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FREE GUIDE
PASS THE TEST
THE FIRST TIME
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INTRODUCTION

Our goal is to help fleet owners comply with the Periodic Smoke Inspection Program (PSIP). This guide will help outline some factors that affect the results of the smoke opacity test.

VEHICLE PREPARATION

Ensuring that the tested vehicle is in good operating condition will affect the results of the smoke test.

To ensure good operating condition:

• Maintain your vehicles in accordance with manufacturers recommended maintenance schedules and repair procedures.
• Don't tamper with fuel settings
• Use only replacement parts, which meet manufacturer's specifications.

The following items are some of the common causes of high smoke levels in diesel vehicles:

• Not properly adjusted/ No air pressure (Cummins)
• Not properly adjusted AFRC (CAT/Navistar)
• Not properly adjusted fuel rack (DDC and others)
• Defective or Not properly adjusted puff limiter (Mack)
• Defective AFC plunger bellows (Cummins)
• Defective or Not properly adjusted throttle delay (DDC)
• Restricted air filter
• Not properly adjusted injection timing
• Clogged, worn or mismatched injectors or nozzles
• Not properly adjusted or defective fuel injection pump
• Worn or incorrect fuel injector rocker arms and linkage parts
• Not properly adjusted valve lash
• Defective or Not properly adjusted governor
• Low air box pressure
• Air manifold leaks
• Malfunctioning turbo and after coolers
• Poor fuel quality
• Improper driving gear

**If you’re still trouble shooting to find the cause of excessive smoke, here is some more specific diagnostic information.**
**WHITE SMOKE**

White exhaust smoke consists of a larger number of particles of fuel oil larger than 1.0 microns in diameter. This indicates that the “fuel is not burning.”

**POSSIBLE CAUSE OF WHITE SMOKE**

- Faulty ignition pump
- Too high injection pressure or faulty injection
- Improper grade or delivery of fuel
- Incorrect engine value timing
- Engine overheating or too cold.
- Coolant entering combustion chamber
- Water in fuel
- High exhaust back pressure

**POSSIBLE REMEDY**

- Set injection timing
- Check emission system operation
- Check fuel injection pump calibration
- Check injection nozzles
- Check fuel being used
- Check engine valve timing
- Check cooling system for overheating
- Check head gasket leakage
- Check exhaust back pressure
BLUE SMOKE
Blue smoke consists of a large number of fuel oil particles about .5 microns in
diameter or less. These particles are condensed droplets of unburned fuel or
incompletely burned fuel. This indicates that the engine burns excessive oil or
“lubricating oil” being burned.

POSSIBLE CAUSE

• Engine crankcase oil level too high
• Wrong grade or type of fuel
• Oil level in air cleaner too high
• Air cleaner oil too light in viscosity
• Worn piston rings, valve guides or cylinders
• Turbocharger or blower defective

POSSIBLE REMEDY

• Check oil in crankcase and air cleaner
• Try another grade of fuel
• Perform compression test
• Check rings or valve seals
• Check turbocharger or blower
• Using a Heavy Duty Oil Stabilizer
BLACK OR GREY SMOKE
Black or grey smoke consists of particles of carbon formed when fuel is heated in oxygen lean regions in the combustion chamber. Part of the fuel in the chamber is not being ignited or burned.

POSSIBLE CAUSE

- Faulty injection pump timing
- Injection pressure too high
- Faulty injection nozzles
- Clogged or damaged air intake filter
- Improper grade or delivery of fuel
- Incorrect engine valve timing
- Engine overheating
- High exhaust back pressure
- Poor cylinder compression

POSSIBLE REMEDY

- Set injection pump timing
- Check emission system operation
- Check fuel injection pump
- Check injection nozzles
- Check fuel being used
- Check engine valve timing
- Check cooling system for overheating
- Check air intake filter
- Check exhaust back pressure
- Check compression
**TESTING PROCEDURE**
Proper vehicle preparation and safety check will affect the results of the test. Improper set up will skew the results of the test and your vehicle may “fail” even though it is below the opacity threshold.

**SET UP OF VEHICLE**
- Transmission in Neutral
- Brakes Released and Wheels Chocked
- Vehicle A/C Off
- Engine Brake Off
- Any devices that affect normal acceleration turned off
- Proper governor speed limiting and engine soundness
- Check for exhaust leaks and exhaust smoke color

**WEATHER CONDITION**
Some of the items below can affect the results of the smoke test. They need to be accounted for during testing:
- Ambient Air Test Conditions
- Altitude above 1500 feet
- Air Temperature below 36 degrees of above 86 degrees
- Excessively windy conditions should be avoided
- Dry air density may affect smoke opacity
- Humidity, fog, rain, or snow may affect opacity

**SMOKE METER SET UP**
The smoke meter needs to be properly calibrated. Using the correct inputs for the specific vehicle is necessary for accurate results.
- Proper horsepower input
- Proper exhaust diameter input
- Properly calibrated smoke meter
- Smoke meter lenses clean
- Proper % opacity standard
PROPER TESTING PROCEDURE

- Engine at operating temperature
- Driver depresses throttle to full open as rapidly as possible
- Driver holds throttle open at max governed speed for 1-4 seconds
- Driver allows 5 to 45 seconds at low idle between snaps
- Cleanout snaps are performed

If you’re getting ready for your annual smoke test or your vehicles are not passing the smoke tests, use some of the trouble shooting ideas above.