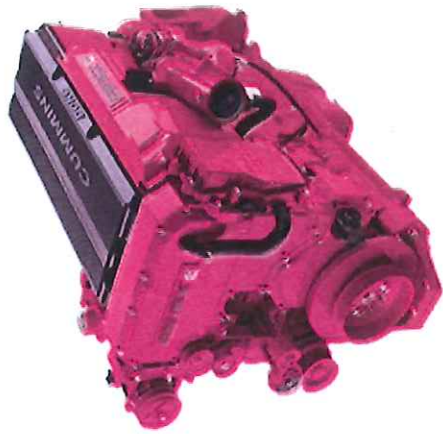


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Cummins ISX Regeneration Process



Exclusive U.S. **YanFool** Distributor

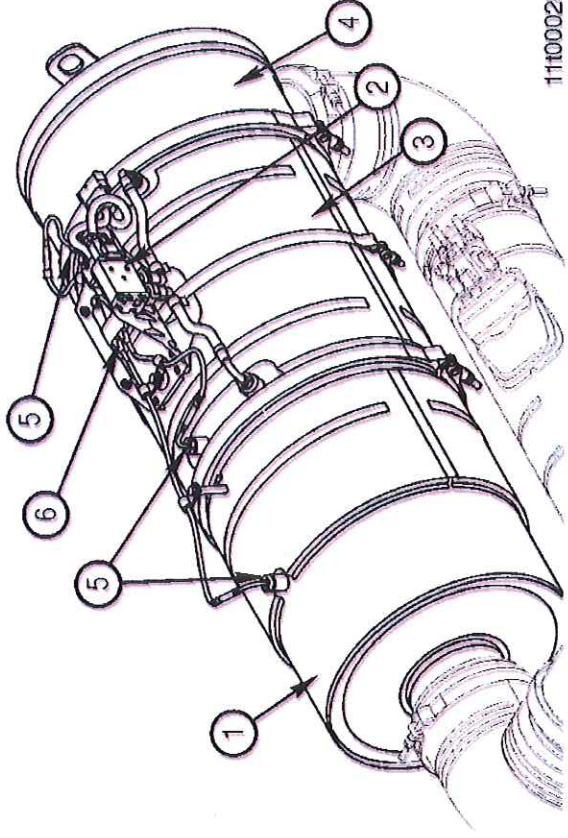
Introduction

- The Cummins Particulate Filter consists of four sections:
 1. Inlet
 2. Diesel Oxidation Catalyst (DOC),
 3. Diesel Particulate Filter (DPF)
 4. Outlet
- Exhaust flows out of the engine and into the Cummins Particulate Filter. It passes through the DOC and then into the DPF where PM is collected on the walls of the DPF. The PM collected is then oxidized to remove it from the DPF. This is known as regeneration.
- When operating conditions maintain sufficient exhaust temperatures, the DPF is continually self-regenerating. This is known as passive regeneration and results in clean exhaust out of the tailpipe. On very infrequent occasions, an active self-regeneration is required to remove a build-up of PM in the DPF, due to insufficient exhaust temperatures.



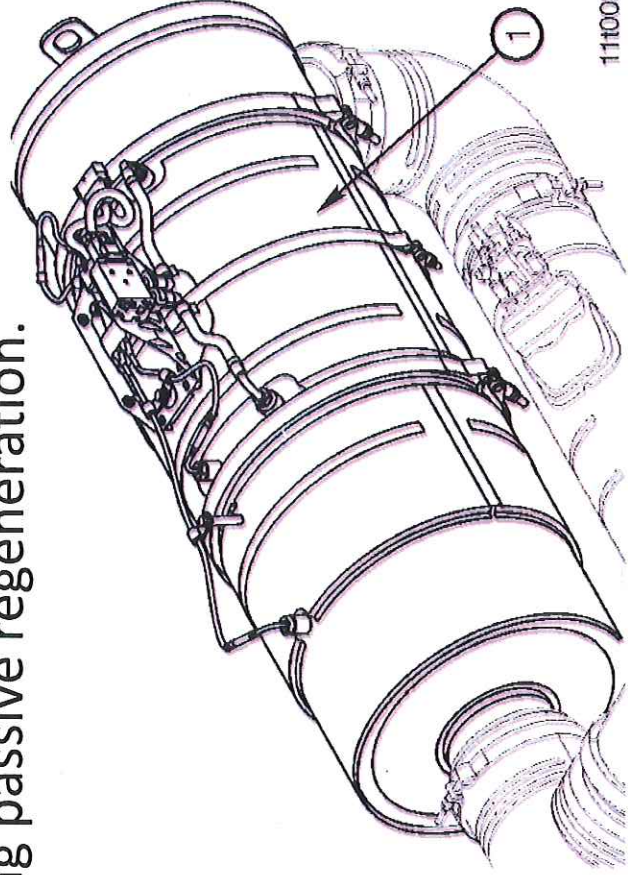
DPF

- The aftertreatment Diesel Particulate Filter (DPF) system is used to reduce particulate emissions and is composed of six main components:
 1. Aftertreatment inlet and aftertreatment Diesel Oxidation Catalyst (DOC)
 2. Aftertreatment DPF (Differential Pressure Sensor)
 3. Aftertreatment DPF
 4. Aftertreatment outlet
 5. Aftertreatment exhaust gas temperature sensors
 6. Aftertreatment DPF temperature sensor interface module



ISX

- Passive regeneration occurs when the exhaust temperatures are naturally high enough to oxidize the soot collected in the aftertreatment DPF (1) faster than the soot is collected.
- Passive regeneration typically occurs when the temperature of the aftertreatment DPF is above 316°C [601°F]. This occurs during highway driving or driving with heavy loads.
- Since passive regeneration occurs naturally, it is considered to be normal engine operation. No fuel is added to the exhaust stream during passive regeneration.



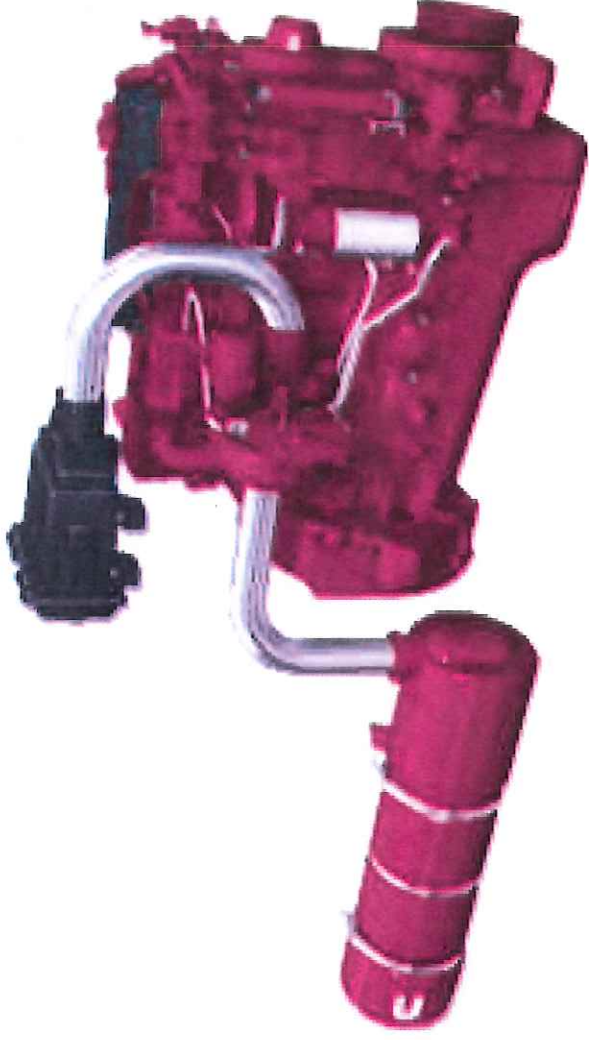
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- **Active Regeneration** occurs when the exhaust temperatures are **not** naturally high enough to oxidize the soot collected in the aftertreatment DPF faster than it is collected.
- Active regeneration requires assistance from the engine in order to increase the exhaust temperature. This is typically done by injecting a small amount of diesel fuel into the exhaust stream (called aftertreatment injection) which is then oxidized by the aftertreatment DOC. The oxidation of this additional fuel creates the heat needed to regenerate the aftertreatment DPF.
- For active regeneration to occur, the engine control module (ECM) **MUST** detect that the aftertreatment DPF restriction has reached a specified limit. Once this limit is reached, the engine will alter its operation in order to create exhaust temperatures high enough to actively regenerate the aftertreatment DPF.

Passive Regeneration

- Cummins engines are designed to maximize the use of passive self-regeneration. This occurs when operating conditions maintain sufficient exhaust temperature, therefore enabling continuous oxidation of the PM. Passive self-regeneration is completely transparent to the operator and does not affect the operation or performance.



Stationary Regeneration

- Stationary, or parked regeneration is the same as active regeneration but takes place while the equipment is not being operated. It offers the equipment operator the option, if needed, of performing regeneration outside the normal duty cycle. Using this option may only be required in a very limited number of applications.



DPF Symbols

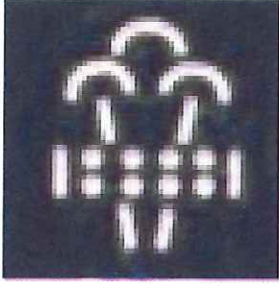
- DEF Lamp



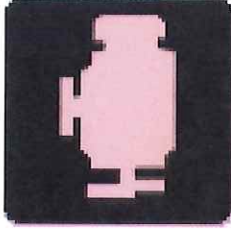
- High Exhaust Temperature



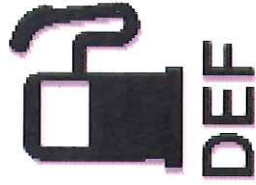
- DPF Regeneration Required



- MIL Lamp



- DEF Level



Malfunction Indicator Lamp (MIL)



(Illuminated)

- Used on engines that are equipped with On-board Diagnostics (OBD), the emission control system monitors and reports malfunctions that impact the emission control devices.
- If the OBD detects such a malfunction, the on-board diagnostic system illuminates the MIL to indicate that the engine needs to be serviced at the first available opportunity.
- The MIL can be illuminated along with any of the engine indicator lamps.



High Exhaust System Temperature (HEST) Lamp



- The HEST Lamp illuminates to indicate that high exhaust temperatures may exist due to after-treatment regeneration.
- This is normal and does not signify the need for any kind of vehicle or engine service.
- When this lamp is illuminated, ensure that the exhaust pipe outlet is not directed at any combustible surface or material.

After treatment Diesel Particulate Filter (DPF) Lamp



The After treatment DPF Lamp indicates, when illuminated or flashing, that the after treatment DPF requires regeneration. This is accomplished by the following:

Perform DPF regeneration by one of the following methods:

Change to a more challenging duty cycle, such as highway driving, for at least 20 minutes.

-- OR --

Perform a parked regeneration.



DEF Lamp

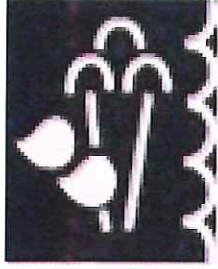


Illuminated

- An illuminated DEF is an indication that the DEF level is low (15% remaining). This can be corrected by refilling the DEF tank.



DEF Lamp



Flashing

A flashing DEF lamp indicates that the DEF level has fallen below a critical level (10% remaining).

This can be corrected by refilling the DEF tank.

Note: Van Hool recommends that the DEF level not fall below 20%. Allowing this can cause fault codes.



DEF Lamp



Flashing with Check Engine Light

- A flashing DEF Lamp combined with an illuminated MIL Lamp indicates that the DEF level is critically low (5%).
- A speed inducement of 55 mph will be enacted the first time the ignition switch is cycled off then back on.
- The speed limit of 55 mph will be suspended during pumping operations.
- Normal engine power and vehicle speed will be restored after the DEF tank is refilled.



DEF Lamp



Stop Engine Lamp, MIL Lamp with flashing DEF

- If the engine has been shut down after the DEF tank has run dry, the Stop Engine lamp will also be illuminated, along with the flashing DEF Lamp.
- **A speed inducement of 25 mph will be enacted the first time the ignition switch is cycled off then back on.**
- **The speed limit of 25 mph will be suspended during pumping operations.**
- Normal engine power and vehicle speed will be restored after the DEF tank is refilled.



After Treatment Diesel Particulate Filter (DPF) Lamp



Flashing

- If regeneration is not performed in a timely manner after the DPF Lamp is illuminated, the DPF Lamp will begin to flash. This indicates a higher level of soot in the DPF.
 - a. Change to a more challenging duty cycle, such as highway driving, for at least 20 minutes.

OR

 - b. Perform a parked regeneration.



Regeneration Process Overview

A message that may appear on dashboard display



DPF REGENERATION REQUIRED

Two options to perform regeneration:

1. **Automatic Regeneration**: Drive at highway speeds for minimum of 20 minutes without dropping speed below 5MPH.
2. **Stationary Regeneration**: Involves the following procedure:

Note: DPF lamp must be solid or flashing to perform stationary regeneration.



Regeneration Process Overview

Location of Regeneration buttons in engine compartment:



Regeneration Inhibit

Regeneration Process Cummins Engine

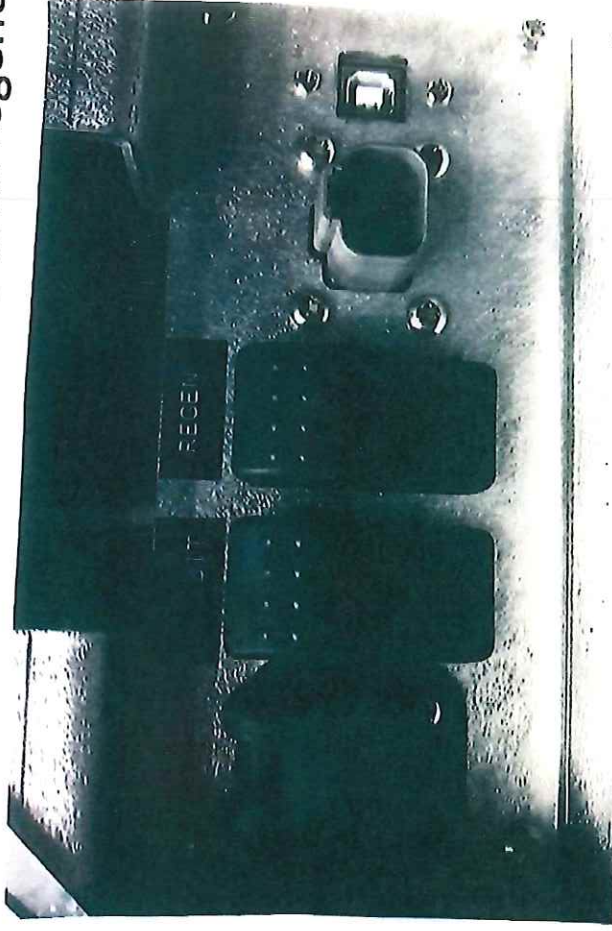
Equipment Conditions:

1. Engine running Temperature range of 175° to 185° Fahrenheit.
2. Parking brake on (Wheels chocked).
3. Transmission in Neutral.
4. HVAC System off.



Regeneration Process Cummins Engine

- Press regeneration switch for at least 2-7 seconds.
- If Regeneration is accepted, RPM will rise until regeneration is complete.



Note: Prior 2009 models had regeneration switch inside the cab in driver controls.



Regeneration Process Overview

Regeneration in process:

- Once regeneration process has begun, engine RPM's increase to 1500.
- Observe vehicle and immediate surroundings during regeneration.
- Regeneration process takes 20 to 40 minutes.
- When regeneration has been successful, the engine speed automatically returns to idling speed, and the "DPF Regeneration" symbol will turn off.
- If the "DPF Regeneration" symbol reappears, the regeneration process has failed. In that case, ask for technical assistance.



Regeneration Process Overview

To Interrupt Regeneration:

WARNING! If an unsafe situation occurs, stop the regeneration process immediately by pushing the brake pedal or by switching off the engine. The regeneration process is also stopped if you momentarily press the “Regeneration Inhibit” button.

