NO_X\left(\frac{5.9}{20.9 - \%O_2}\right)$$

Where:

E_m:	Pollutant concentration corrected to 15% O_2, ppm
NO_x:	Pollutant concentration, ppm
$\%O_2$:	Oxygen concentration in percent, measured on a dry basis

Mass Emissions Calculations

The F-factor Method and guidance from Part 75 was used to calculate the mass emissions rates.

$$Em = Cd \times Fd \times \frac{20.9}{(20.9 - \%O_2)} \times Qh \times \frac{GCV}{10^6}$$

Where:

E_m:	Pollutant emission rate, lb/hr
C_d:	Pollutant concentration, lb/scf
F_d:	Fuel specific F-factor, dscf/MMBtu
$\%O_2$:	Oxygen concentration, dry basis
Q_h:	Fuel rate from calibrated AGA specified Meter, scfh.
GCV:	Heating value of the fuel, Btu/scf

To Convert from:	To	Multiply by:
ppm CO	lb/scf	7.268 x 10^{-8}
ppm NO_x	lb/scf	1.194 x 10^{-7}

5. QUALITY ASSURANCE PROCEDURES

Each reference method presented in the U.S. Code of Federal Regulations details the instrument calibration requirements, sample recovery and analysis, data reduction and verification, types of equipment required, and the appropriate sampling and analytical procedures to ensure maximum performance and accuracy. EQM and EQM's affiliates and subcontractors adhere to the guidelines for quality control set forth by the United States Environmental Protection Agency. These procedures are outlined in the following documents:

- Code of Federal Regulations, Title 40, Part 51
- Code of Federal Regulations, Title 40, Part 60
- Quality Assurance Handbook, Volume 1, EPA 600/9-76-005
- Quality Assurance Handbook, Volume 2, EPA 600/4-77-027a
- Quality Assurance Handbook, Volume 3, EPA 600/4-77-027b

6. CONCLUSIONS

An Emissions Test was conducted on the Turbine No. 802 at TC Energy's GLGT Pipeline Company's Crystal Falls Compressor Station located in Crystal Falls, MI. The testing was conducted on December2, 2021.

During the course of the testing, the Turbine No. 802 conformed to the requirements of Code of Federal Regulations, Title 40, Part 60, Appendix A.

The usefulness and/or significance of the emissions values presented in this document as they relate to the compliance status of the Turbine No. 802 emissions shall be determined by others.

For additional information pertaining to the testing program see Appendix E of this report.

A. FIELD TEST DATA