



pennsylvania

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF MINE SAFETY

930

August 1, 2013

Mr. Todd Homet
Consol Coal Company
192 Crabapple Road
Wind Ridge, PA 15380

RE: Engine and emissions control package evaluation under Sections 403, 417, and 418 of the Act for a Kubota V2403-M-DI-E3 (49HP @ 2700RPM) diesel engine (MSHA Approval 07 ENA-080011) with DST M194 emissions control system using a DST Model M70-0417-01 DPM filter and a DST Model M260-223-02 diesel oxidation catalyst in a Royal Hydraulics Skid Steer Loader

Dear Mr. Homet:

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 July 15, 2013, Royal Hydraulics Service and Manufacturing 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 July 22, 2013, the TAC and DEP traveled to Royal Hydraulics Service and Manufacturing in Cokeburg, PA to conduct their investigation.

The TAC recommends temporary approval of this equipment in their report of July 29, 2013. You requested a temporary approval to use this equipment in an email submitted to the Bureau on July 31, 2013. Permanent approval will be recommended at the next scheduled TAC meeting on October 9, 2013.

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

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

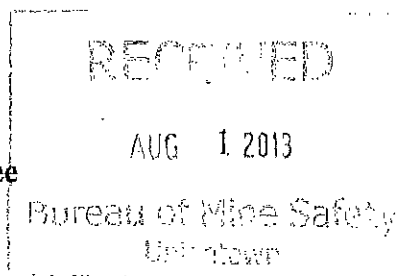
Sincerely,

Joseph A. Scaffoni
Director
Bureau of Mine Safety

cc: Bowersox
Borchick
George Gumbert, Royal Hydraulics

Enclosure(s)

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



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936

July 29, 2013

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

RE: Engine and emissions control package evaluation under Sections 403, 417 and 418 of the Act for a Kubota V2403-M-DI-E3 (49HP @ 2700 RPM) diesel engine (MSHA Approval 07 ENA-080011) with DST M194 emissions control system using a DST Model M70-417-01 DPM filter and a DST Model M260-223-02 diesel oxidation catalyst in a Royal Hydraulics Skid Steer Loader.

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 July 15, 2013 Royal Hydraulics Service and Mfg. submitted a request to the TAC and Bureau of Mine Safety (BMS) for approval for a Royal Hydraulics Skid Steer Loader using a Kubota V2403-M-DI-E3 (49HP @ 2700 RPM) diesel engine (MSHA Approval 07 ENA-080011) with DST M194 emissions control system using a DST Model M70-417-01 DPM filter and a DST Model M260-223-02 diesel oxidation catalyst. The engine and emissions control package has not been previously approved under Section 403 of the Act.

The Director of BMS requested the TAC to evaluate the Royal Hydraulics Skid Steer Loader using a Kubota V2403-M-DI-E3 (49HP @ 2700 RPM) diesel engine (MSHA Approval 07 ENA-080011) with DST M194 emissions control system using a DST Model M70-417-01

DPM filter and a DST Model M260-223-02 diesel oxidation catalyst 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:

- Kubota V2403-M-DI-E3 diesel engine (MSHA Approval 07 ENA-080011) 49HP @ 2700 RPM
- DST M194 emissions control system:
 - DST Model M70-417-01 DPM filter (95% efficient)
 - DST Model M260-223-02 diesel oxidation catalyst

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 July 22, 2013 the TAC and DEP traveled to Royal Hydraulics Service and Mfg. in Cokeburg, 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 136° F, which is well below the 302° F allowed by Section 403 (b)(4) of the Act. The maximum surface temperature observed was 200° F on the exhaust manifold after conducting all the CO testing. The maximum engine coolant temperature observed was 130° F.

The after-treatment system is fitted with a DST Model M70-417-01 DPM filter. The filter is rated by MSHA at a 95 % efficiency rating. The engine and filter extrapolations show that the diesel power package will result in an average ambient concentration of .064 mg/m³ of diesel particulate matter when diluted by 100% of the MSHA approval plate ventilation rate for this engine, which is below the .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.

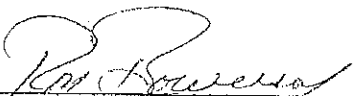
The TAC requested Royal Hydraulics to develop a stall test procedure to insure the engine is properly lugged when performing the repeatable emissions tests as required by Sections 417 and 418 of the Act. This "Hydraulic Stall Emissions Test Procedure" will be included in the 100 hour maintenance training for this Skid Steer.

Recommendation

Our recommendation is based upon the data supplied by Royal Hydraulics Service and Mfg., the results of the tests conducted on July 22, 2013, as well as the data acquired and observations made during our investigation. The TAC has determined that the Kubota V2403-M-DI-E3 (49HP @ 2700 RPM) diesel engine (MSHA Approval 07 ENA-080011) with DST M194 emissions control system using a DST Model M70-417-01 DPM filter 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.

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


Paul Borchick


Ron Bowersox

General Specification Sheet

I. Engine

Manufacturer	Kubota	High Idle (RPM)	2700
Manufacturer Address	505 Schleiter Road, Lincolnshire, IL	Particulate Index (PI)	4000
Model Number	V2403-M-DI-E3	Gaseous Ventilation Rate (CFM)	3000 cfm
Serial Number		Raw DPM (gr/hp)	6.54 g/hr
Horse Power	49@2700 RPM	MSHA 7E Approval Number	07-ENA080011
Max. dirty Intake Air Restriction (H ² O)	20" wg	Type of Aspiration	Natural
Max. Allowed Backpressure H ² O	42" wg	Fuel Delivery System	Mechanical Injection
Turbocharger Boost Pressure	N/A	Low Idle (RPM)	800

ATTACHMENT 1/1

II. Filter System

Manufacturer	Dry System Technology
Manufacturer Address	8102 Lemont Road, Suite 700 Woodridge, Illinois 60517
Model Number	M194
System Type	Dry Paper
System Composition	Paper - DST - M70-417-01
Efficiency Rating	95 %
Type of Regeneration	N/A

III. Catalyst

Manufacturer	Dry System Technology
Manufacturer Address	8102 Lemont Road, Suite 700 Woodridge, Illinois 60517
System Name	Oxidation Catalyst
Model Number	M260-223-02

DPM Calculation Sheet

Engine Model	Kubota V2304-M-DI-E3
MSHA Number	07-ENA080011
Ventilation Rate	3,000 cfm
Filter Type	Paper
Filter Efficiency	95%

Convert DPM From (grams/hr) to (mg/min)

$$(6.54\text{g/hr.}) \times (1\text{hr./60min}) \times (1000\text{mg/g}) = 109 \text{ mg/min}$$

Convert Ventilation Rate from cfm to m³/min.

$$(3000 \text{ ft}^3/\text{min}) \times (.028315 \text{ m}^3/\text{ft}^3) = 84.95 \text{ m}^3/\text{min.}$$

Divide DPM (mg/min) by Ventilation Rate (m³/min.)

$$(109\text{mg/min}) \div (84.95 \text{ m}^3/\text{min.}) = 1.28 \text{ mg/m}^3.$$

Solve for Ambient DPM Level AT 95% Filter Efficiency

$$1.28 \text{ m}^3/\text{min} \times (100-95\% \text{ Filter Efficiency}) = .064 \text{ mg/ m}^3$$

ATTACHMENT 2

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

Paul Borchick

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Ron Bowersox

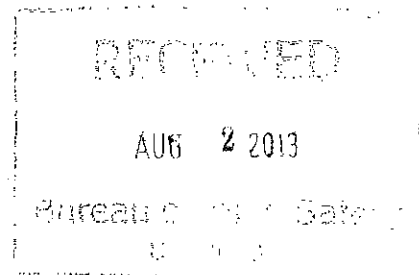
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Email: unwarbowersox@yahoo.com

July 29, 2013

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Dear Mr. Scaffoni,

The TAC has been notified that the Bailey Mine would like to use the Royal Hydraulics Model RH-T110 Diesel Bobcat referenced in the TAC recommendation dated July 29, 2013 as soon as possible.

The TAC recommends temporary approval of the Royal Hydraulics Diesel Bobcat so it may be used before formal approval is recommended at the next TAC meeting on October 9, 2013.

Paul Borchick

Ron Bowersox