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Bureau of Mine Safety  
Uniontown

**Pennsylvania Technical Advisory Committee  
On Diesel Powered Equipment**

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October 14, 2010

Joseph Sbaffoni, Director  
Bureau of Mine Safety  
Fayette County Health Center  
100 New Salem Road, Room 167  
Uniontown, Pa. 15401

Sbaffoni  
cc: Bookhar  
McCaffrey  
Artoon  
Gaida  
original/Dunn

RE: TAC recommendation on Bucyrus request for approval to use an *Airflow Model 482D7510-7W oxidation catalyst* in a Bucyrus 482D Diesel Scoops equipped with a Deutz BF4L-2011 78 HP engine with a DBT Management System using a model FST-115-26 DPM filter.

Dear Mr. Sbaffoni:

Chapter 4 of the "Bituminous Coal Mine Safety Act" (the Act) provides for the use of diesel-powered equipment in underground bituminous coal mines. Section 424 of the act created a Technical Advisory Committee ("TAC") for the purpose of advising the Department regarding implementation of Chapter 4 and evaluation of alternative technology or methods for meeting the requirements of Chapter 4.

**Background**

On July 30, 2010 Bucyrus submitted a request to the TAC and Bureau of Mine Safety for evaluation and approval pursuant to Chapter 4 of the Act to use an Airflow Model 482D7510-7W oxidation catalyst in a Bucyrus 482D Diesel Scoops equipped with a Deutz BF4L-2011 78 HP engine with a DBT Management System using a model FST-115-26 DPM filter.

On August 20, 2010 the Director of BMS requested the TAC to advise the Department whether or not this request meets the requirements of the ACT regarding the exhaust emission and control system.

The Bucyrus 482D Diesel Scoop is equipped with a:

- Deutz BF4L 2011 78HP engine MSHA Certification number 07 ENA040004-1 (Part 7)
- Airflow Model 482D7510-7W oxidation catalyst
- Bucyrus Cooling Systems Model 399823 Heat Exchanger
- Filter Service & Testing Model FST-115-26 DPM filter (95% efficient)

More detailed information on the specifications for the Model 482D Alternate Scoop diesel power packages are included on the General Specification Sheet attached. (Attachment 1)

### **Investigation**

On October 14, 2010 the TAC and DEP traveled to Cherry Tree Mine when the scoop became available to conduct emissions test and evaluate the Bucyrus 482D diesel scoop. The TAC evaluated the engine and exhaust emissions package.

Emissions testing of the engine and after-treatment system were performed, as well as exhaust gas temperature monitoring and stall test procedure. The DEP's ECOM emission monitoring instrument malfunctioned again, so Rosebud's new ECOM Model J2KN emission monitoring instrument was used for the emissions testing. The results of the emission tests showed the engine was performing within MSHA's approval specifications.

The maximum surface temperature observed was over 302° F on the engine head cover and at the turbo flange, but Bucyrus installed a cover and a fire wrap blanket over these areas to eliminate the problem. All significant surface areas were below 302° F as required by Section 403 of the Act. The maximum exhaust gas temperature observed was 180° F which is also below the 302° F allowed by Section 403 (b)(4) of the Act. The maximum engine oil temperature observed during testing was 202° F.

The results of the emissions tests showed the engine was performing within MSHA's approval specifications. The after-treatment system is fitted with Filter Service & Testing Model FST-115-26 DPM filter (95% efficient). The engine and filter extrapolations show that the diesel power package will result in an average ambient concentration of .017 mg/m<sup>3</sup> of diesel particulate matter when diluted by 100% of the MSHA approval plate ventilation rate for this engine, which is well below the .12 mg/m<sup>3</sup> requirement of Section 403 (a)(1) the Act. (Attachment 2)

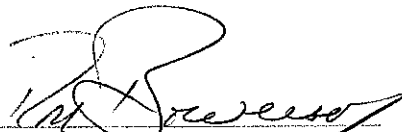
### **Recommendation**

Based on the information received, our investigation and our discussions the TAC believes that the diesel power package utilizing the Airflow Model 482D7510-7W oxidation catalyst is capable of meeting all requirements of Section 403 of Chapter 4 of the Act without reducing or compromising the level of health or safety afforded by the Act.

As such, we are recommending approval of Bucyrus's request to use an Airflow Model 482D7510-7W oxidation catalyst in a Bucyrus 482D Diesel Scoops equipped with a Deutz BF4L-2011 78 HP engine with a DBT Management System using a model FST-115-26 DPM filter. This recommendation is provided with the understanding that the General Specification Sheet (Attachment 1) be strictly adhered to.

Should the Director receive a request for temporary approval for use prior to the next TAC meeting, the TAC will recommend temporary approval until the next scheduled TAC meeting on January 12, 2011 at which time permanent approval will be recommended.

  
Paul Borchick

  
Ron Bowersox

Bucyrus  
 MODEL 482D Alternate      October, 2010  
 Diesel Scoop

**General Specifications of the Diesel-Powered Equipment Package**

Engine Manufacturer	Deutz
Engine Model	BF4L 2011
Horsepower	78 HP
Rated Speed	2800 RPM
Manufacturers Maximum Recommended Exhaust Backpressure (H2O)	35 Inches Water Gage
Maximum Exhaust Out Temperature	300° F
MSHA Engine Approval	MSHA Part 7
MSHA Certification No.	07 ENA040004-1
Rated Speed	2800 RPM
Rated Horsepower	78 HP
Exhaust Gas Flow (CFM)	553 CFM
ISO 8178-1 Average DPM (gr/hr)	3.50 gr/hr
Average Ambient DPM Level	.02 mg/m <sup>3</sup>
MSHA Ventilation Rate (CFM)	6000 CFM (Part 7)
PA State Ventilation Rate (CFM)	

<b>Emission Control System</b>		<b>DBT Management System</b>
Fuel Injection Pump	Make P/N	Bosch S/N Specific
Oxidation Catalyst	Make Model #	Airflow 482D7510-7W 47% DPM removal eff.
Heat Exchanger	Make P/N	Bucyrus / Cooling Systems 399823
DPM Filter	Make Model # Efficiency	Filter Service & Testing FST -115-26 95% DPM removal eff.
System DPM Eff.		105%
Flame Arrestor	Make Model Description	CIC 804/D-IL-C4C 304 Stainless Steel Element for Group D Vapor Service

ATTACHMENT 1



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April 3, 2008

482D Diesel Emissions Calculations

Calculations for DPM

BF4L 2011

Power Rating: 58 kW / 78 HP @ 2800 rpm

Approval No: 07-ENA040004-0

Assigned Ventilation: 6,000 cfm / 169.90 m<sup>3</sup>/min

Actual Ventilation Rate: 5,518 cfm / 156.2 m<sup>3</sup>/min (see Auswertung\_C1\_MSHA\_EG Bau\_1215\_25052005.)

PM rate: 3.50 g/hr = 58.33 mg/minute

Fiberglass Filter Element Efficiency 95% MSHA rating.

Adjustment based on 95% efficiency =  $(.95)(58.33 \text{ mg/minute}) = 55.41 \text{ mg/minute}$

$58.33 \text{ mg/minute} - 55.41 \text{ mg/minute} = 2.91 \text{ mg/minute emitted}$

Calculating for mg/m<sup>3</sup>, which must be less than .12 mg/m<sup>3</sup> pursuant to 196-1-5.1 of West Virginia Rules for Operating Diesel Equipment in Underground Mines in West Virginia Title 196 & Pennsylvania Diesel Regulations Article II-A Section 203-A subpart (a)

$2.91 \text{ mg/minute} / 169.90 \text{ m}^3/\text{min} = \underline{.017 \text{ mg/m}^3}$

**Conclusion: This combination of power package and DPM control method meets the requirements for WV 196-1-5.1 and PA Article II-a Section 203 -A subpart (a).**

ATTACHMENT 2