



pennsylvania
DEPARTMENT OF ENVIRONMENTAL
PROTECTION

August 4, 2016

Cameron Miller, Manager
Brookville Services, LLC
4 S. Pickering Street
Brookville, PA 15825

Re: Brookville Model 25T174D locomotive utilizing a Deutz BF6M2012C diesel engine (MSHA ID 07-ENA040008-Part7) 208HP @ 2500 RPM with an AirFlow Management System emissions control system using and MSHA Approved Airflow ACSMNC DPM Filter / Diesel Oxidation Catalyst (87% Efficient).

Dear Mr. Miller:

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 June 3, 2016 Brookville Equipment Corp. submitted a request to the Technical Advisory Committee ("TAC") and Bureau of Mine Safety to have this piece of equipment inspected. On June 8, 2016, The DEP Bureau Director requested the TAC to review and comment on this request.

The TAC and DEP traveled to Bailey Mine in Wind Ridge, PA to conduct their investigation and issued their report recommending temporary approval on June 30, 2016. Temporary approval was granted on July 5, 2016. Permanent approval was recommended at the TAC meeting on July 22, 2016.

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 me at either cocarson.pa.gov or at 724.404.3154.

Sincerely,

Colvin C. Carson
Director

cc: Ron Bowersox, TAC
Paul Borchick



pennsylvania

DEPARTMENT OF ENVIRONMENTAL
PROTECTION

July 5, 2016

Mr. Michael Caprini
ConsolEnergy, Inc.
Bailey Mine
192 Crabapple Road
Wind Ridge, PA 15380

Re: Temporary Approval – Brookville Model 25T174D 25-Ton Locomotive

Dear Mr. Caprini:

This is in response to your email dated July 1, 2016, requesting temporary approval for underground use of the Brookville Model 25T174D 25-Ton Locomotive. The next Technical Advisory Committee on Diesel-Powered Equipment (TAC) meeting is scheduled for July 22, 2016, at which time the final approval for this equipment will be recommended by the TAC.

The TAC and the DEP traveled to the Bailey Mine, Crabapple Shop in Wind Ridge, PA, to evaluate this equipment. Subsequently, the TAC issued a recommendation dated June 30, 2016, to the Bureau recommending the approval of the equipment with the understanding that the enclosed General Specification sheet be strictly adhered to.

Temporary approval is granted for this equipment to be used prior to the regular scheduled TAC meeting that is to be held on July 22, 2016.

Sincerely,

A handwritten signature in black ink, appearing to read "Colvin C. Carson".

Colvin C. Carson
Director

Enclosures

cc: Ron Bowersox, TAC
Paul Borchick, TAC

BROOKVILLE

July 5, 2016

Craig Carson
Bureau of Mine Safety
DEP New Stanton Office
131 Broadview Road
New Stanton, PA 15672

Dear Mr. Carson,

Brookville is requesting temporary approval to use Bailey mine asset #204 (Brookville serial #9198). This is a mainline locomotive and Bailey mine is in need of this unit. They have a lot of pan line to haul out of the mine after their recent longwall move.

On behalf of Brookville and Bailey Mine, thank you for considering temporary approval of the use of #204 locomotive.

Sincerely,



Cameron Miller
Manager
Brookville Services LLC

Cc: Ron Bowersox
Paul Borchick
Jeff Kerch

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

Paul Borchick

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Ron Bowersox

(724) 726-8987 (Home)
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Email: umwarbowersox@yahoo.com

June 30, 2016

Colvin Carson, Director
Bureau of Mine Safety
Department of Environmental Protection
131 Broadview Road
New Stanton, PA 15672

RE: Brookville Model 25T174D locomotive utilizing a Deutz BF6M2012C diesel engine (MSHA ID 07-ENA040008 - Part 7) 208HP @ 2500 RPM with an AirFlow Management System emissions control system using an MSHA Approved AirFlow ACSMNC DPM Filter / Diesel Oxidation Catalyst (87% Efficient).

Dear Mr. Carson:

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 3, 2016 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 an AirFlow Management System emissions control system using an MSHA Approved Airflow ACSMNC DPM Filter / Diesel Oxidation Catalyst (87% Efficient). This new passively regenerating diesel filter / DOC catalyst designed emissions control package replaced the previously approved DST emissions control package.

On June 8, 2016 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 with an AirFlow Management System emissions control system
- MSHA Approved AirFlow ACSMNC DPM Filter / Diesel Oxidation Catalyst (87% Efficient).
- This new AirFlow system uses a fan forced air mixing box design to cool the exhaust gas that is exiting the system.

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 30, 2016 the TAC and DEP traveled to Bailey Mine in Wind Ridge, 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. The CO measured on the clean side of the emissions control system was 2 ppm when measured during the stall test. The raw CO measured was 122 ppm during the stall test.

Monitoring of the exhaust gas temperature produced a high exhaust gas temperature reading of 110° F at the exit of the mixing box, which is well below the 302° F allowed by Section 403 (b)(4) of the Act. The maximum surface temperature observed was 292° 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 190° F, and the maximum engine oil temperature observed was 140° F. A smoke dot test was conducted on the exhaust system at the exit of the mixing box and the result yielded a number 1 on the smoke dot scale.

The after-treatment system is fitted with a MSHA Approved Airflow ACSMNC DPM Filter / Diesel Oxidation Catalyst rated at 87% efficient. The engine and filter extrapolations show that the diesel power package will result in an average ambient concentration of .042 mg/m³ 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/m³ 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.

The TAC had a few concerns regarding the mixing box that were addressed by the Bailey and Brookville representatives.

- There is a vacuum switch installed on the mixing box forced air fan that will shut down the engine in the event of a fan failure or air path obstruction, and also if the vacuum line is removed or cut. It was agreed this vacuum switch will be tested every 100 hour maintenance inspection for proper operation.
- A test was conducted to measure the surface temperature on the exhaust and mixing box immediately after the engine was shut down. This showed no significant increase in the surface temperature on any exhaust components, and all were maintained below 302° F.
- Since the forced air fan draws intake air into the mixing box, the TAC was concerned that there may be an accumulation of dust that may be deposited inside the mixing box. It was agreed that this area will be inspected and cleaned as needed during each 100 hour maintenance inspection.
- Since the AirFlow Model ACSMNC filter / catalyst system is a passively regenerated system, the results of the smoke dot test will determine when the components will be replaced. Any smoke dot test above a 3 will require the components to be replaced or regenerated (cleaned). Smoke dot tests will be conducted as part of every 100 hour maintenance inspection or more often if necessary.
- The TAC requested that the performance of this new designed emissions control system be closely observed. It was agreed that the mine will share by email with the TAC and DEP the first 3 full 100 hour maintenance inspection results which will include emission test results, smoke dot test results, vacuum switch shutdown test results (both plugged hose and disconnected hose), and maintenance records of any changed components on the emissions system.

Recommendation

Our recommendation is based upon the data supplied by Brookville Equipment Corporation, the results of the tests conducted on June 30, 2016, 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 an AirFlow Management System emissions control system using an MSHA Approved Airflow ACSMNC DPM Filter / 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 with the following stipulations:

- There is a vacuum switch installed on the mixing box forced air fan that will shut down the engine in the event of a fan failure or air path obstruction, and also if the vacuum line is removed or cut. It was agreed this vacuum switch will be tested every 100 hour maintenance inspection for proper operation.
- Since the forced air fan draws intake air into the mixing box, the TAC was concerned that there may be an accumulation of dust that may be deposited inside the mixing box. It was agreed that this area will be inspected and cleaned as needed during each 100 hour maintenance inspection.
- Since the AirFlow Model ACSMNC filter / catalyst system is a passively regenerated system, the results of the smoke dot test will determine when the components will be replaced. Any smoke dot test above a 3 will require the components to be replaced or regenerated (cleaned). Smoke dot tests will be conducted as part of every 100 hour maintenance inspection or more often if necessary.
- The TAC requested that the performance of this new designed emissions control system be closely observed. It was agreed that the mine will share by email with the TAC and DEP the first 3 full 100 hour maintenance inspection results which will include emission test results, smoke dot test results, vacuum switch shutdown test results (both plugged hose and disconnected hose), and maintenance records of any changed components on the emissions system.

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 July 22, 2016 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 ₂ O)		40 Inches Water Gauge		
Maximum Exhaust Out Temperature		869 deg F		
MSHA Engine Approval		MSHA Part 7		
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 ³)		0.011 mg/m ³		
MSHA Ventilation Rate (CFM)		9,000 CFM (Part 7)	CFM (Part 32)	
Pa. State Ventilation Rate (CFM)				
Emissions Control System		AirFlow Management System		
Fuel Injection Pump	Make	Bosch		
	P/N	TBD		
Oxidation Catalyst	Make	ACSMNC		
	P/N	Low NO ₂ 15" TBD		
Heat Exchanger	Make	Dry Systems Technologies		
	P/N	M190-301-01		
DPM Filter	Make	AirFlow	Model	MinNoCat DOC
	P/N	TBD		
	Air Rating (CFM)	3000		
	Surface Area (In ³)	2,592		15"
	Efficiency			87%
Recommended Exhaust Back-Pressure				25 Inches Water Gauge

Rev. 0 08/08/06

ATTACHMENT 1

CALCULATION: AMBIENT DPM EMISSION LEVEL FOR DUETZ BF6M2012C DIESEL ENGINE

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 with AirFlow Catalyst System Model ACSMNC, 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_{VENT} = Quantity of ventilation air req'd per MSHA 24/D88

$$\begin{aligned} &= \frac{9,000 \text{ ft}^3}{\text{min}} \times \frac{1 \text{ m}^3}{35.31 \text{ ft}^3} \\ &= 254.89 \text{ m}^3/\text{min} \end{aligned}$$

Average DPM level over 8178-1 8 mode Test = 4.89 g/hr

Based on Southwest Research Institute testing filter efficiency was found to be 87%.
Therefore the DPM would be $4.89 \times .13 = 0.6357$ g/hr

PT = Average DPM level

$$= \frac{0.6357 \text{ gr}}{1 \text{ hour}} \times \frac{1000 \text{ mg}}{1 \text{ gr}} \times \frac{1 \text{ hour}}{60 \text{ min}}$$

$$= 10.595 \text{ mg/min}$$

SOLVE FOR AMBIENT DPM LEVEL:

$$\text{DPM}_{\text{AMB}} = \frac{(10.595 \text{ mg/min})}{254.89 \text{ m}^3/\text{min}}$$

$$= 0.042 \text{ mg.m}^3$$

CONCLUSION: To comply with section 203-A-a-1, the tailpipe emissions for the equipment cannot exceed 0.12 mg/m^3 , when diluted by 100% of the MSHA approval plate ventilation rate for that diesel engine with AirFlow Catalyst $0.042 \text{ mg/m}^3 < 0.12 \text{ mg/m}^3$, therefore, this engine package meets the requirement.