

PERFORM PERIODIC MAINTENANCE OF AUTOMOTIVE ENGINE

After completing this module, you are expected to be capable of:

- Define the chemical composition of gasoline.
- Know the effects of gasoline volatility in automotive engines.
- Identify the fuel tank components and their functions.
- Implement safety precautions and proper cleaning process of fuel-injection system.
- Perform fuel tank servicing procedures.
- Determine engine oil level.
- Explain the maintenance of superchargers and turbochargers

Automotive Engine Fuels

For automobile engines, **Gasoline** is the most often utilized fuel. Hydrogen (H) and carbon (C) make up the majority of this hydrocarbon (HC).

The capacity of gasoline to prevent engine knocking is measured by its octane number or rating. Engine knocking is less probable if the octane grade is higher. Fuel pumps show the Antiknock Index (AKI), which is the average of the Motor Octane Number (MON) and the Research Octane Number (RON), which is computed as:

$$(R+M)/2$$

The volatility of gasoline, or its inclination to evaporate, influences how well it performs depending on particular events such as:

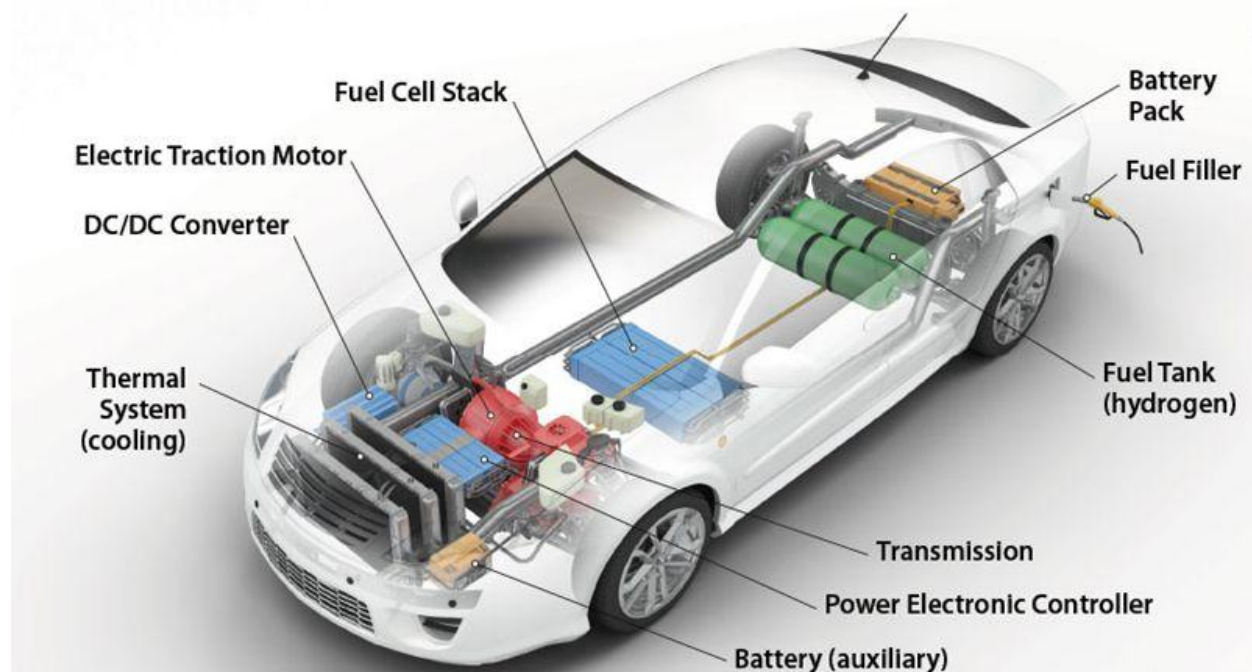
- Cold Starting and Warm-Up: If gasoline is struggling to vaporize, it may be tough to start and cause reluctance during warming up. Excessively volatile gasoline can result in vapor lock in hot temperatures, which reduces fuel flow and impairs performance.
- Altitude: Because gasoline vaporizes more readily at greater elevations, the elevation at which it gets sold determines its volatility.
- Crankcase Oil Dilution: Adequate vaporization keeps fuel from diluting crankcase oil, which could trigger sludge and lubrication.

Fuel-injection system safety precautions when servicing:

- Only disconnect parts of the fuel system once the pressure has been released.
- The ignition switch should never be turned on when the fuel system is off.
- Use only diagnostic tools that have been specifically approved by the car's maker.
- To avoid unintentional short circuits, frequently detach the negative cable first when removing the battery.
- To release static energy when working with electrical parts such as computers, modules, and computer chips, use a grounding strap.
- To reduce the chance of electric shock, inspect and verify that all high-voltage systems are switched off or isolated prior to testing or maintenance of the fuel system.

Through the circulation of a cleaning solution, injection cleaning systems efficiently eliminate deposits from the tips of fuel injectors. Pre-mixed, pressurized spray cans and self-mixed, self-pressurized tanks are only two examples of the several types of these systems. In systems with pressurized cans, the can is connected to the Schrader valve on the fuel rail, and the engine runs for around 20 minutes using the cleaning solution. It disables the fuel pump to avoid fuel interference. More sophisticated systems use electrically powered pumps and could need the cleaning solution to be manually mixed and pressurized. The engine is idled for a few minutes following the cleaning procedure in order to get rid of any remaining cleaner. It is crucial to remember that the computer system of the car can require some time to become used to the cleaned injectors, guaranteeing peak engine performance.

Fuel System's Components



Source: autoprotoway.com

Assuring a consistent supply of clean fuel to the engine is the primary goal of the fuel system, which promotes easy and successful operation, improves performance, and reduces emissions. To produce power, it moves and gathers fuel in the cylinder chamber, where it is combined with air, evaporated, and burnt. Together, the gasoline pump, injectors, filter, fuel lines, and hoses make up the system, which accomplishes its purpose. In this case, a malfunction in any part could result in a negative impact on the vehicle's entire functioning.

Fuel Tank

The fuel tank holds gasoline until the engine needs it. Frequently equipped with a filler neck for refilling and including a gasoline pump and level sensor, it is made for handling the weight of the fuel and the exertions of driving.

Fuel Injector

These devices inject high-pressure fuel into the combustion chamber of the engine, while controlling circulation to guarantee adequate air-fuel mixture for combustion. To avoid fuel overflow or underflow, each fuel injector is carefully regulated.

Fuel Pump

The fuel pump ensures a steady flow of gasoline by moving it from the tank to the engine at the proper pressure. To produce the required pressure to deliver, it is mechanically pushed by this device.

Fuel Filter

The fuel filter keeps contaminants like rust, dirt, and debris out of the engine, offering clean fuel for optimum performance. Fuel flow restriction and engine performance could come from a blocked filter.

Fuel lines and hoses

Fuel lines and hoses are composed of sturdy materials that are capable of supporting high-pressure and corrosive fuel when transporting gasoline from the tank to the engine. They allow for vibrations and engine movement while maintaining a safe, leak-proof channel.

Fuel Pressure Regulator

This device keeps the fuel pressure in the fuel lines constant, ensuring an ongoing supply to the injectors. It aids in fuel efficiency optimization and air-fuel mixture regulation.

Some usual indicators of fuel tank necessitate cleaning:

- Engine Performance Problems: Fuel impurities can cause challenges starting the engine, poor idling or misfires, reduced power and acceleration, and increased consumption of fuel.

- **Fuel Filter Clogging:** Frequently occurring blockages might be caused due to an overflowing fuel tank. If blocked filters are routinely replaced without treating the underlying reason, escalated issues may arise.
- **Visible Fuel Tank Sludge:** This mixture of rust, dirt, and other impurities can constrict fuel circulation and harm injectors and the fuel pump.
- **Abnormal Noises from the Fuel Tank:** The fuel pump may be having trouble drawing fuel through sludge and debris, which is why pounding or whining sounds from the fuel tank could be an indication of impurities.
- **Fuel contamination:** can result in costly repairs due to deterioration and harm to the fuel system caused by contaminants in the fuel.
- **Reduced Fuel Productivity:** Pollutants can obstruct fuel delivery and create blockages, which makes the engine work more tirelessly and use more gasoline.

Fuel Tank Service

Drain the gasoline tank after releasing the pressure in the fuel system and disconnecting the negative battery connector. Lift the car and employ compressed air to clean the electrical connections and fuel line fittings. After disconnecting the ground wire and wiring harness for the fuel tank, unplug the fuel lines following the instructions provided by the manufacturer. Detach and clean the vent pipe and filler hoses, remove the filler from the tank, and take off the bolts that secure the straps of the fuel tank. Finally, carefully lower the tank, making sure that all cables and tubes are disconnected. Watch out for any leftover fuel.



Engine Oil Level Analysis

1. To obtain an accurate oil level reading, make sure your car is parked on an even surface.

2. The dipstick can usually be found by opening the bonnet. Consult your user handbook if you are unclear about its location. Keep in mind that some modern automobiles have no traditional dipsticks but rather electronic oil monitors.
3. To clean the dipstick, take it off and use a towel to wipe out the oil. Two markings show the lowest and highest oil levels.
4. Verify the oil level by completely bringing back the dipstick and then taking it out again. You are in good condition if the oil is between the markings. Think about adding oil if it is less than halfway done. It is necessary to add oil if it is less than the minimum.
5. If you need to fill off car's oil supply, be sure you're using the right kind. Find and remove the oil cap, then gradually add oil, using the dipstick to check the level to prevent overfilling.
6. Reattach the dipstick and cap, wipe up any spills, and then close the hood.

Superchargers Maintenance

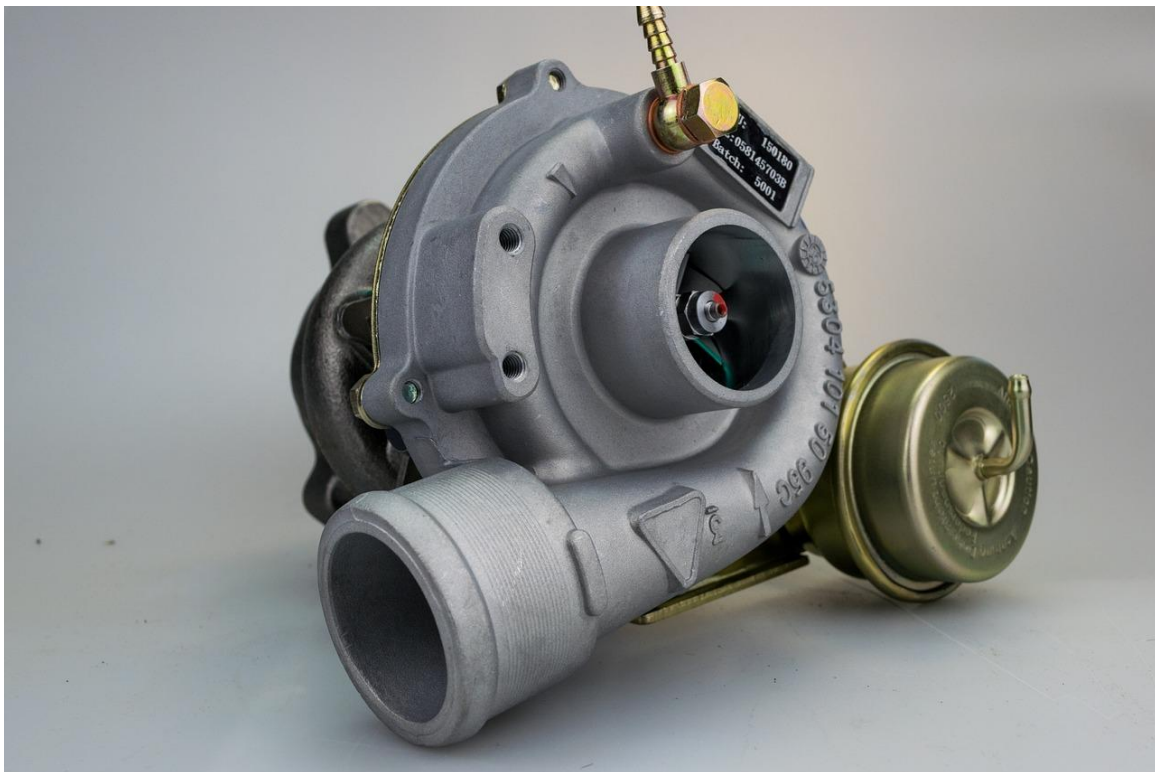


A device where air intake pressure is raised above normal range is called a **supercharger**. Superchargers are mechanically driven by a belt or chain that is attached to the engine's crankshaft. It is another term for a blower.

Maintaining the condition of a supercharger is simple and takes little effort. Note that the supercharger has its own oil supply, which often doesn't need to be changed. Check and replenish with the recommended oil if necessary. Otherwise, follow the vehicle's maintenance plan for engine oil and filter changes. The drive belt should be inspected often and replaced or adjusted as needed. Make sure the intake system is free of contaminants, the air filter is changed as needed, and all clamps and connections are tight to prevent vacuum and pressure leaks. In port-injected engines, vacuum leaks can result in lean situations, stalling, or rough idling while troubleshooting, frequently setting off ECM fault codes. Conversely, a whistling sound and poor engine performance might be caused by pressure leaks.

Because only cold intake air passes through superchargers, the bearings and seals last longer and usually don't need any regular maintenance. Because of the relatively modest working speeds of the rotors, bearing lubrication is rarely a problem. Superchargers that require repair are often replaced as a whole, either with a new or refurbished unit.

Turbocharger Maintenance



Unlike superchargers, the turbochargers use exhaust gasses to power a turbine. Numerous problems could occur in turbocharger. One problem is the low boost, and each must be fixed differently. Finding and repairing the leak or replacing any damaged parts can solve the usual source of an air leak in parts such the intercooler, flanges, ducts,

supercharger housing, or supercharger outlet. Low boost can also result from system contaminants or blockages, which should be removed to return the system to normal operation. When the supercharger is not running, it's crucial to ensure the pulley is firmly fastened to the shaft, evaluate the drive belt for appropriate tension and state, and look for defects in the connection. Low boost can also result from a defective bypass that isn't closing correctly; to fix this problem, it is important to examine how the bypass actuator works, adjust the stop as necessary and ensure the vacuum hose is installed correctly and in good condition. The supercharger's clearances and pulley diameter must be checked to make sure they fit specifications given that worn or contaminated parts can trigger inadequate flow from the supercharger.

Excessive flow is usually the source of high boost; this can be fixed by looking for exhaust limits or damage, examining the catalyst for any flaws, and making sure the pulley diameter is appropriate. It could indicate a sign that the bypass fails to open correctly if the car responds too sensitively and uses less gasoline. examine the bypass actuator's operation, search for a blocked or jammed bypass valve, confirm the vacuum hose's installation and condition, and examine the actuator diaphragm for leakage or breakage in order to fix this.

Mechanical deterioration is typically the cause of a loud supercharger, necessitating its replacement. Air leaks are frequently the noise source in air handling systems, but they could be prevented by ensuring all flanges are correctly installed and placed and that the various parts are sufficiently insulated. Finally, leaky seals, a loose fill plug, or damage to the input shaft at the seal could be the cause of oil on the supercharger's exterior. If seals or the input shaft have ruptured, replace the supercharger; otherwise, tighten the fill plug.

Wrap Up

A car's fuel system has to be maintained for stable function and long-term durability. The most widely used fuel, gasoline, is designed to avoid engine knocking and to adjust to different circumstances, such as cold starts or high altitudes. Maintaining fuel injectors, pumps, filters, and lines on a regular basis guarantees that the engine runs smoothly, absorbs clean fuel, and produces less pollutants.

Superchargers and turbochargers are performance-enhancing devices that must be properly maintained to avoid problems like leaks or mechanical wear. Maintaining these systems in top working order requires routine inspections, the use of the proper instruments, and adherence to manufacturer instructions.

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