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SUBJECT: Maximum Total Exhaust System Backpressure Specification Increase for Caterpillar Inc.'s (Caterpillar's) 3304 PCNA and 3306 PCNA Diesel Engines

Who needs this information?
This Program Information Bulletin (PIB) is intended for all underground mine operators using diesel-powered equipment, manufacturers of diesel-powered underground mining equipment (including manufacturers of exhaust after-treatment control devices and systems), diesel engine manufacturers, miners' representatives, and Mine Safety and Health Administration (MSHA) personnel.

Why is MSHA issuing this PIB?
This PIB is being issued to inform interested parties of the increase of the maximum total exhaust system backpressure specification for Caterpillar's 3304 PCNA and 3306 PCNA diesel engines used in underground mining.

What is the new maximum total exhaust system backpressure limit for the Caterpillar engine approvals listed?
The maximum total exhaust system backpressure specifications for Caterpillar's 3304 PCNA and 3306 PCNA diesel engines have been updated to allow for a maximum total exhaust backpressure limit of 60 inches of water for each engine. Caterpillar's

original exhaust backpressure limit for each engine was 34 inches of water. Caterpillar allows this increase with two stipulations: 1) no warranty claims for valve train components will be accepted for any mining company who adopts this increase in backpressure, and 2) participating mining companies and their subsidiaries should submit a list of serial numbers from affected engines to Caterpillar for warranty tracking purposes. MSHA will not be involved in the warranty stipulations specified by Caterpillar. Warranty is an issue between the mine operator and Caterpillar.

Does the increase in the maximum total exhaust system backpressure limit affect the Checklists for Permissible Diesel Powered Machines?

Permissible machines approved by MSHA must be evaluated using approved permissibility checklists (Machine Checklist and Power System Checklist). MSHA has an addendum to the existing permissibility checklists which addresses the change to Caterpillar's 3304 PCNA and 3306 PCNA maximum total exhaust system backpressure limit engine specification from 34 to 60 inches of water. This checklist addendum details the procedure to be used to check the engine's total exhaust system backpressure and the service indicator gauge installation for the diesel particulate matter (dpm) filter if the higher maximum total exhaust backpressure limit is used. The addendum checklist supersede the total exhaust system backpressure limit and the dpm filter service indicator gauge installation checks currently listed in the approved permissibility checklists. The addendum is attached to this PIB.

How does this increase in the backpressure limit affect the performance of wet exhaust conditioner systems (scrubbers)?

The increase in maximum total exhaust system backpressure limit to 60 inches of water may affect the performance of gravity feed water make-up tank systems on permissible equipment. The additional backpressure within the scrubber may prevent the gravity feed make-up tank from supplying water to the scrubber, resulting in nuisance engine shutdowns. If a mine chooses to increase the backpressure limit to 60 inches on the subject engines, it is recommended that the gravity feed make-up tank design be changed to a pressure feed make-up tank design.

Where can I find more information?

More information on engine backpressure effects can be obtained by contacting MSHA's Technical Support, Approval and Certification Center (A&CC) at the contact information listed below or your engine manufacturer or distributor. MSHA provides a list of approved engines that specifies their respective maximum total exhaust system backpressure limits at the A&CC's List of Approved Products. This list can be found on the internet at:
https://lakegovprod1.msha.gov/ReportView.aspx?ReportCategory=EngineAppNumbers.

A list of acceptable dpm filters can be found at:
http://www.msha.gov/01-995/Coal/DPM-FilterEfflist.pdf

What is the background for this PIB?

Diesel engine manufacturers specify a maximum total exhaust system backpressure limit in their approval documentation. Mine operators requested an increase in the backpressure specifications to allow for increased operating time before changing disposable diesel exhaust particulate filters. Caterpillar agreed to increase the maximum total exhaust system backpressure specification for the two engine models specified in this PIB. MSHA has determined that the increase to 60 inches of water exhaust backpressure limit remains in accordance with the manufacturer specifications for the filters in MSHA's listing of acceptable DPM Control Technologies found on MSHA's website and listed above. MSHA has also determined through laboratory testing that the increase in backpressure does not adversely affect ventilation rates.

Who are the contact persons for this PIB?

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Technical Support, Approval and Certification Center
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What is the authority for this PIB?

The Federal Mine Safety ad Health Act of 1977, as amended, 30 U.S.C. § 801 et seq.; 30 C.F.R. part 7 subpart E, 30 C.F.R. part 75 subpart T, and 30 C.F.R. § 57.5066.

Who will receive this PIB?

Program Policy Manual Holders
Miners' Representatives
Underground Coal Mine Operators
Special Interest Groups
Engine Manufacturers

Permissibility Checklist
Addendum

The inspection checks in this addendum are to be used if the MSHA Part 36 Approved Equipment with a Caterpillar 3304PCNA or 3306PCNA engine is operated at the increased maximum allowable total exhaust system backpressure of 60 inches of water. These inspection checks are to be used in conjunction with the vehicle's approved Permissibility Checklists.

Inspection Frequency:

All inspection checks in this addendum should be performed on a **weekly** basis.

All Inspections and Tests Shall be Performed in Fresh Air

Maximum Total Exhaust System Backpressure Check

1. ( ) The total exhaust system backpressure does not exceed **60 inches of water**.

   a. Remove the total exhaust system backpressure test port plug or disconnect the exhaust filter service indicator gauge hose and flame proof port from the total exhaust backpressure test port located at the outlet of the exhaust manifold and install a pressure measuring device.

   b. With the engine running at maximum rpm, no load, and with the scrubber water level at normal operating depth, note the exhaust system backpressure.

   c. If the total exhaust system backpressure exceeds **60 inches of water**, drain and flush the scrubber, service the dpm filter and correct any other problems. Retest the exhaust backpressure to verify that problems have been corrected and the exhaust backpressure is below the maximum total exhaust system backpressure limit.

2. ( ) The following checks have been performed on the diesel particulate matter (dpm) filter installation:

a. Verify that the piping from the water scrubber to the dpm filter housing, including the water separator (if equipped), is in good condition with no leaks, open holes or cracks, missing plugs or clamps and that all attaching hardware is in place and tightened.

b. Remove and visually inspect the dpm filter for any damage (i.e. holes, missing gaskets, signs of burning) and check that the acceptable part number filter is installed.

c. Verify that an exhaust filter service indicator gauge with either a warning tag next to the gauge or a red marking on the gauge specifying the maximum allowable exhaust backpressure before servicing the exhaust system is installed in the operator's compartment. If the gauge is monitoring total exhaust system backpressure using a flame proof port, the maximum exhaust system backpressure limit is **60 inches of water**. If the gauge is monitoring the exhaust backpressure caused by the dpm filter, the maximum backpressure limit is the difference between Caterpillar's maximum allowable exhaust system backpressure of 60 inches of water and the backpressure caused by the exhaust components (e.g., piping, water separator, catalyst, exhaust conditioner, etc.) located between the exhaust manifold and the dpm filter housing. For example, if the exhaust backpressure caused by the exhaust system components upstream from the dpm filter housing is measured at 12 inches of water, the maximum allowable backpressure limit before servicing the dpm filter is 48 inches of water [60-12=48].

d. Verify that the service indicator gauge is not damaged. Check at low idle condition. A fluctuating needle indicates the gauge is working.

e. With the engine operating at maximum rpm and no load, verify that the exhaust filter service indicator gauge does not indicate an exhaust backpressure greater than the maximum backpressure limit specified on warning tag or gauge marking.

Note: The backpressure measured with the service indicator gauge should be consistent with the backpressure measured with the backpressure measuring device used to perform the maximum total exhaust system backpressure check. If backpressure readings are not similar, inspect ports or plumbing for clogging and/or damage of the on-board dpm filter's service indicator gauge.

3. ( ) If equipped with a flame proof port, remove the flame proof port and perform the following checks:

a. For Dry Systems Technologies (DST) flame proof ports: verify that the Model M40-596-01 flame proof port pin is held in place by a retaining ring ***OR*** that the M30-585-01 flame proof port pin is securely tightened into the body of the flame proof port.

b. For DBT/Jeffrey Model 518475 or 518510 flame proof ports verify that it is stamped “Jeffrey 518475” or “Jeffrey 518510”, the tamperproof weld is in place and not broken and the mesh is inside the flame proof port housing and in place.

Reinstall the flame proof port by tightly threading it into the exhaust backpressure test port. Reconnect the dpm filter service indicator gauge hose.