Diesel Particulate Filter (DPF)
Filter Cleaning
Cummins Northwest Cleaning Procedures

Cummins Northwest offers a full line of cleaning services for Diesel Particulate Filters (DPF) incorporating pneumatic cleaning, testing and thermal regeneration equipment. Our business process focuses on the customer needs with inspections, air flow testing, Level I or Level II cleaning, specialized cleaning if required and filter baking.

In addition, we offer Cummins ReCon “Exchange” Diesel Particulate Filters. This may be required if you have a filter housing or element damage caused by ash content build-up resulting in low temperature glazing or sintering. Cummins Northwest can also offer ReCon “Exchange” replacement programs with cleaning options where equipment up time is critical.

Process for Diesel Particulate Filter Cleaning

1. All (DPF) filter serial numbers are recorded with Customer name and location to ensure integrity of the filter content upon return and to maintain adherence to EPA guidelines. We utilize a “clean and return” process on customer supplied filters, unless a replacement alternative is requested.

2. Filter element is inspected for gouges, cracks, or signs of shifting / slippage in the housing.

3. Filter housing is inspected for flange damage, dents, and breach points.
4. Filter bands or seals are inspected and cleaned to insure sealing surfaces are intact.

5. Outlet filter face cells are inspected for damage or missing plugs. 
   (Note: If external or internal failures are found that do not meet reuse guidelines, customer is notified and the inspection process is terminated).

6. Filter element is tested on a flow test bench for air flow restrictions. 
   Airflow is recorded against bench mark standards and visual inspection is conducted in cells for soot passage or other related damage prior to cleaning. Flow restrictions are measured and evaluated against DPF cleaning range values.

7. Perform Level I cleaning with pneumatic cleaner to remove existing ash content from filter. This cleaning process is the baseline procedure completed on all filters that pass the initial filter inspection.

8. Filter is retested after Level I cleaning on flow test bench. Airflow results are compared against acceptable cleaning range values. Filter status is measured for air flow acceptance as follows:
• **Level Green** – filter air flow testing yields acceptable cleaning range values

• **Level Yellow** – filter air flow after Level I cleaning and testing does not yield acceptable cleaning range values. Filter is recommended for Level II cleaning that utilizes (a) thermal regeneration (b) pneumatic cleaning and (c) filter air flow testing.

• **Level Orange** – filter air flow does not yield acceptable cleaning range values after Level I and Level II cleaning and testing have been applied. Existing filter air flow values may allow some continued usage or require additional hand cleaning for acceptance. Higher range air flow data values suggest filter is reaching or may have reached the end of its serviceable life

• **Level Red** – Unit fails to yield acceptable cleaning range values. Subject element can no longer be cleaned and replacement is recommended

9. The level of DPF cleaning required on each individual filter is a function of the filter condition upon receipt by Cummins Northwest. **Level Green** cleaning is complete if the flow test yields acceptable cleaning range values.

10. **Level Yellow** cleaning is performed after an unsuccessful Level I process has been completed. Level II process is effective at oxidizing soot that is compacted and not removed by the Level I procedure. The DPF filter is placed in thermal regeneration. This baking process requires 12 hours for completion. After baking, Level I cleaning is applied again along with filter testing and measured against acceptable cleaning range values.

11. **Level Orange** – After Level I and Level II cleaning measures have been applied; the filter air flow measures do not yield acceptable cleaning range values. The filter in question may allow continued usage, but at reduced air flow capacity. If harden particles and ash remain, alternative manual cleaning processes may yield improved air flow solutions. Cummins Northwest will offer these as well as other alternative cleaning or replacement solutions for all Orange Level values before returning to customer.
12. **Level Red** – The DPF filter is no longer capable of meeting acceptable air flow standards due to a filter element failure or the element is not capable of being cleaned with existing cleaning equipment technology. Level Red filters should be destroyed and replaced. Customer will be notified to discuss alternative resolutions.

13. Filter is repackaged, and returned to customer property.

**Filter Record Keeping**

All (DPF) filter serial numbers are recorded with Customer name and location to ensure integrity of the filter content upon return and to maintain adherence to EPA guidelines. Complete and accurate record keeping is recorded in Cummins Business Management System for documentation and future reference. All future reference can be identified by filter serial number.

- Serial Number along with Customer name, date, location are recorded in Cummins Business Management System
- Cleaning results (Level I or Level II) are posted in BMS along with testing results and air flow achievements (Level Green/Yellow/Orange/Red) and Thermal Regeneration activity

**Cleaning Guarantee**

Cummins Northwest does not guarantee or warrant the performance, recovery or serviceability of any filter for which a cleaning process was applied due to the vast majority of DPF applications. Every diesel particulate filter has its own individual footprint and no two filters will provide the same testing results after Level I or Level II cleaning process has been applied. Some filters, due to design and operating condition will have extended service life over identical filters used in similar applications. Cummins Northwest will clean to the processes identified and share all results with our customers.

Other processes may also contribute to or cause DPF filter failures prior to testing. Depending upon the vehicle application and the vehicle operating conditions, DPF failures can be attributed to (1) thermal events such as sintering, cell wall failures or sub-strate cracking or (2) damage due to vibration, excessive oil soaking, thermal shocking, handling and or shipping damage and (3) failure of vehicle regeneration processes.
Cleaning Guidelines

Cummins Northwest cleaning process does not control the time line between cleanings, nor do we make any guarantees, implied or expressed as to the length of operational time until the next cleaning process is required.

It is recommended by Cummins Northwest that a cleaning maintenance schedule after the first 200,000 miles of operations be established for your 2007 and newer vehicles. Even with active regeneration, ash build-up can lead to a high concentration of potassium which can cause temperature glazing (cold spots) or sintering in filter cells within the Diesel Particulate Filter. Overall filter life greatly decreases when large concentration of ash build up occurs in the filter cells, and the longer the build up, the more compacted the ash becomes, thereby decreasing the filter life expectancies. The end results are possible damage to the DPF and or increases in the time of the cleaning process.

To avoid such damage in the DPF, regular testing and Level I cleaning process can help to extend DPF filter life. Your Cummins Northwest Representative can recommend a plan to meet your needs.

Packaging DPF Filters for Shipment

Packaging of filters for shipment is the responsibility of the customer, and care should be taken to insure the value of such filters during transportation. Special care should be maintained in packaging DPF filters for shipment. All filters should be placed in a closed or sealed container. Protection needs to be placed in front of the ceramic faces to prevent damage while in transit. Package protection should also focus on protecting the rims or flanges from denting or structural damage during shipment.

Customer property will be returned in the package as received. If Cummins Northwest deems the packaging material is unsafe for the filter return, the filter will be repackaged and additional charges will apply. Cummins Northwest offers packaging containers for filter shipment. Contact your Cummins Northwest Representative for more information.
Filter Freight for Cleaning

- All incoming freight expense will be prepaid by the customer. Collect shipments will not be accepted.
- All outgoing shipments will be freight collect unless open account agreements are in place.
- Limited pick-up and delivery service are available. Contact your Cummins Northwest representative for program details.

Filter Cleaning Time

Actual clean time depends upon the filter condition after receipt and inspection. In general, Cummins Northwest requires the following lead times after receipt of DPF filter:
- Level I - Flow restrictions and pneumatic cleaning – 8 working hours after receipt.
- Level II - Thermal regeneration, pneumatic cleaning and flow restriction. Testing - 48 working hours after receipt.

Bench Mark Standards

Air flow testing (as measured in inches of water) will determine the bench mark and acceptable cleaning range values (Green Level) that will be applied to all DPF air flow measures for repeatable testing standards.

Pricing

Cummins Northwest will provide price quotes, upon request, for filter cleaning, and removal & replacing DPF filters for your specific vehicle models. Pricing will vary depending upon Level I or Level II cleaning needs. Contact your local Cummins Northwest Service Center for pricing information.

Level I Cleaning

- Filter receipt and inspection
- Filter band and seal cleaning
- Air Flow Testing
- Pneumatic Cleaning
- Filter Air Flow Testing
- Filter repackaging for shipment
Level II Cleaning (Includes Level I)
- Thermal regeneration (12 hours)
- Pneumatic Cleaning
- Filter Air Flow Testing
- Filter repackaging for shipment

Replacement Filters

Cummins Northwest offers Cummins ReCon “Exchange” Diesel Particulate Filters for your on-highway truck needs. With this option, you can maximize uptime on your vehicle and help extend your useful filter service life. ReCon “Exchange” filters are available for 2007 engine models only. The ReCon warranty is honored at over 3500 Cummins authorized service center locations in North America. Contact your Cummins Northwest representative for more information.

Shipping Containers

Since Diesel Particulate Filters are requirements on all 2007 and newer EPA certified vehicles, for customer who elected to remove and ship the DPF to Cummins facilities for cleaning, extreme care should be taken in packaging and protecting the DPF while in transit. Cummins Northwest offers reusable shipping containers lined with polyurethane foam for shipment protection.
PM Filter Components

- Diesel Particulate Filter
- Oxidation Catalyst

Cordierite Ceramic
Wall-Flow
Lightly Platinum-Coated