



Department of Environmental Quality

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



Matthew H. Mead, Governor

John Corra, Director

April 11, 2012

RE: Sublette County Addendum to the Contract Year 2011 Emission Study Report

Dear Wyoming Engine Operator:

During contract year 2011 the Air Quality Division (AQD) conducted nine weeks of engine emissions testing statewide. The results of the testing are summarized in the 2011 Engine Emissions Summary Report dated September 14 and the attached Sublette County Addendum. The engine emissions study test results have been important for the Division and operators to assess the effectiveness of ongoing engine emissions management practices. The test results indicate that the operational and maintenance changes in Sublette County from August 2011 to February 2012 have resulted in a significant decrease in the excess emissions from engines in that area. However, the February 2012 study results indicate that a significant number of engines continue to be in noncompliance with permitted emissions levels based on pollutant specific emissions factors (g/hphr). More rigorous testing will be necessary for the Division to assess compliance on a mass emissions rate (lb/hr) basis.

For contract year 2012 the Division currently has 10 weeks of engine emissions testing planned statewide. The majority of this testing will be conducted this summer and the Division will continue to request that operators take corrective action and conduct follow-up testing for measured exceedances. However, for exceedances measured during the engine emissions testing conducted after October 1, 2012, the AQD will require operators to conduct the Administrator Directed Test Requirements as specified in Table 1.

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
Administrator
Air Quality Division



Table 1. AQD Administrator Directed Test Requirements for Engine Emission Limit Exceedances Based on Results of AQD Engine Emissions Testing

Wyoming Portable Analyzer Monitoring Protocol Method Used To Calculate Engine Emissions	Nature of Exceedance as Determined by AQD Engine Emissions Test Results	Administrator Directed Test Requirement
Emissions Calculated Using Default BSFC = 9400 Btu/hphr* and Site Rated Load	$1 < \text{g/hphr} \leq 2 \times \text{Permitted Level}$	Corrective action and 21-Minute Protocol portable analyzer retest for NOx and CO within 7 days
	$\text{g/hphr} > 2 \times \text{Permitted Level}$	Immediate Reference Method testing for All applicable regulated pollutants
Emissions Calculated Using Actual Fuel Flow, Tested Horsepower and Fuel Heat Content	$\text{g/hphr} > \text{Permitted Level}$ and $\text{lb/hr} \leq \text{Permitted Level}$	Corrective action and 21-Minute Protocol portable analyzer retest for NOx and CO within 7 days
	$\text{lb/hr} > \text{Permitted Level}$	Immediate Reference Method testing for All applicable regulated pollutants

*For engines less than 500 hp, the manufacturer's specific fuel consumption may be used.

**WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION
MEMORANDUM**

TO: Steve Dietrich, Administrator *SD*
THROUGH: Lori Bocchino, Operating Permits Program Manager *LB*
Bob Gill, Compliance Program Manager *BG*
District 1 -5 Engineers (Electronic)
FROM: Jon Walker, Air Quality Engineer *JW*
SUBJECT: Sublette County Addendum to the Contract Year 2011 Emission Study Report
DATE: March 5, 2012

Contract Year 2011 Summary

The September 14, 2011, report titled "2011 Engine Emissions Study Summary Report" included a summary for the five weeks of engine emissions testing that were conducted around the State from May to August, 2011, including one week of testing in August in Sublette County. This addendum to that report summarizes data from the week of testing in Sublette County in August, 2011, and four additional weeks of testing that were conducted in Sublette County during November 2011 and February 2012. The September 14 report and this addendum comprise the final report for engine emissions testing conducted during contract year 2011. In total, engine emissions tests were conducted on 198 engines in 9 weeks of testing around the State. The emissions test result for one uncontrolled engine is not included in the project summary.

Contract Year 2011 Sublette County Engine Emissions Study Summary

The Air Quality Division conducted engine emissions testing in Sublette County during August and November 2011, and February 2012. This section summarizes the results of all engine emissions testing conducted in Sublette County during contract year 2011. During the November 2011 and February 2012 testing in Sublette County, the number of engines tested weekly decreased significantly as project emphasis changed from data collection to communication with operators. Data indicate that the excess emissions from engine in Sublette County declined significantly from August 2011 to February 2012. Measured exceedances on a g/hphr basis became smaller as the project progressed. The following tables summarize engine emissions test results based on quantifying pollutant specific emission factors (g/hphr) from the three engine emissions testing campaigns in Sublette County.

**Combined Results of Contract Year 2011 AQD Engine Emissions Study Tests
Conducted in Sublette County in August and November 2011, and February 2012**

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	18	40	19	59	77	98
#Failed	1	11	20	14	34	45	46
% Failed	5%	61%	50%	74%	58%	58%	47%

Results of February 2012 AQD Engine Emissions Testing in Sublette County

Test Results from 15 Operators, 2 Major Facilities and 22 Minor Facilities

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
Average HP	3327	1455	864	433	738	865	1217
# Tested	5	4	17	7	24	28	33
#Failed	1	2	9	3	12	14	15
% Failed	20%	50%	53%	43%	50%	50%	45%

Results of November 2011 AQD Engine Emissions Testing in Sublette County

Test Results from 12 Operators, 4 Major Facilities and 18 Minor Facilities

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
Average HP	3675	1182	913	459	777	870	1530
# Tested	8	6	14	6	20	26	34
#Failed	0	3	7	5	12	15	15
% Failed	0%	50%	50%	83%	60%	58%	44%

Results of August 2011 AQD Engine Emissions Testing in Sublette County

Test Results from 11 Operators, 3 Major Facilities and 16 Minor Facilities

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
Average HP	3681	879	848	445	687	754	1509
# Tested	8	8	9	6	15	23	31
#Failed	0	6	4	6	10	16	16
% Failed	0%	75%	44%	100%	67%	70%	52%

Discussion

The following observations are noted:

1. In general, the g/hphr exceedances measured during the February 2012 engine emissions study testing in Sublette County are significantly smaller than those measured in previous test campaigns. Measured exceedances on a g/hphr basis became smaller as the project progressed.
2. The February 2012 engine emissions study indicates that a significant number of engines in Sublette County were not operating within their permitted level when independently tested by the Division. For operators that are frequently monitoring engine emissions, the pass/fail rate has improved, and the amount of excess emissions has decreased significantly. Operators that do not monitor engine emissions continue to perform poorly.
3. To address concerns noted in the August or November test campaigns, operators have repaired or replaced engines, installed new air-fuel ratio controllers (AFRC's), repaired or replaced load banks, cleaned or replaced catalysts, performed other engine maintenance, and have begun internal engine emissions monitoring programs.
4. For lean burn engines, load changes associated with generator engines continue to be a significant problem in maintaining the minimum exhaust oxygen content needed to meet permitted NOx levels. NOx emission can increase to multiples of permitted levels if the AFRC does not function properly. Operators use load banks during normal engine operation to help maintain the minimum load necessary for lean burn engine AFRC's to function properly.
5. For rich burn engines, operators are installing AFRC's capable of compensating for load changes by using multiple set-points based off of manifold pressure. Operators also use load banks for rich burn engine generators to help maintain a stable load.
6. Most of the Caterpillar 3600 series compressor engines continue to perform well. With the colder weather, NOx emissions have dropped significantly and are near 60% of permitted levels on a g/hphr basis.