Strategies for DPF maintenance for heavy vehicle OEMs

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Strategies for aligning DPF maintenance for heavy vehicle OEMs with engineering, regulatory and environmental commitments in a tightening emissions landscape

Emissions compliance is a critical strategic issue for truck and bus manufacturers, considering progressively tighter environmental rules on pollutants (NOx, PM) and climate emissions (CO2). For OEMs, this means more demanding aftertreatment systems and stricter test regimes, as the industry transitions toward battery-electric and other zero-emission powertrains over the next decade.

Pollutant limits are becoming tougher, with key developments including the EU's Euro VII standards, which introduce stricter exhaust emission limits for trucks and buses in both laboratory and real-driving tests. For the first time, light and heavy-duty vehicles and engines are covered by a single EU regulation for emission standards.

Crucially, Euro VII will see emissions compliance being monitored over the vehicle's lifecycle, instead of just at the type-approval stage. In the US, for example, California's 'heavy-duty omnibus' regulation cuts per-vehicle NOx limits by 90% for new large goods vehicles from 2024 - 2031 and tightens PM limits, with tougher in-use testing that covers a wider range of real-world operating conditions.

This thought leadership article from leading Tier 1 DPF remanufacturer, **Ceramex**, outlines the critical role that **Diesel Particulate Filters (DPFs)** have in reducing emissions from diesel-powered large/heavy goods vehicles (HGV/LGV) and public service vehicles (PSV) and how DPF remanufacturing meets the specific needs of OEMs, globally.

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These include predictable DPF uptime and assured emissions compliance, as well as delivering an industry-leading yield on clean and remanufactured DPFs at a lower cost than brand new replacement. OEMs also expect simple logistics, clear reporting on filter condition and aftersales support that integrates with their existing service and warranty processes.

Introduction

Diesel Particulate Filters (DPFs) play a critical role in reducing emissions from diesel-powered HGVs and PSVs. As environmental regulations become increasingly stringent, the demand for DPF cleaning and remanufacturing services has grown, particularly among Original Equipment Manufacturers (OEMs) producing HGVs for on road use. Understanding customer needs in this sector is essential for delivering effective remanufacturing solutions that meet both operational and regulatory standards. This begins with a thorough understanding of the exhaust emissions systems fitted to HGVs and PSVs, of which DPFs are a vital and serviceable component.

Ceramex Euro VI DPF

Diesel-powered HGVs and PSVs are equipped with advanced emissions systems designed to significantly reduce harmful pollutants. These systems typically comprise a Diesel Oxidation Catalyst (DOC), Diesel Particulate Filter (DPF) and a Selective Catalytic Reduction (SCR) unit.

The DOC is the initial treatment stage in the exhaust aftertreatment chain, which acts as a chemical converter, using a catalyst to change carbon monoxide (CO) and hydrocarbons (HC) into carbon dioxide (CO_2) and water vapour. The DOC converts the nitrogen monoxide (NO) present in the exhaust gas into nitrogen dioxide (NO2) which is subsequently used in the DPF to assist regeneration. Solid carbon particles in the exhaust gases pass through the open structure of the DOC and are subsequently captured downstream by the DPF.

The DPF traps particulate matter (PM), including soot and ash, from the exhaust stream and ensures that the vehicle's emissions meet strict PM standards. DPFs periodically require regeneration, a process that burns off accumulated soot to maintain its capacity. High-quality remanufacturing and cleaning are essential to restore used DPFs to optimal performance, as inefficacy can lead to costly replacements, downtime and regulatory non-compliance.

SCR systems inject a urea solution (commonly known as AdBlue or DEF) into the exhaust, which reacts with nitrogen oxides (NOx) over a catalyst to convert these harmful gases into nitrogen and water. SCR technology is highly effective at reducing NOx emissions, which are a major contributor to poor air quality. The integration and correct functioning of the SCR system with the DOC and DPF are crucial for meeting the most stringent Euro, EPA and B5 emissions standards.

A detailed understanding of the function and interplay of these systems is fundamental to effective DPF remanufacturing. Each component relies on the proper operation of the other. A well-functioning DOC ensures efficient DPF regeneration, whilst a clean DPF reduces back pressure and prolongs the life of downstream SCR catalysts. As a result, a holistic approach to exhaust aftertreatment is required for remanufacturers, OEMs and their customers.

Ensuring quality, reliability and yield in DPF remanufacturing

Typical OEM specifications for DPF remanufacturing quality centre on restoring ‘like-new’ flow/back pressure performance, controlling residual ash and verifying emissions capability under documented test conditions. OEMs require remanufactured DPFs that match the performance and durability of new components.

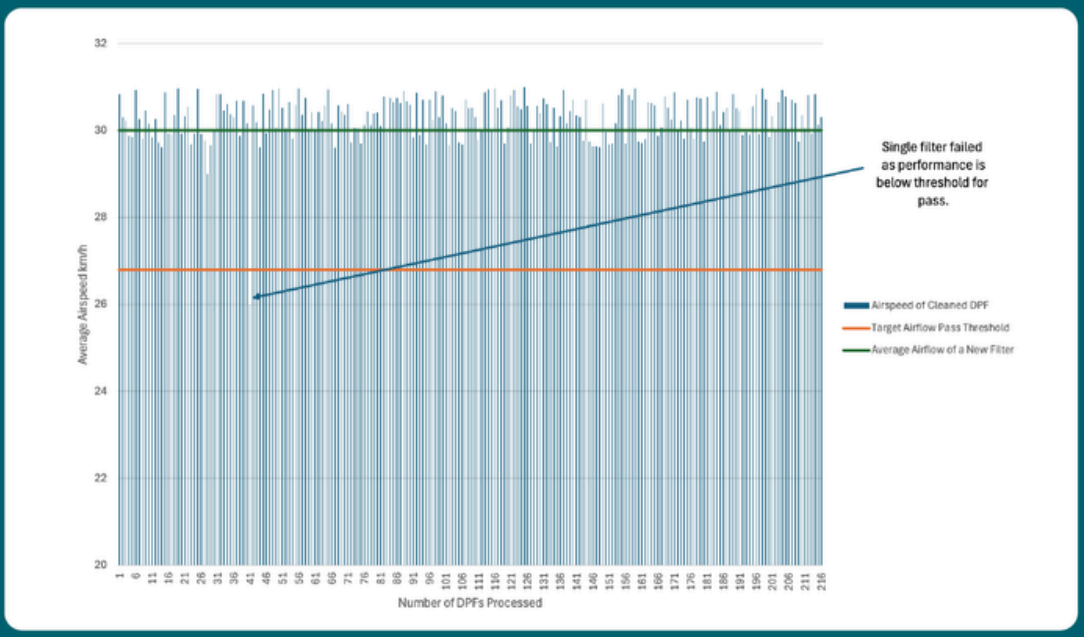
Specific requirements include the need for remanufactured units to be thoroughly cleaned and restored to OEM specifications, to provide consistent filtration efficiency and acceptable back pressure levels within the emissions system.

OEMs demand adherence to recognised quality standards supported by rigorous quality checks throughout the DPF remanufacturing process, as well as documented proof of performance and compliance with emissions standards. Trusted remanufacturers, such as Ceramex, operate in line with ISO 9001 or IATF 16949 certifications, ensuring traceable processes, documented procedures, and regular audits. These standards demand detailed inspection protocols, testing of every remanufactured DPF for flow and back pressure, as well as the use of calibrated equipment throughout. Ensuring quality benchmarks are met provides OEMs with the reassurance that each DPF meets strict operational and regulatory requirements, maximising reliability in the field.

Remanufactured DPFs from **Ceramex** are **100% tested for flow/back pressure and are compared to OEM reference data before release,** which is supported by unique IDs or barcodes for traceability.

An essential aspect of the quality verification process is the use of advanced inspection technologies. Methods such as ultrasonic testing, thermal imaging, endoscopy, and pressure differential measurement are commonly used to assess the internal and external condition of each DPF. Ultrasonic inspection can detect internal cracks or blockages, whilst thermal imaging highlights uneven soot distribution or residual contamination. The use of endoscopic examination allows visual inspection of inaccessible internal surfaces, whilst pressure differential testing verifies that DPF airflow is within safe limits. The integration of automated inspection systems and digital record-keeping further enhances consistency, traceability and reliability in remanufacturing to OEM standards. Remanufactured DPFs from Ceramex are 100% tested for flow/back pressure and are compared to OEM reference data before release, which is supported by unique IDs or barcodes for traceability.

DPF airflow speeds after Ceramex cleaning

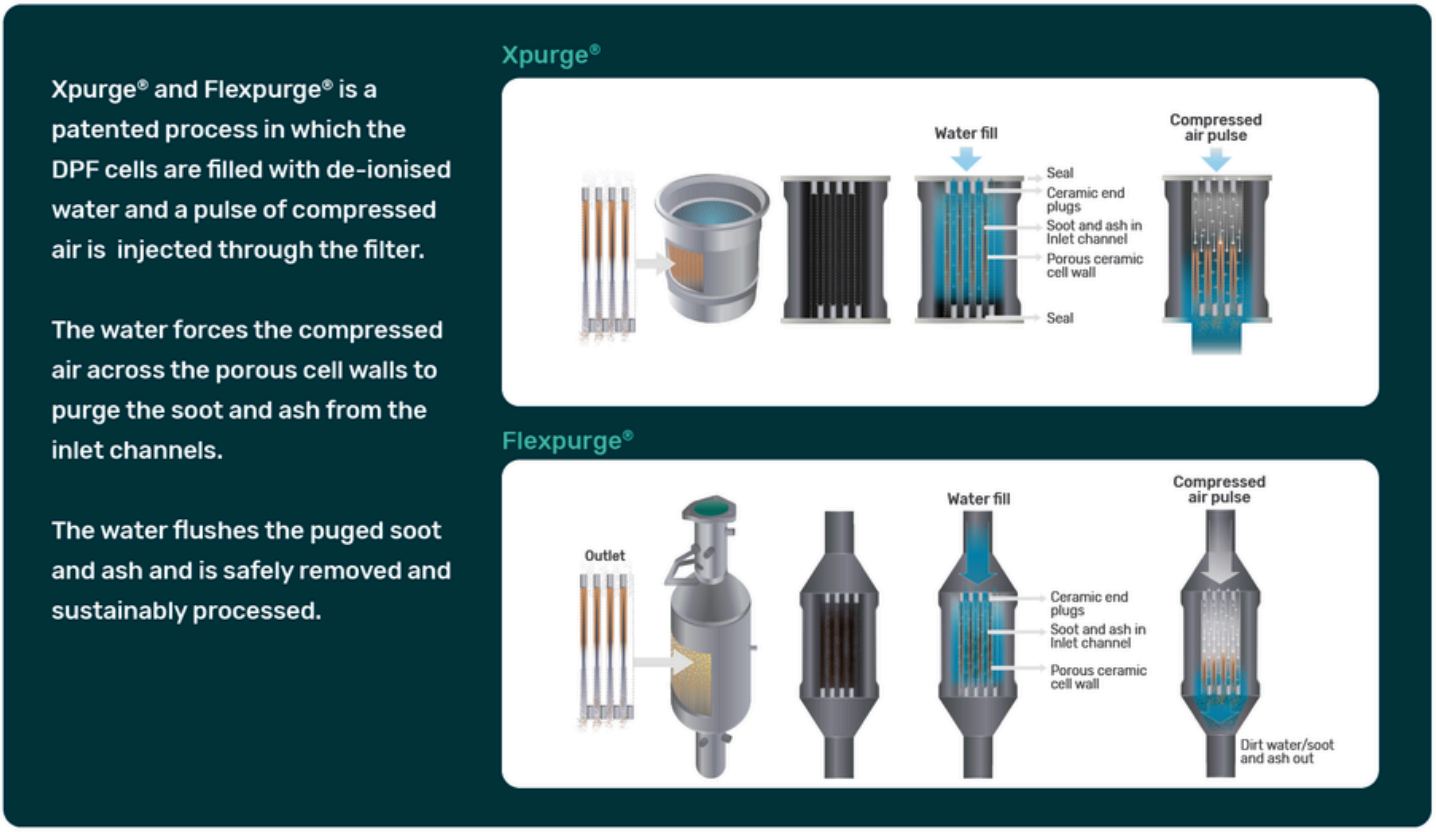


A further key consideration for OEMs is yield. This is the proportion of DPFs that are successfully cleaned or remanufactured from a batch of units, without failure. The cost of replacing a failed DPF, especially when this results from ineffective cleaning, is substantially greater than the cost of a proven cleaning process. This makes high yield rates essential, to ensure the process restores DPFs to near-new condition and minimises the cost of replacement to OEMs and fleet operators.

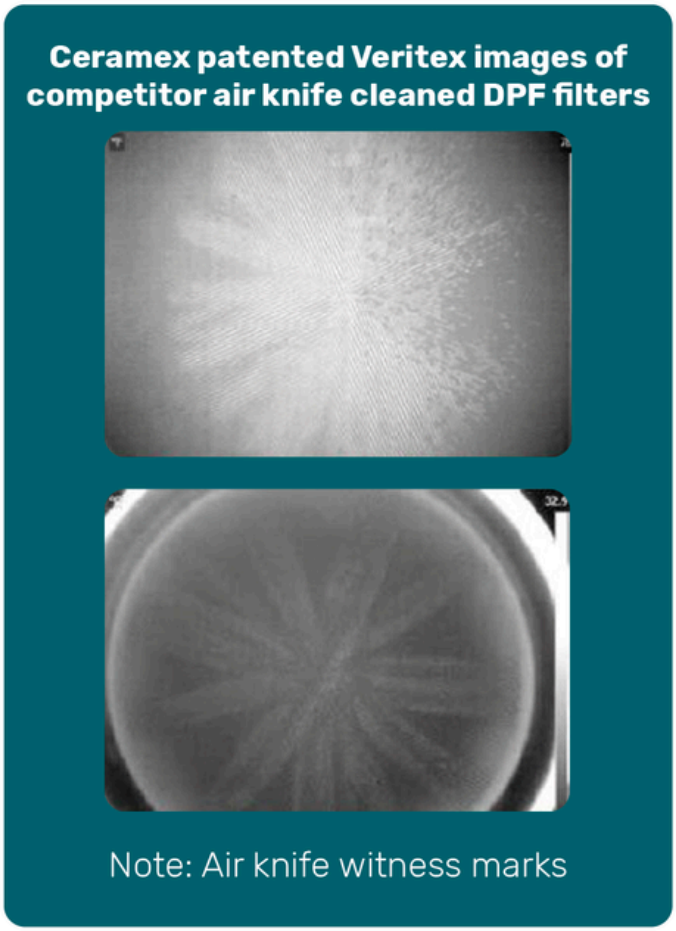
With facilities in the UK, Europe and India, and joint ventures in North America and Japan, Ceramex is a leading international supplier of patented DPF cleaning and remanufacturing services, at scale. Ceramex provides OEM truck and bus manufacturers with an exchange-based service, where batches of used DPFs are collected and replaced with cleaned or remanufactured units on a scheduled basis.

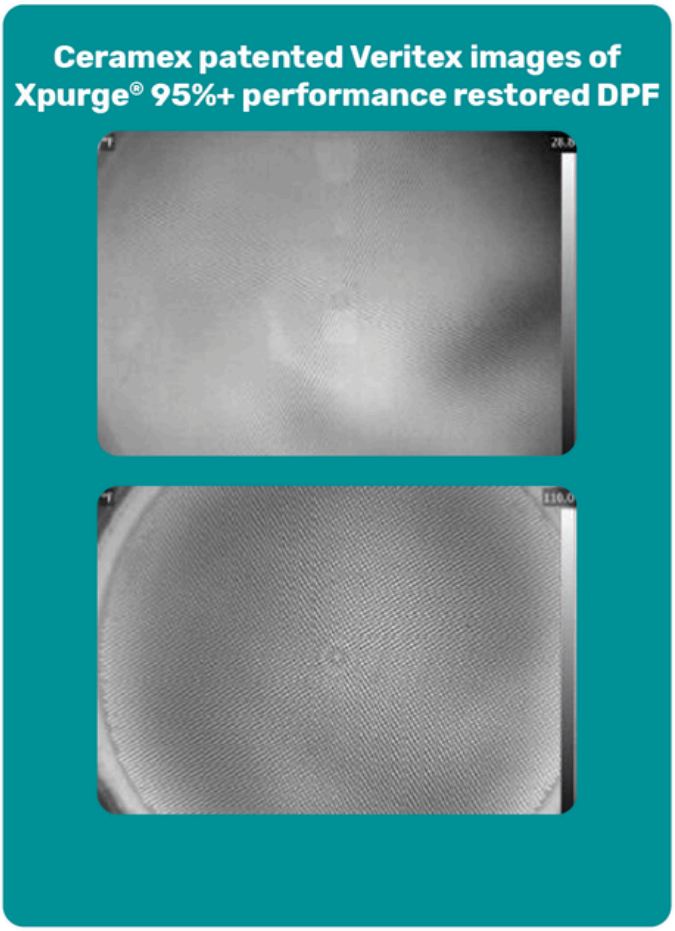
This fast turnaround, contract-based approach, is designed to **minimise vehicle downtime**, and provide value to vehicle operators, through economies of scale and a planned approach to DPF cleaning. Ceramex provides patented cleaning and inspection technologies with a high-capacity service, that's designed to meet the needs of OEMs, as well as fleet operators and the aftermarket sector. As part of the UK-based Eminox group of companies, Ceramex also draws on Eminox's industry-leading exhaust aftertreatment system engineering knowledge and expertise.

Ceramex's patented **Xpurge®** cleaning process, which uses an innovative combination of purified water and compressed air, removes accumulated soot and ash deposits within the DPF. This is a fully automated process that provides rapid processing and best-in-industry first pass cleaning results. The contaminant deposits are suspended in purified water during cleaning to ensure there is no risk of them entering the atmosphere. **Xpurge® is around 30% more effective than other cleaning systems in the market**, which use compressed air or other water-based methods. Supporting a high yield rate, Xpurge® returns the DPF in a virtually new condition, delivering up to 99% of its original OEM performance.



After cleaning, Ceramex's patented **Veritex®** technology provides a thorough internal inspection of the DPF. This verifies the cleaning process, identifies any cracks or defects to the substrate, and provides a digital verification of the remanufactured unit's quality.



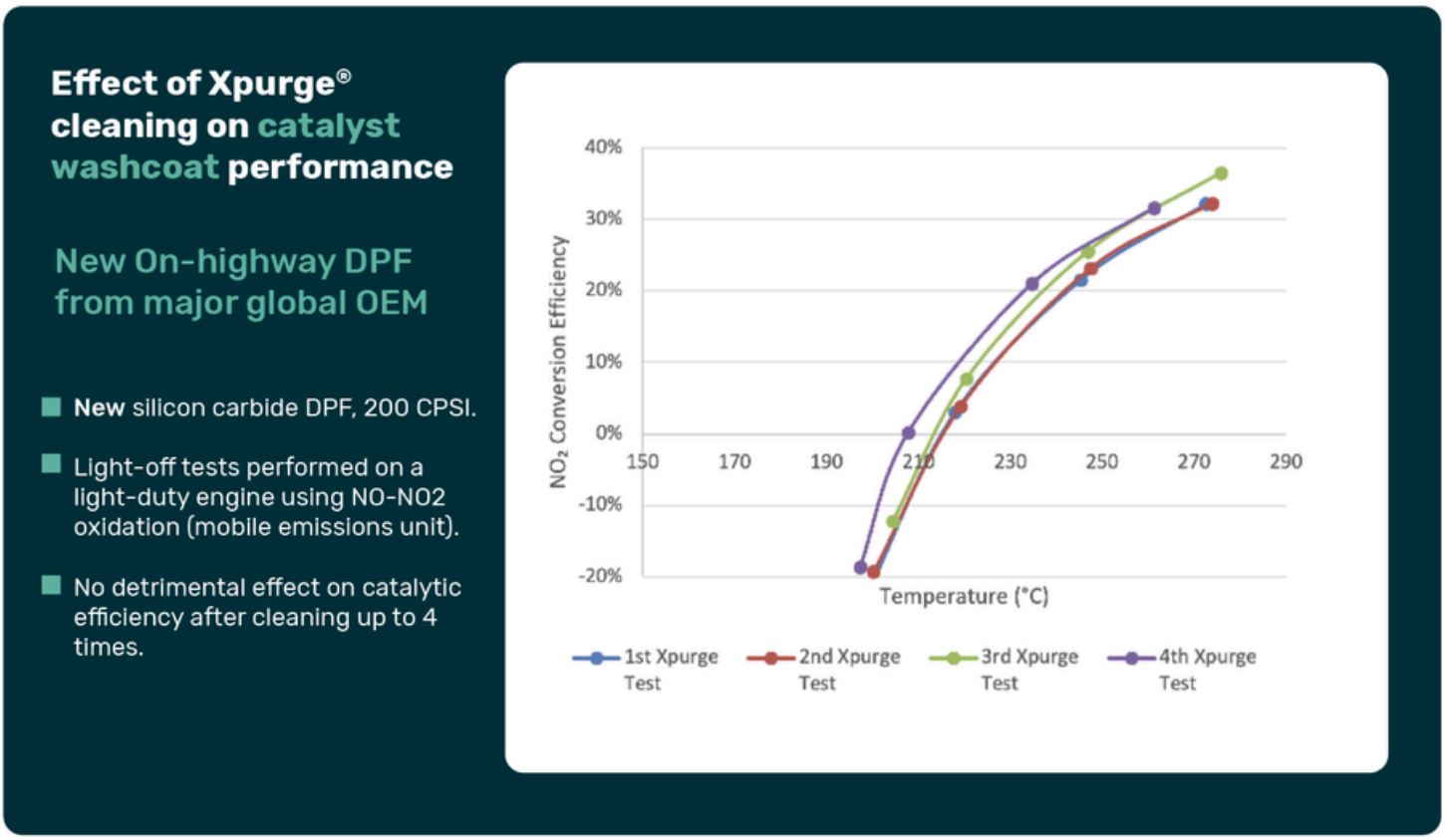


As Euro VII shifts emissions compliance from type approval to lifecycle monitoring, OEMs require auditable evidence that critical aftertreatment components continue to perform in service. Ceramex's inspection data, unique unit identification and digital reporting provide the documentation required to demonstrate in-use compliance across the vehicle lifecycle.

Regulatory Compliance

OEM standard remanufactured DPFs are required to meet applicable emissions regulations, including Euro VII, EPA and Bharat Stage VI (In India), throughout the unit's service life. With the introduction of lifecycle-based emissions compliance regimes such as Euro VII, inconsistent DPF performance in the field now represents a growing regulatory and reputational risk for OEMs. As a result, high-yield, verifiable remanufacturing becomes a compliance safeguard for OEMs, as opposed to just an aftersales service.

Regulatory compliance for DPFs focuses on ensuring the unit restores the engine to its original, certified emissions standard and prevents any violations in relation to emissions control. The key compliance requirements for remanufactured DPFs include legal and regulatory status, performance and quality standards, and documentation and certification.



For example, EPA compliance in the US requires that remanufactured units must meet EPA standards, often requiring them to function as close to OEM specifications as possible. In addition, tampering violations, such as removing a DPF or using a non-functional unit, are illegal in many jurisdictions, including the UK's Road Vehicles (Construction and Use) Regulations.

Cost-effectiveness, margin protection and volume capacity

From the OEM perspective, it is essential that DPF remanufacturing solutions not only offer cost savings to end customers but also protect the OEM's aftersales profitability and margins. This requires DPF remanufacturers to provide established, predictable and competitive cost structures to OEMs to maintain strong margins, whilst delivering value to the operator.

Tier 1 DPF remanufacturers that offer flexible pricing models and integrated logistics can support OEMs in managing costs effectively and ensure that remanufacturing programmes contribute positively to their aftersales revenue. OEMs also require robust volume capability to accommodate the demands of their large fleets and nationwide service networks. The ability to process high volumes of DPFs efficiently, without compromising quality, is fundamental to supporting OEM business models and ensuring consistent supply.

Scalable operations, investment in automated cleaning and inspection technologies and streamlined logistics are all vital to meeting the needs of OEMs, which must manage fluctuations in demand and maintain rapid turnaround times across multiple locations. **Volume capability**, as provided by Ceramex, underpins the reliability and flexibility that OEMs expect from remanufacturing partners.

Incoming check and barcode

Visual inspection

Pre-clean weight

Pre-clean airflow

FlexPurge® cleaning

Drying

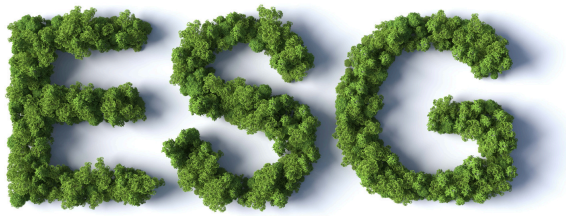
Post-clean weight

Post-clean airflow

External refurbishment

Storage and shipping

Meeting Environmental Social and Governance standards (ESG)



DPF and emissions system health are essential components of clean diesel technology and regulatory compliance. Ceramex's sophisticated DPF cleaning and remanufacturing solutions enable OEMs to implement cost-efficient exchange programmes that align with corporate Environmental, Social, and Governance (ESG) standards in the UK.

By restoring DPFs to 99% of OEM efficiency, Ceramex ensures optimal performance of emission control systems under real-world conditions, resulting in reduced exhaust emissions and improved air quality. Properly cleaned and remanufactured DPFs also enhance engine operation by lowering exhaust back pressure and reducing the frequency of fuel-intensive DPF regeneration cycles, thereby decreasing CO_2 emissions.

Ceramex's advanced DPF cleaning and remanufacturing processes also extend DPF service life, preventing early replacement and mitigating the embodied carbon associated with new parts. This approach supports circular economy principles, increasingly adopted by OEMs as part of their ESG frameworks, where applicable.

Typical embodied carbon for conventional steel is roughly 2.0–2.8 kg CO_2e (carbon dioxide equivalent) per kg of steel produced via conventional manufacturing. Whilst there aren't many standard public factors for the cordierite or silicon carbide ceramic used in DPFs, industry sources suggest ceramics generally have several tens of kg CO_2e per kg, which is significantly higher than steel due to energy intensive processing.

Remanufacturing DPFs can drastically reduce embodied carbon. One study (1) found **remanufactured units at ~8.3 kg CO_2e** versus ~126 kg CO_2e for new

Industrial scale, high-yield DPF remanufacturing also minimises PM emissions through the safe and regulated capture and disposal of particulates during cleaning, to support environmental best practices. In terms of social impact, improved emissions control in HGVs/LGVs and PSVs contributes to enhanced roadside air quality and public health, particularly in communities which are reliant on diesel-powered public transport and logistics.

Accumulated soot cake, removed from DPFs

Ceramex's comprehensive inspection procedures and full traceability also assist OEMs in meeting compliance requirements through records that detail the condition of a DPF and its refurbishment record. This auditable information supports OEMs in satisfying mandatory environmental reporting obligations.

Summary

The cleaning and remanufacturing of DPFs for truck and bus OEMs is a complex process shaped by stringent performance, regulatory and business requirements. Ensuring high yield by investing in DPF remanufacturing that aligns with rigorous quality standards, advanced inspection technologies and scalable volume capability not only meets OEM needs but also secures long-term reliability and aftersales cost efficiency.

With a complete understanding of exhaust emissions systems, spanning DOC, DPF and SCR, Ceramex offers full exhaust aftertreatment system (EATS) remanufacturing solutions, which are designed to integrate seamlessly into modern heavy vehicle platforms and deliver lasting value for OEMs.

Ceramex is a strategic Tier 1 partner for OEMs seeking to align engineering, regulatory and environmental commitments to ensure competitiveness in a constantly tightening emissions control landscape.

Sources: (1) Science Direct

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Ceramex provides industry-leading diesel particulate filter cleaning technologies that help customers maximise performance, maintain emissions compliance, and extend the service life of critical components. Our patented technologies, including Xpurge, Flexpurge, Veritex, Veritrap, and Vericat, deliver industry-leading cleaning performance and repeatable, OEM-compliant processes.

EMISSION CONTROL
By Eminox

Emission Control by Eminox, the new brand of, Eminox, has been a trusted industry leader since 1978. Specializing in exhaust aftertreatment systems it supplies emissions reduction technologies to global OEMs in the heavy duty and industrial power sectors. These products and services are essential for global emission regulation compliance, reducing harmful exhaust pollutants from diesel- and gas-powered engines, supporting cleaner and more sustainable operations worldwide.

SaveGuard

SaveGuard is a global leader in engineered thermal and acoustic insulation solutions. With over 20-years of experience, we specialize in advanced textile-based insulation products which significantly enhance application performance, improve safety standards, and ensure environmental compliance across many sectors in the automotive, off-highway, industrial, and construction industries. We reduce time, cost, and risk for our customers through the utilization of advanced materials, precision design, and reliable delivery.

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