UNDERSTANDING VEHICLE EMISSION CONTROL SYSTEM TAMPERING IN ALBERTA

AMTA Report for CASA

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Contents

1.0 Introduction from AMTA (Alberta Motor Transport Association)

Development of the Report

The Alberta Motor Transport Association (AMTA) is a province-wide, not-for-profit industry association that represents and supports the commercial transportation industry in Alberta.

This report is the culmination of AMTA's detailed market research, jurisdictional scans, one-on-one interviews and surveys conducted with 60 mechanics in the Alberta region that service Class 8 vehicles, including AMTA members and numerous other mechanics and shops throughout the region. We reached out to over 90 mechanics and shops in the Alberta region, emphasizing that any information gathered will not incriminate or implicate anyone and that this is merely a data-collection exercise.

We encouraged precision and citing of specific examples wherever possible, connecting with individuals through a combination of telephone, email, and in-person interactions. Through our communications, we were able to conduct surveys and one-on-one interviews with 60 mechanics and shops in the Alberta region. Unfortunately, even though we were able to identify some specific shops that are performing tampering and deletion services, it is possible that those specific shops were hesitant to participate in the surveys and interviews.

We believe that some shops' unwillingness to participate was because they were performing tampering and deletion services, although we were sure to emphasize that we would not incriminate or "name names". Some of the mechanics surveyed were able to provide us with specific shops they are aware of that are performing tampering/deletion services; however, the identified shops declined to speak with us, even "off the record". We continued to emphasize that any information gathered would not be used against them and that they would remain anonymous with any disclosures.

Limited use of artificial intelligence (AI) was made in drafting this report, primarily for language refinement and formatting support. All key ideas, interpretations, and findings reflect the independent work and judgment of the author(s).

All references included in this report were carefully vetted for relevance, credibility, and accuracy. Sources were selected based on their authority in the field of heavy-duty trucking and tampering, regulatory compliance, and equipment integrity, with priority given to peer-reviewed studies, government publications, and reputable industry reports. Information

related to tampering incidents was cross-verified across multiple sources, where possible, to ensure reliability.

The following report will be broken into two main sections: our findings for each of the identified questions as laid out in the scope of work, and our suggestions for next steps moving forward. These are by no means recommendations for industry; however, there may be certain steps that could be taken to contribute to a lower rate of tampering and deletions throughout Alberta.

Please note that AMTA undertook a portion of the questions identified in the Vehicle Emission Controls in Alberta Request for Proposals (CASA Understanding Vehicle Emission Control System Tampering in Alberta Project). AMTA identified which themes and questions we could sufficiently answer and chose to omit some questions as a result.

Theme I – Number of Tampered Vehicles
Questions A-C
- This theme was answered by reaching out to as many mechanics and shops in the Alberta region as possible to conduct interviews and surveys.

Theme II – Profile of Tampered Vehicles
Questions A-D
- This theme was answered by reaching out to as many mechanics and shops in the Alberta region as possible to conduct interviews and surveys. In addition, a literature review for Canada, the U.S. and other jurisdictions was conducted, with supporting information from corroborating websites.

Theme III – Economic Impacts of Tampering
Questions A-F
- This theme was answered by reaching out to as many mechanics and shops in the Alberta region as possible to conduct interviews and surveys.

Theme IV – Emissions Control System Effectiveness and Vehicle Performance
Questions A-F
- *This theme was not undertaken by AMTA*.

Theme V – Perceptions and Beliefs Around Tampering
Questions A-C
- This theme was answered by completing a jurisdictional scan of changes in regulatory approaches to vehicle emissions or tampering in the last decade. AMTA also scanned

media and opinion pieces on vehicle emissions and tampering for changes in sentiment through time.

This report contains information that has been prepared for the Clean Air Strategic Alliance (CASA). CASA's processes do not require consultant reports to be reviewed or approved by its Board of Directors, and as such, any conclusions or recommendations in this report are those of the report's authors, and the contents of this report do not necessarily reflect the views of CASA, its Board of Directors, or its members.

2.0 Forward from CASA (Clean Air Strategic Alliance)

Understanding Vehicle Emission Control System Tampering in Alberta – Project Summary

The Clean Air Strategic Alliance (CASA) is a not-for-profit society that contributes to the strategic air quality management for Alberta by identifying priority issues and developing action plans, evidence-based recommendations, information, and tools that weigh environmental, health, and economic consequences and expected outcomes.

The transportation sector is one of the largest air emission sources of nitrogen oxides (NOx) in the province. Vehicle emissions also contain particulate matter and volatile organic compounds, all of which are air contaminants associated with health impacts, and CASA has had a long-standing series of projects in this area.

CASA began the Roadside Optical Vehicle Emissions Reporter (ROVER) project in 1998, with additional iterations ROVER II and ROVER III in 2006 and 2024, respectively. The results of all three projects showed a similar trend, that a small proportion of vehicles was responsible for most of the recorded emissions. With ROVER III results showing that approximately 30% of heavy-duty diesel-fueled vehicle emission measurements were ten times the NOx emissions benchmarks, the focus of CASA's current project was to explore emission control system tampering and the reliability of emission control technology in Alberta's climate.

The project's strategic intent was to complete a comprehensive study that:

- identifies the magnitude and sources of vehicle emission control system tampering, including information gathered about manufacturers, sellers, and installers of defeat devices
- includes an assessment of the economic impact of vehicle emission control system tampering
- improves understanding of the reliability of factory-installed emissions control devices

After the project began, CASA's financial situation changed so that it could not continue to work towards fulfilling the project's scope of work as originally intended. With less time and fewer resources, the project team prioritized data collection via a contract with the Alberta Motor Transportation Association (AMTA), who were able to address approximately 80% of the information gaps identified for heavy-duty on-road vehicles.

The following report summarizes the work carried out by AMTA on behalf of CASA. Future opportunities to carry this work forward could include filling remaining information gaps (for vehicle types other than on-road heavy-duty vehicles, emission control effectiveness and vehicle performance), gathering data from those that refused to participate in AMTA's surveys, and engaging with owners/operators who may do their own private tampering.

It is hoped that the important work supporting management of transportation emissions in Alberta can continue to move forward to the benefit of all Albertans.

3.0 Acronyms, Abbreviations and Terms

AMTA – Alberta Motor Transport Association

CASA – Clean Air Strategic Alliance

CCME – Canadian Council of Ministers of the Environment

Class 8 – Heavy-duty vehicle. This refers to a commercial vehicle above the Government of Alberta's registered weight of 11,794kg for a vehicle combination.

CEPA – Canadian Environmental Protection Act

CVIP – Commercial Vehicle Inspection Program. This is a mandatory inspection program in Canada, specifically in Alberta, designed to ensure that commercial vehicles, including trucks, are safe and compliant with provincial standards.

DEF – Diesel Exhaust Fluid. It is used to reduce emissions from diesel engines by converting nitrous oxide into water and nitrogen.

Deleting – Deleting a truck refers to the modification or removal of factory-installed emissions control systems, typically to improve performance or reduce maintenance issues. These systems typically include:

- DPF (Diesel Particulate Filter)
- EGR (Exhaust Gas Recirculation)
- DEF / SCR systems

Derating – Derating a heavy-duty truck refers to the intentional reduction of the vehicle's Gross Vehicle Weight Rating (GVWR) and/or Gross Axle Weight Ratings (GAWR), as recognized for regulatory, registration, or operational purposes. This establishes a new, lower maximum allowable weight for the vehicle, and may affect:

- Registration weight
- Compliance category
- Licensing or regulatory requirements

DOC – Diesel Oxidation Catalyst. This is a crucial component in diesel engines designed to reduce harmful emissions by converting carbon monoxide and hydrocarbons into less harmful substances like carbon dioxide and water.

DPF – Diesel Particulate Filter. It is a device used in the exhaust system of trucks to trap particulate matter, such as soot, from diesel engine emissions.

DriveON – Ontario's digital-based initiative for vehicle safety and emissions inspections, replacing the traditional paper-based Motor Vehicle Inspection Stations (MVIS) program.

ECU – Electronic Control Unit. This is a microprocessor-based device that manages and coordinates various electronic systems within a truck, ensuring optimal performance and safety.

EGR – Exhaust Gas Recirculation. This is a system in diesel trucks that recirculates a portion of exhaust gases back into the engine to reduce nitrogen oxide (NOx) emissions and control combustion temperature.

EPA – Environmental Protection Agency. This is the U.S. federal agency responsible for regulating vehicle emissions and environmental standards.

ESG – Environmental, Social, and Governance. ESG reporting helps assess a company's impact on the environment, its social responsibilities, and its governance practices.

HDV – Heavy-Duty Vehicle. This refers to a commercial vehicle above the Government of Alberta's registered weight of 11,794kg for a vehicle combination.

LDV – Light-Duty Vehicle. This refers to private vehicles and commercially registered vehicles with a registered weight of less than 11,794kg.

MVIS – Motor Vehicle Inspection Stations

NOx – Nitrogen Oxides. These are pollutants generated from the combustion of diesel engines.

NSC11 – National Safety Code, Standard 11. This focuses on the Periodic Motor Vehicle Inspections (PMVI). This standard outlines the minimum performance standards for the safe operation of commercial vehicles, including trucks, and is designed to ensure the mechanical fitness of vehicles on the road.

OBD – On-Board Diagnostics. This system is essential for monitoring and diagnosing a vehicle's performance and health.

OEM – Original Equipment Manufacturer. OEMs are companies that produce parts, components, or systems used in a company's end product.

PM – Particulate Matter. This refers to small particles in the air that can be harmful to health and the environment.

PMVI – Periodic Motor Vehicle Inspection Program. This program is designed to ensure that commercial vehicles are safe for operation and must undergo regular inspections to maintain compliance with safety standards.

SCR – Selective Catalytic Reduction. This is an emissions control technology used in diesel engines to reduce nitrogen oxide (NOx) emissions from exhaust gases.

Tampering – As described by the Canadian Council of Ministers of the Environment (CCME), tampering with vehicles or engine emission controls includes:

- Removing, bypassing, defeating, or rendering inoperative any emission control system device installed in or on a vehicle or engine, including software designed to monitor or control vehicle emissions
- Modifying the vehicle or engine in any way that results in increased emissions from the level to which it was originally designed or certified by the manufacturer or importer of the vehicle or engine

4.0 Findings

4.1 Theme I | Number of Tampered Vehicles

a) How frequently are tampering services performed by mechanics in Alberta?

Never	14/60 respondents	23% of respondents
Rarely – only when absolutely necessary	42/60 respondents	70% of respondents
Frequently	4/60 respondents	7% of respondents

Out of 60 respondents to this question, 14 responded that their shops and mechanics will never perform tampering or deletion services on heavy-duty vehicles.

42 of the respondents were more "on the fence" about performing these services, indicating that they will perform them "when necessary". The situations where they deemed these services necessary were almost entirely financially related, when costs to remedy the emission control systems on the truck became cost-prohibitive.

40 of the 42 respondents who indicated they "rarely" perform tampering services indicated that financial motivations are when they deem tampering necessary. The other two did not specify specific scenarios in which they deem tampering necessary.

Of the four respondents who indicated they frequently tamper, they indicated that they do it to improve the heavy-duty vehicle's overall performance.

Theme I | Number of Tampered Vehicles

b) How many vehicle owners or operators are tampering with their own vehicles?

Many/Numerous	28/60 respondents	47% of respondents
Very Few	21/60 respondents	35% of respondents
Don't know/ Unsure	11/60 respondents	18% of respondents

This question seemed to really create a division with the answers we received. 28 of the respondents stated that, to their knowledge, owners and operators are often tampering with their own vehicles (over 50% of the time was the average number cited), although 21 respondents indicated just the opposite and said that operators typically don't know how to perform these services without the assistance of a mechanic shop to support them.

11 of the respondents were completely unsure or did not want to commit to an answer either way.

c) Are there differences in tampering rates for different-sized operations (e.g. fleets from 2-20 vehicles compared to fleets with greater than 20 vehicles)?

Yes – smaller fleets tamper more often	57/60 respondents	95% of respondents
No – there is no difference	1/60 respondents	2% of respondents
Don't know/ Unsure	2/60 respondents	3% of respondents

This question was almost unanimous amongst our respondents. 57 of the 60 people interviewed claimed that tampering is more prevalent in small fleets than in larger fleets. Only one person responded that they weren't aware of any difference. And two were unsure.

4.2 Theme II | Profile of Tampered Vehicles

a) Is there a difference in tampering rates or types of tampering performed on vehicles that are staying in Alberta vs. those that are driving to other jurisdictions where inspection and maintenance programs include emission control devices or emission testing?

Yes – within Alberta more often	59/60 respondents	98% of respondents
Don't know/ Unsure	1/60 respondents	2% of respondents

When assessing the perceptions surrounding tampering, it is important to understand how Alberta compares to other provinces and even the U.S. when it comes to enforcement. The literature reviewed has been cited, as well as some websites that back up the included information.

Alberta vs Ontario vs U.S. — enforcement intensity

Alberta: weakest enforcement structure (historically and currently)

The core reality is that there are no dedicated provincial anti-tampering regulations or inspection programs for heavy-duty trucks. [theicct]

Enforcement relies mostly on general safety inspections (which are not designed to detect deletes).

The practical implications of this mean that there is a very low probability of detection in day-to-day operations in Alberta, due to no routine emissions testing to trigger enforcement, and limited roadside capability focused on emissions compliance.

This gap is evidenced by the fact that Alberta is explicitly identified as lacking inspection and maintenance programs, as well as enforcement mechanisms to identify tampered trucks. [theicct]

This means that tampering has historically been low-risk locally, which is why prevalence is relatively high (around 20% across all vehicles and 38% among vehicles at least seven years old). (There is no regulatory risk; however, certain dealerships may refuse to work on a tampered truck or refuse warranty work, which is an identified risk factor). [theicct]

Ontario: structured, active enforcement

Ontario has built a multi-layered enforcement system, with three primary components [theicct]:

1) Mandatory rules & legal framework

- Vehicles must:
  - retain original emissions systems
  - operate without fault codes or visible emissions [canlii.org], [ontario.ca]

2) Active enforcement mechanisms

- DriveON program (inspection & compliance system)
- Roadside enforcement expanded (2021–2025)**:**
    - on-board diagnostic (OBD) checks
    - opacity testing
    - visual checks for tampering [trucknews.com]

3) Real enforcement actions

- Thousands of inspections and hundreds of tickets issued
- Repair orders averaging over $12,000 per truck
- Inspections include out-of-province vehicles [ontruck.org]

In Ontario, this means that tampering is detectable, penalized, and increasingly risky, even for passing-through trucks.

United States: strongest enforcement

The U.S. has had the most aggressive enforcement regime in North America, with two primary components:

1) Federal prohibition + active enforcement

- The Clean Air Act bans tampering, selling, and installing delete kits
- EPA has run a national enforcement initiative targeting defeat devices [epa.gov]

2) Real penalties & scale

- 2020–2023:
    - 172 civil cases
    - $55.5 million in fines
    - criminal prosecutions with jail time [epa.gov]
- Individual cases:
    - $100k+ fines for small fleets (multi-vehicle deletes) [overdriveonline.com]

An important nuance to take note of in the U.S., is the 2026 shift, where the Department of Justice (DOJ) stopped pursuing criminal charges. However, civil penalties are still fully enforced, and state enforcement remains aggressive. [truckinginfo.com], [carscoops.com]

This means that in the U.S., they have fostered a strong inspection, audit and enforcement ecosystem, leading to a high financial risk associated with tampering or deletions.

Key comparison

Feature	Alberta	Ontario	United States
Anti-tampering enforcement	Weak	Moderate–strong	Strong
Inspection program	None (HD trucks)	Yes	Yes
Roadside emissions checks	Limited	Active & expanding	Extensive
Out-of-province enforcement	Minimal	Active	Active
Financial penalties	Rare in practice	Regular	Severe
Criminal enforcement	No	No	Yes (reduced in 2026)

What happens when Alberta trucks leave the province?

Entering Ontario (immediate enforcement exposure)

Ontario explicitly inspects out-of-province trucks and has found approximately 60% of those inspected were non-compliant. [ontruck.org]

The risks for an Alberta truck at a roadside stop include the detection of missing diesel particular filters (DPF)/ diesel exhaust fluid (DEF) / exhaust gas recirculation (EGR), bad on-board diagnostics (OBD) data, and/or visible smoke. Consequences include fines, repair orders, and potential vehicle restrictions. So even if a truck is "legal" in Alberta, it can become non-compliant instantly in Ontario.

Crossing into the United States

A deleted truck may physically cross into the U.S., however, the risk shifts from essentially none to financially severe. Firstly, U.S. Customs and EPA will inspect the vehicle at the border and can detect any missing emissions systems. Any violations have triggered fines (e.g., $41,000+ penalty for a single imported tampered truck). [epa.gov]

In terms of legal requirements, the vehicle must meet original emissions configurations from the time of manufacture. This applies even to used vehicles and Canadian imports. [epa.gov]

On-road enforcement after entry from an EPA and state regulator level includes audits, inspections and even fleet investigations. The risks include fines per vehicle and in extreme cases, fleet-level enforcement actions.

Bottom line for operators

A deleted truck operating only in Alberta is historically low risk. That same truck in Ontario carries a moderate, immediate enforcement risk. In the U.S., that same truck carries high financial and regulatory risk.

This is why industry perception is shifting. There are concerns around whether or not the truck is "legal", but also, "where will this truck operate?"

Alberta can be more relaxed in terms of enforcement than other provinces (such as Ontario), with fewer regulations than the U.S. It was common in our interviews to hear from respondents that their drivers don't worry about operating a tampered vehicle in Alberta, but more so if it has to leave the province, and particularly if it has to go to the U.S.

Obviously, we don't have specific numbers as to how many tampered and deleted vehicles exist in Alberta, as opposed to other provinces, but our research indicates that most tampered and deleted vehicles in Alberta are staying in Alberta to avoid any negative repercussions.

Theme II | Profile of Tampered Vehicles

b) Are vehicles tampered with at a specific vehicle age, or are vehicles of certain model years more likely to be tampered with?

Yes – older vehicles, but not a specific age	46/60 respondents	77% of respondents
Yes – vehicles more than five years old	8/60 respondents	13% of respondents
No	2/60 respondents	3% of respondents
Don't know/ Unsure	4/60 respondents	7% of respondents

According to research, truck age and model year are among the strongest predictors of whether a heavy-duty diesel has been tampered with. There's a very clear pattern tied to how emissions systems evolved. This information is more Alberta-specific, and could vary between provinces and throughout the U.S.

The breakdown below outlines which vehicles are more prone to tampering and deletions, and why.

The highest-risk group: ~2010–2015 model years

- About 38% of model year 2010–2015 tractor trucks show signs of tampering or malfunction. [theicct], [trueinitiative.org], [trucknews.com]
- This group produces nearly half of the total NOx emissions despite being a minority of the fleet. [trueinitiative.org]

According to research, this is the peak tampering window.

Why are these trucks most likely to be deleted?

1) These are the first generation of complex emissions systems

- 2007–2010 introduced:
  - DPF (diesel particulate filter)
  - EGR (already present but expanded)
- 2010 tightened NOx → forced adoption of SCR + DEF systems [ttnews.com], [dpfguys.com]

These early systems were more failure-prone, less refined and expensive to repair.

2) They're old enough that the warranty no longer matters

- Deletes typically happen ~3+ years after purchase [greencarreports.com]
- By now (2024–2026), 2010–2015 trucks:
  - are well out of warranty
  - still have usable life

This means that they fall into the perfect window for high repair costs, no warranty protection, and a strong incentive to "solve it permanently".

3) They're heavily used in working fleets

These trucks are often workhorses (Class 8 tractors, oilfield trucks, etc.), and often high mileage. Emissions components wear out, which means there are repeated failures.

Second-highest risk: 2007–2009 (early emissions era)

Why do these trucks get deleted?

These were the first trucks with DPF systems. Early DPF systems had poor regeneration performance and clogging issues. They are simpler than later trucks, in that there is no SCR or DEF yet in many cases. There was also a big drop in fuel economy compared to pre-2007 trucks. [drivingline.com]

This means that many were deleted early in their life cycle, and a significant portion may still be running today in deleted form.

Moderate risk: 2016–2019

What changes with these trucks?

Emissions technology improved, allowing for better SCR reliability, improved fuel economy, and fewer catastrophic failures.

There are still some deletes, but these vehicles tend to be less driven by severe reliability issues, and more influenced by cost avoidance and performance. These trucks are less likely to be tampered with and deleted than 2010–2015 model years, but they are still present in the tampered pool.

Lower risk: 2020+ (newer trucks)

Why are deletes in these vehicles less common?

Many of these vehicles are still under warranty (or recently out). They have much better emissions system integration and more electronic integration, which makes it more difficult to tamper cleanly.

It should be noted that deletes still occur in these vehicles, however, they are less common and more well-hidden and cautious.

Very low risk: pre-2007

Why are these vehicles so low risk?

These trucks had minimal emissions controls, often with no DPF/SCR to remove. So technically, these trucks are not “deleted”, but they emit at levels similar to newer deleted trucks. Also, many of these trucks are no longer on the road, so there is obviously a lower prevalence of tampering.

c) Are certain types of emission control devices more likely to be defeated than others due to failure rates, repair costs, maintenance requirements, replacement part availability, or other reasons?

Yes – Diesel Particulate Filter (DPF)	3/60 respondents	5% of respondents
Yes – Selective Catalytic Reduction (SCR)	7/60 respondents	11% of respondents
Yes – more than one device/system	49/60 respondents	82% of respondents
Don't know/ Unsure	1/60 respondents	2% of respondents

When questioning the mechanics and shops, some responded that certain devices (such as DPF or SCR) are more likely to be defeated. Most respondents stated that a combination of more than one device was most common. The most common answer we received was that these devices are often the diesel particulate filter (DPF), exhaust gas recirculation (EGR), and the diesel exhaust fluid (DEF).

Some emissions components are much more likely to be defeated than others, and the pattern is very consistent across fleets. It does not seem random: it seems to directly reflect which systems fail most often, cost the most, and disrupt operations the most.

The components most likely to be removed are the ones that combine high failure rates, high repair costs, and the ability to shut the truck down, which is why DPF, EGR, and SCR systems are almost always targeted together.

The systems and devices most likely to be defeated are:

1. Diesel Particulate Filter (DPF)
2. Exhaust Gas Recirculation (EGR) (almost always paired with DPF delete)
3. Selective Catalytic Reduction (SCR)/ Diesel Exhaust Fluid (DEF) (in full deletes, especially problem-prone trucks)

Most commonly defeated: Diesel Particulate Filter (DPF)

Why the DPF gets removed most often:

1) It fails frequently

- DPF issues are often reported as the #1 aftertreatment problem in heavy-duty trucks [truckclub.com]
- It clogs with soot and ash over time, especially in:
    - stop-and-go work
    - cold weather
    - high-idle conditions [truckclub.com]

2) It directly causes downtime

Requires regeneration cycles (burning off soot). If regeneration fails, the truck can lose power and go into "derate" mode [truckclub.com]

3) Repair/replacement is expensive

- Cleaning: ~$300–$600
- Replacement: $3,000–$6,000+ (often up to $10,000 with related parts) [truckclub.com]

4) It impacts performance directly

- Creates exhaust backpressure
- Reduces fuel economy and power when clogged [explosivediesels.com]

In summary, the DPF is the single biggest driver of deletes because it is high-maintenance, failure-prone, and directly disruptive to operations.

Very commonly defeated: Exhaust Gas Recirculation (EGR)

Why EGR is frequently deleted (usually removed along with DPF):

1) Carbon buildup issues

- Recirculates dirty exhaust back into the engine
- Leads to:
    - clogged intake
    - valve sticking
    - cooler failures [diezeltuner.com]

2) Reliability and engine wear concerns

It introduces soot and heat stress into engine components, and can reduce efficiency and increase maintenance.

3) Frequent failure points

Common issues include stuck valves, plugged coolers, and sensor faults. [drivingline.com]

4) Strong link to other failures

EGR problems increase soot, which accelerates DPF clogging. This means that EGR is often removed together with the DPF because it contributes to the same root problem (soot and clogging).

Increasingly targeted: Selective Catalytic Reduction (SCR) / Diesel Exhaust Fluid(DEF) System

Why SCR/DEF systems get defeated:

1) Operational complexity

The SCR/DEF system has become a growing source of frustration (particularly after 2010) because it requires DEF fluid supply, injectors, heaters, pumps and sensors. More components equate to more failure points. [explosivediesels.com]

2) Sensor and system failures

- Common problems:
  - NOx sensor failures
  - DEF crystallization
  - injector clogging [jsdequipment.com]

3) Severe derate consequences

This is one of the biggest operator frustrations – a small sensor issue can effectively shut down the truck. If the SCR/DEF system fails, the truck may limit speed drastically or become inoperable. [epa.gov]

4) Logistics issues (important in Alberta)

DEF availability can be a problem in remote oilfield areas and rural operations. [diezeltuner.com]

All of these factors contribute to a combination of complexity, derates, and fluid dependence, which result in operational risk.

Systems are usually removed together (not individually)

In practice, most "full deletes" remove DPF, EGR, SCR/DEF, and require electronic control unit (ECU) reprogramming to avoid fault codes. [diezeltuner.com]

These are often removed together, or "all at once", because these systems are tightly integrated, and failures in one often trigger failures in others. [semitrailernews.com]

Factor	Effect on deletion likelihood
Frequent clogging (DPF, EGR)	Very high
High repair cost	Very high
Causes derate/downtime	Very high
Adds operational complexity (SCR)	High
Hard to maintain in real conditions	High

Less commonly targeted components

These are rarely deleted on their own, but fail often:

DOC (Diesel Oxidation Catalyst)

- Supports DPF regeneration
- Failure contributes to DPF issues
- Usually replaced, not deleted independently [truckclub.com]

Sensors (NOx, pressure, temperature)

- Very common failure points
- Trigger fault codes and derates
- Not "deleted" directly—but often bypassed in tuned systems [jsdequipment.com]

d) Are there regional differences in transportation emissions (e.g. rural vs. urban), and would actions or programs to reduce tampering have more impact if they are targeted at different areas?

Yes – city driving causes higher emissions	27/60 respondents	45% of respondents
Yes – programs would need to target fleets	9/60 respondents	15% of respondents
Yes	19/60 respondents	32% of respondents
Don't know/ Unsure	5/60 respondents	8% of respondents

Anti-tampering efforts are most effective when urban programs target exposure hotspots and rural programs target high-emitting fleets, because emissions harms are distributed very differently across regions.

How emissions differ: rural vs urban

1) Urban areas: concentrated exposure + stop-and-go emissions

What's happening

- Urban freight systems produce:
  - high NOx and particulate concentrations during peak hours [mdpi.com]
- A large share of the population is exposed:
  - e.g., ~50% of Albertans live within 1 km of major roadways [theicct]

Key characteristics

- Stop-and-go driving leads to poor combustion and higher NOx spikes
- Lower speeds lead to DPF systems struggling to regenerate properly
- Dense population means that emissions have direct health impacts (there is a higher concentration of traffic-related pollutants)

What this means is that even a small number of high-emitting (tampered) trucks can have large public health impacts.

2) Rural/highway areas: higher total emissions, lower exposure concentration

What's happening

- Highway and long-haul driving:
  - produces large total emissions due to distance and fuel use [mdpi.com]
- Trucks operate at higher speeds and under more stable loads [nlr.com]

Key characteristics

- Better combustion efficiency (lower per-km emissions spikes)
    - But there is a much higher total emissions volume, and fewer people exposed per km

Rural/freight corridors are where most emissions are generated, but not where the highest exposure risk occurs.

Where tampering matters most

Tampering dramatically increases emissions:

- Can raise pollution by orders of magnitude (10×–1000× depending on system) [cleanair.epa.gov], [mdpi.com]

But its impact varies by location**:**

Urban impact of tampering = HIGH (health-driven)

- Tampered trucks in cities:
    - expose large populations directly
    - worsen air quality hotspots
- Alberta analysis shows:
    - a minority of trucks (many likely tampered/malfunctioning) produce a disproportionate share of NOx emissions [theicct]

This results in each tampered truck having an outsized health and policy impact in urban areas.

Rural impact of tampering = HIGH (volume-driven)

- Tampered trucks in rural/highway settings:
    - contribute heavily to total emissions inventory
- This is especially important in:
    - long-haul trucking
    - oilfield/resource sectors

This results in bigger climate and regional air pollution effects, even if fewer people are directly exposed.

Why regional targeting matters for enforcement

There's a critical insight from emissions research indicating that vehicle emissions are highly skewed—a small fraction of vehicles (often tampered or malfunctioning) produce a large share of pollution. [nature.com]

That means targeted programs could be very effective.

What could work best in different regions

Urban-focused strategies (high impact per truck)

Some of the tools that could be impactful in these regions include focusing on high-traffic corridors with:

- Roadside remote sensing, which would identify high emitters in dense traffic
- Targeted roadside inspections
- Low-emission zones or access restrictions

These would theoretically work because:

- High traffic density would ensure it was easier to detect violators
- High population exposure allows for a strong justification
- Repeat vehicle patterns help point out offenders (e.g. delivery fleets)

This would allow Alberta to remove the worst offenders where they do the most harm.

Rural / corridor-focused strategies (fleet-level impact)

Some of the tools that could be impactful in these regions include focusing on long-haul trucks and older fleets with:

- Weigh-scale inspections
- Fleet compliance audits
- Interprovincial/cross-border enforcement
- Industry-focused programs (oilfield, long-haul)

These would theoretically work because:

- Trucks travelling long distances allow for predictable checkpoints
- Fewer inspection opportunities mean there is a need for strategic placement
    - Operators often run older, higher-risk trucks that are more likely to be tampered with

This would allow Alberta to reduce total emissions volumes across the system.

Factor	Urban	Rural / Highway
Emission concentration	High	Lower
Total emissions volume	Moderate	High
Population exposure	Very high	Low
Tampering impact	Health-driven	Volume-driven
Best intervention	Detection & restriction	Fleet compliance & checkpoints

4.3 Theme III | Economic Impacts of Tampering

a) What are the costs associated with maintaining emission control systems, and have those costs changed over time (e.g. cost of DEF)?

$800 - $1,000	9/60 respondents	15% of respondents
$1,000 - $5,000	9/60 respondents	15% of respondents
Yes – costs have increased over time	40/60 respondents	67% of respondents
Don't know/ Unsure	2/60 respondents	3% of respondents

When asked about the costs associated with maintaining emission control systems and whether or not those costs have changed over time, a majority of the respondents (40/60) were certain that costs have increased over time. 18 respondents were more specific and identified a specific price range for that increase. Nine respondents cited a cost of around $800 - $1,000 for a heavy-duty vehicle (although they did not explicitly state whether these were one-time costs or costs over the duration of ownership). Nine additional respondents cited maintenance costs of $1,000 - $5,000. Two respondents were unsure or couldn't speak to specific increases.

b) Does tampering with emission control systems impact operating costs (e.g. changes in fuel consumption or engine life)?

Yes	60/60 respondents	100% of respondents

This was our only 100% unanimous question that was asked of respondents. Every person polled agreed that tampering with emission control systems impacts operating costs. Most subtly indicated or referred to tampering being done to decrease the lifetime costs of a heavy-duty vehicle. None of the respondents indicated that tampering would increase costs over time – many were of the opinion that it lowers costs over the life of ownership.

c) Does tampering impact the competitiveness of an operator when compared to other operators in Alberta, Canada, and the U.S.?

Yes	58/60 respondents	96% of respondents
No	1/60 respondents	2% of respondents
Don't know/ Unsure	1/60 respondents	2% of respondents

This question was also a "landslide" amongst respondents – an overwhelming 96% said that tampering does impact the competitiveness of an operator when compared to other operators in Alberta, Canada, and the U.S.

Only one respondent disagreed, and one was unsure. A large majority of the 58 respondents who said yes referred to the fact that tampering is much more accepted for heavy-duty vehicles remaining in the province of Alberta. There are strict fines and penalties depending on where the truck is going once it leaves Alberta, and most respondents agreed that this wasn't a risk they would be willing to take.

Theme III | Economic Impacts of Tampering

d) What is the cost range for tampering or defeating an emission control system vs. replacing or repairing one that is defective or malfunctioning?

$4,000 - $6,000	4/60 respondents	7% of respondents
50% less for tampering	4/60 respondents	7% of respondents
Substantially less for tampering	50/60 respondents	83% of respondents
Don't Know/ Unsure	2/60 respondents	3% of respondents

Respondents were hesitant to identify a specific cost range for tampering or defeating an emission control system vs. replacing or repairing one that is defective or malfunctioning. 50 out of the 60 respondents would only say that the cost range is substantially less for tampering with a vehicle. Eight respondents provided more specificity, with four actually stating a price range between $4,000 and $6,000. Four others were willing to state that tampering would reduce costs by around 50%. And as we have seen with a number of the questions so far, there is a small percentage of respondents who just said they didn't know or were unsure.

e) What is the downtime for maintenance vs. tampering services (e.g. removing devices and defeating software in comparison to routine maintenance requirements or repairs for these systems) over the life of the vehicle?

Much less downtime for tampering	58/60 respondents	96% of respondents
About the same	1/60 respondents	2% of respondents
Don't Know/ Unsure	1/60 respondents	2% of respondents

This is another question where respondents weren't willing to provide a high level of specificity. 58 out of the 60 mechanics and shops polled were relatively certain that there is substantially less downtime for tampering services vs. maintenance over the life of the vehicle. One outlier stated that the time is about the same, and one said they were unsure.

f) As a vehicle depreciates, does the cost to replace or repair emission control systems become higher (both absolute cost and relative to the value of the vehicle)?

Yes, much higher	57/60 respondents	95% of respondents
Yes, a little bit higher	3/60 respondents	5% of respondents

All respondents agreed that as a vehicle depreciates, the cost to replace or repair emission control systems becomes higher. Nobody was able to state a specific number, but it was still a resounding yes to this question. The only division of opinions came to whether or not these costs were substantially higher, or just negligibly higher.

4.4 Theme IV | Emission Control System Effectiveness and Vehicle Performance

AMTA did not undertake this portion of the work.

4.5 Theme V | Perceptions and Beliefs Around Tampering

a) Has there been a change in perceptions around tampering over time?

There has been a noticeable shift over time in how emissions "tampering" (e.g., deletes, defeating systems) on heavy-duty trucks is perceived in Canada, and Alberta is a particularly interesting case. The change isn't just cultural—it's tied to evolving regulation, enforcement gaps, economic pressures, and more recent public-health framing.

Below is a clear breakdown of how perceptions have changed.

Earlier period (2000s–mid-2010s): tolerated, practical workaround

Key perception:

Tampering was often seen as practical, even rational, especially in Alberta's trucking culture.

- Modern emissions systems (DPF, EGR, SCR) were introduced mainly starting around 2007–2010.
- Many operators found them expensive, unreliable, and poorly suited to real-world use (especially in cold climates and with heavy workloads).
- This led to a widespread belief that "deleting":
    - improved reliability
    - reduced maintenance costs
    - increased fuel economy or power [kohout.com]

Regulatory context mattered heavily:

- Alberta historically lacked strong anti-tampering rules or enforcement systems, unlike provinces such as Ontario or BC. [theicct]
- Inspection programs that could detect tampering were limited or absent. [theicct]

The result is tampering was often perceived as low-risk and socially normalized in parts of the industry.

Late 2010s–early 2020s: awareness grows, but enforcement still weak

Key perception:

During this time period, tampering becomes more controversial, but still common. During this period:

- Governments began tightening emissions standards to meet climate targets. [mehmi.com]
- Industry discussions increasingly framed deletes as:
    - non-compliant
    - risky for resale and inspections

- But the economic motivations didn't disappear:
    - high repair costs (thousands of dollars for emissions components)
    - downtime concerns
    - small operators feeling squeezed

At the same time, research highlighted gaps:

- Canada lacked robust data on how widespread tampering was. [theicct.org]
- Enforcement mechanisms were still limited, especially in Alberta.

The result is that perception then splits: regulators & environmental groups saw this as a growing concern, while many operators were still pragmatically accepting this.

Mid-2020s (recent shift): public-health and economic impacts change the narrative

Key perception:

Tampering is increasingly seen as a serious public-health and policy issue, not just a mechanical or compliance choice.

Recent data has dramatically changed the conversation:

- A 2025 Alberta study found:
    - About 38% of 2010–2015 tractor trucks show evidence of tampering or malfunction [theicct.org]
    - These trucks produce nearly half of NOx emissions from the fleet [theicct.org]
    - Potential impacts:
        - CA$5.4 billion in health damages (2024–2035)
        - hundreds of premature deaths [trucknews.com]

This kind of evidence reframes tampering as:

- not just a compliance issue
- but a major air-quality and public-health driver

There's also more visibility that:

- up to 30% of heavy-duty vehicles may be emitting far above expected levels. [theicct]
- tampering rates are higher than previously estimated [trueinitiative.org]

The result is that public and policy perception is shifting toward this being a "systemic problem needing intervention", not an individual choice.

Policy & enforcement direction (emerging)

Although Alberta still lags in enforcement compared to some regions, momentum is building:

There is increasing pressure for:

- Federal anti-tampering legislation with penalties
- Provincial inspection/maintenance programs
- Roadside emissions monitoring (remote sensing) [trucknews.com]

Broader trends:

- Canada is tightening emissions rules (2025–2027+) [mehmigroup.com]
- There is a push toward zero-emission vehicles and stricter compliance overall [dieselarmy.com]

The results are that tampering is increasingly viewed as legally risky, economically short-sighted, and misaligned with long-term industry direction.

Summary

Yes, perceptions around tampering and deletions have changed significantly—but unevenly over time:

Period	Dominant perception
2000s–mid-2010s	Practical workaround, low stigma
Late 2010s–early 2020s	Legally questionable but still normalized
Mid-2020s (now)	Major environmental & health problem, increasing scrutiny

In short, especially in Alberta, tampering has moved from “common industry practice” to “controversial compliance issue” to “evidence-backed public health concern”.

Most shops will refuse to do this type of work unless there are major financial ramifications for not doing it. Even then, many shops will still refuse to do this work.

b) Are vehicle owners and operators aware of the impacts of excess vehicle emissions on human health and the environment, and does it factor into decision-making around tampering?

Most heavy-duty truck owners/operators are generally aware that emissions affect health and the environment, but this awareness is often broad and abstract. In practice, when it comes to decisions like tampering, economic and operational factors usually outweigh environmental considerations.

Heavy-duty operators usually understand that emissions are harmful, but tampering decisions are overwhelmingly driven by cost, reliability, and downtime—not environmental or health concerns—unless those concerns are reinforced by enforcement or economic incentives.

What operators typically know

There is widespread baseline awareness that:

- Diesel exhaust contains harmful pollutants (NOx, PM)
- These pollutants are linked to:
    - respiratory illness
    - cardiovascular disease
    - premature death [ucs.org]

In fact, truck drivers themselves:

- are heavily exposed to diesel exhaust daily
- experience direct health risks from in-cab pollution [nrdc.org]

Most operators know emissions are "bad," and many understand they can affect health, but awareness is often not detailed or quantified.

What's usually less well understood:

- How large the impact is (e.g., billions of dollars in health damages)
- How much tampered trucks increase emissions (can be 10×–100× higher) [uts.edu.au]
- That a small share of high emitters drives a large share of pollution

If health/environmental awareness strongly influenced decisions, you would expect low tampering rates. But in Alberta:

- Over 20% of all HDVs show tampering/malfunction
- About 38% of 2010–2015 trucks are affected [theicct.org], [trueinitiative.org]

This indicates that awareness alone does not strongly deter tampering behaviour.

Across studies and industry data, operator decisions are dominated by:

Cost pressure

- Emissions system repairs can cost thousands to tens of thousands per event
- Thin margins mean even small cost increases affect viability

Environmental concerns rarely compete with: "Can I keep this truck running affordably?"

Downtime and reliability risk

- Emissions failures can derate the engine and shut the truck down
- Lost time = lost income

Operators prioritize reliability over compliance when forced to choose.

Complexity and frustration

- Modern systems are sensor-heavy and failure-prone (especially older generations)
- Operators often view problems as "system design issues," not environmental trade-offs

Perceived distance of impacts

Environmental/health impacts are often seen as:

- diffuse
- long-term
- affecting "others" (e.g., cities, public)

Whereas costs are immediate and personal. This creates a classic behavioural gap: immediate costs outweigh distant benefits.

Where awareness *does* influence decisions

Awareness isn't irrelevant—it just works indirectly and unevenly. Larger fleets and corporate operators are more likely to factor in ESG goals, brand reputation, and regulatory risk. They are also more likely to avoid tampering altogether.

Some evidence suggests that drivers are increasingly aware of in-cab air quality issues, but this hasn't consistently translated into anti-tampering decisions. This is because drivers often lack control over equipment decisions (fleet-owned trucks). [carexcanada] [researchgate]

c) What are non-monetary or perceived vehicle performance improvement motives for tampering (e.g. modifying a vehicle to intentionally increase noise)?

There are several non-monetary, perception-driven, or performance-identity motives behind heavy-duty truck tampering that go beyond simple cost avoidance. These motives are often rooted in driver experience, control, culture, and perceived vehicle performance, and they can be just as influential as economic factors.
In many cases, operators are trying to make their trucks:

- simpler
- more predictable
- more responsive
- or more aligned with how they believe a truck should behave

—even if that conflicts with emissions compliance.

Perceived performance improvements

Power and throttle response

- Removing emissions systems (especially EGR and DPF) can:
    - reduce exhaust restriction
    - lower intake contamination
- This leads to a perception of stronger acceleration and smoother power delivery

Even when actual horsepower gains are modest, drivers often report:

- "more responsive"
- "less lag"
- "pulls harder under load"

Engine "running cleaner" or cooler (perceived)

- EGR recirculates hot exhaust gases, so some operators believe removing it reduces engine stress
    - Drivers may feel that the engine runs cooler and that there is less "strain" under heavy loads

This reinforces a belief that the engine is healthier or being "treated better".

More predictable behaviour (fewer interruptions)

- Emissions systems introduce regeneration events, derates, and sensor-driven interventions

- Removing them creates a truck that behaves more consistently and doesn't "take control away" from the driver. This is often described as "getting rid of the truck thinking for itself"

Control and autonomy motives

Desire for full mechanical control

Many operators (especially owner-operators) strongly value mechanical simplicity and direct control over the vehicle. Emissions systems are seen as opaque ("black box" systems), and controlled by software and sensors.

Deleting them can feel like reclaiming control from electronics and regulators.

Frustration with automated derates

- One of the strongest non-financial motivations is loss of control when a truck derates or limits speed
- Even minor faults can trigger severe performance restrictions

Identity, culture, and aesthetics

Sound (noise as a deliberate outcome)

- Removing DPF/SCR systems changes exhaust characteristics:
  - louder
  - deeper tone
- Some operators deliberately want:
  - a "traditional diesel sound"
  - audible engine presence

This is similar to aftermarket exhaust culture in pickup trucks and performance identity signaling.

"Old-school diesel" identity

- Pre-2007 trucks are often seen as simpler, stronger, and more "authentic"

Deleting emissions systems can be perceived as making a modern truck behave more like an older one. This reflects a cultural narrative that newer systems equal compromised reliability, while older systems equal "real trucks".

Psychological and experiential motives

Frustration/"rebellion" against regulation

- Regulations may be perceived as disconnected from real-world conditions or designed without operator input

- Tampering can become a form of resistance or pushback, especially in regions like Alberta, where there is a strong culture of independence that amplifies this effect

Belief that emissions systems "don't work right"

Even when not fully accurate, some operators believe emissions systems reduce engine life, increase fuel use, and create more problems than they solve. This leads to "I'm fixing a bad design," rather than breaking rules.

Operational feel and comfort

Smoother operation under real-world conditions

There are no regeneration cycles, which eliminates the need to monitor or adapt driving behavior. There is also no DEF management, which reduces driver workload. The perceived benefit is a simpler, less mentally taxing operation.

Better perceived fit for harsh environments

In cold climates or remote areas, emissions systems can behave unpredictably. Removing them creates a sense of robustness and reliability under extreme conditions.

Social and peer influences

Norms within specific sectors

In some segments (e.g., oilfield, small fleets), tampering may be normalized or widely known. Operators may hear "everyone does it," or "it's the only way these trucks work properly." This creates social reinforcement and reduces perceived stigma.

Word-of-mouth performance claims

Many decisions are influenced by anecdotes and peer recommendations. Claims like better fuel economy, fewer breakdowns, or stronger performance are prevalent. These don't need to be fully accurate to drive behaviour.

Important nuance: perception vs reality

A lot of these motives are perceived benefits, not always objectively true. Some performance gains are real (e.g., reduced backpressure). But others are often exaggerated, dependent on tuning quality, and offset by other risks (engine stress, legal exposure). However, perception is what drives decisions, not engineering reality alone.

5.0 Suggestions

5.1 Suggestion #1

Work with regulators at the provincial and federal levels to update the Canadian PMVI (Periodic Motor Vehicle Inspection) Program so that Alberta inspectors have greater authority to fail trucks based on tampering and deletions.

BACKGROUND

The Canadian PMVI (Periodic Motor Vehicle Inspection) manual does not give Alberta inspectors strong authority to fail a truck solely for being "deleted" or electronically tampered, and Alberta's own inspection/adoption of that standard explicitly limits what inspectors can do with emissions systems.

1) What the Canadian PMVI (NSC 11) says about tampering:

The PMVI (Periodic Motor Vehicle Inspection, National Safety Code Standard 11, which Alberta adopts for commercial inspections) is primarily a mechanical safety inspection standard, not an emissions enforcement document.

- Its purpose is to ensure mechanical roadworthiness (brakes, steering, structure, etc.), not environmental compliance [0901.nccdn.net]
- Across Canada, it includes general language that:
    - Exhaust systems must be intact and not visibly modified in a way that creates a safety issue
    - Components that are required for safe operation must be present

However, the national framework has known gaps around emissions tampering. Even regulators acknowledge that roadside inspectors often can't reliably identify deleted systems without specialized training or tools [raventrans.com]

So while the "spirit" of NSC 11 is that systems shouldn't be tampered with, it doesn't provide a strong, consistent enforcement mechanism for delete kits and tampering.

2) How Alberta modifies/uses the PMVI

Alberta adopts NSC 11 into law through its Vehicle Inspection Regulation and CVIP program [canlii.org]. But in practice, Alberta limits emissions inspection requirements:

- Alberta does not run an emissions inspection program
- It has no dedicated anti-tampering inspection regime
- Inspection manuals and procedures used by technicians are largely safety-focused

Independent research and policy reviews confirm that Alberta has no provincial anti-tampering regulations or inspection/maintenance program to detect deletes. [theicct.org]

Unlike BC, Ontario, or Quebec, inspection programs elsewhere are the only real enforcement tool—and Alberta doesn't have one for emissions. [theicct.org]

3) What inspectors can (and cannot) do in Alberta

What inspectors CAN do

Inspectors in Alberta (CVIP or out-of-province inspections) can document obvious modifications and fail a truck if:

- There is a safety-related defect with the exhaust system (such as leaks, broken mounts, unsafe routing)
- Components are missing, and that creates a safety issue
- The vehicle fails any NSC 11 safety criteria
- If they believe it violates the inspection manual as adopted

What inspectors generally CANNOT do (in Alberta)

They typically cannot fail a truck solely because:

- It has a DPF / DEF / EGR delete
- The ECU has been tuned or reflashed
- Emissions equipment is disabled electronically

Why:

1. Emissions checks are not part of Alberta's inspection scope
2. The PMVI, as applied in Alberta, does not require functional emissions testing

This is why many people say: "Emissions are 'omit' in Alberta inspections"—that reflects how the manuals are practically applied.

4) What this means in real-world inspections

Out-of-province inspections

- Still mainly safety-based
- A deleted truck may pass, unless the inspector interprets missing components as a failure item

CVIP (commercial trucks)

- More strict overall
- But still focused on safety, not emissions functionality

Roadside enforcement

- Enforcement officers may look for smoke / obvious tampering
- But identification of deletes is inconsistent and limited

SUMMARY

- Over 20% (and up to 38%) of heavy-duty trucks in Alberta show signs of tampering or malfunctioning emissions systems [theicct.org], [trueinitiative.org]
- This is largely because:
    - Inspection systems don't target deletes
    - Enforcement tools are weak or absent

So in Alberta today, a deleted truck may still pass inspection as long as it is mechanically safe and doesn't trigger a specific inspection failure item.

5.2 Suggestion #2

Approach the Original Equipment Manufacturers (OEMs) directly and have them enforce restrictions on deletions and tampering, and refuse to work with trucks that have had this work done. *Some OEMs are attempting to put these restrictions into place, but this isn't yet widespread.

BACKGROUND

OEMs already have several levers they can use—and expand—to discourage (or effectively prevent) emissions "deletions" and tampering. The key is combining technical controls, service policy, legal leverage, and ecosystem coordination rather than relying on any single tactic.

1) Refusal of Service Policies

OEMs can formalize policies that:

- Deny warranty coverage for any truck with altered emissions systems
- Refuse non-essential repairs until the truck is returned to compliance
- Require inspection checks (engine control module (ECM) scan, visual emissions audit) before performing work

Practical implementation

- Engine Control Module (ECM) flags for:
  - Diesel Particulate Filter (DPF) removal
  - Diesel Exhaust Fluid (DEF) system disabled
  - Non-OEM calibrations/tunes
- Dealer scan tools automatically detect "non-compliant state"
- Service advisor workflow blocks repair orders unless:
  - Truck is restored to OEM configuration
  - Customer signs compliance agreement

Impact

- Creates a strong deterrent:
  - No dealer support = reduced resale value
  - Harder to maintain fleet uptime
- Especially effective for large fleets (which depend on dealer networks)

2) Software Locks & Secure Electronic Control Unit (ECU) Architecture

OEMs can make tampering technically difficult:

Measures

- Encrypted ECUs & signed firmware

- Secure boot systems (only OEM-approved software runs)
- Backend authentication required for reprogramming
- Telematics validation (cloud checks against expected configurations)

Result

- Unauthorized "delete tunes" become harder to install and easier to detect remotely
- Independent tuners lose access to proprietary calibration pathways

3) Remote Monitoring & Compliance Verification

Connected trucks give OEMs visibility beyond the shop.

Techniques

- Telematics systems flag:
  - Missing emissions regen cycles
  - Implausible DEF consumption
  - Sensor bypass patterns
- Periodic "compliance health scores" assigned to vehicles
- Automated alerts:
  - To fleet managers
  - To dealers before service visits

Outcome

- Early detection
- Pressure applied before major servicing is needed

4) Parts & Service Dependency Strategy

OEMs can design trucks so that:

- Replacement parts require:
  - Electronic Control Unit (ECU) pairing
  - VIN-based authorization
- Key systems won't function correctly unless:
  - Emissions components are present and communicating

Example approach

- Dosing module, (diesel particulate filter) DPF sensors, or turbo calibration tied together
- If the emissions systems are missing:
  - Engine enters derate or restricted mode
  - Certain updates or features cannot be applied

5) Dealer Network Enforcement

Even if the OEM sets policy, dealer compliance is critical.

Actions OEMs can take:

- Audit dealers for:
  - Working on deleted trucks
  - Installing non-compliant parts
- Impose penalties:
  - Loss of franchise status
  - Reduced incentives or support
- Provide:
  - Clear inspection protocols
  - Required documentation for every service

6) Collaboration with Regulators

OEMs can align with regulators to strengthen enforcement:

- Share anonymized tampering trend data
- Support roadside or inspection audits
- Use compliance reporting to:
  - Validate warranty claims
  - Flag repeat offenders

Result

- Raises industry-wide risk for non-compliance
- Shifts the burden away from OEM alone

7) Incentives for Compliance

Pure enforcement can backfire. OEMs can also:

- Offer:
  - Discounted "restore-to-stock" programs
  - Trade-in incentives for compliant vehicles
- Provide:
  - Better reliability improvements in newer emissions systems
  - Training for operators to reduce frustration (a key driver of deletions)

8) Address the Root Cause

Many deletions happen because of:

- Downtime due to emissions faults
- Cost of repairs
- Perceived reliability issues

OEMs can reduce tampering by:

- Improving the durability of:
    - Diesel particulate filter (DPF) systems
    - Selective catalytic reduction (SCR)/ diesel exhaust fluid (DEF) components
- Reducing false fault triggers
- Simplifying maintenance procedures

SUMMARY

While refusing service is powerful, on its own, it has gaps:

- Independent shops may still work on deleted trucks
- Some operators accept the trade-off (especially in off-road or poorly regulated settings)
- Older trucks outside dealer networks are harder to control

That's why the most effective strategy for OEMs is layered: detection, denial of service, technical barriers, and incentives.

OEMs can significantly reduce truck deletions by refusing to work on tampered vehicles—but it's most effective when combined with:

- Secure electronic control unit (ECU) systems
- Mandatory compliance checks
- Dealer enforcement
- Telematics monitoring
- Economic incentives

When those systems work together, tampering becomes more difficult, easier to detect, and more expensive to live with, which is ultimately what changes behaviour at scale.

5.3 Suggestion #3

Implement a robust roadside emissions testing program provincially for Class 8 trucks.

BACKGROUND

Very few Canadian provinces actually do meaningful roadside emissions testing for Class 8 trucks today—and only Ontario has a robust, active program. Effectiveness is mixed: it can work if it's modern (on-board diagnostics + remote sensing), but older smoke/opacity approaches alone often miss tampering.

Alberta could implement a robust roadside emissions testing program for heavy-duty trucks by combining proven tools (used in Ontario, California, and Europe) into a layered, enforcement-plus-screening system. The key is to move from today's limited enforcement to a data-driven, high-throughput detection model focused on high emitters.

Alberta can build a highly effective roadside emissions program by combining remote sensing (mass detection), roadside inspections (targeted enforcement), and mandatory repair compliance—focusing specifically on high emitters and high-risk fleets.

Done correctly, this kind of system could:

- catch tampering in real-world conditions
- minimize burdens on compliant operators
- deliver large emissions reductions at relatively low cost

Focus on "high emitters" (not all trucks)

The most efficient programs target the worst-performing vehicles, not the entire fleet. Remote sensing can identify a smaller fraction of vehicles responsible for a larger percentage of emissions.

Set thresholds (e.g., top 5–10% highest emitters trigger enforcement). And use repeat measurements (require 2–3 high readings before action to reduce false positives).

Address compliance barriers

A program fails if it only enforces without enabling compliance. Alberta should include:

- Clear repair pathways
- Certified repair shops
- Guidance for operators

Optional (but effective):

- temporary incentives for:
    - DPF replacement
    - SCR repair

Key success factors

A robust Alberta program must:

- Be visible
  - Operators must believe “I can get caught anywhere”
- Be targeted
  - Focus on high emitters and high-risk fleets
- Be data-driven
  - Continuous measurement and adjustment
- Be coordinated
  - Align provincial enforcement, federal rules, and cross-border compliance

SUMMARY

The strategy of implementing robust roadside testing must be used alongside other strategies for a more far-reaching impact. There is not one single method that will catch all deleted and tampered vehicles; however, each approach offers its own unique benefits.

5.4 Suggestion #4

Conduct further research to identify specific years, makes and models that undergo the most deletions and tampering. Then, specific strategies could be implemented to target these vehicles.

BACKGROUND

There are certain makes, models and years of Class 8 trucks that undergo higher levels of tampering and deletions. We cannot definitively identify any of those specifically at this point (although we have gathered data that leads us to believe certain years of vehicles are much more prone to tampering), but this data would be beneficial to determine which strategies would best impact those specific vehicles.

A combination of data collection and further driver and mechanic interviews would allow us to collect the necessary data to identify the highest occurrence of "offenders".

SUMMARY

If we can identify those who are habitually deleting or tampering, it will allow us to develop specific strategies and target shops that work most with those vehicles. Certain model years may be more prone to certain failures for instance, and working to identify these vehicles will allow us to take a more targeted approach.

5.5 Suggestion #5

Permit certain exceptions/exemptions to the tampering and deletion regulations for specialized vehicles (such as fire trucks and cranes).

BACKGROUND

Certain specialized vehicles, such as fire trucks and cranes, could be exempt from the rules surrounding tampering and deletions if it makes sense and expands the lifespan of the vehicle. Compliance for some of these vehicles is extremely cost-prohibitive, and in certain instances, it would make sense to have them be exempt.

For instance, if a municipality has one fire truck and it would be cost-prohibitive for it to remain compliant, but the municipality faces a choice of either decommissioning the truck or purchasing a new one (both options would prevent the municipality from having an operational fire truck until the funds can be raised to repair or replace the vehicle). Situations such as these indicate that there are certain instances where exemptions could be made to accommodate those specific circumstances.

SUMMARY

While it is crucial that vehicles comply with regulations set out for them regarding emissions-reduction, it is also important to understand which situations should serve as an exception to the rule. Certain vehicles are in a unique situation where it would be a detriment to decommission them; however, their current standard of operation isn't sufficient given the circumstances.

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