



pennsylvania

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF MINE SAFETY

90a

January 10, 2013

Mr. Nate Morris
Irwin Mine and Tunneling Supply
9953 Broadway
P O Box 409
Irwin, PA 15642

RE: Irwin Mine and Tunneling Supply Model RD4018000ACRC48D Diesel Rockduster utilizing a Deutz D2011L03i diesel engine (MSHA ID 07-ENA040011-0-Part 7) 49HP @ 2800 RPM with a DST emissions control system using a DST Model M70-417-01 DPM Filter (96% efficient) and a DST Model M260-223-02 diesel oxidation catalyst.

Dear Mr. Morris:

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 August 21, 2012, Irwin Mine and Tunneling Supply sent a request to have this piece of equipment inspected. The DEP requested TAC to do so on September 6, 2012. On October 31, 2012, the TAC and DEP traveled to Sandvik to conduct their investigation.

The TAC gave recommended approval in the enclosed report with several stipulations on November 6, 2012. All stipulations must be adhered to in operation of this equipment. They recommended final approval at the meeting on January 9, 2013.

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

Sincerely,

Joseph A. Sbaffoni
Director
Bureau of Mine Safety

cc: Bowersox
Borchick

Enclosure(s)

JAS/cd

bcc: Kerch
Brower
Antoon
Gaida
Dunn/TAC file

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Rockduster.doc

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

Paul Borchick

(412) 736-9105 (Cell)
(724) 485-4414 (Office)
Email: paulborchick@consolenergy.com

Ron Bowersox

(724) 726-8987 (Home)
(724) 479-8692 (Office)
Email: umwarbowersox@yahoo.com

November 6, 2012

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

RE: Irwin Mine and Tunneling Supply Model RD4018000ACRC48D Diesel Rockduster utilizing a Deutz D2011L03i diesel engine (MSHA ID 07-ENA040011-0 - Part 7) 49HP @ 2800 RPM with a DST emissions control system using an DST Model M70-417-01 DPM filter (96% efficient) and a DST Model M260-223-02 diesel oxidation catalyst.

Dear Mr. Scaffoni:

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 August 21, 2012 Irwin Mine and Tunneling Supply submitted a request for evaluation of their Model RD4018000ACRC48D Diesel Rockduster utilizing a Deutz D2011L03i diesel engine (MSHA ID 07-ENA040011-0 - Part 7) 49HP @ 2800 RPM with a DST emissions control system using an DST Model M70-417-01 DPM filter (96% efficient) and a DST Model M260-223-02 diesel oxidation catalyst.

On September 6, 2012 the Director of BMS requested the TAC to evaluate the Irwin Mine and Tunneling Supply Model RD4018000ACRC48D Diesel Rockduster 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 D2011L03i diesel engine (MSHA ID 07-ENA040011-0 - Part 7) 49HP @ 2800 RPM
- DST emissions control system:
 - DST Model M70-417-01 DPM filter (96% efficient)
 - DST Model M260-223-02 diesel oxidation catalyst
 - DST Model M184-301-01 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 October 31, 2012 the TAC and DEP traveled to RM Manufacturing in Waynesburg, 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 TAC addressed a few special concerns and considerations based on the nature and design of this type of equipment (track mounted bulk rockduster):

- Since this is a rockduster, the stall test procedure had to be established by inducing the proper lug on the engine using the air compressor. This was accomplished using the air compressor to discharge through a filter at a specific pressure. The TAC requested that the Stall Test Pressure Gage be clearly identified with a tag and the corresponding required lug test pressure (40 psi) be clearly marked on the gage and included in the Stall Test Procedure.
- The TAC also was concerned that the fire suppression annunciator did not comply with Section 408(d) since it was not mounted to be clearly seen or heard by the operator unless he was positioned at the controls, which is not likely for this specific type of equipment (rockduster). Irwin agreed to provide a strobe type light that could be visible from around the equipment to comply with Section 408(d).
- There was a 40 degree F discrepancy between the reading on the Exhaust Gas Temperature gage on the control panel and the measurement taken at the end of the tailpipe. It was determined that the location of the exhaust gas temperature sensor was not in the exhaust gas stream and thus causing the difference in temperature readings. Irwin agreed to relocate the exhaust gas temperature sensor to eliminate this problem.
- There were several gages on the operator control panel that were identified by symbols, and the TAC requested that they be labeled. Irwin agreed to label the gages.
- There was one small area on the exhaust manifold that exceeded 302° F, but Irwin agreed to wrap the area with a Firewrap blanket and send confirmation pictures to DEP.

Monitoring of the exhaust gas temperature produced a high exhaust gas temperature reading of 190° F, which is well below the 302° F allowed by Section 403 (b)(4) of the Act.

The maximum surface temperature observed 250° F on the exhaust manifold, which is below the 302° F allowed by Section 403 (b)(3) of the Act. The maximum engine oil temperature observed was 218° F.

The after-treatment system is fitted with a DST M70-417-01 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 0.058 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.

Recommendation

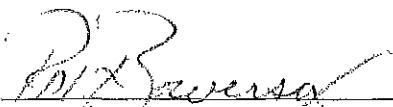
Our recommendation is based upon the data supplied by Irwin Mine and Tunneling Supply, the results of the tests conducted on October 31, 2012, as well as the data acquired and observations made during our investigation. The TAC has determined that the Deutz D2011L03i diesel engine (MSHA ID 07-ENA040011-0 - Part 7) 49HP @ 2800 RPM with a DST emissions control system using an DST Model M70-417-01 DPM filter (96% efficient) and a DST Model M260-223-02 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, once all of the following specific equipment issues are completed and confirmed:

- The TAC requested that the Stall Test Pressure Gage be clearly identified with a tag and the corresponding required lug test pressure (40 psi) be clearly marked on the gage and included in the Stall Test Procedure.
- Irwin agreed to provide a strobe type light that could be visible from around the equipment to comply with Section 408(d).
- Irwin agreed to relocate the exhaust gas temperature sensor to eliminate the difference in the exhaust gas temperature gage reading.
- There were several gages on the operator control panel that were identified by symbols, and the TAC requested that they be labeled. Irwin agreed to label the gages
- There was one small area on the exhaust manifold that exceeded 302° F, but Irwin agreed to wrap the area with a Firewrap blanket and send confirmation pictures to DEP

This recommendation is provided with the understanding that the General Specification Sheet (Attachment 1) be strictly adhered to.

Should the Director receive a request to use this equipment prior to the next scheduled TAC meeting, the TAC recommends temporary approval until the next regular scheduled TAC meeting on January 9, 2013 at which time permanent approval will be recommended.


Paul Borchick


Ron Bowersox

General Specification Sheet

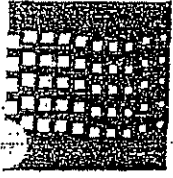
EQUIPMENT MANUFACTURER
IRWIN MINE AND TUNNELING SUPPLY

MODEL
RD4018000ACRC48D

DATE 5/30/12

I. Engine			
Manufacturer	DEUTZ	Particulate Index (PI)	3,000 CFM
Manufacturer Address	3883 STEVE REYNOLDS BLVD., NORCROSS, GA 30093		
Engine Model No.	D 2011L03i	Gaseous Ventilation Rate (CFM)	2,000
Engine Serial No.	11089396	Raw DPM (gr/hr)	4.89
HP/RPM (rated)	49 / 2,800	MSHA Part 7 Approval #	07-ENA040011-0
Low Idle (RPM)	900	MSHA Part 7 Ventilation Rate (CFM)	2,000
Max. Dirty Intake Air Restriction H ² O	22	Type of Aspiration	NATURAL
Max. Allowed Backpressure H ² O	26	Turbocharger Boost (psi)	N/A
High Idle (RPM)	3,220	Fuel Delivery System	DIRECT INJECTION
Water-jacketed components	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Engine Cooling via	INTEGRATED OIL
II. Particulate Filter			
Manufacturer	DRY SYSTEM TECHNOLOGIES		
Manufacturer Address	104 RISING COURT, WOODRIDGE, IL 60517		
Model Number	M70-417-01	System Type	PAPER
MSHA Efficiency Rating	96%	MSHA Approved	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Treated DPM mg/m ³ when diluted w/100% Part 7 ventilation rate (show calc on separate sheet)	0.058 mg/m ³		
III. Catalyst			
Manufacturer	DRY SYSTEM TECHNOLOGIES		
Manufacturer Address	104 RISING COURT, WOODRIDGE, IL 60517		
System Name	DST MODEL M343 EXHAUST SYSTEM		
Model Number	M280-223-02		
IV. Flame Arrestor			
Manufacturer	DRY SYSTEM TECHNOLOGIES		
Manufacturer Address	104 RISING COURT, WOODRIDGE, IL 60517		
System Name	DST MODEL M343 EXHAUST SYSTEM		
Model Number	M241-401-01	MESG	0.064"
V. Heat Exchanger			
Manufacturer	DRY SYSTEM TECHNOLOGIES	Model or Part #	M184-301-01
VI. Fire Suppression System			
Manufacturer	ANSUL	Model or Part #	A-MF-348

ATTACHMENT 1



**Dry Systems[®]
Technologies**

Technology for a cleaner environment

AMBIENT DPM CALCULATION SHEET

Engine Model	Deutz D2011L03i
MSHA Number	07-ENA040011 (48 HP)
Ventilation Rate	2,000 CFM
DPM (Weighted)	4.89 g/hr
Filter Type	Dry System Technologies Model M70
Filter Efficiency	96%

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

$$(4.89 \text{ g/hr}) \times (1\text{hr}/60 \text{ min}) \times (1,000\text{mg/g}) = 81.5 \text{ mg/min}$$

CONVERT VENTILATION RATE FROM (CFM) TO (m³/min)

$$(2,000 \text{ ft}^3/\text{min}) \times (.028315 \text{ m}^3 / 1\text{ft}^3) = 56.63 \text{ m}^3/\text{min}$$

DIVIDE DPM (mg/min) BY VENTILATION RATE (m³/min.)

$$(81.5 \text{ mg/min}) \div (56.63 \text{ m}^3/\text{min}) = 1.44 \text{ mg/m}^3$$

SOLVE FOR AMBIENT DPM LEVEL AT 96% FILTER EFFICIENCY

$$1.44 \text{ mg/m}^3 \times (100\% - 96\% \text{ Filter Efficiency}) = 0.058 \text{ mg/m}^3$$