

Workgroup Discussion Paper:
Heavy-Duty Vehicle Inspection and Maintenance

BACKGROUND

In California, heavy-duty diesel vehicles with a gross vehicle weight rating over 14,000 pounds represent one of the largest sources of air pollution in California. 2019 estimates indicate that these vehicles contribute approximately 58 percent of the statewide on-road mobile source oxides of nitrogen (NOx) emissions and about 82 percent of the statewide on-road mobile source particulate matter (PM 2.5) emissions¹. Even with modern emissions controls and on-board diagnostics (OBD) monitoring systems, heavy-duty diesel vehicles are responsible for the majority of on-road mobile source emissions due, in part, to broken emissions-related components. Currently, there is no smog check-type program for heavy-duty vehicles to ensure their emissions control systems are functioning properly and repaired in a timely manner.

CARB's existing heavy-duty inspection programs rely on random field inspections by CARB staff and annual self-inspections by truck owners to test for smoke opacity levels. However, these programs do not ensure that vehicle owners are regularly inspecting and repairing their vehicles' broken emissions controls. A well-designed heavy-duty vehicle inspection and maintenance (HD I/M) program that creates minimal operational disruption for owners could help ensure that vehicles' emissions control systems are operating as designed to meet California's public health protection goals. As an ancillary benefit, keeping vehicles tuned up and properly maintained may result in better fuel economy and less operational downtime.

Through this HD I/M Workgroup, CARB staff is seeking input on a comprehensive strategy for implementing a cost effective and feasible HD I/M program. Such a program could be designed to incentivize vehicle owner and driver behavior that will ensure that heavy-duty vehicles are well maintained and properly repaired. A well-designed program will also protect consumers against inadequate repairs, include mechanisms to measure program performance and effectiveness, and possibly offer compliance assistance.

The Workgroup will discuss potential concepts for a program that ensures heavy-duty vehicles are inspected and maintained. Discussion topics could include, among other things:

- How fleets use OBD data;
- Exhaust aftertreatment (selective catalytic reduction systems, diesel particulate filters) repair durability;

¹ CARB's on-road motor vehicle emissions inventory model, EMFAC2017, for calendar year 2019. <https://www.arb.ca.gov/msei/categories.htm#emfac2017>.

- The use of remote sensing and plume capture technology to identify high emitters and validate program effectiveness;
- Methods to enforce the program for in-state and out-of-state vehicles;
- OBD data submission security and fraud prevention strategies;
- Remote OBD data submission methods;
- Testing methods for non-OBD heavy-duty vehicles;
- Repair technician training/licensing; and
- Preventive maintenance, and fleet education and training.

PROGRAM DESIGN CONSIDERATIONS

KEEPING TRUCKS REPAIRED

- *Preventive Maintenance:* Making training available to vehicle owners and operators on the value and importance of preventive maintenance would encourage owners to keep vehicles repaired. Preventive maintenance can reduce unexpected downtime and other repair costs.
- *Testing:* There are many ways to check to ensure a truck is properly inspected, maintained, and repaired, ranging from physical inspections to emissions testing.
 - For 2013 and newer trucks, this might be done through on-board diagnostics, which could be submitted periodically.
 - Data submittals could be done through telematics providers, third-party testers, or fleets; using a variety of methods, such as telematics, dongles, kiosks, repair facilities, and/or third party mobile inspectors.
 - Fraud prevention and detection will be important to ensure program effectiveness.
 - Alternative inspection methods could be developed for non-OBD equipped vehicles. The inspection methods could be new, or the existing SAE J1667 smoke opacity test protocol.
- *Repair:* Vehicles with broken emissions-related components would need to be repaired in a timely manner.
 - The program should limit vehicle operation until emissions-related repairs are completed.
 - The program should encourage durable and timely repairs to help trucks remain in revenue service with minimal downtime and to reduce harmful emissions.

- This could include encouraging or requiring training for repair technicians, and/or information sharing to ensure technicians have the information necessary to accurately diagnose and repair broken heavy-duty vehicle emissions control components.
- *Compliance Assistance:* A compliance assistance program could help encourage program participation, especially among smaller fleets. Such a program might:
 - Encourage or incentivize participation in a telematics-based preventive maintenance program that helps minimize downtime and provide information to comply with OBD reporting requirements.
 - Establish a HD I/M repair assistance program for low-income vehicle owners who need financial assistance getting their vehicles inspected and repaired.

COMPLIANCE DEMONSTRATION

- This program would apply to all trucks operating in California, and should be designed in a way that is enforceable and encourages compliance.
- Compliance might be demonstrated by registering and/or reporting information to CARB through a variety of methods.
 - These requirements should be as unobtrusive as possible.
 - Registration could be blocked for California trucks that are not registered in the program.
- Out-of-state trucks make up approximately two-thirds of the heavy-duty trucks on the road every year in California.
 - The program should be designed to ensure that out-of-state vehicles have adequate methods to demonstrate compliance with program requirements.
- To level the playing field, the program must include enforcement strategies for all vehicles operating in California.

PROGRAM IMPLEMENTATION AND ENFORCEMENT

- The program should have a mechanism for tracking program performance.
 - OBD data can be a powerful tool.
 - If provided through telematics, OBD data can assess the frequency of OBD fault codes. The frequency of fault code triggers might decrease over time.
 - If provided regularly, OBD data can be used to monitor the frequency of OBD test failures and can help detect patterns of failure. This can lead to better repair strategies overall and could lead to manufacturer recalls in some instances.

- Remote sensing and/or plume capture technologies can be used to screen for potential high emitters between periodic OBD data inspection cycles.
 - Systems could be strategically deployed in disadvantaged communities, along high-volume trucking routes, and in known traffic corridors where out-of-state vehicles frequently travel.
 - Data could be used to target high emitters for enforcement.
- The program should have a funding source to ensure resources are available for implementation and enforcement.

SUMMARY

A program is needed to ensure trucks are properly maintained in order to minimize air pollutant emissions during operation. A well-designed HD I/M program that creates minimal operational disruption for owners could help ensure that vehicles' emissions control systems are operating as designed to meet California's public health protection goals. CARB staff is seeking input on a comprehensive strategy for implementing a cost effective and feasible HD I/M program. A well- designed program will also protect consumers against inadequate repairs, include mechanisms to measure program performance and effectiveness, and possibly offer compliance assistance.