



95%+ OEM Performance Promise | Major DPF Supplier to Leading OEM's

"DPF IMPACT ON YOUR FLEET"



**AIR KNIFE
VERSUS
CERAMEX RESTORED**

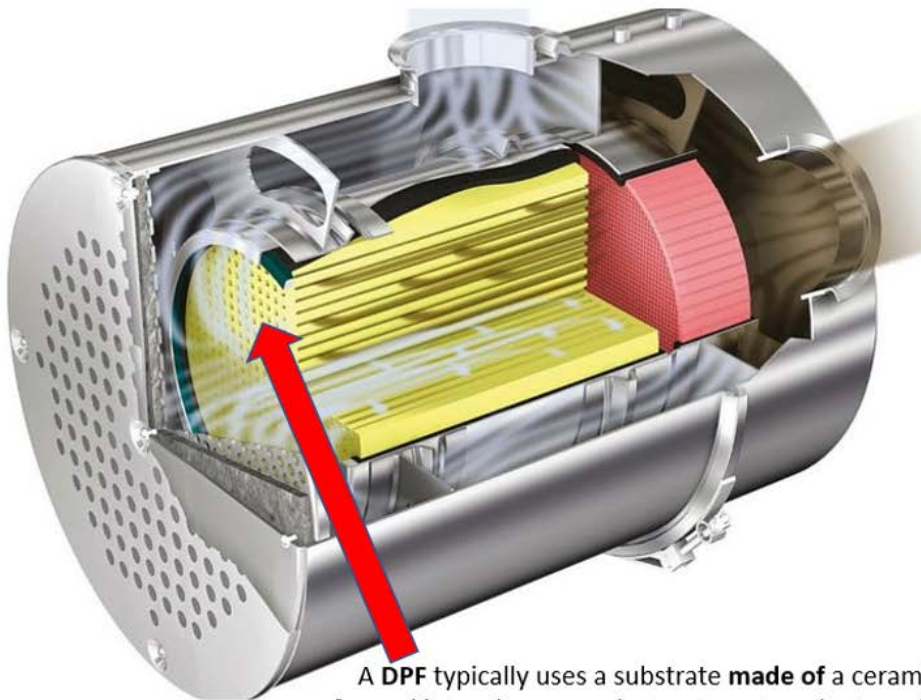
DPF IMPACT ON YOUR DIESEL ENGINE

The Diesel Particulate Filter (DPF) is a critical component of the modern diesel engine. Designed to capture and keep diesel particulate matter, nitrogen oxide and hydrocarbons from entering the air we breathe, DPFs play a critical role in meeting EPA standards for diesel engine exhaust quality.

- DPFs utilize an oxidizing catalyst to control ash and soot and trap them inside the channel walls of the DPF. To keep air flowing through the DPF, the built-up material must be burned off or oxidized through a process called regeneration.
- During normal operation of the engine, the DPF will self-regenerate when exhaust gases reach a temperature of 1,000° F (538° C); in the absence of these conditions, the engine systems will create a forced regeneration. This regeneration burns the trapped soot and leaves ash behind.
- Over time and depending on the duty-cycle of the engine, this ash will build up, resulting in decreased performance of the DPF and increased engine back pressure. Too much back pressure will decrease fuel economy and can cause costly failures to upstream components like the turbocharger.

Now it's time to emphasize the importance of preventative maintenance. This is generally around 200,000 miles; however, some OEM's recommend extended intervals for late model engines before servicing the DPF.

DIESEL PARTICULATE FILTER



A DPF typically uses a substrate **made of** a ceramic material that is formed into a honeycomb structure. In order to reduce emissions from diesel vehicles, **diesel particulate filters** capture and store exhaust soot, which must be periodically burned off to regenerate the **filter**.

DPF MAINTENANCE—KEY TO SAVINGS

Knowing exactly when, how, and what type of DPF maintenance to perform can be confusing and frustrating. Upstream engine conditions, oil quality and engine duty-cycle all play critical roles in how quickly ash will accumulate. Once this threshold is reached, maintenance options include:

- Replacement with a new DPF
- Replacement with a 95%+ Ceramex Restored DPF
- Have the DPF filter field cleaned
- See comparisons below

MAINTENANCE OPTIONS	AFTERMARKET NEW DPF	CERAMEX RESTORED DPF	FIELD CLEANING
COST	\$1,600 to \$2,400 Depending on engine model	\$825 with restorable core	\$200-\$500
PERFORMANCE	100% Ash Holding Capacity	95%+ Guaranteed	Variable Up to 50-60% ash may remain in filter
DOWNTIME	Less than 1 hour	Less than 1 hour	3-8 hours or more
QUALITY	New Part	Veritex Validated 95%+ OEM	Flow bench verifications cannot accurately show how much ash remains or catch other failures
RECOMMENDED SERVICE	200,000 to 400,000 miles	200,000 to 400,000 miles	Unknown
WARRANTY	1 year/ 100,000 miles	1 year/ 100,000 miles	Usually none. If a warranty is offered it would need to be taken back to the original service provider

Important: The above are dependent upon incoming quality of the DPF and cleaning machine technology used. If a DPF is too clogged, field cleaning will not work, and the DPF will have to be replaced. Most field-cleaning methods leave behind much of the hard-to-remove ash which means additional ash will accumulate more quickly. Recommended service intervals are based on optimal duty-cycles where regenerations occur naturally. When extreme duty-cycles or negative upstream engine conditions exist, the DPF should be serviced more frequently.

CONSEQUENCES OF POOR DPF MAINTENANCE

- Reduced fuel economy
- Unexpected and more frequent regenerations
- Increased engine back-pressure that can damage upstream engine components
- Increased downtime due to more frequent cleanings

UPSTREAM FAILURES THAT CAN AFFECT DPF PERFORMANCE

- Leaking injectors
- Coolant leaks
- Turbo failures
- Exhaust Leaks; EGR, manifold, and exhaust pipe damage
- Doser valve and Doser injector issues
- Sensors and wiring failures

"FIRST CLEAN" IS CRITICAL

When you pay \$200 to \$500 dollars for an air clean, there is a high probability after cleaning that your filter is still at least 50% dirty. The remaining ash in the cell can lead to potential cracking or damaging of your DPF, resulting in a costly DPF replacement. While partnering with large fleets across the nation, we have proven that DPF filter fallout can be 90% eliminated if the first clean isn't performed by an air knife. Comparably, our fleet research has additionally shown that if the first DPF clean is with an air knife, you can anticipate 50% of your filters will not be suitable for a 2nd clean. With Ceramex, we know that your DPF can be 95%+ restored as many as 3-4 times, saving you thousands over the life of your fleet.

50/50/50

When thinking about air knife cleans, it is wise to consider this general 50/50/50 principle:

- Your supposedly clean filter may be returned up to 50% dirty
- Your 50% dirty filter can rob you up to 50% of your service level
- There is a high probability that 50% of your filters will not be suitable for a 2nd clean

STEPS IN THE "AIR KNIFE" CLEANING PROCESS

Often referred to as a bake and blow, the typical air clean process is just that and described in the steps below.

Step 1: The DPF filter is placed into a kiln or oven to slowly heat up to operating temperature of over 600 degrees and baked for 6-12 hours then slowly cooled (bake)

Step 2: The DPF filter is placed into a blast cabinet where an air knife forces high pressure air into each cell of the DPF, while suction is applied at the bottom or side of the DPF. (blow)

Step 3: The DPF filter is placed on a flow meter attempting to verify the filter meets the OEM standards. This flow meter test will not identify other potential DPF failures.

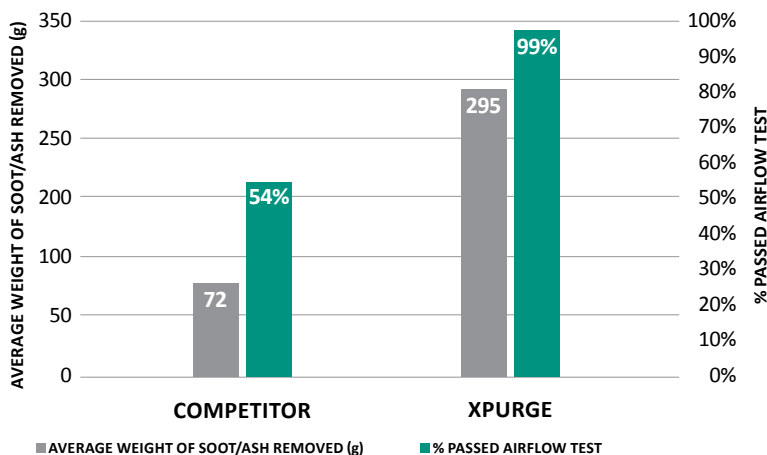
HOW MUCH ASH IS LEFT AFTER AN AIR KNIFE CLEAN?

There is not an effective method of determining leftover ash after an air clean without performing special testing like Ceramex does with our Veritex imaging. Ceramex testing of competitor air knife cleaned DPFs indicate over 1/2 lb. of ash is often left in the filter. Because you don't know for sure, how much ash remains in your filter, it is impossible for you to determine when to schedule your next DPF service. At best with an air knife your DPF life has been greatly diminished or shortened.

CERAMEX XPURGE REMOVES 4X TIMES ASH WHEN TESTED AGAINST LEADING AIR KNIFE MACHINE

CLEANING TEST RESULTS - XPURGE VS COMPETITOR

(100 FILTERS IN EACH MACHINE)



THE TRUTH ABOUT DPF AIR KNIFE CLEANS

When DPFs are cleaned with an air knife, the knife leaves what are commonly referred to as “**witness marks**” similar as pictured in Ceramex Veritex imaging below. These Veritex images clearly indicate that not all the cells are being cleaned during the air knife process. Regardless of time on the air knife, it will never effectively clean your filter.

CERAMEX PATENTED VERITEX IMAGES OF COMPETITOR AIR KNIFE CLEANED DPF FILTERS PICTURED BELOW



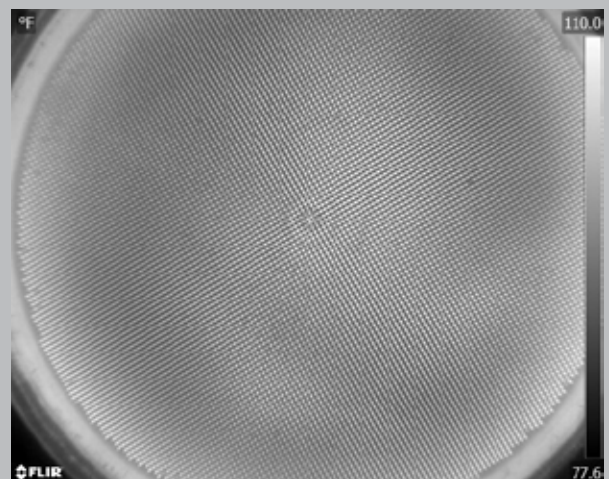
Air knife cleaned filters
pictured at left

CERAMEX XPURGE CLEANS THE ENTIRE FILTER

In both the air knife cleaned filters below at left, over 1/2 lb. of ash was left in each filter after the air knife cleaning.



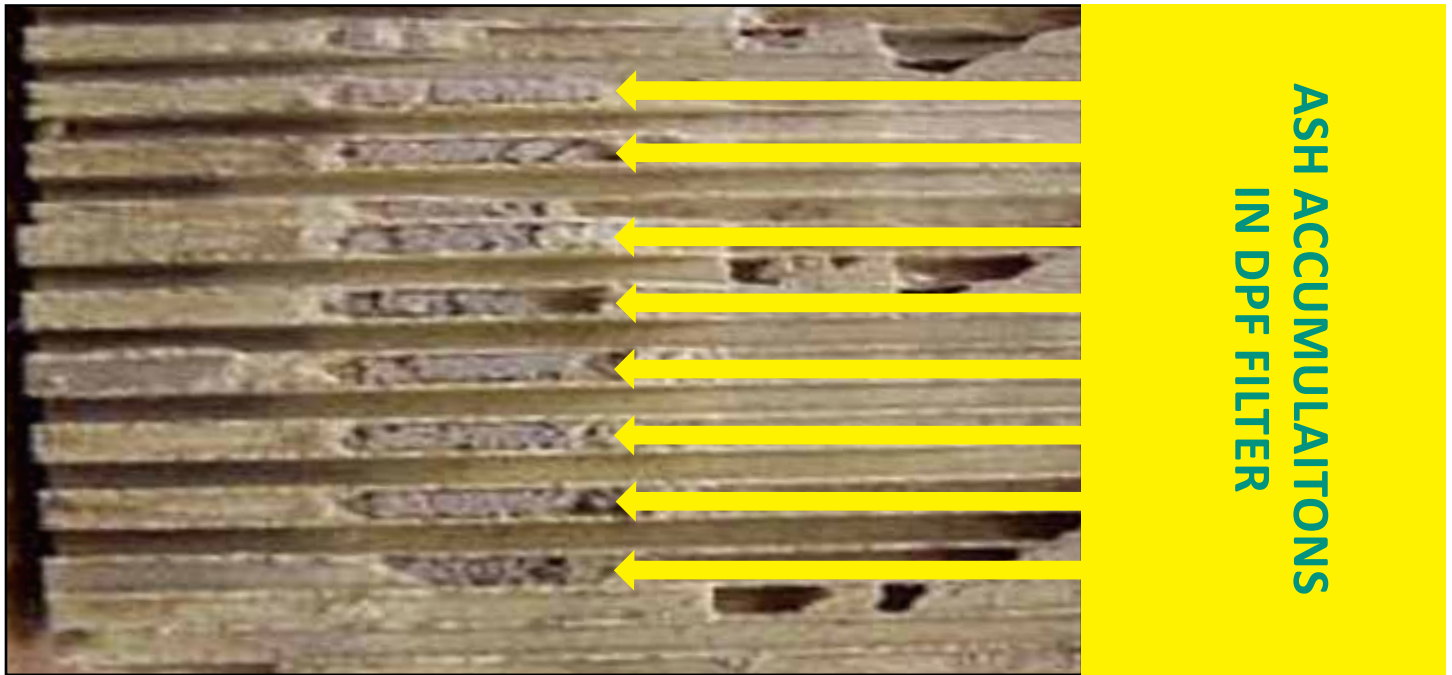
CERAMEX PATENTED VERITEX IMAGES OF XPURGE 95%+ PERFORMANCE RESTORED DPF FILTERS PICTURED BELOW



Xpurge restored filters
pictured at right

WHY CERAMEX RESTORED BEATS FIELD CLEANING

Ceramex has been perfecting restorable DPF technology for 15 years. As an original OEM supplier and innovator of restorable aftertreatment restoration technology, we've invested millions of dollars in research and development in our propriety technology that includes **100% validation of our 95%+ Performance Promise**. Various field-cleaning methods may provide temporary performance improvement of your DPF, but in the long run they can end up costing you hundreds of thousands of dollars over the life of your fleet.



CERAMEX RESTORED

Ceramex restored DPF's are subjected to a thorough inspection process before they are restored. Any DPF that doesn't meet Ceramex OEM standards or acceptance are rejected for restoration.

Unlike typical cleaning machines the Ceramex restoration process utilizes proprietary chemicals and technology that breaks down hard to remove ash in preparation of the restoration process.

Ceramex restored DPF's are subjected to an additional patented process called X'Purge. This technology further removes any remnants of particulate matter that have been left in the filter.

All Ceramex restored DPFs are subjected to an exhaustive testing and validation program. Ceramex patented Veritex infrared imaging allows us to see inside every DPF cell to validate the thorough removal of ash. This validation process ensures that every Ceramex DPF is restored to 95%+ OEM performance.

FIELD-CLEANED

Without a Ceramex certified OEM inspection, a substandard DPF might be recleaned or reused.

Use a common "bake and blow" cleaning process at best where a regeneration (bake is performed and then high-pressure air is forced threw the filter channels (blow).

The air cleaning process removes much of the light, "easy to remove" ash, but the crust layer of thicker "hard to remove" ash often remains. New ash begins to collect and harden which further blocks the DPF, leaving a potential 2nd cleaning unlikely.

Various field-cleaning methods may temporarily improve performance of your DPF, get you back on the road and provide some peace of mind. However, air cleanings alone are generally very ineffective when it comes to removing the "hardened ash" that generally clings to DPF cell walls.

CERAMEX GETS THE ASH OUT—GUARANTEED!

Owning four unique patents, Ceramex has revolutionized the diesel emissions world with an environmentally friendly technology, that quickly restores diesel particulate filters to a guaranteed 95%+ OEM Performance.

Unlike our competitors, Ceramex not only makes the **95%+ Performance Promise**, but we can back it up with documented “proof of restoration” on every 95%+ restored DPF. Ceramex restoration patents include the following:



Utilizing our experience in the industry, as well as collaborations with the various OEM's we supply, we developed our patented Xpurge filter restoration technology. Developed specifically for the task, our patented XPurge process cleans filters more efficiently than conventional pneumatics.



The Veritex inspections system is the industry ultimate in comprehensive DPF testing. Our patented process uses both visual and infrared light to examine and evaluate the conditions inside the filter once it has been cleaned. Using this industry exclusive Veritex system, we can identify any potential remaining blockages in the filters, as well as, expose and verify any damage such as holes and cracks.



The Veritrap is designed to check for non-visible cracks in the filter substrate. It measures the DPF's ability to trap particle matter less than 10 microns in width. If it passes too large of a particle or too many, the substrate is cracked.

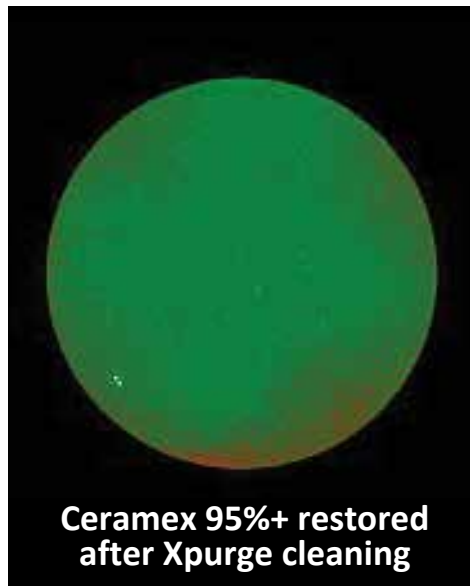


The Vericat catalytic efficiency test allows us to validate the integrity of the catalytic properties of the unit. This test measures how efficient the unit is performing its catalytic function of converting pollution to clean air and benchmarks its performance to a new OEM unit.

CERAMEX TESTING AND VALIDATION

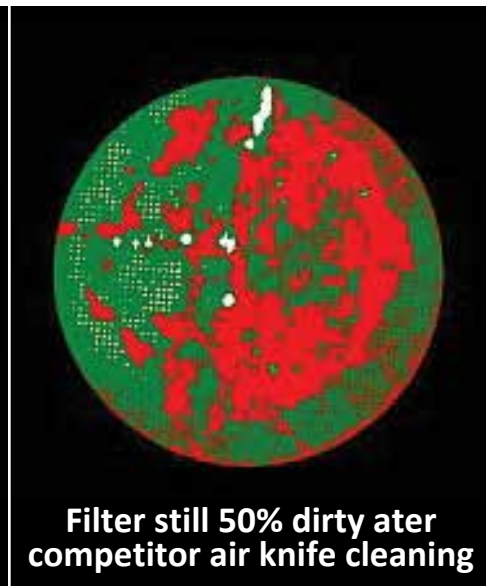
It is critical to examine the DPF after cleaning as it is a highly engineered, complex and expensive component.

The Ceramex Veritex® inspection system is the industry ultimate in comprehensive DPF testing and validation. Our process uses both visual and infrared light to examine and evaluate the conditions inside the filter once it has been cleaned. Using this industry exclusive system, we can identify any potential remaining blockages in the filters, as well as expose and verify any damage such as holes and cracks.



**Ceramex 95%+ restored
after Xpurge cleaning**

Picture above left:
Infrared photo of DPF 95%+ Performance
restored by Ceramex



**Filter still 50% dirty after
competitor air knife cleaning**

Picture above right:
Infrared photo of DPF after air knife;
red areas indicate remaining ash

CERAMEX IS THE OEM ANSWER TO DPF RESTORATION

As a global manufacturing leader in emissions restoration products, our technology and restoration processes have been approved and are being used by many HD OEM's throughout the world including:

- Paccar
- Navistar
- Isuzu
- Cat
- Bobcat
- Scania
- Case/New Holland
- Hitachi
- Komatsu
- Many others



Ceramex
NORTH AMERICA LLC

95%+ PERFORMANCE PROMISE



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