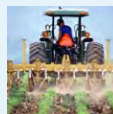




Technical Bulletin

Diesel Particulate Filter Operation and Maintenance



National Clean Diesel Campaign

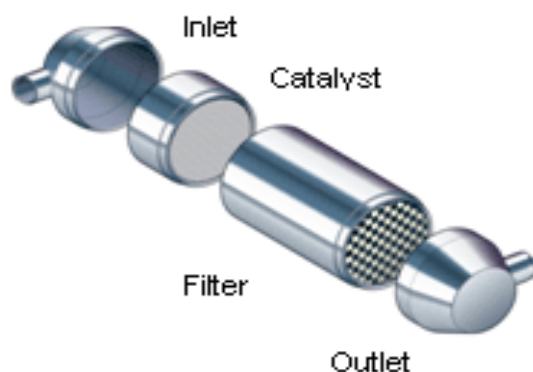
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Diesel Particulate Filter (DPF) manufacturers and product suppliers should provide vehicle service technicians with training on proper retrofit product maintenance procedures.

Backpressure Monitoring

DPFs work by physically trapping and removing PM from the engine's exhaust. As the DPF collects PM, the passage of exhaust gas through the pores of the filter element may be progressively blocked causing an increase in exhaust backpressure. Backpressure increases are caused by the short term build up of PM, which is remedied in the short term by regeneration. The long term build up of ash is remedied by periodic cleaning.

Engine manufacturers place limits on the exhaust backpressures for their engines; therefore, an exhaust backpressure monitoring and operator notification system must be installed with every DPF. If exhaust backpressure exceeds certain thresholds, the operator is notified that maintenance is needed. It is important that all vehicle/equipment operators and fleet service technicians are properly trained to recognize and respond to high backpressure alert signals. Backpressure monitoring systems should be periodically inspected for proper operation.



Diesel Particulate Filter (DPF)

Filter Regeneration

Regeneration occurs when the filter element reaches the temperature required for combustion of the carbon

in the PM, converting it to gaseous carbon dioxide (CO₂) and carbon monoxide (CO). The minimum frequency of regeneration is determined by the rate of PM build-up and is generally once per day or shift.

"Passive" regeneration occurs when the exhaust temperatures during the normal duty cycle are hot enough to sufficiently raise the temperature of the filter element. Metal based catalysts applied to the filter alter the combustion chemistry and reduce the exhaust temperature needed for passive regeneration. Passive regeneration requires no action or maintenance by the operator.

"Active" regeneration must be used when the engine exhaust temperature during the normal duty cycle is not hot enough to initiate combustion of the collected PM, and an additional heat source is required to sufficiently raise the temperature of the filter element. Active regeneration can be accomplished through either "on-board" or "off-board" strategies. For on-board regeneration, an electric heater is built into the upstream section of the DPF and regeneration takes place while vehicle is off duty. For off-board regeneration, the DPF is removed from the equipment and placed into a filter regenerating system. Regeneration times can range from two to eight hours depending on DPF size, filter media, and type of regeneration system. The regeneration time dictates the time required every shift or every day that the vehicle must be out of service.

Filter Cleaning

In addition to PM, the filter also traps noncombustible materials (ash) resulting primarily from lubrication oil and fuel additives. The removal of the ash from the DPF is called "cleaning" and is done much less frequently than regeneration. Intervals for DPF cleaning generally vary from biannually to annually, or longer, depending on engine-out PM emissions. Monitoring engine exhaust backpressure is the best way to determine if and when DPF cleaning is necessary. The need for very frequent filter cleanings may indicate incomplete filter regeneration or the need for engine maintenance. Periodic filter cleaning for ash removal is necessary for both active and passive DPF systems.

In general, cleaning requires heating the filter and using compressed air combined with a vacuum system to blow the ash from the filter and capture it in a sealed container.

Professional filter cleaning services are available. Highly automated cleaning stations are also becoming available, allowing fleet service technicians to perform cleaning on-site. Costs for cleaning stations or professional cleaning services should be considered when purchasing DPFs.

Cleaning requires manually removing the DPF from the vehicle. If equipment down time during cleaning is a concern, fleets may consider buying extra filters so that each vehicle will always be equipped with a filter. The filter must be reinstalled on the original vehicle and in the correct flow direction to maintain proper operation. Track the serial numbers for each retrofit device and which vehicle on which it is originally installed. Removal of the DPF for filter cleaning and reinstallation is typically performed by fleet service technicians.

It is important that all vehicle/equipment operators and fleet service technicians are properly trained on filter cleaning procedures.

Engine Maintenance

It is important to properly maintain vehicles and monitor fuel and lubrication oil consumption. A bad fuel injector or increased in oil consumption may be masked by a DPF. A DPF may be damaged by a poorly maintained engine.