



west virginia department of environmental protection

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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.: R13-2056G
Plant ID No.: 039-00221
Applicant: Cecil I. Walker Machinery Co. (Walker)
Facility Name: Belle Plant
Location: Kanawha County
SIC Code: 5082
Application Type: Modification
Received Date: September 29, 2011
Engineer Assigned: Joe Kessler
Fee Amount: \$1,000
Date Received: October 5, 2011
Complete Date: October 27, 2011
Due Date: January 25, 2011
Applicant Ad Date: October 4, 2011
Newspaper: *The Charleston Daily Mail*
UTM's: Easting: 453.0 km Northing: 4,230.9 km Zone: 17
Description: Modification to authorize use of the dynamometer (DY-01) to test natural gas-fired engines.

DESCRIPTION OF PROCESS/MODIFICATIONS

On February 20, 2002, Permit Number R13-2056C was issued to Walker for the installation of a new dynamometer (DY-01) to test the performance of various new and repaired engines. An older and unpermitted (grandfathered) dynamometer was concurrently phased out of service and has since been removed from the facility. When originally permitted, only diesel engines were authorized to be tested in the unit. Walker is now applying for a modification to the permit to authorize additional testing of natural gas-fired engines.

A dynamometer is used primarily to test the force or power generated by an engine when coupled with the unit. As a dynamometer is a passive device, it is not directly an emissions-generating unit (the engines coupled to it produce the emissions). However, as various engines are tested in the dynamometer while it remains in place, the dynamometer has been designated the emissions unit in this case.

The specific dynamometer installed at the Belle Plant is a Power Test Model 25x24 with a capacity to test up to 4,800 horsepower engines. While the unit has the capability to test two engines simultaneously, Walker does not utilize this feature.

SITE INSPECTION

The author conducted a site inspection of the Walker Belle Plant on July 31, 2007 during the review of permit application R13-2056F. A new inspection of the facility as a result of this action was deemed not necessary. The facility was last inspected by the Compliance/Enforcement Section in 2009.

REVIEW OF APPLICANT'S EMISSIONS ESTIMATE

Walker is proposing to test three types of engines in DY-01:

- (1) Diesel engines up to an aggregate designed maximum fuel usage of 189.9 gallons/hour (26.02 mmBtu/hour MDHI);
- (2) Four-Stroke Lean Burn (4SLB) natural gas-fired engines up to an aggregate designed maximum of fuel usage of 10,520 ft³/hour (10.52 mmBtu MDHI); or
- (3) Four-Stroke Rich Burn (4SRB) natural gas-fired engines up to an aggregate designed maximum of fuel usage of 10,520 ft³/hour (10.52 mmBtu MDHI).

To calculate potential emissions from DY-01, Walker first provided a worst-case emissions estimate for each of the above engine types. The estimate based worst-case hourly emissions on the maximum design parameters listed above and emission factors obtained from AP-42 (a database of emission factors maintained by USEPA). Emissions from 4SLB and 4SRB engines were based on AP-42, Section 3.2 and emissions from diesel engines are based on AP-42, Section 3.3 (with the exception of SO₂ emissions which were based on a mass balance calculation of all sulfur in the diesel - 0.27% - oxidizing to form SO₂). Annual emissions for each engine type was based on testing engines for a maximum of 1,153 hours per year.

With worst-case emissions from each engine type calculated, Walker then based the potential-to-emit (PTE) of DY-01 on the highest per-pollutant emission rate from each engine type. The above is represented in the following table:

Table 1: DY-01 PTE

Pollutant	4SLB		4SRB		Diesel		DY-01	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
CO	3.33	1.92	39.13	22.56	24.72	14.25	39.13	22.56
NO _x	42.91	24.74	23.24	13.40	114.76	66.16	114.76	66.16
PM _{2.5}	0.10	0.06	0.10	0.06	8.07	4.65	8.07	4.65

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Pollutant	4SLB		4SRB		Diesel		DY-01	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
PM ₁₀	0.10	0.06	0.10	0.06	8.07	4.65	8.07	4.65
PM	0.10	0.06	0.10	0.06	8.07	4.65	8.07	4.65
SO ₂	0.01	0.01	0.01	0.01	7.55	4.35	7.55	4.35
VOC	1.24	0.71	0.31	0.18	9.37	5.40	9.37	5.40

Based on the emission limits of DY-01 originally permitted under R13-2056C (which the author believes were not accurate), the increase in emissions associated with the proposed modification is given in the following table:

Table 2: Modification Emissions

Pollutant	DY-01 (R13-2056F)		DY-01 (R13-2056G)		Change	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
CO	14.56	12.75	39.13	22.56	24.57	9.81
NO _x	54.81	48.00	114.76	66.16	59.95	18.16
PM _{2.5}	0.98	0.86	8.07	4.65	7.09	3.79
PM ₁₀	0.98	0.86	8.07	4.65	7.09	3.79
PM	1.19	1.05	8.07	4.65	6.88	3.60
SO ₂	17.30	15.15	7.55	4.35	-9.75	-10.80
VOC	1.54	1.35	9.37	5.40	7.83	4.05

Greenhouse Gases

As part of this permitting action, the writer conducted a facility-wide GHG PTE analysis of the Belle Plant. The results are presented in the following table:

Table 3: Facility-Wide Annual GHG Emissions in TPY

Source	CO ₂	N ₂ O	CH ₄	CO ₂ e
Various Training Engines (18E)	1.07	0.00	0.00	1.07
Training Engine 3408E (23E)	1.07	0.00	0.00	1.07
DY-01	2,460.00	0.00	0.00	2,460.00
Total	2.14	0.00	0.00	2,462.14

Emission factors for diesel combustion were taken from AP-42 Section 3.3. Emissions from DY-01 were based on the worst-case emissions of testing diesel engines. All emissions were based on parameters as limited in the permit.

Facility-Wide Potential to Emit

The facility-wide post-modification annual PTE of the Belle Plant is given in the following table:

Table 4: Post-Modification Facility-Wide Annual PTE Summary in TPY

Source	CO	NO _x	PM _{2.5}	PM ₁₀	PM	SO ₂	VOCs	CO _{2e}
Various Training Engines (18E)	0.01	0.03	0.01	0.01	0.01	0.01	0.01	1.07
Training Engine 3408E (23E)	0.01	0.03	0.01	0.01	0.01	0.01	0.01	1.07
DY-01	22.56	66.17	8.07	8.07	8.07	15.32	5.40	2,460.00
HS-1	0.00	0.00	0.49	0.49	0.49	0.00	0.00	0.00
Facility-Wide Totals →	22.58	66.23	8.58	8.58	8.58	15.34	5.42	2,462.14

REGULATORY APPLICABILITY

This section will address the potential regulatory applicability/non-applicability of substantive state and federal air quality rules relevant to this permitting action.

45CSR2, 45CSR7, and 45CSR10

As DY-01 is a means of testing internal combustion engines and not “fuel burning units” as defined under 45CSR2 and 45CSR10, the sections of those rules applicable to “fuel burning units” do not apply.

Concerning the applicability of particulate matter standards under §45-7-4.1, while it is certainly reasonable to characterize DY-01 as a “source operation,” the writer believes it is not appropriate in the context of 45CSR7. The use of a “process weight rate” to determine emission limits under Rule 7 renders applicability to straight combustion sources as problematic (and rather absurd). Rule 7 has not previously been applied to the training or testing operations at the Belle Plant and shall not be in this case.

Concerning compliance with the in-stack SO₂ limitation of 2,000 ppm_v given under §45-10-4.1: at the volumetric flow rate and exhaust flow rate given in the permit application, the SO₂ pound per hour limit pursuant to §45-10-4.1 would be approximately 230. The SO₂ emission limit given for DY-01 in the permit is 26.59 lb/hr, or an order of magnitude smaller than the Rule 10 limit. Therefore, compliance with the Rule 10 2,000 ppm_v limit is shown by demonstrating compliance with the proposed permit SO₂ limit.

45CSR13: Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, and Procedures for Evaluation

The proposed modification of DY-01 to allow testing of natural gas-fired engines has a potential to increase emissions in excess six (6) pounds per hour and ten (10) tons per year of a

regulated air pollutant (see Table 2 above) and, therefore, pursuant to §45-13-2.17a, the requested change is defined as a “modification” under 45CSR13.

As required under §45-13-8.3 (“Notice Level A”), Walker placed a Class I legal advertisement in a “newspaper of general circulation in the area where the source is . . . located.” The ad ran on October 4, 2011 in *The Charleston Daily Mail*. The affidavit of publication for this legal advertisement was submitted on October 13, 2011.

45CSR14 and 45CSR19

The post-modification potential-to-emit of the Belle Plant is below the levels that would define the source as “major” under either 45CSR14 or 45CSR19 and, therefore, the modification evaluated herein is not subject to the provisions of 45CSR14 or 45CSR19.

45CSR30

The post-modification potential-to-emit of the Belle Plant is below the level that would define the source as “major” under either 45CSR30 and no emissions source at the facility is subject to requirements promulgated under §111 or §112(r) of the Clean Air Act. Therefore, the facility is not subject to the provisions of 45CSR30.

40 CFR 60, Subpart IIII: Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

Pursuant to §60.4200(b) - “The provisions of this subpart are not applicable to stationary CI ICE being tested at a stationary CI ICE test cell/stand” - the testing of potentially Subpart-III applicable diesel-fired engines in DY-01 are not subject to Subpart IIII.

40 CFR 60, Subpart JJJJ: Standards of Performance for Stationary Spark Ignition Internal Combustion Engines

Pursuant to §60.4230(b) - “The provisions of this subpart are not applicable to stationary SI ICE being tested at a stationary SI ICE test cell/stand” - the testing of potentially Subpart-JJJJ applicable natural gas-fired engines in DY-01 are not subject to Subpart JJJJ.

40 CFR 63, Subpart ZZZZ: National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

Pursuant to §65.6385 - “You are subject to this subpart if you own or operate a stationary RICE at a major or area source of HAP emissions, except if the stationary RICE is being tested at a stationary RICE test cell/stand” - the testing of potentially Subpart-ZZZZ applicable engines in DY-01 are not subject to Subpart ZZZZ.

TOXICITY ANALYSIS OF NON-CRITERIA REGULATED POLLUTANTS

This section provides an analysis for those regulated pollutants that may be emitted from the modified Belle Plant and that are not classified as “criteria pollutants.” Criteria pollutants are defined as Carbon Monoxide (CO), Lead (Pb), Oxides of Nitrogen (NO_x), Ozone, Particulate Matter (PM), Particulate Matter less than 10 microns (PM₁₀), Particulate Matter less than 2.5 microns (PM_{2.5}), and Sulfur Dioxide (SO₂). These pollutants have National Ambient Air Quality Standards (NAAQS) set for each that are designed to protect the public health and welfare. Other pollutants of concern, although designated as non-criteria and without national concentration standards, are regulated through various federal and programs designed to limit their emissions and public exposure. These programs include federal source-specific Hazardous Air Pollutants (HAPs) limits promulgated under 40 CFR 61 (NESHAPS) and 40 CFR 63 (MACT). Any potential applicability to these programs were discussed above under REGULATORY APPLICABILITY.

The majority of non-criteria regulated pollutants fall under the definition of HAPs which, with some revision since, were 188 compounds identified under Section 112(b) of the Clean Air Act (CAA) as pollutants or groups of pollutants that EPA knows or suspects may cause cancer or other serious human health effects.

The potential HAPs sources at the Belle Plant are from combustion emissions associated with the engine testing operations in DY-01. The potential emissions of most HAPs are less than 100 pounds per year. However, as with all natural-gas combustion, there is a potential for higher emissions of formaldehyde. Based on the operating parameters as limited in the proposed permit and an emission factor taken from AP-42, Section 3.2, the worst-case emission rate of formaldehyde will be 640.44 pounds per year. Although combustion sources are not applicable, this emission rate would not subject the source to the Best Available Technology (BAT) requirements under 45CSR27.

The following table details the carcinogenic risk of formaldehyde according to the Integrated Risk Information System (IRIS) database.

Table 5: Potential HAP Carcinogenic Risk

HAPs	Type	Known/Suspected Carcinogen	Classification
Formaldehyde	VOC	Yes	B1: Probable Human Carcinogen

All HAPs have other non-carcinogenic chronic and acute effects. These adverse health affects may be associated with a wide range of ambient concentrations and exposure times and are influenced by source-specific characteristics such as emission rates and local meteorological conditions. Health impacts are also dependent on multiple factors that affect variability in humans such as genetics, age, health status (e.g., the presence of pre-existing disease) and lifestyle. As stated previously, *there are no federal or state ambient air quality standards for these specific chemicals.* For a complete discussion of the known health effects of formaldehyde refer to the IRIS database located at www.epa.gov/iris.

AIR QUALITY IMPACT ANALYSIS

No air quality impact modeling was deemed necessary for this permitting action.

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MONITORING, COMPLIANCE DEMONSTRATIONS, RECORD-KEEPING, AND REPORTING REQUIREMENTS

Compliance with the DY-01 engine testing limits are primarily demonstrated by limiting boilerplate capacities of engines tested and limitation/monitoring of DY-01 hours of operation as per requirements given under 4.1.3.b and 4.2.2. Additionally for compliance with SO₂ emissions, Walker must limit the sulfur content of all diesel fuel to 0.27% by weight and provide, with each purchase of fuel, a certification of the sulfur content of the fuel supplied obtained from the diesel supplier. These requirements are given under 4.1.4 and 4.2.3, respectively.

Standard record-keeping and reporting requirements will apply.

TESTING OF OPERATIONS

Due to the large variation in engines tested in DY-01 and the short-time each engine is in operation, no specific post-modification testing was required for DY-01. However, under 4.3.1, at the Director's discretion, Walker shall have to test emissions and fuel consumption rates of any engine tested in DY-01.

CHANGES TO PERMIT R13-2056F

The following substantive changes were made to permit R13-2056F:

- The emission limits and operating restrictions for DY-01 were significantly changed under 4.1.3.; and
- Monitoring requirements for DY-01 were broken out from 4.2.1. and modified under 4.2.2.

RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates that compliance with all applicable regulations will be achieved. Therefore, I recommend to the Director the issuance of a Permit Number R13-2056G to Walker for the modification of the Belle Plant in Belle, Kanawha County, WV.

Joe Kessler, PE
Engineer

Date

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