Tired of Not Understanding the DPF System on Your International?

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Introduction

If you're struggling to fully understand the functionality of your commercial vehicle's DPF emissions control system, you are not alone. Today's trucks are technological masterpieces, and much of the technology found in these vehicles is dedicated to running more efficiently with less pollution and better fuel economy. DPFs are one form of emissions control technology found in thousands of commercial trucks today, and in this short whitepaper, we will discuss the operation of the DPF, and how to properly react to dash warning lights when they appear.

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What is a DPF?

A DPF, or Diesel Particulate Filter, is a canister through which all exhaust gases from a diesel engine pass. The dark smoke associated with diesel motors contains significant particulate matter, and with the installation of a DPF unit, the majority of these sooty particles never reach the air. DPF units contains filtering walls similar to those on a catalytic converter that block particles from the engine from leaving the system, and the particles collect within the unit for later removal and disposal during regular cleaning intervals.

How does a DPF work?

Over time, exhaust particles build up inside the DPF and begin to clog the filter walls. Once a certain fill level has been reached, a sensor inside the DPF unit sends commands to the truck's computers, and a warning light on the dash is activated telling the operator to perform a regeneration, or burning of exhaust particles. Regeneration is a process by which the engine injects additional fuel into the exhaust system either on the ignition or exhaust stroke, increasing the RPMs, and heating the exhaust much hotter than normal operation. During a regen, the exhaust can reach temperatures of up to 1000 degrees or more, so drivers should take care to avoid any physical contact with the exhaust system during a regen to avoid severe burns. With the exhaust heated to a proper temperature, the DPF system can then convert trapped soot particles into ash. The ash takes up much less space than the soot particles, allowing a much longer interval between cleanouts. However, when the ash level inside the unit eventually reaches full, the DPF must be de-ashed by a certified professional.

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Methods of Cleaning a DPF

Once a DPF has been fully clogged by ash, it must be removed and thoroughly cleaned. DPF cleaning can take on several forms including vacuuming, blasting with compressed air, or water activated with sound waves[1]. Using the water method, the DPF unit is immersed in liquid agitated by ultrasonic waves. The moving liquid flows through each hole in the DPF's filtering wall, removing it from the unit[2]. Once cleaning is complete, the unit must be dried, and any remaining particles trapped in the liquid must be removed.

With the air pulse method, powerful jets of air blast both openings on the DPF unit, dislodging particles from the filter wall[3]. When no more particles remain in the filter, the unit is then tested for airflow before being reinstalled in the truck's exhaust system[4 5].

Regardless of cleaning method, the end result is a DPF unit that allows air to pass freely through the unit, and traps all sooty particles before they escape out of the system. If the unit becomes cracked or damaged, however, the ability of the filter to block soot from entering the atmosphere will be compromised, and the DPF canister will have to be replaced.

In normal mileage situations, with normal engine operation and consistent regenerations, the DPF unit shouldn't require cleaning more than two to three times per year.

Types of Regeneration

As mentioned before, the engine exhaust temperature must drastically increase in order for regeneration to occur. There are two main ways to perform a regeneration: while rolling and parked[6]. A regeneration can be performed at highway speeds if the DPF light has recently come on, thus allowing drivers to continue

1 Berg, T. (2011, August). *Maintaining and Servicing Diesel Particulate Filters*. Retrieved from http://www.truckinginfo.com/channel/maintenance/article/story/2011/08/maintaining-and-servicing-diesel-particulate-filters.aspx

2 [TechSonicServices]. (2012, July 26). *Diesel Particulate Filter Cleaning*. [Video File] Retrieved from https://www.youtube.com/watch?v=oi-Ti6Z4_nw

3 [Donaldson Company]. (2013, February 27). *Donaldson DPF Pulse Cleaner*. [Video File] Retrieved from https://www.youtube.com/watch?v=cJCOIdZ9Pcc

4 [Westrux Santa Fe Springs]. (2013, August 14). *FSX DPF Cleaning Video*. [Video File] Retrieved from https://www.youtube.com/watch?v=S-EfgGAZ240

5 DPF-Diesel Particulate Filter Cleaning. (No date). Retrieved from http://www.erscooling.com/services/dpf-diesel-particulate-filter-cleaning

6 Sturgess, S. (2009, May). *Diesel Particulate Filters*. Retrieved from http://www.truckinginfo.com/article/story/2009/05/diesel-particulate-filters.aspx

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on their way. A rolling regen requires no additional actions from the operator, but the vehicle must maintain speed, and thus exhaust temperature, to complete the process. However, if the initial DPF warning light is ignored, the system will need to perform a parked regen once the driver has located a safe place to park. The full operation of DPF-related dash warning lights is covered more thoroughly below.

Stages of DPF Warning Lights

If the DPF light on the dash is solid, the vehicle is in Stage 1 of the regeneration process. At this point, either a parked or rolling regen will reset the system back to full operation, and the light will go off. The driver must active the regeneration switch to begin the process.

If the DPF light begins to blink, the truck has entered Stage 2 of the regen process, but this time only a parked regen will suffice. It is essential that drivers pay attention to the DPF lights to avoid system issues that could result in costly downtime. If the flashing DPF light is ignored or the driver fails to initiate the regen process after the vehicle is parked, the truck will enter Stage 3 of the regen process.

The two main reasons for Stage 3 are system failure and failure to perform a regen when prompted. At this point, the truck should be parked immediately and towed to the dealership to prevent damage to the system. If the DPF has overfilled with particulate matter, the system is unable to perform a regen, or the system is experiencing a failure of some type, a warning buzzer and flashing DPF light will alert the driver to have the vehicle brought in either for cleaning of the DPF or for diagnostic work and repairs.

It is possible that the truck may not start or run properly if Stage 3 is in effect, hence the need to have it towed. Further operation of the vehicle with the Stage 3 warnings present could result in damage to the system.

Recommendations:

- Pay attention to dashboard indications of DPF system clogging.
- When the system requests a regeneration, perform it as soon as possible.
- If the system reaches Stage 3, find a safe spot to park, and have the unit towed to the shop.

Since your DPF's proper operation is essential to keeping your truck compliant with emissions laws, following these simple steps to keep it in working order will ensure the DPF unit's service life is extended as far as possible, limiting your downtime and keeping your wheels on the road!

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