Department of Environmental Quality

To protect, conserve and enhance the quality of Wyoming's environment for the benefit of current and future generations.

Matt Mead, Governor

John Corra, Director

October 9, 2012

RE: WDEQ/AQD 2012 Engine Emissions Study Summary Report, Weeks 1 Through 8

Dear Wyoming Engine Operator:

The attached report summarizes the results of 8 weeks of engine emissions testing conducted to date for the contract year 2012 Engine Emissions Study. The study showed that a significant number of engines were not operating within their permitted emission level when independently tested by the Division.

For the remainder of contract year 2012 the Division is planning to conduct additional testing in November 2012 and the first quarter of 2013 in the ozone non-attainment area. For exceedances measured during Division engine emissions testing conducted after October 1, 2012, the Division will require operators to conduct the Administrator Directed Test Requirements specified in the April 11, 2012, cover letter for the Sublette County Addendum to the Contract Year 2011 Emission Study Report.

I appreciate the cooperation that the Division has received and look forward to working with operators in developing effective engine emissions management practices as the Division's engine emissions test program continues.

Sincerely,

Steven A. Dietrich

Steven A. Dietrich
Administrator
Air Quality Division

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION
MEMORANDUM

TO: Steve Dietrich, Administrator SD
THROUGH: Lori Bocchino, Operating Permits Program Manager LB
Cole Anderson, NSR Program Manager
Bob Gill, Compliance Program Manager
District 1 -5 Engineers (Electronic)

FROM: Jon Walker, Air Quality Engineer

SUBJECT: 2012 Engine Emissions Study Summary Report, Weeks 1 through 8

DATE: September 28, 2012

Summary

The Air Quality Division conducted the 2012 Engine Emissions Study to independently evaluate emission data from engines operating around the State. A test firm was contracted by the Division to evaluate the emissions from the selected engines in an as-found condition. Engine emissions testing was conducted using reference method equipment and the procedures from the Wyoming Air Quality Division Portable Analyzer Monitoring Protocol. The project flow was consistent with testing conducted during contract year 2011. The project goal was unchanged and consisted of conducting 20 engine emissions tests during the test weeks. During the eight weeks of testing, NOx and CO emissions tests were conducted on 197 engines around the State. The engines were permitted to approximately 40 operators and were located at 16 Title V facilities and 90 minor facilities. The table below summarizes combined emissions test results by engine type. The tables that follow summarize test results for each week of testing by engine and facility type.

Contract Year 2012 Weeks 1 to 8 Combined Statewide Results by Engine Type

Note: Preliminary tested levels shown below assume a default BSFC = 9400 Btu/hphr

Engine Type	4SLB 3600 Cats Only	4SLB Excluding 3600 Cats	4SRB ≥500 HP	4SRB <500 HP	All Rich Burn	All Excluding 3600 Cats	All
# Tested	21	61	91	24	115	176	197
#Failed	1	8	32	13	45	53	54
% Failed	5%	13%	35%	54%	39%	30%	27%

Contract Year 2012 Weeks 1 to 8 Test Results by Engine Type

Note: Preliminary tested levels shown below assume a default BSFC = 9400 Btu/hphr

Engine Type/Test Results	4SLB 3600 Cats Only	4SLB Excluding 3600 Cats	4SRB ≥500 HP	4SRB <500 HP	All Rich Burn	All Excluding 3600 Cats	All
Week 1: May 2012 Fremont/Natrona Counties, 6 Operators, 1 Major and 13 Minor							
Avg HP	N/A	954	1430	220	1375	1310	1310
# Tested	0	4	21	1	22	26	26
#Failed	0	1	7	0	7	8	8
% Failed	N/A	25%	33%	0%	32%	31%	31%
Week 2: May 2012 Sublette County, 12 Operators, 1 Major and 17 Minor							
Avg HP	N/A	1013	757	402	626	707	707
# Tested	0	5	12	7	19	24	24
#Failed	0	0	3	6	9	9	9
% Failed	N/A	0%	25%	86%	47%	38%	38%
Week 3: June 2012 Carbon/Sweetwater Counties, 7 Operators, 5 Major, 8 Minor							
Avg HP	2066	1394	912	236	815	1042	1193
# Tested	4	9	12	2	14	23	27
#Failed	0	4	10	2	12	16	16
% Failed	0%	44%	83%	100%	86%	70%	59%
Week 4: July 2012 Southwest Wyoming, 10 Operators, 4 Major and 7 Minor							
Avg HP	2588	1300	1328	253	1256	1267	1572
# Tested	6	5	14	1	15	20	26
#Failed	0	0	5	1	6	6	6
% Failed	0%	0%	36%	100%	40%	30%	23%
Week 5: July 2012 Central and NW Wyoming, 7 Operators, 1 Major and 12 Minor							
Avg HP	3550	1375	1311	269	1154	1191	1373
# Tested	2	4	17	3	20	24	26
#Failed	0	1	4	0	4	5	5
% Failed	0%	25%	24%	0%	20%	21%	19%
Week 6: August 2012 Sublette County, 11 Operators, 1 Major, 16 Minor							
Avg HP	3668	982	1013	402	746	810	1250
# Tested	4	6	9	7	16	22	26
#Failed	0	1	2	4	6	7	7
% Failed	0%	17%	22%	57%	38%	32%	27%
Weeks 7 and 8: Aug/Sept 2012 Northeast Wyoming, 10 Operators, 3 Major and 17 Minor							
Avg HP	1918	1050	1406	404	1072	1069	1178
# Tested	5	28	6	3	9	37	42
#Failed	1	1	1	0	1	2	3
% Failed	20%	4%	17%	0%	11%	5%	7%

Contract Year 2012 to Date Results by Facility Type

Test Week	Area	Major Facilities, #			% Failed	Minor Facilities, #			% Failed	Total Facilities, #			% Failed
		Visited	Tested	Failed		Visited	Tested	Failed		Visited	Tested	Failed	
1	Fremont Natrona	1	3	0	0%	13	23	8	35%	14	26	8	31%
2	Sublette	1	2	0	0%	17	22	9	41%	18	24	9	38%
3	Carbon Sweetwater	5	18	11	61%	8	9	5	56%	13	27	16	59%
4	SW Wyo	4	19	3	16%	7	7	3	43%	11	26	6	23%
5	Central, NW Wyo	1	3	0	0%	12	23	5	22%	13	26	5	19%
6	Sublette	1	4	0	0%	16	22	7	32%	17	26	7	27%
7, 8	NE Wyo	3	10	1	10%	17	32	2	6%	20	42	3	7%
Total		16	59	15	25%	90	138	39	28%	106	197	54	27%

Discussion

The statistical significance of the acquired data makes it difficult to draw conclusions with a great degree of certainty. However, the following observations are noted:

1) Results for contract years 2011 and 2012 are similar. The 2012 study showed that a significant number of engines were not operating within their permitted level when independently tested by the Division. Operations that produced good results during the 2011 study may not have been revisited during the 2012 study. The 2012 study was focused on visiting new operations and revisiting operations where poor results were obtained during the 2011 study.

2) Test data shows that operators with good emissions management practices performed well. Noted failures are specific to operations with poor emissions management practices. Emissions management practices vary greatly between operators and in different areas.

3) Both excessively rich and lean engine operation were experienced. Based on observations at the time of testing, all exceedances are attributed to operational and maintenance problems.

4) Return visits to operations where emissions test failures occurred during Contract Year 2011 testing shows great improvement in some cases, and no improvement in others. Simply requiring follow-up testing for failed emissions tests conducted by the Division may be inadequate to ensure that the root cause of exceedances is identified and corrected. For engines suspected of exceeding mass emissions rates, a more thorough demonstration of the effectiveness of corrective actions is needed.

5) Engine emissions test results in Sublette County continued to improve in May and August. Exceedances are generally small as compared to those measured one year ago. With many generator engines having more sophisticated engine air-fuel ratio controllers, the most prevalent problem currently being addressed is load management with load banks.

6) Statewide, generator engines were more problematic than compressor engines. In some applications generators may require more sophisticated air-fuel ratio controllers and load banks that automatically compensate for changes in power demands.

7) In general, this project has been very well received by the approximately 40 operators that were visited during contract year 2012. As a result of the Division's engine emissions testing activity more operations continue to establish internal emissions monitoring programs to ensure ongoing engine emissions remain within permitted levels.