



April 3, 2014

Mr. Eli Schmader  
Brookville Equipment Corporation  
175 Evans Street  
P O Box 130  
Brookville, PA 15825

RE: Brookville Model 25T174D locomotive utilizing a Deutz BF6M2012C diesel engine (MSHA ID 07-ENA040008 – Part 7) 208 HP @ 2500 RPM with a DST emissions control system using a DST Model M30 DPM filter (96.9% efficient) and a Syncat Corp P/N M357-220-02 diesel oxidation catalyst.

Dear Mr. Schmader:

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.

On January 4, 2014, Brookville Equipment Corporation submitted a request to the TAC and Bureau of Mine Safety to have this piece of equipment inspected. The DEP requested TAC to do so. On March 26, 2014, the TAC and DEP traveled to Brookville Equipment Corporation in Brookville, PA to conduct their investigation.

The TAC recommended temporary approval of this equipment in their report of March 28, 2014. Permanent approval was recommended at the TAC meeting on April 9, 2014.

Based on the recommendation of the TAC and the equipment approval staff, your request for approval is granted.

If you have any questions on this request, please contact Joseph Sbaffoni at [jsbaffoni@pa.gov](mailto:jsbaffoni@pa.gov) or at 724-439-7469.

Sincerely,

Joseph A. Sbaffoni  
Director  
Bureau of Mine Safety

cc: Bowersox  
Borchick

Enclosure(s)

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

**Paul Borchick**

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March 28, 2014

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

RE: Brookville Model 25T174D locomotive utilizing a Deutz BF6M2012C diesel engine (MSHA ID 07-ENA040008 - Part 7) 208HP @ 2500 RPM with a DST emissions control system using an DST Model M30 DPM filter (96.9% efficient) and a Syncat Corp. P/N M357-220-02 diesel oxidation catalyst.

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 January 17, 2014 Brookville Equipment Corp. submitted a request for evaluation of their Model 25T174D locomotive utilizing a Deutz BF6M2012C diesel engine (MSHA ID 07-ENA040008 - Part 7) 208HP @ 2500 RPM with a DST emissions control system using an DST Model M30 DPM filter (96.9% efficient) and a Syncat Corp. P/N M357-220-02 diesel oxidation catalyst.

On January 21, 2014 the Director of BMS requested the TAC to evaluate the Brookville Model 25T174D locomotive engine and emission package 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 engine and emissions control package has not been previously approved under Section 403 of the Act.

The diesel power package includes the following items:

- Deutz BF6M2012C diesel engine (MSHA ID 07-ENA040008 - Part 7) 208HP @ 2500 RPM DST model M249 emissions control system
- DST Model M30 DPM filter (96.9% efficient)
- Syncat Corp. P/N M357-220-02 diesel oxidation catalyst
- DST Model M190-301-01 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 March 26, 2014 the TAC and DEP traveled to Brookville Equipment Corp. in Brookville, 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.

Monitoring of the exhaust gas temperature produced a high exhaust gas temperature reading of 160° F, which is well below the 302° F allowed by Section 403 (b)(4) of the Act. The maximum surface temperature observed 220° F on the exhaust manifold, which is below the 302° F allowed by Section 403 (b)(3) of the Act. The maximum engine coolant temperature observed was 170° F, and the maximum engine oil temperature observed was 130° F.

\*It should be noted that these tests were conducted outside with the air temperature around 20° F.

The after-treatment system is fitted with a DST Model M30 DPM filter. The filter is rated by MSHA at a 96.9 % efficiency rating. The engine and filter extrapolations show that the diesel power package will result in an average ambient concentration of .011 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 0.12 mg/m<sup>3</sup> 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.

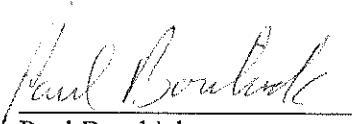
### **Recommendation**

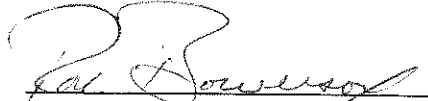
Our recommendation is based upon the data supplied by Brookville Equipment Corporation, the results of the tests conducted on March 26, 2014, as well as the data acquired and observations made during our investigation. The power package utilizing a Deutz BF6M2012C diesel engine (MSHA ID 07-ENA040008 - Part 7) 208HP @ 2500 RPM with a DST emissions control system using an DST Model M30 DPM filter (96.9% efficient) and a Syncat Corp. P/N M357-220-02 diesel 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.

If the Director should receive a request to use this equipment prior to the next scheduled TAC meeting, the TAC will recommend temporary approval until the next regular scheduled TAC meeting on April 9, 2014 at which time permanent approval will be recommended.

  
Paul Borchick

  
Ron Bowersox

**BROOKVILLE EQUIPMENT CORP.  
MODEL 25T174D  
Diesel 25 Ton Locomotive**

General Specifications of the Diesel-Powered Equipment Package

Engine Manufacturer		Deutz			
Engine Model		BF6M2012C			
Horsepower		208 HP			
Rated Speed		2500 RPM			
Manufacturer's Recommended Exhaust Back-pressure (InH <sub>2</sub> O)		40 Inches Water Gauge			
Maximum Exhaust Out Temperature		869 deg F			
<b>MSHA Engine Approval</b>		<b>MSHA Part 7</b>			
MSHA Certification No.		07-ENA040008			
Rated Speed		2500 RPM			
Rated Horsepower		208 HP			
Exhaust GAS Flow (SCFM)		1510.1 CFM			
ISO 8178-1 Average DPM (gr/hr)		5.578 gr/hr			
Average Ambient DPM Level (mg/m <sup>3</sup> )		0.011 mg/m <sup>3</sup>			
MSHA Ventilation Rate (CFM)		9,000 CFM (Part 7)	CFM (Part 32)		
Pa. State Ventilation Rate (CFM)					
<b>Emissions Control System</b>		<b>DST Management System</b>			
Fuel Injection Pump	Make	Bosch			
	P/N	TBD			
Oxidation Catalyst	Make	Syncat Corp.			
	P/N	M357-220-02			
Heat Exchanger	Make	Dry Systems Technologies			
	P/N	M190-301-01			
DPM Filter	Make	DST	Model	M 30	
	P/N	M30-411-01R	Filter Size	16 x 12 in Diameter	
	Air Rating (CFM)	2100 CFM	Filter Length	20 in	
	Surface Area (in <sup>3</sup> )	42,231 in <sup>3</sup>			
	Efficiency				98.5%
	Recommended Exhaust Back-Pressure				25 Inches Water Gauge

**CALCULATION: AMBIENT DPM EMISSION LEVEL FOR  
DUETZ BF6M2012C DIESEL ENGINE  
BASED ON SOUTHWEST RESEARCH INSTITUTE TEST DATA**

RE: To meet the requirements of the Pennsylvania ACT 182 Diesel Powered Equipment Law, Section 203-A, a) 1), entitled Exhaust Emission Control

To comply with section 203-A-a-1, the tailpipe emissions for the equipment cannot exceed  $0.12\text{mg}/\text{m}^3$ , when diluted by 100% of the MSHA approval plate ventilation rate for that diesel engine.

For Brookville Equipment Corporation's request for BOTE approval for our Model 25T174D Locomotive, the Deutz BF6M2012C Diesel Engine will be used at 208 hp @ 2500 rpm.

MSHA specifications for the Deutz BF6M2012C:  
Approval No: 07-ENA040008  
Ventilation Req't: 9,000 cfm

The MSHA approved ventilation rate for the Deutz is as follows:

Ventilation Rate: 9,000 cfm under MSHA approval 07-ENA040008

Using the equation:

$$\text{Ambient DPM Level} = \text{DPM}_{\text{AVG}} = \text{PT}/V_{\text{vent}}$$

Where:

$V_{\text{VENT}}$  = Quantity of ventilation air req'd per MSHA 24/D88

$$= \frac{9,000 \text{ ft}^3}{\text{min}} \times \frac{1 \text{ m}^3}{35.31 \text{ ft}^3}$$

$$= 254.89 \text{ m}^3/\text{min}$$

Average DPM level over 8178-1 8 mode Test = 5.578 g/hr

Based on Southwest Research Institute testing filter efficiency was found to be 96.9%.  
Therefore the DPM would be  $5.578 \times .031 = 0.173$  g/hr

PT = Average DPM level

$$= \frac{0.173 \text{ gr}}{1 \text{ hour}} \times \frac{1000 \text{ mg}}{1 \text{ gr}} \times \frac{1 \text{ hour}}{60 \text{ min}}$$

$$= 2.88 \text{ mg/min}$$

SOLVE FOR AMBIENT DPM LEVEL:

$$\text{DPM}_{\text{AMB}} = \frac{(2.88 \text{ mg/min})}{254.89 \text{ m}^3/\text{min}}$$

$$= 0.011 \text{ mg.m}^3$$

CONCLUSION: To comply with section 203-A-a-1, the tailpipe emissions for the equipment cannot exceed  $0.12 \text{ mg/m}^3$ , when diluted by 100% of the MSHA approval plate ventilation rate for that diesel engine.  $0.011 \text{ mg/m}^3 < 0.12 \text{ mg/m}^3$ , therefore, this engine package meets the requirement.