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

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~~ORIGINAL~~
TAC
file

March 23, 2009

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

RE: Final TAC Recommendation- Johnson Industries diesel powered Model SS Rubber Tire Mantrip with a Deutz BF4M2011 87 HP (de-rated to 74HP) diesel engine (MSHA Approval No. 07-ENA040004) and an Engine Control System Silicon Carbide Filter (ECS S/9) and an Engine Control System Oxidation Catalyst (AZ 27) utilizing Off Board Regeneration.

Dear Mr. Sbaffoni:

Article II-A of the Pennsylvania Bituminous Coal Mine Act (the act) provides for the use of diesel-powered equipment in underground bituminous coal mines. Section 224-A of the act created a Technical Advisory Committee ("TAC") for the purpose of advising the Department regarding implementation of Article II-A.

During the TAC evaluation period for this Johnson Industries diesel powered Model SS Rubber Tire Mantrip, the new Pennsylvania mining laws took effect on January 3, 2009. Therefore the TAC must abide by Chapter 4 of the "Bituminous Coal Mine Safety Act".

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.

Background

On September 12, 2008, Johnson Industries submitted a request to the Technical Advisory Committee for evaluation and approval pursuant to Article II-A of the Act of a Deutz BF4M2011 87 HP (de-rated to 74 HP) engine (MSHA Approval No. 07-ENA040004) with a Engine Control System Silicon Carbide Filter (ECS S/9) and an Engine Control System

Oxidation Catalyst (AZ 27) in a Model SS Rubber Tire Mantrip. This system will incorporate the use of a ceramic filter which will have no piping beyond the filter. Therefore the ceramic DPM filter will be the only flame arrestor in the system. A cooling fan will be mounted directly over the ceramic filter to cool the exhaust gas and also keep the ceramic filter from regenerating onboard. The system will utilize off board DPM filter regeneration.

Johnson Industries also requested an Alternate Test Procedure for the 5 minute CO test required by Sections 217A and 218A.

The Bureau of Mine Safety received a copy of this request on October 6, 2008.

On October 21, 2008, the Director of BMS requested the TAC to evaluate the diesel power package and to advise the Department regarding the TAC's recommendation as to whether the diesel power package meets the requirements of the Act. The Director also requested the TAC to evaluate the use of the ceramic filter as a flame arrestor, and for the TAC's recommendation on Johnson Industries request for an Alternate Test Procedure for CO testing.

The TAC began its investigation on November 14, 2008 when the equipment became available and traveled to Rosebud Mining's Shop in Kittanning, Pa along with BMS to evaluate the equipment.

On **November 17, 2008** the TAC made a recommendation to the Director for **temporary approval** of the Johnson Industries diesel powered Model SS Rubber Tire Mantrip with a Deutz BF4M2011 87 HP (de-rated to 74HP) diesel engine (MSHA Approval No. 07-ENA040004) and an Engine Control System Silicon Carbide Filter (ECS S/9) and an Engine Control System Oxidation Catalyst (AZ 27) utilizing Off Board Regeneration.

This temporary approval allowed for a ninety (90) calendar day evaluation period beginning on the date the mantrip was put in service. During this time all maintenance; replacement parts, pre-op and operational records would be documented and made available for review by the TAC. After reviewing these records at the end of the 90 day period, the TAC could make a recommendation for permanent approval, require changes to the system based on information found during the 90 day period, or reject the system if evidence shows that this alternative method did not meet the requirements with regards to Section 403 (b) of the act.

On February 26, 2009 the TAC and DEP traveled to the Tom's Run Mine to do the follow up evaluation of the Model SS Rubber Tire Mantrip upon the completion of the 90 day evaluation period.

Investigation

The changes to the system and operating procedures the TAC recommended to Johnson industries during the November 14, 2008 evaluation were made to the mantrip. These changes included:

- Add another temperature sensor in the swirl box, where the hottest surface temperature was detected, to monitor the temperature in the swirl box to identify a problem with the cooling fan or system. The sensor would be attached to a cooling fan shut down gage mounted in the operator's compartment which would show an alarm if the temperature in the box exceeded 270 degrees F.

- Examine the exhaust cooling fan during every service interval and filter change to ensure it is in good operating condition and record the condition on the checklist.
- Clean out the swirl box during every service interval and filter change to ensure that there is no accumulation of coal or combustible material in the box.
- Include in the pre-op check list the examination of the exhaust cooling fan intake for any obstructions and the condition of the swirl box to be free of damage or leaks.

The maintenance records and replacement parts used during the 90 day evaluation period were reviewed by the TAC. The replacement of the cooling fan was necessary one time during the period. The fan motor failed due to excessive heating of the motor after shut down. A timer will be installed to allow the fan more time to run after the engine is shut down. No other parts were replaced. Maintenance records showed that the engine and emissions control package performed within the limits as required by Section 418 of the act.

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 **final approval** of the above described diesel power package, **subject to the conditions listed above**. This recommendation is provided with the understanding that the General Specification Sheet (Attachment 1) be strictly adhered to.

The need for the Alternate Test procedure was shown during testing conducted on November 14, 2008. A TAC recommendation for approval of the Alternate Test is not necessary since the 90 second test is the standard as provided in Chapter 4, Sections 417 and 418 of the act.

Our recommendation is based upon the data supplied by Johnson Industries; the results of the tests conducted on November 14, 2008; the results of the follow up evaluation after the 90 day test period on February 26, 2009; as well as the data acquired and observations made during our investigation.



Paul Borchick



Ron Bowersox

General Specification Sheet

I. Engine

Manufacturer	Deutz	High Idle (RPM)	3100
Manufacturer Address	3883 Steve Reynolds Blvd. Norcross, Ga. 30093	Particulate Index (PI)	2500 cfm
Model Number	BF4L20II	Gaseous Ventilation Rate (CFM)	6000 cfm
Serial Number	TBD	Raw DPM (gr/hp)	3.7 g/hr
Horse Power	87@ 2800 rpm Derated to 74 hp	MSHA 7E Approval Number	07-ENA040004
Max. dirty Intake Air Restriction (H²O)	26" wg	Type of Aspiration	Turbocharged
Max. Allowed Backpressure H²O	20" wg	Fuel Delivery System	Mechanical Injection
Turbocharger Boost Pressure	18.5 psi	Low Idle (RPM)	900

II. Filter System

Manufacturer	Engine Control System
Manufacturer Address	165 Pony Drive Newmarket, Ontario, Canada, L3Y7V1
Model Number	ECS S/9 Silicone Carbide (Sic)
System Type	Non- Catalyzed - Off Board Regeneration
System Composition	Silicone Carbide
Efficiency Rating	87%
Type of Regeneration	Off- board - electrical

III. Catalyst

Manufacturer	Engine Control System
Manufacturer Address	165 Pony Drive Newmarket, Ontario, Canada, L3Y7V1
System Name	A-Z Severe Duty
Model Number	AZ 27