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Pennsylvania Technical Advisory Committee
On Diesel Powered Equipment

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December 20, 2011

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

RE: Brookville Equipment Corporation Model 10M78D-1 Ten Man Personnel Carrier utilizing the Deutz BF4L2011 -78HP engine (MSHA Approval 07-ENA040004-1) and an Emissions Control System DST Management System using a M30 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 October 25, 2011 Brookville Equipment Corp. submitted a request to the Bureau of Mine Safety (BMS) for approval for a Brookville Model 10M78D-1 Ten Man Personnel Carrier utilizing the Deutz BF4L2011 -78HP engine (MSHA Approval 07-ENA040004-1) and an Emissions Control System DST Management System using a M30 Filter.

On November 16, 2011 the Director of BMS requested the TAC to evaluate the Brookville Equipment Corporation Model 10M78D-1 Ten Man Personnel Carrier utilizing the Deutz BF4L2011 -78HP engine (MSHA Approval 07-ENA040004-1) and an Emissions Control System DST Management System using a M30 Filter and to advise the Department regarding the TAC's recommendation as to whether the referenced equipment meets requirements of Section 403 of the Act.

The diesel power package includes the following items:

- Deutz BF4L2011 -78HP engine @ 2800 rpm (MSHA Approval 07-ENA040004-1) (Part 7)
- Emissions Control System DST Management System
  - Syncat Corporation M260-223-02 oxidation catalyst
  - Dry Systems Technologies M30 DPM filter (MSHA efficiency rating 96%)
  - DST M150-301-01 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 December 19, 2011 the TAC and DEP traveled to Brookville Equipment Corporation 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.

Monitoring of the exhaust gas temperature produced a high exhaust gas temperature reading of 195° F, which is well below the 302° F allowed by Section 403 (b)(4) of the Act. It is our belief that the heat exchanger will maintain the exhaust gas temperature well below the required 302 ° F. The maximum surface temperature observed was 250° F on the exhaust manifold after conducting all the CO testing. There was a small area on the black polyamide coating that measured above 302° F, but that area will be reinsulated by Brookville to eliminate the problem.

The after-treatment system is fitted with a DST M30 DPM filter. The filter is rated by MSHA at a 96 % efficiency rating. The engine and filter extrapolations show that the diesel power package will result in an average ambient concentration of .015 mg/m^3 of diesel particulate matter when diluted by 100% of the MSHA approval plate ventilation rate for this engine, which is well below the 0.12 mg/m^3 requirement of Section 403 (a)(1) the Act. (Attachment 2)

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 Brookville Equipment Corporation, the results of the tests conducted on December 19, 2011, as well as the data acquired and observations made during our investigation. The TAC has determined that the Deutz BF4L2011 -78HP engine (MSHA Approval 07-ENA040004-1) and an Emissions Control System DST Management System using a M30 Filter 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 January 11, 2012 at which time permanent approval will be recommended.

Paul Borchick

Ron Bowersox

General Specification Sheet

EQUIPMENT MANUFACTURER BROOKVILLE EQUIPMENT CORP. MODEL 10M78D-1 DATE 11/16/11

Manufacturer	Deutz	Particulate Index (PI)	2500
Manufacturer Address	3883 Steve Reynolds Blvd. Norcross, GA 30093		
Engine Model No.	BF4L2011	Gaseous Ventilation Rate (CFM)	6000
Engine Serial No.		Raw DPM (gr/hr)	3.7
HP/RPM (rated)	78 / 2800	MSHA Part 7 Approval #	07-ENA040004-1
Low Idle (RPM)	900	MSHA Part 7 Ventilation Rate (CFM)	6000
Max. Dirty Intake Air Restriction H^2O	26	Type of Aspiration	Turbocharged
Max. Allowed Backpressure H^2O	30	Turbocharger Boost (psi)	11.5-16
High Idle (RPM)	3100	Fuel Delivery System	Direct Injection
Water-jacketed components	☒ Yes ☐ No	Engine Cooling via	Oil to Air

Manufacturer	Dry Systems Technologies		
Manufacturer Address	8102 Lamont Road, Suite 700, Woodridge, IL 60517		
Model Number	M30	System Type	
MSHA Efficiency Rating	96%	MSHA Approved	☒ Yes ☐ No
Treated DPM mg/m^3 when diluted w/100% Part 7 ventilation rate *(show calc on separate sheet)*	0.015		

Manufacturer	Syncat Corp.		
Manufacturer Address	1843 Choke Cherry Drive, Louisville, CO 80027		
System Name	Syncat S 5.0 LS		
Model Number	M260-223-02		

Manufacturer	PaaS Technologies		
Manufacturer Address	1843 Choke Cherry Drive, Louisville, CO 80027		
System Name			
Model Number	M48-115-01	MESG	0.90 mm

Manufacturer	Dry Systems Technologies	Model or Part #	M150-301-01

Manufacturer	ANSUL	Model or Part #	Checkfire SC-N

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ATTACHMENT 1

AMBIENT DPM CALCULATION SHEET

Engine Model	Deutz BF4L2011
MSHA Number	07-ENA040004-1 (78 hp)
Ventilation Rate	6,000 CFM
DPM (Weighted)	3.7 g/hr
Filter Type	Dry System Technologies Model M30
Filter Efficiency	96%

CONVERT DPM FROM (grams/hr) to (mg/min)

(3.7 g/hr) X (1hr/60 min) X (1,000mg/g) = 61.67 mg/min

CONVERT VENTILATION RATE FROM (CFM) TO (m^3/min)

(6,000 ft^3/min) X (.028315 m^3/ 1ft^3) = 169.89 m^3/min

DIVIDE DPM (mg/min) BY VENTILATION RATE (m^3/min.)

(61.67 mg/min) ÷ (169.89 m^3/min) = 0.363 mg/m^3

SOLVE FOR AMBIENT DPM LEVEL AT 96% FILTER EFFICIENCY

0.363 mg/m^3 X (100% - 96% Filter Efficiency) = **0.015 mg/m^3**

ATTACHMENT 2