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Pennsylvania Technical Advisory Committee
On Diesel Powered Equipment

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June 28, 2011

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

RE: Engine and emissions control package evaluation under Sections 403, 417 and 418 of the Act for a Cummins C3.3 Engine (MSHA ID 07-ENA040017 Part 7) 85hp @ 2600 rpm with an emissions control system using a FS&T Model FST-115-26 DPM filter and a Evarpar Model AZ29 oxidation catalyst in a Bucyrus Model 482D Diesel Scoop.

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 June 21, 2011 Bucyrus submitted a request to the TAC and Bureau of Mine Safety (BMS) for approval for a Bucyrus Model 482D Diesel Scoop using a Cummins C3.3 Engine (MSHA ID 07-ENA040017 Part 7) 85hp @ 2600 rpm with an emissions control system using a FS&T Model FST-115-26 DPM filter and a Evarpar Model AZ29 oxidation catalyst. The engine and emissions control package has not been previously approved under Section 403 of the Act.

The diesel power package includes the following items:

- Cummins C3.3 Engine (MSHA ID 07-ENA040017 Part 7) 85hp @ 2600 rpm
- Emissions control system:
 - FS&T Model FST-115-26 DPM filter (95% efficient)
 - Evarpar Model AZ29 oxidation catalyst
 - Bucyrus #399823 Heat Exchanger

More detailed information on the specifications of the diesel power package is included on the General Specification Sheet which is attached as Attachment 1.

Investigation

On June 27, 2011 the TAC traveled to Bucyrus in Washington, PA to inspect the equipment when it became available. 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 results of the emission tests showed the engine was performing within MSHA's approval specifications. (Attachment 2)

Monitoring of the exhaust gas temperature showed the maximum exhaust gas temperature was below the 302° F allowed by Section 403 (b)(4) of the Act. The TAC discovered an area near the turbo where the surface temperature exceeded 302° F. Corrections were made by Bucyrus by modifying the fire blanket to cover this area. The maximum surface temperature observed was 270° F on the exhaust manifold after conducting all the CO testing.

The after-treatment system is fitted with a FS&T Model FST-115-26 DPM filter. The filter is rated by MSHA at a 95 % efficiency rating. The engine and filter extrapolations show that the diesel power package will result in an average ambient concentration of .10 mg/m³ of diesel particulate matter when diluted by 100% of the MSHA approval plate ventilation rate for this engine, which is below the .12 mg/m³ requirement of Section 403 (a)(1) the Act.

In addition to the testing that was conducted, our investigation and our observations confirmed that the diesel power package is capable of meeting all the requirements of Section 403 of the Act.

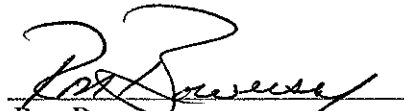
Recommendation

Our recommendation is based upon the data supplied by Bucyrus, the results of the tests conducted on June 27, 2011 as well as the data acquired and observations made during our investigation. The TAC has determined that the Cummins C3.3 Engine (MSHA ID 07-ENA040017 Part 7) 85hp @ 2600 rpm with an emissions control system using a FS&T Model FST-115-26 DPM filter and a Evarpar Model AZ29 oxidation catalyst meets all requirements of Section 403 of Chapter 4 of the Pennsylvania Bituminous Coal Mine Safety Act. As such, we are recommending approval of the above described diesel power package.

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 July 13, 2011 at which time permanent approval will be recommended.


Paul Borchick


Ron Bowersox

June 6, 2007

**BUCYRUS EQUIPMENT CORP.
MODEL 482D
Diesel Scoop**

General Specifications of the Diesel-Powered Equipment Package

Engine Manufacturer		Cummins		
Engine Model		C3.3		
Horsepower		85		
Rated Speed		2600		
Manufacturer's Recommended Exhaust Back-pressure (InH ₂ O)		40.8		
Maximum Exhaust Out Temperature		270 F		
MSHA Engine Approval		MSHA Part 7		
MSHA Certification No.		07-ENA040017		
Rated Speed		2600		
Rated Horsepower		85		
Exhaust GAS Flow (SCFM)		475 CU.FT/MIN		
ISO 8178-1 Average DPM (gr/hr)		16.14		
Average Ambient DPM Level (mg/m ³)		.10		
MSHA Ventilation Rate (CFM)		Part 7)	4500	
Pa. State Ventilation Rate (CFM)				
Emissions Control System				
Fuel Injection Pump	Make	Bosch	Mechanical	
	P/N	n/a		
Oxidation Catalyst	Make	EVARPAR	AZ29	
	P/N	1055319		
Heat Exchanger	Make	BUCYRUS		
	P/N	399823		
DPM Filter	Make	FS&T	Model	FST-115-26
	P/N	607513	Filter Size	12.75 O.D.
	Air Rating (CFM)		Filter Length	26.00
	Surface Area (in ³)			
	Efficiency = 95%			95%@302
	Recommended Exhaust Back-Pressure			28"

ATTACHMENT 1

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Date Time
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Gas analysis

Fuel type
Oil-Diesel

T.Air	85	°F
T.Gas	76	°F
T.Sensor	87	°F
O2	10.3	%
CO	6	PPM
NO	503.8	PPM
NO2	58.5	PPM
NOx	562.3	PPM
CO2	7.8	%

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Date Time
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Gas analysis

Fuel type
Oil-Diesel

T.Air	85	°F
T.Gas	76	°F
T.Sensor	87	°F
O2	9.9	%
CO	115	PPM
NO	519.9	PPM
NO2	45.4	PPM
NOx	565.3	PPM
CO2	8.1	%

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ATTACHMENT 2