



Strategies for reducing the Total Cost of Ownership of heavy vehicle fleets and ensuring emissions compliance, as EU legislation tightens

Context

As the UK phases out sales of diesel-powered heavy-duty vehicles by 2040, existing truck and bus fleets will remain critical for freight and passenger transport well into the 2030s. The challenge is to operate these legacy assets as cleanly and efficiently as possible.

New emissions legislation is a critical strategic issue for large/heavy goods vehicles (LGV/HGV) and public service vehicles (PSV) fleets, as Europe moves towards a phased compliance for Euro VII in 2028-2029. This has the potential to affect operating costs, fleet asset values and profitability. As fleets plan replacement cycles typically 7–12 years in advance for trucks and similar or longer for buses, management decisions made now will define whether assets remain compliant and financially viable into the 2030s.

This thought leadership article from Ceramex outlines the impact of more stringent emissions legislation on existing diesel-powered fleets. It examines how DPF (Diesel Particulate Filter) health, as well as restorative DOC (Diesel Oxidation Catalysts) and SCR (Selective Catalytic Reduction) can help lower the total cost of ownership (TCO) and ensure emissions compliance.

As EU environmental legislation tightens further, being able to maintain profitable fleet operations and emissions compliance converge around smarter lifecycle decisions, rigorous maintenance, and data-driven emissions management. For fleet operators, the question is no longer “How do we stay compliant at minimum cost?” but “How do we turn emissions compliance into a structural reduction in Total Cost of Ownership (TCO) and a competitive advantage?”

With the advancement of alternative fuels, as the road transport industry transitions towards zero emission vehicles, it also considers the role of Ceramex in providing cleaner power solutions. As operators look towards the UK government’s Net Zero targets, Ceramex can demonstrate that high-quality, scalable, DPF cleaning and remanufacturing is a practical and cost-effective strategy for reducing emissions, lowering lifetime costs, as well as responsible asset stewardship.

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1. Introduction

Euro VII is the EU's newest vehicle emissions type-approval regulation, which broadens the scope of regulated emissions significantly. Whilst this does not repeal Euro VI outright immediately, it effectively replaces its requirements for new vehicles under the current regulatory framework.

There are much tighter pollutant limits for heavy-duty vehicles and stricter limits for nitrogen oxides (NO_x), particulate matter and other exhaust pollutants, with enhanced real-driving emissions (RDE) testing. Specifically, the Euro VII NO_x limit is 200 mg/km versus 460 mg/km under Euro VI, and it includes a 75% reduction in allowable PM (particulate matter), compared to Euro VI.

Additionally, pollutants not previously regulated under Euro VI, such as ammonia and nitrous oxide (N₂O), as well as non-exhaust emissions, including brake dust and tyre particulates, now fall within the Euro VII legislation.

Separately from Euro VII but complementary nonetheless, the EU has strengthened CO₂ emission performance standards for trucks and buses, aimed at achieving climate targets rather than local air quality. These set fleet-wide average limits on CO₂ emissions that vehicle manufacturers must meet. Financial penalties for manufacturers that miss them can amount to several thousand euros per gram of CO₂ per tonne-kilometre.

The revised standards target progressive CO₂ reductions for new heavy-duty vehicles, as follows: <45 % by 2030; <65 % by 2035; <90 % by 2040 for new trucks and coaches. For city buses specifically, the EU requires that 90% of vehicles will be zero-emission by 2030, and 100% of new buses by 2035.

Both legislative tracks aim to reduce overall environmental impact of trucks and buses, but through different, but parallel mechanisms. Euro VII tightens pollutant limits on every new vehicle, whilst CO₂ standards push manufacturers toward low/zero-emission powertrains to meet average carbon targets.

Crucially for fleets, Euro VII also includes new durability and vehicle lifetime requirements, whereby trucks and buses must comply with emissions limits over a longer service life (e.g., up to 200,000 km/10 years.)

2. How Euro VII legislation will impact fleets

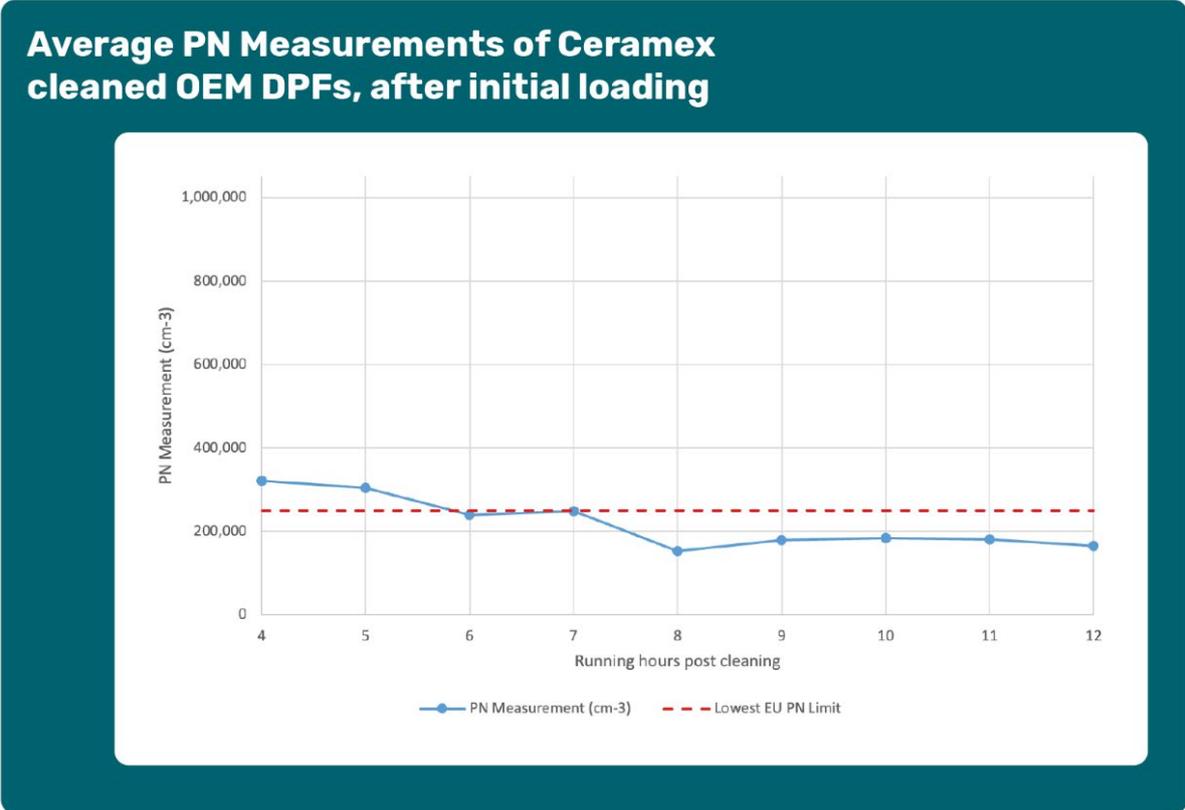
With mandatory compliance for all newly registered types of heavy-duty vehicle in EU (trucks and buses) enforceable from 29 May 2028 and ALL new vehicles sold from 29 May 2029 having to comply, the clock is ticking for fleets to plan.

Whilst heavy vehicle fleet operators are not forced to change overnight, as there are no retrofitting obligations or access restrictions triggered by Euro VII, this does not mean inaction is the best policy. In fact, the need for implementing a regulation-aware lifecycle plan is brought into sharp focus, rather than continuing with ad-hoc cleaning and refreshing of DPFs/DOCs respectively.

Fleets will certainly start to feel indirect effects, as vehicle manufacturers prepare for the compliance deadlines. This is expected to mean higher leasing or acquisition costs, because of more complex after-treatment systems, such as a larger SCR system, increased sensors and stricter OBD conformity, for example.

Equally, the new extended durability requirements of Euro VII mean vehicles must stay within limits for a larger portion of their operational life, not just at type-approval. For fleets, this should encourage improved maintenance regimes and closer monitoring of emissions-critical components.

For the first time, the incorporation of particle number (PN) testing into periodic technical inspection (PTI) programmes across Europe introduces an emissions compliance requirement. This means emissions performance becomes a continuous operational and ultimately, a legal responsibility for fleet owners, rather than a one-off homologation issue handled solely by OEMs. As PN testing must be demonstrated repeatedly over the vehicle's operational life, this closes the gap between certified and real-world emissions and materially changes compliance obligations for fleets. In short, emissions performance becomes a roadworthiness issue, not just an environmental one.



3. Why emissions compliance matters to fleets

Under Euro VII, emissions compliance is critical for heavy vehicle and PSV fleets, because it ensures adherence to EU and national air-quality standards designed to reduce pollution, protect public health, and meet climate targets. For truck and bus operators, demonstrating conformity with emissions standards is often a contractual requirement in municipal and public procurement tenders. Cities and local authorities increasingly include emissions criteria in tender specifications to align with their sustainability goals, meaning non-compliant vehicles are excluded from winning contracts for public transport, waste collection, delivery services, and other outsourced services.

In addition, many EU cities enforce access restrictions that bar older, higher-emitting trucks and buses from entering defined urban zones (such as low-emission zones or clean air zones). Non-compliant vehicles may face fines, restricted operating hours, or total exclusion, which can significantly disrupt logistics and service delivery. Ensuring emissions compliance is therefore essential not only for legal operation but also for maintaining commercial competitiveness and uninterrupted access to key urban markets.

Emissions compliance has direct financial implications beyond fuel and urea consumption. EU regulations foresee financial penalties when CO₂ performance targets are missed, at €4,250 per gCO₂/tkm from 2025 and rising to €6,800 per gCO₂/tkm by 2030, indicating the scale of monetary risk associated with emissions non-compliance at manufacturer and, indirectly, operator level.

Euro VII will rely more on in-service testing and on-board emissions monitoring (OBM), which logs exceedances and can trigger warnings and mandatory maintenance actions.

Vehicles that cannot meet evolving emissions expectations, or that are locked out of major markets, suffer accelerated depreciation and reduced resale value. Fleets holding large numbers of older, non-compliant vehicles face the risk that these assets become economically non-viable earlier than anticipated, especially in city-bus and urban-delivery segments.

Managing emissions compliance proactively is therefore a way to protect balance sheets and avoid unplanned capital write-downs.

4. Why emissions system health contributes to a reduction in TCO

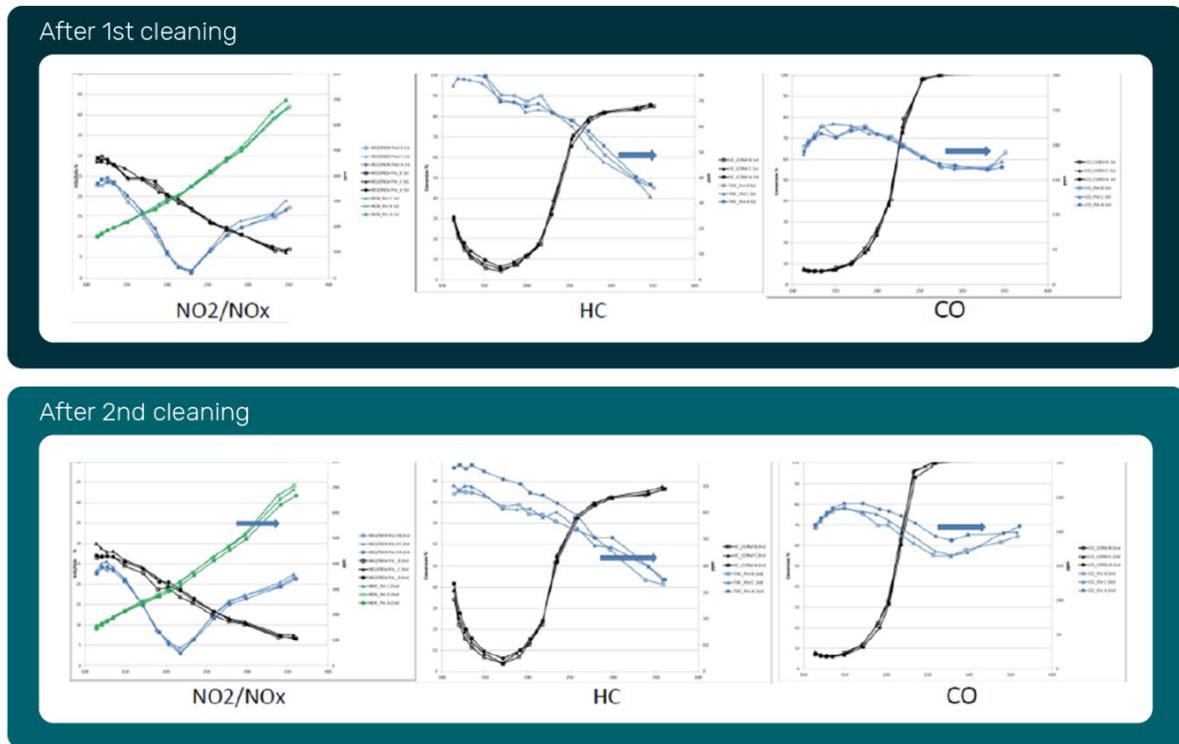
Ceramex helps truck and bus fleets reduce total cost of ownership by restoring diesel particulate filters (DPFs) and Diesel Oxidation Catalysts (DOCs) to near-new performance, cutting fuel burn, unplanned downtime, and replacement spend while supporting emissions compliance and ESG goals. For fleet

managers, this turns maintenance from an unpredictable cost burden into a strategic lever for achieving financial, risk, and sustainability objectives.

Effect of Xpurge® cleaning on catalyst washcoat performance

Tests conducted by leading global catalyst washcoat company – results showing HC, CO and NO oxidation after 1st and 2nd Xpurge® cleaning with soot loading in between.

-> No significant change seen after 1st or 2nd cleaning



A DPF is effectively a breathing system for the engine. When it is saturated with soot and ash, back pressure rises, the engine works harder, and fleet economics degrade. As well as increased fuel consumption, the engine performs more frequent DPF regenerations, leading to a higher risk of breakdowns if it is left long enough to clog up completely.

Premature DPF and emissions system component failure forces an operator into expensive replacement of filters and sometimes associated sensors and catalysts. Under the new PN testing regime, it has the potential to expose operators to fiscal penalties and license restrictions.

For high-utilisation HGV/LGV and PSV fleets, these negative effects highlight the compelling case for making an emissions system maintenance strategy a material contributor to lifetime vehicle economics.

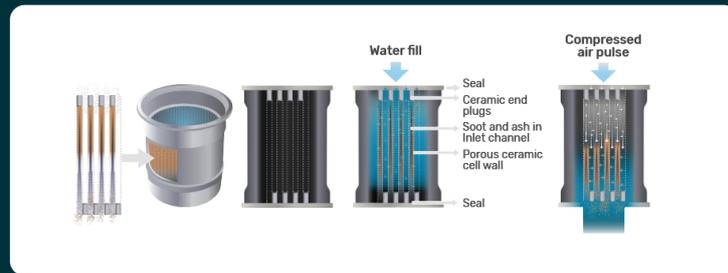
The major benefits of partnering with an industrial-scale DPF/DOC refurbishment specialist such as Ceramex, are proven cost efficiency and patented cleaning and inspection technologies, that's volume-driven and designed for high-capacity operators.

Xpurge® and Flexpurge® is a patented process in which the DPF cells are filled with de-ionised water and a pulse of compressed air is injected through the filter.

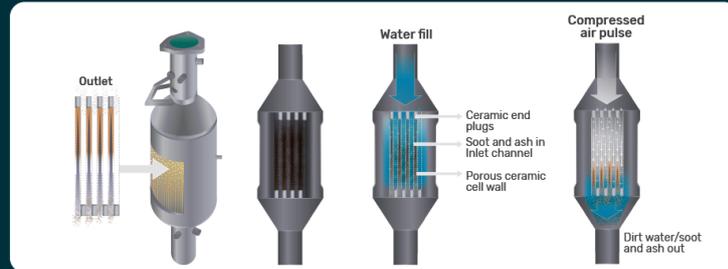
The water forces the compressed air across the porous cell walls to purge the soot and ash from the inlet channels.

The water flushes the purged soot and ash and is safely removed and sustainably processed.

Xpurge®

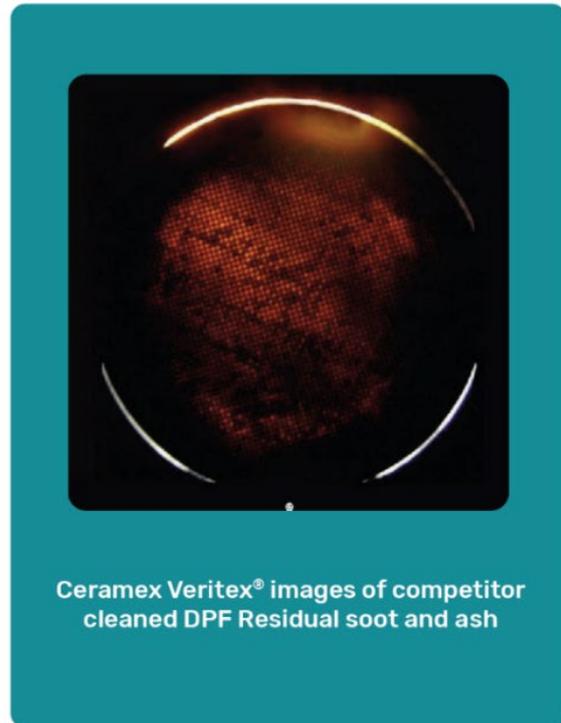
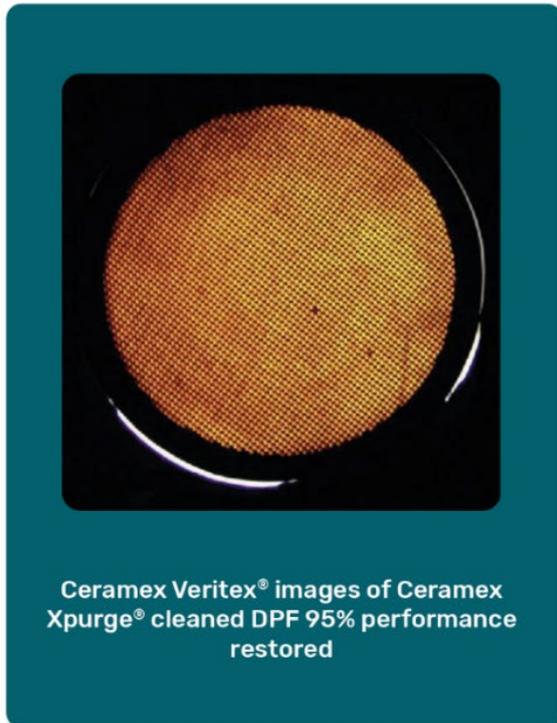


Flexpurge®



Ceramex's experience and expertise has a positive impact on several TCO levers including fuel saving, maintenance, vehicle uptime, asset life, and compliance. Restoring a clogged DPF to near-new flow significantly reduces exhaust back pressure, which in turn lowers engine workload and the frequency and duration of active regenerations. As a result, fuel consumption decreases compared with running on partially blocked filters. Ceramex highlights a minimum 2% fuel penalty for each saturated DPF, which becomes a major cost consideration across larger fleets, e.g. 400 plus vehicles. Regeneration cycles become less frequent and more effective, cutting fuel wasted during high-temperature cycles and reducing thermal stress on the engine and aftertreatment system. For long-haul trucks or intensive urban bus operations, even small percentage improvements in fuel efficiency can translate into substantial lifetime savings per vehicle.

By maintaining DPFs at 99% of original flow, Ceramex's patented cleaning and inspection process reduces the likelihood of pressure-related fault codes, limp-home modes, and breakdowns, thereby directly improving vehicle serviceability. Detailed inspection identifies damaged units that genuinely need replacement, while confirming that structurally sound filters can be safely returned to service, preventing unnecessary write-offs. Ceramex's purified water-based process and waste handling of contaminants ensures that captured particulates are not re-emitted during cleaning and are disposed of as non-hazardous material under controlled conditions, contributing to circular economy.

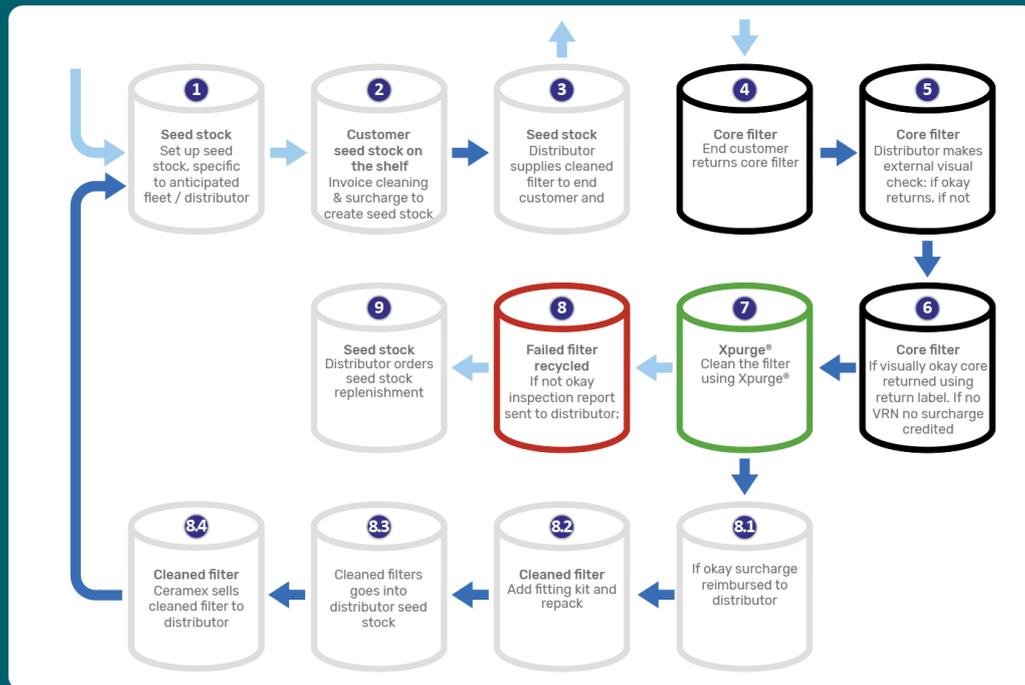


Ceramex's exchange-based business model allows fleets to swap units with remanufactured filters in a planned window, rather than waiting for on-site cleaning or reactive repair, reducing workshop dwell time and scheduling disruption. Replacement DPFs are a major cost item, and excessive replacements erode margin and shorten the economic life of the vehicle.

Higher uptime means better asset utilisation, stronger on-time performance for customers, and minimises the need for spare or buffer vehicles in the fleet. Over a vehicle's life, extending the DPF service life and reducing premature replacements can materially lower maintenance cost per kilometre or per operating hour. For operators selling transport as a service, for example, reliable emissions control underpins customer contracts, brand trust and the ability to compete on cleaner fleet credentials.

Overall, this combination of patented process, inspection, and volume capability turns DPF cleaning and refurbishment into a repeatable, quality-controlled industrial service, rather than an ad-hoc workshop activity, which lowers the Total Cost of Ownership.

Ceramex exchange process



5. Understanding the electrification transition economics

Heavy-duty vehicles account for more than a quarter of EU road-transport greenhouse-gas emissions and over 6% of total EU emissions, placing fleets under growing pressure from regulators and investors to demonstrate credible decarbonisation plans.

UK policy anchors transport decarbonisation in the legally binding Net Zero 2050 target, with the Transport Decarbonisation Plan outlining an end to new non-zero-emission HGV/LGV sales by 2040 and large investment in zero-emission buses. At the same time, corporate ESG expectations and disclosure rules are tightening.

Under pressure from tougher emissions policy and ESG scrutiny, some operators may be pushed toward electrification prematurely, and poorly maintained diesel fleets can make electrification appear artificially attractive by inflating fuel, maintenance, and penalty costs.

However, running diesel assets inefficiently undermines the business case for a staged transition. By restoring diesel vehicles to best-in-class emissions and efficiency, Ceramex allows fleets to make rational, data-driven investment decisions about when and where zero-emission vehicles deliver the greatest return. This approach supports a capital-efficient transition, avoiding stranded investments or forced early write-downs.

The emerging UK Sustainability Disclosure Requirements framework will compel companies and financial institutions to report their environmental impacts, including fleet-related Scope 1 and 3 emissions. As a result, investors, lenders and large customers increasingly expect robust fleet-emissions data, plans for transition to zero-emission vehicles, and evidence of near-term actions to reduce pollution and carbon intensity.

From an environmental perspective, emissions directly affect local air quality, particularly NO_x and particulate matter in urban areas where buses and delivery trucks operate most intensively. For many operators, emissions performance is now part of their ESG reporting, contract tendering inclusion and public brand positioning. Demonstrating active management of aftertreatment systems, reduced exhaust particulates, and clear pathways to electrification helps operators show they are mitigating harm, whilst continuing to deliver essential passenger transport and freight logistics services.

6. Ramifications of non-compliance

Euro VII, combined with CO₂ performance standards, is designed to align road transport with 2050 climate objectives, and non-compliance undermines an operator's ability to claim alignment with these pathways, as well as weakening competitive positioning.

Non-compliance in the Euro VII era will carry a mix of regulatory, financial and operational consequences for truck and PSV fleets. Furthermore, reputation and ESG considerations make emissions compliance not only a legal duty but also a strategic component of brand and stakeholder relationships.

Regulatory and legal consequences can be severe. Repeated entry into low-emission zones with non-compliant vehicles, for example, can rapidly escalate penalties, and persistent non-compliance can trigger enforcement actions, including vehicle prohibition, operator license revocation, plus additional scrutiny by regulators. Furthermore, lost access to valuable LEZs or contracts will erode margins and tilt the economics in favour of compliant competitors.

From an operational standpoint, OBM and in-service conformity testing under Euro VII will expose emissions system faults more quickly, potentially forcing vehicles into derate or requiring immediate workshop intervention to restore compliance. Fleets that do not maintain aftertreatment systems proactively face higher downtime, reduced availability, and constrained ability to serve time-critical routes.

Failure to align fleet renewal and maintenance strategies with Euro VII timelines can result in a "compliance cliff", where a significant portion of the fleet must be replaced or restricted within a short window, thereby straining capital and operational planning.

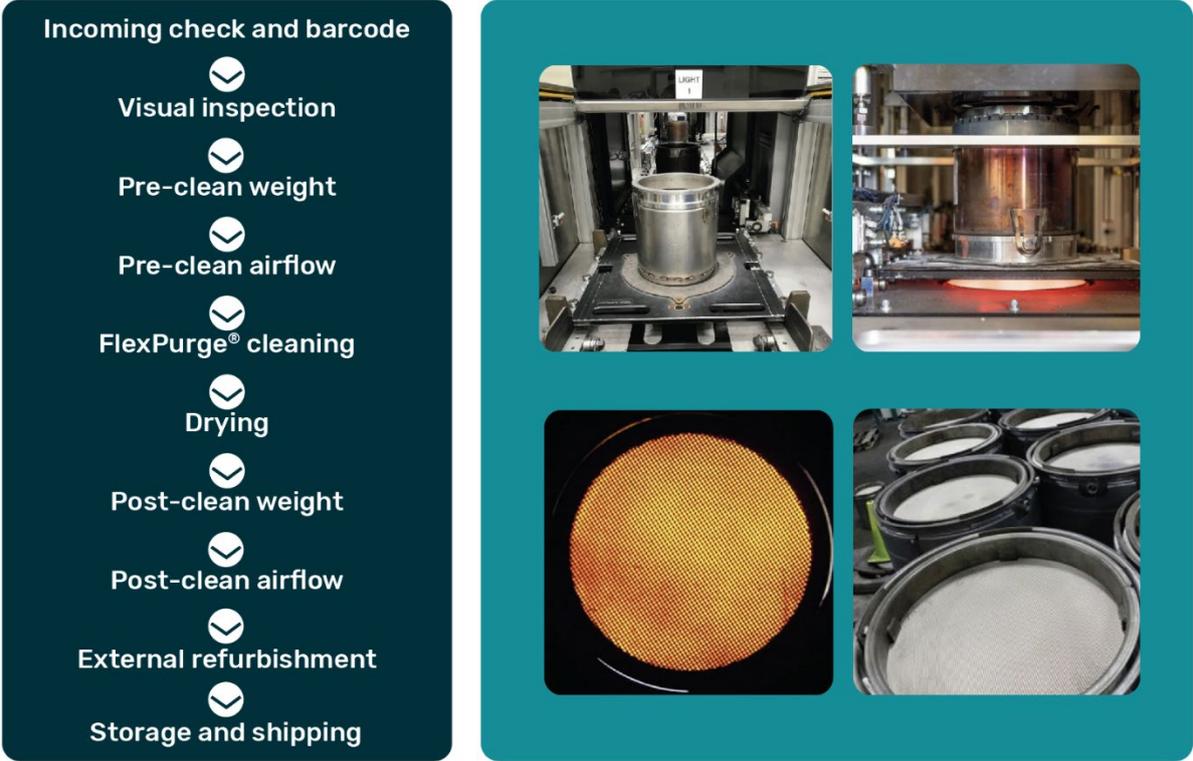
In the run-up to 2028, emissions compliance is therefore not just about avoiding fines, it is about safeguarding long-term market access, asset value, and competitive positioning in an environment of increasingly stringent regulation.

7. Positioning diesel fleets in an electrified future

Whilst the UK’s evolving transport system will continue to see growth in electrically powered PSVs, and clean delivery vans, zero-emission trucks are still in their infancy. Diesel powertrains will remain prominent for many years due to asset lifetimes, infrastructure timelines and operational constraints.

Running its diesel fleet as cleanly as possible allows operators to meet tightening air quality expectations, whilst allocating capital to new zero-emission assets where and when they can deliver the greatest impact.

Through a planned programme of high-quality DPF cleaning and remanufacturing, legacy vehicles will remain compatible with increasingly stringent emissions legislation, helping avoid premature write-offs and potentially redundant assets.



A credible Net Zero strategy acknowledges both the destination (zero-emission vehicles) and the transition (cleaner operation of residual diesel assets) and Ceramex’s services contribute to the latter in a demonstrable, reportable way. For the foreseeable future, diesel engines remain the backbone of heavy freight and transport because of their high energy density and established infrastructure.

However, latest generation diesel engines paired with advanced technologies and on-board diagnostics are reducing emissions of nitrogen oxides (NO_x), particulate matter (PM), and carbon dioxide (CO₂), as cleaner alternatives scale up. Fleets that can show measurable reductions in particulate emissions, fuel use and component waste from their diesel operations are therefore much better placed to satisfy regulators, investors and customers.

8. Supporting fleets by enabling clean power solutions

Emissions system health sits at the heart of optimising diesel power. Ceramex’s patented technologies help fleets convert regulatory obligation into operational advantage. By restoring DPFs to near-new efficiency, Ceramex ensures particulate control systems perform as designed in real-world duty cycles, reducing emissions and PM from high-mileage trucks and buses in urban corridors. Its remanufacturing approach keeps DPFs in service for multiple refresh cycles, avoiding premature replacement and the embodied carbon associated with new components.

	Ceramex patents & TMs	Ceramex restoration	Aqueous restoration	Airjet restoration
Deionised water Ensure no poisoning and impact to catalyst		✓	✗	N/A
Purge aqueous substrate clean Fast, safe, effective and resource efficient	xpurge	✓	✗	N/A
Airflow and backpressure testing Measures effective clean by comparing with new filter		✓	✓	✓
Light imaging test Ensures substrate integrity with no cracks or exotherm damage	Veritex	✓	✗	✗
Infrared light imaging test Confirms no substrate blockages remain	Veritex	✓	✗	✗
Catalytic test Confirms catalyst performance	Vericat	OPTIONAL	✗	✗
Filtration test Confirms filtration performance	Veritrap	OPTIONAL	✗	✗
Solid and liquid waste management Ensures no pollution to air or water		✓	?	?
Customer report Confirmation of test results		✓	?	?

Contract-based, scheduled cleaning aligned to duty cycles allows fleets to sustain these efficiency gains consistently, across large vehicle inventories, rather than reacting only when faults occur. It also encourages formalised policies and KPIs around emissions-system maintenance, embedding governance into day-to-day fleet operations. This supports circular economy principles that are increasingly embedded in ESG expectations and in OEM and fleet sustainability strategies.

Such measures are not designed to replace the evolution of electrification, however, but they materially reduce the environmental footprint of diesel powertrains through the transition period.

Cleaner buses and trucks help improve roadside air quality and public health in communities that rely on diesel-powered public transport and logistics. Compliant emissions control also supports uninterrupted public transport and freight services, which have high social and economic value.

Ceramex's inspection and full traceability processes provide auditable records of DPF and DOC condition and performance, giving fleets documentation to support compliance, and ESG reporting.

9. Summary

Euro VII shifts the focus from type approval certification at point of sale to continuous emissions performance over the full vehicle life. Fleet operators are no longer buyers of compliant vehicles, they become active and legally bound custodians of emissions compliance. This elevates the strategic importance of maintenance quality, operating practices, and record-keeping.

In summary, Euro VII transforms emissions maintenance from a compliance checkbox into a strategic capability. Heavy vehicle fleet operators that invest early in disciplined maintenance will not only meet regulatory demands but also improve reliability, manage costs, and strengthen their position during the transition to an electrified future.

For fleet directors, engineering heads and asset finance providers, partnering with Ceramex enables a shift from reactive emissions system fixes to a strategic, data-driven preventive and predictive maintenance programme.

By embedding DPF/DOC refurbishment into planned maintenance cycles, using exchange units and inspection data to align with vehicle service intervals, fleets can integrate Euro VII standards into a broader decarbonisation and CO₂ compliance strategy, and minimise disruption.

In doing so, Ceramex becomes not just a supplier, but a strategic partner that's focused on delivering lower TCO for fleets seeking to run leaner, greener, and more resilient operations in a tightening regulatory and margin environment.

Euro VII effectively raises the bar for diesel operations, narrowing the cost and complexity gap between diesel and zero-emission alternatives. For many fleets, enhanced emissions maintenance under Euro VII becomes a transitional strategy, buying time whilst the necessary infrastructure, duty-cycle suitability, and economics of electrification mature.