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

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July 7, 2009

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

RE: TAC recommendation on Daimler Chrysler Model OM 904 LA – 100 HP diesel engine with a M30 DST Management System using an Air Flow Catalyst System CCCA-100-MB-C catalyst in a Brookville Model 7M100D, Brookville Model 4M100DMV, and a Brookville Model ULPC. The request from Brookville was to replace the catalyst in the previously approved power package that utilized a Syncat Corp. Model M150-301-01 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 June 3 2009, Brookville Equipment Corporation submitted a request to the Bureau of Mine Safety for evaluation and approval pursuant to Chapter 4 of the Act of a modification to the previously approved power package in a Brookville Model 7M100D, Brookville Model 4M100DMV, and a Brookville Model ULPC using the Daimler Chrysler Model OM 904 LA – 100 HP diesel engine with a M30 DST Management System. Brookville requests to change the catalyst on all three models from the previously approved Syncat Corp. Model M150-301-01 catalyst to an Air Flow Catalyst System CCCA-100-MB-C catalyst.

On June 16, 2009 the Director of BMS requested the TAC to evaluate the diesel power package utilizing the Air Flow Catalyst and to advise the Department regarding the TAC's recommendation as to whether the diesel power package meets the requirements of Section 403.

On July 7, 2009 the TAC and DEP traveled to Bailey Mine Crabapple Portal to inspect the Brookville Model 7M100D -7 Man Personnel Carrier with the Air Flow catalyst installed.

Investigation

The Brookville Model 7M100D – 7 Man Personnel Carrier as well as the Model 4M100DMV and the Model ULPC had been previously approved by the TAC and DEP and each was assigned a BOTE-D Number by the DEP. These previous approvals included the following diesel engine and emissions package:

- Daimler Chrysler Model OM 904 LA – 100 HP diesel engine (MSHA Certification No.7E-B098-0)(Part 7)
- Syncat Corp. M113-210-02 Catalyst
- Paas Tech M150-301-01 Heat Exchanger
- Dry Systems Technology M30 DPM Filter (96% Efficient)

Brookville's request to modify the power package on all 3 models is to replace the Syncat Corp. catalyst with an Air Flow catalyst.

The following is the new diesel engine and emissions package being evaluated:

- Daimler Chrysler Model OM 904 LA – 100 HP diesel engine (MSHA Certification No.7E-B098-0)(Part 7)
- *Air Flow Catalyst System CCCA-100-MB-C catalyst*
- Paas Tech M150-301-01 Heat Exchanger
- Dry Systems Technology M30 DPM Filter (96% Efficient)

More detailed information on the specifications for the Model 7M100D, Model 4M100DMV, and Model ULPC diesel power packages are included on the General Specification Sheets which are attached. (Attachments 1, 2, 3)

On July 7, 2009 the TAC and DEP representatives traveled to Bailey Mine to inspect the Brookville Model 7M100D personnel carrier. Emissions testing of the engine and after-treatment system were performed, as well as exhaust gas temperature monitoring and stall test procedure.

Monitoring of the exhaust gas temperature produced a high exhaust gas temperature reading of 178° F, which is well below the 302° F allowed by Section 403. The maximum surface temperature detected was 249 ° F which is also below 302° F. The maximum engine oil temperature measured was 200° F.

The 90 second emission stall test was performed. The results of the emission tests showed the engine was performing within MSHA's approval specifications. The results of that testing are included in Attachment 4. The emissions showed an increase in the NO2 emissions. This would be expected with the platinum and Activex washcoat used in the new catalyst. The passenger compartment of the equipment should be periodically checked with a handheld detector for NO2 concentration to assure that the exhaust is not

being directed into the passenger compartment. Deflectors may need to be added over the exhaust tailpipe to direct the exhaust away from the passengers. Some newer models of the Brookville Models 7M100D, 4M100DMV and ULPC are equipped with these deflectors, while the Model 7M100D tested does not have the deflector installed.


Recommendation

In addition to the testing that was conducted, our investigation and our observations confirmed that the diesel power package 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 the above described diesel power package. This recommendation is provided with the understanding that the General Specification Sheets (Attachments 1, 2, and 3) be strictly adhered to.

The TAC recommends that care should be given to assure that the MSHA/DEP vent rate for this engine (4,500 cfm) is strictly followed, especially in the case of multiple units on the same air split, as addressed in Section 404(c) and 404(d) of the Act. Since this is rail mounted transportation equipment, care should also be given to assure that no excessive idling occurs as addressed in Section 423(c) of the Act.

The TAC recommends that the passenger compartment of the equipment should be periodically checked with a handheld detector for NO₂ concentration to assure that the exhaust is not being directed into the passenger compartment. Air deflectors may need to be added to direct the exhaust away from the passengers. Some newer models of the Brookville Models 7M100D, 4M100DMV and ULPC are equipped with deflectors.

Our recommendation is based upon the data supplied by Brookville Equipment Corporation; the results of the tests conducted on July 7, 2009; as well as the data acquired and observations made during our investigation.


Paul Borchick


Ron Bowersox

October 17, 2006

**BROOKVILLE EQUIPMENT CORP.
MODEL 7M100D
7 Man / 8 Ton Diesel Locomotive**

General Specifications of the Diesel-Powered Equipment Package

Engine Manufacturer		Daimler Chrysler			
Engine Model		OM 904 LA			
Horsepower		100 HP			
Rated Speed		2200 RPM			
Manufacturer's Maximum Recommended Exhaust Backpressure (In H ₂ O)		41 Inches Water Gauge			
Maximum Exhaust Out Temperature		302 deg F			
MSHA Engine Approval		MSHA Part 7			
MSHA Certification No.		7E-B098-0 (Part 7)			
Rated Speed		2200 RPM			
Rated Horsepower		100 HP			
Exhaust GAS Flow (SCFM)		318 CFM @ 25 deg C			
ISO 8178-1 Average DPM (gr/hr)		4.14 gr/hr			
Average Ambient DPM Level (mg/m ³)		0.022 mg/m ³			
MSHA Ventilation Rate (CFM)		4,500 CFM (Part 7)	CFM (Part 32)		
Pa. State Ventilation Rate (CFM)					
Emissions Control System		DST Management System			
Fuel Injection Pump	Make	Bosch			
	P/N	0280746902			
Oxidation Catalyst	Make	Air-Flow Catalyst System			
	P/N	CCCA-100-MB-C			
Heat Exchanger	Make	Paas Tech.			
	P/N	M150-301-01			
DPM Filter	Make	Dry Systems Technology M 30	Model	M 30	
	P/N		Outer Filter Size	16 x 12 in Diameter	
	Air Rating (CFM)	2100 CFM	Inner Filter Size	10 x 6 in Diameter	
	Surface Area (in ³)	42,231 in ³	Filter Length	20 in	
	Efficiency				96%
	Recommended Exhaust Back-Pressure				25 Inches Water Gauge

January 8, 2007

**BROOKVILLE EQUIPMENT CORP.
MODEL 4M100DMV
4 Man Diesel Maintenance Vehicle**

General Specifications of the Diesel-Powered Equipment Package

Engine Manufacturer		Daimler Chrysler			
Engine Model		OM 904 LA			
Horsepower		100 HP			
Rated Speed		2200 RPM			
Manufacturer's Maximum Recommended Exhaust Backpressure (In H ₂ O)		41 Inches Water Gauge			
Maximum Exhaust Out Temperature		302 deg F			
MSHA Engine Approval		MSHA Part 7			
MSHA Certification No.		7E-B098-0 (Part 7)			
Rated Speed		2200 RPM			
Rated Horsepower		100 HP			
Exhaust GAS Flow (SCFM)		318 CFM @ 25 deg C			
ISO 8178-1 Average DPM (gr/hr)		4.14 gr/hr			
Average Ambient DPM Level (mg/m ³)		0.022 mg/m ³			
MSHA Ventilation Rate (CFM)		4,500 CFM (Part 7)	CFM (Part 32)		
Pa. State Ventilation Rate (CFM)					
Emissions Control System			DST Management System		
Fuel Injection Pump	Make	Bosch			
	P/N	0280746902			
Oxidation Catalyst	Make	Air-Flow Catalyst System			
	P/N	CCCA-100-MB-C			
Heat Exchanger	Make	Paas Tech.			
	P/N	M150-301-01			
DPM Filter	Make	Dry Systems Technology	Model	M 30	
	P/N	M 30	Outer Filter Size	16 x 12 in Diameter	
	Air Rating (CFM)	2100 CFM	Inner Filter Size	10 x 6 in Diameter	
	Surface Area (in ³)	42,231 in ³	Filter Length	20 in	
	Efficiency				96%
	Recommended Exhaust Back-Pressure				25 Inches Water Gauge

June 16, 2006

**BROOKVILLE EQUIPMENT CORP.
MODEL ULPC
Diesel 9-Ton Loco / 15-Man Personnel Carrier**

General Specifications of the Diesel-Powered Equipment Package

Engine Manufacturer		Daimler Chrysler			
Engine Model		OM 904 LA			
Horsepower		100 HP			
Rated Speed		2200 RPM			
Manufacturer's Maximum Recommended Exhaust Backpressure (In H ₂ O)		41 Inches Water Gauge			
Maximum Exhaust Out Temperature		302 deg F			
MSHA Engine Approval		MSHA Part 7			
MSHA Certification No.		7E-B098-0 (Part 7)			
Rated Speed		2200 RPM			
Rated Horsepower		100 HP			
Exhaust GAS Flow (SCFM)		318 CFM @ 25 deg C			
ISO 8178-1 Average DPM (gr/hr)		4.14 gr/hr			
Average Ambient DPM Level (mg/m ³)		0.022 mg/m ³			
MSHA Ventilation Rate (CFM)		4,500 CFM (Part 7)	CFM (Part 32)		
Pa. State Ventilation Rate (CFM)					
Emissions Control System		DST Management System			
Fuel Injection Pump	Make	Bosch			
	P/N	0280746902			
Oxidation Catalyst	Make	Air-Flow Catalyst System			
	P/N	CCCA-100-MB-C			
Heat Exchanger	Make	Paas Tech.			
	P/N	M150-301-01			
DPM Filter	Make	Dry Systems Technology M 30	Model	M 30	
	P/N		Outer Filter Size	16 x 12 in Diameter	
	Air Rating (CFM)	2100 CFM	Inner Filter Size	10 x 6 in Diameter	
	Surface Area (in ³)	42,231 in ³	Filter Length	20 in	
	Efficiency				96%
	Recommended Exhaust Back-Pressure				25 Inches Water Gauge

Brookville 7M100D Personnel Carrier with Daimler Chrysler OM904LA 100 HP Diesel Engine with Air Flow Catalyst

#2009-07-07 10:35:37#

Time(h:m:s)	O2(%)	CO(ppm)	NO(ppm)	NO2(ppm)	NOx(ppm)	SO2(ppm)	CxHy(%)	CO2(%)	T Gas(F)	T Amb(F)	ETA	Lambda	Comments:
0:13:54	18.6	116	154	27	181	0	0	1.8	69	61.9	98.8	8.75	90 sec Raw start
0:14:03	17.9	104	320	28	348	0	0	2.3	69	61.9	99.1	6.77	
0:14:14	13.7	183	296	35	331	0	0	5.4	70	61.9	99.6	2.88	
0:14:24	13.6	138	290	36	326	0	0	5.4	69	61.8	99.6	2.84	
0:14:33	13.5	106	290	37	327	0	0	5.5	70	61.8	99.6	2.8	
0:14:44	13.5	93	291	38	329	0	0	5.5	69	61.8	99.6	2.8	
0:14:54	13.5	89	295	38	333	0	0	5.5	69	61.8	99.6	2.8	
0:15:03	13.5	87	300	38	338	0	0	5.5	70	61.8	99.6	2.8	
0:15:13	13.5	85	302	38	340	0	0	5.5	69	61.8	99.6	2.8	
0:15:24	13.5	84	305	38	343	0	0	5.5	70	61.9	99.6	2.8	
0:15:34	13.5	84	308	39	347	0	0	5.5	70	61.9	99.6	2.8	
0:15:43	13.5	84	309	39	348	0	0	5.5	70	61.9	99.6	2.8	
0:15:54	13.4	84	311	39	350	0	0	5.6	69	61.9	99.6	2.76	
0:16:04	13.4	85	314	39	353	0	0	5.6	70	61.9	99.6	2.76	End
0:23:24	18.9	2	124	39	163	0	0	1.5	69	61.7	98.7	10.90	sec clean start
0:23:33	18.6	2	235	39	274	0	0	1.8	69	61.8	98.8	8.75	
0:23:43	14.8	22	268	36	304	0	0	4.5	69	61.8	99.6	3.39	
0:23:54	14.5	21	250	41	291	0	0	4.8	69	61.8	99.6	3.23	
0:24:04	14.4	12	244	47	291	0	0	4.8	69	61.8	99.6	3.18	
0:24:13	14.4	7	241	53	294	0	0	4.8	69	61.8	99.6	3.18	
0:24:24	14.4	5	238	59	297	0	0	4.8	69	61.8	99.6	3.18	
0:24:34	14.4	4	237	64	301	0	0	4.8	69	61.8	99.6	3.18	
0:24:43	14.4	3	236	67	303	0	0	4.8	69	61.8	99.6	3.18	
0:24:53	14.4	3	236	70	306	0	0	4.8	69	61.8	99.6	3.18	
0:25:04	14.4	2	236	72	308	0	0	4.8	69	61.8	99.6	3.18	
0:25:14	14.4	2	236	74	310	0	0	4.8	69	61.8	99.6	3.18	
0:25:23	14.4	2	236	76	312	0	0	4.8	69	61.8	99.6	3.18	
0:25:33	16.3	2	404	95	499	0	0	3.4	69	61.8	99.4	4.47	
0:25:44	17.2	2	442	99	541	0	0	2.8	69	61.8	99.3	5.53	end