



Dow AgroSciences LLC

305 N. Huron Avenue Harbor Beach, MI 48441

November 21, 2016

CERTIFIED MAIL
7015 0640 0007 0204 2509

Mr. Chris Hare, District Supervisor
Air Quality Division
Michigan DEQ - Saginaw Bay District
401 Ketchum St., Suite B
Bay City, MI 48708

DEQ-AQD

NOV 28 2016

SAGINAW BAY

RE: B4942 VIOLATION NOTICE – November 3, 2016

Dow AgroSciences, LLC, (DAS) received a violation notice dated November 3, 2016. The notice alleges turbine emissions exceeded nitrogen oxides (NOx) ROP emission limits. As an immediate corrective action, gas rates to the turbines will be limited until permit conditions are modified.

The notice received on November 3 stems from compliance testing conducted to resolve another issue involving the low NOx burner technology used to limit NOx formation while operating the turbines. During initial permitting, limits were never established for periods when the low NOx burner technology is offline due to subzero ambient conditions. To correct this issue, a permit was submitted along with compliance test measurements and dispersion modelling. A permit to install (PTI) application was submitted on September 15, 2016.

The turbines are equipped with a low NOx burner technology manufactured by Solar® Turbines – A Caterpillar Company. Solar® Turbines introduced SoLoNOx™ in 1992 as a low emissions option. Solar® gas turbines with SoLoNOx™ use lean-premixed combustion technology to ensure uniform air/fuel mixture and to reduce formation of regulated pollutants such as NOx. The initial permit to install application was based on a vendor recommended NOx limit of 25 ppm.

Flexible Group FG-Turbines limits NOx emissions to 25 ppm @ 15%O₂ and 3.8 lb/hr. Attached to this letter are compliance test report HBO-Solar-2016-006026 summaries for the turbines. Attachment 1 applies to the north turbine. Attachment 2 applies to the south turbine. Full reports were previously submitted to the MDEQ Permitting and Technical Programs Units as well as Saginaw Bay District office.

The emission results for the turbines are:

- North Turbine = 22.22 ppm @ 15%O₂ and 4.02 lb/hr; and
- South Turbine = 21.40 ppm @ 15%O₂ and 3.55 lb/hr.

At 25 ppm corrected to 15%O₂, both units would be greater than the 3.8 lb/hr limit while remaining compliant with the concentration limit.

As mentioned previously, DAS is limiting the natural gas input to the turbines as an immediate corrective action. The turbines power process air compressors used to meet process air demands. The turbine exhaust heat is captured by a heat recovery steam generator (HRSG) to meet process stream demands. The north and south HRSG units are also equipped with burners to supplement the heat load as necessary.

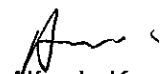
The turbines create less NOx per cubic feet of natural gas than the burners. Attachment 3 is a table provided in the previously submitted compliance test report. The emission factors developed are expressed in terms of pounds NOx per million cubic feet of natural gas (lb/mmSCF). As shown below, the burners produced more NOx per million cubic feet of natural gas compared to the turbines:

- North Burner = 133.8 lb NOx/mmSCF vs North Turbine = 99.62 lb NOx/mmSCF;
- North Burner = 132.95 lb NOx/mmSCF vs North Turbine = 97.09 lb NOx/mmSCF.

The corrective action, limiting the turbines gas feed, does have a negative energy and emission impact. The pending permit application will resolve this issue as well as the issue associated with SoLoNOx™ burner technology availability when ambient temperatures fall below zero degrees Fahrenheit.

If you have any questions regarding this report, please contact Jim McGee at (989) 479-5283 or by email at wmcgee@dow.com.

Sincerely,



Alfredo Kowalski
Site Leader
Dow AgroSciences, Harbor Beach Facility
(989) 479-5258

Attachment 1

EU_N_Turbine SoLoNOx_On TEG/Turbine Summary

Symbol	Run #	1	2	3	Average
SD	Sample Date	5/26/2016	5/26/2016	5/26/2016	N/A
ST	Sample Times (start/end)	8:40 - 9:40	10:00 - 11:00	11:22 - 12:22	N/A
D	Sampling Time (minutes)	60	60	60	60
P _{BAR}	Lab Barometric Pressure ("Hg)	29.91	29.91	29.91	29.91
A _S	Stack Area (sq ft)	9.62	9.62	9.62	9.62
V _{IC}	Impinger Weight Gain (g)	49.5	50.1	42.9	47.5
DGMCF	Dry Gas Meter Cal Factor	0.924	0.924	0.924	0.924
V _G	Total Gas Volume collected (ft ³)	33.890	35.010	35.160	34.687
T _M	Average Meter Temperature (deg F)	70	80	82	77
B _{WS}	Moisture Fraction	0.069	0.069	0.060	0.066
DGF	Dry Gas Fraction	0.931	0.931	0.940	0.934
T _S	Average Stack Temperature (deg F)	313	314	314	314
P@	Barometric Pressure @ Stack ("Hg)	29.85	29.85	29.85	29.9
P _G	Measured Static Pressure ("H2O)	-0.20	-0.20	-0.20	-0.20
P _S	Absolute Stack Pressure ("Hg)	29.84	29.84	29.84	29.84
P _M	Meter Pressure ("Hg)	29.98	29.98	29.98	29.98
%O ₂	Concentration O2, dry basis (%)	16.1	16.3	16.2	16.2
%CO ₂	Concentration CO2, dry basis (%)	3.0	3.0	3.0	3.0
%N ₂	Concentration N2, dry basis (%)	80.9	80.7	80.8	80.8
M _{SD}	Stack Gas Molecular Weight (wet)	29.1	29.1	29.1	29.1
M _S	Stack Gas Molecular Weight	28.4	28.4	28.5	28.4
√Δ _p	AVG (dp) ^{1/2}	1.251	1.267	1.262	1.260
Δ _p	AVG dp	1.538	1.575	1.563	1.558
V _S	Stack Gas Velocity (ft/s)	85.9	87.0	86.5	86.5
Q _w	Stack Gas Wet Flow (cf/hr)	2.98E+06	3.01E+06	3.00E+06	2.99E+06
Q _{wc}	Stack Gas Wet Flow Std Cond (scf/hr)	2.03E+06	2.05E+06	2.04E+06	2.04E+06
Q _s	Stack Gas Dry Flow (dscf/hr)	1.89E+06	1.91E+06	1.92E+06	1.90E+06
NO _x CONC	Conc. NOx in Outlet (ppmvd)dry	17.8	17.5	17.8	17.7
E _{NOx}	NOx Emissions (Lb/Hr)	4.01	3.99	4.07	4.02
E _{NOx}	NOx Emissions (ppmv @ 15% O2)	21.88	22.45	22.34	22.22
COCONC	Conc. CO in Outlet (ppmvd)dry	2.6	2.7	2.8	2.7
E _{CO}	CO Emissions (Lb/Hr)	0.36	0.38	0.39	0.37
E _{CO}	CO Emissions (ppmv @ 15% O2)	3.20	3.46	3.51	3.39
Process Data Summary					
	North Boiler Gas Flow (scfm)	N/A	N/A	N/A	N/A
	North Boiler Gas Flow (mmscf/hr)	N/A	N/A	N/A	N/A
	North Turbine Gas Flow (scfm)	678	668	674	673
	North Turbine Gas Flow mmscf/hr)	0.04068	0.04008	0.04044	0.04040
	Total Fuel Gas Flow (mmscf/hr)	0.04068	0.04008	0.04044	0.04040
Natural Gas Emission Factor					
	NOx Natural Gas Factor (Lb/mmscf)	98.55	99.58	100.74	99.62
	CO Natural Gas Factor (Lb/mmscf)	8.75	9.36	9.64	9.25

Attachment 2

EU_S_Turbine SoLoNOx_On TEG/Turbine Flow Summary

Symbol	Run #	1	2	3	Average
SD	Sample Date	6/2/2016	6/2/2016	6/2/2016	N/A
ST	Sample Times (start/end)	11:55 - 12:55	13:10 - 14:10	14:20 - 15:20	N/A
O	Sampling Time (minutes)	60	60	60	60
P _{BAR}	Lab Barometric Pressure ("Hg)	29.90	29.90	29.90	29.90
A _S	Stack Area (sq ft)	9.62	9.62	9.62	9.62
V _{IC}	Impinger Weight Gain (g)	30.1	27.1	27.6	28.3
DGMCF	Dry Gas Meter Cal Factor	0.924	0.924	0.924	0.924
V _G	Total Gas Volume collected (ft ³)	26.160	26.330	26.750	26.413
T _M	Average Meter Temperature (deg F)	77	79	88	81
B _{WS}	Moisture Fraction	0.056	0.051	0.052	0.053
DGF	Dry Gas Fraction	0.944	0.949	0.948	0.947
T _S	Average Stack Temperature (deg F)	311	311	311	311
P@	Barometric Pressure @ Stack ("Hg)	29.84	29.84	29.84	29.8
P _G	Measured Static Pressure ("H2O)	-0.20	-0.20	-0.20	-0.20
P _S	Absolute Stack Pressure ("Hg)	29.63	29.63	29.63	29.63
P _M	Meter Pressure ("Hg)	29.97	29.97	29.97	29.97
%O ₂	Concentration O2, dry basis (%)	16.5	16.5	16.6	16.5
%CO ₂	Concentration CO2, dry basis (%)	3.0	3.0	3.0	3.0
%N ₂	Concentration N2, dry basis (%)	80.5	80.5	80.4	80.5
M _{SD}	Stack Gas Molecular Weight (wet)	29.1	29.1	29.1	29.1
M _S	Stack Gas Molecular Weight	28.5	28.6	28.6	28.6
√Δ _p	AVG (dp) ^{1/2}	1.227	1.219	1.235	1.227
Δ _p	AVG dp	1.488	1.469	1.506	1.488
V _S	Stack Gas Velocity (ft/s)	83.8	83.3	84.4	83.8
Q _w	Stack Gas Wet Flow (cf/hr)	2.90E+06	2.89E+06	2.92E+06	2.90E+06
Q _{wc}	Stack Gas Wet Flow Std Cond (scf/hr)	1.98E+06	1.97E+06	2.00E+06	1.98E+06
Q _s	Stack Gas Dry Flow (dscf/hr)	1.87E+06	1.87E+06	1.89E+06	1.88E+06
NO _x CONC	Conc. NOx in Outlet (ppmvd)dry	15.9	15.6	16.0	15.8
E _{NOx}	NOx Emissions (Lb/Hr)	3.55	3.48	3.62	3.55
E _{NOx}	NOx Emissions (ppmv @ 15% O2)	21.32	20.92	21.95	21.40
CO _{CONC}	Conc. CO in Outlet (ppmvd)dry	3.7	3.8	4.0	3.8
E _{CO}	CO Emissions (Lb/Hr)	0.50	0.52	0.55	0.52
E _{CO}	CO Emissions (ppmv @ 15% O2)	4.96	5.10	5.49	5.18
Process Data Summary					
	South Boiler Gas Flow (scfm)	N/A	N/A	N/A	N/A
	South Boiler Gas Flow (mmscf/hr)	N/A	N/A	N/A	N/A
	South Turbine Gas Flow (scfm)	609	606	613	609
	South Turbine Gas Flow mmscf/hr)	0.03654	0.03636	0.03678	0.03656
	Total Fuel Gas Flow (mmscf/hr)	0.03654	0.03636	0.03678	0.03656
Natural Gas Emission Factor					
	NOx Natural Gas Factor (Lb/mmscf)	97.24	95.74	98.29	97.09
	CO Natural Gas Factor (Lb/mmscf)	13.77	14.19	14.95	14.30

Attachment 3

Fresh Air Mode – EU_N_Burner								
Run	Natural Gas (MMSCF/Hr)	Stack Flow (DSCFHR)	NOx (ppm)	NOx (lb/hr)	NOx Nat Gas Factor (lb/mmSCF)	CO (ppm)	CO (lb/hr)	CO Nat Gas Factor (lb/mmSCF)
1	0.03216	1.93E+06	18.8	4.33	134.58	32.7	4.58	142.51
2	0.03216	1.90E+06	18.8	4.28	132.93	32.8	4.54	141.20
3	0.03222	1.91E+06	18.9	4.31	133.89	32.8	4.56	141.43
Average	0.03218	1.91E+06	18.8	4.31	133.80	32.8	4.56	141.71

Fresh Air Mode – EU_S_Burner								
Run	Natural Gas (MMSCF/Hr)	Stack Flow (DSCFHR)	NOx (ppm)	NOx (lb/hr)	NOx Nat Gas Factor (lb/mmSCF)	CO (ppm)	CO (lb/hr)	CO Nat Gas Factor (lb/mmSCF)
1	0.03162	1.89E+06	19.6	4.42	139.82	16.3	2.24	70.78
2	0.03180	1.86E+06	18.8	4.18	131.45	16.7	2.26	71.07
3	0.03180	1.89E+06	18.0	4.06	127.58	17.3	2.37	74.65
Average	0.03174	1.88E+06	18.8	4.22	132.95	16.8	2.29	72.17

TEG/Turbine – EU_N_Turbine SoLoNOx On								
Run	Natural Gas (MMSCF/Hr)	Stack Flow (DSCFHR)	NOx (ppm)	NOx (lb/hr)	NOx Nat Gas Factor (lb/mmSCF)	CO (ppm)	CO (lb/hr)	CO Nat Gas Factor (lb/mmSCF)
1	0.04068	1.89E+06	17.8	4.01	98.55	2.6	0.36	8.75
2	0.04008	1.91E+06	17.5	3.99	99.58	2.7	0.38	9.36
3	0.04044	1.92E+06	17.8	4.07	100.74	2.8	0.39	9.64
Average	0.04040	1.90E+06	17.7	4.02	99.62	2.7	0.37	9.25

TEG/Turbine – EU_S_Turbine SoLoNOx On								
Run	Natural Gas (MMSCF/Hr)	Stack Flow (DSCFHR)	NOx (ppm)	NOx (lb/hr)	NOx Nat Gas Factor (lb/mmSCF)	CO (ppm)	CO (lb/hr)	CO Nat Gas Factor (lb/mmSCF)
1	0.03654	1.87E+06	15.9	3.55	97.24	3.7	0.50	13.77
2	0.03636	1.87E+06	15.6	3.48	95.74	3.8	0.52	14.19
3	0.03678	1.89E+06	16.0	3.62	98.29	4.0	0.55	14.95
Average	0.03656	1.88E+06	15.8	3.55	97.09	3.8	0.52	14.30