Why Does Your GMC ~~Corvette~~ Smell Like Gas?

A look at the enigmatic Evaporative Emission Control System…

Does your garage reek of gasoline fumes? Seldom-noticed parts in your GMC ~~Corvette~~ make your garage smell better and make the air cleaner. The Evaporation Emission Control system, EVAP or EEC, also called Evaporation Control System, ECS, became a part of many car's inner workings in 1970. It is one of the most benign pollution control systems with a relatively low cost and with no impact on performance. EVAP hasn't gotten the attention or respect it deserves. We will help correct that problem with a look at this little-understood system.

What is an Evaporation Emission Control System (EVAP)?

An Evaporative Emission Control System (EVAP) is used to prevent gasoline vapors from escaping into the atmosphere from the fuel tank and fuel system.

How does an Evaporation Emission Control System (EVAP) work?

Fumes from the gas tank go into a storage canister where activated carbon absorbs the fumes. When driving, a small amount of outside air is drawn through the canister. The air removes the stored gas fumes from the carbon, takes them into the intake manifold and from there they burn along with the main air-fuel mixture. This makes your garage smell better and keeps the air cleaner. The EVAP system is fairly simple and its parts are relatively inexpensive.

The Three Essential Parts of an EVAP System

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  - **EVAP Canister.** The heart of the EVAP system is a canister filled with activated carbon. The carbon absorbs gas fumes from the tank and stores them until being released and drawn into the intake to burn with the engine's air-fuel mixture. Early canisters had an external valve on top.

- **Carbon.** The carbon inside the EVAP system's canister stays effective for many years. With early EVAP canisters, the carbon can be removed and replaced. A common source of activated carbon is aquarium supply stores for their filters.

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    - **EVAP Filter.** A virtually unknown filter is under the lower cover and cleans the air going into early EVAP canisters. The factory service manual says to change the filter at least every 24 months or 24,000 miles. I’ve never seen or heard of one being replaced but they are available.

The History of EVAP Systems: Smog Control

In the early seventies, the smog control devices added to cars were scorned by most performance enthusiasts. People in rural environments wondered what the fuss was all about, unless they flew into LA and saw the fiendish looking brownish cloud blanketing the valley. In this era it was quite common for owners to remove the Air Injector Reactor (AIR) pump and its tubing, Exhaust Gas Recirculation (EGR) valve if the intake manifold was changed, and the catalytic converter after its debut in 1975. Swept away in this rush to restore performance often were the EVAP canister and its hoses. Only the Positive Crankcase Ventilation (PCV) valve was usually untouched.

Hydrocarbon emissions are a principal cause of smog. Prior to the sixties, fumes from the interior of the engine, which are heavily laden with hydrocarbons, were fully vented to the atmosphere by a large road-draft tube and a vented breather cap. These hydrocarbons came from gases blowing by the rings and valve guides and the hot engine oil being whipped up by rotating components. The PCV system allowed these fumes to be drawn into the intake manifold to be burned.

Introducing the Evaporation Emission Control System

EVAP did the same for the gas fumes from the gas tank. In prior years, gas tank fumes were allowed to escape into the atmosphere. This was the era of the fully vented gas caps. The EVAP system's function was and still is admirable. It keeps these completely unburned hydrocarbons out of the atmosphere. A little gas evaporating now and then might seem like a minor issue but it's not.

When a fuel tank is not sealed, fumes escape twenty four-seven, even when the car is parked. This alone can contribute as much as twenty percent of a vehicle's total pollution. It's been widely reported that Sun Oil Company research showed that a vehicle with a fully vented, missing or inoperative fuel cap allows 22 gallons of gasoline to evaporate over the period of one year. Note that these fumes are completely unburned hydrocarbons so they are much worse for smog than the almost completely

burned hydrocarbons emitted from the exhaust of a modern automobile. That's why modern cars produce an error code if the gas cap is not properly sealed.

Understanding Corvette Evaporation Emission Control Systems (EVAP)

The History

For the first few years, Corvette EVAP canisters employed a valve on top that opens when the engine is running above idle to allow manifold vacuum to draw air through the canister. At idle, the valve is closed so that the extra air and vapors don't upset the idle mixture. At higher rpm's more air is going through the motor and the EVAP has little effect on the mixture. The manifold vacuum supplied to the canister on the early systems comes from a hose that runs to the T connector at the PCV valve. The canister valve is controlled by the level of vacuum it receives from the small hose that goes to the timed port on the carburetor.

Other canister components include its activated carbon and, on the first systems, a filter at the bottom to keep dirt and debris from getting into the carbon. The carbon works effectively for many years, but it also can be replaced on the early canisters. The third hose goes from the canister to the steel tubing, which runs along the left side of the frame rearward to the gas tank.

The Evolution of the Corvette EVAP System

At the gas tank on 1970 – 1974 Corvette EVAP systems, a fuel separator valve is bolted onto a bracket near the top of the tank's left side. A 3/8-inch hose on the bottom of this valve connects to a vent tube on the top of the tank and a 1/4-inch hose at the top connects to the steel tubing. The fuel separator valve has a float inside that closes the valve when gas floods the valve. This can happen from fuel sloshing in the tank or if the car was parked on an extreme angle. The valve prevents liquid fuel from entering the tubing and overwhelming the storage value of the canister.

A new type of gas cap was introduced for the EVAP system. It's stamped "SEALED" on early models and it seals the inlet, except in the unlikely case when it can vent if the pressure in the tank gets high enough. The only time high pressure will occur is if a blockage occurs in the EVAP system.

When to Check Your Corvette's EVAP System

If your Corvette has seen many seasons or gone many miles, it's worth checking the EVAP system to make sure it's working properly. The components of the system are hidden from view but it performs an admirable service. And it does so reliably, at a low cost and with no drag on performance or fuel mileage.

9 Components to Check When Inspecting Your Corvette's EVAP System

1. **Canisters** are still available for mid-seventies EVAP systems. Corvette Central lists this canister for all 1974 to 1977 models (#353017). By then the EVAP system dispensed with the

vacuum valve on

top.

2. A **fuel vapor separator valve** (#353162) mounts on the side of the gas tank at the top on most 1970-1974 Corvettes. The good news is that new ones are available. The bad news is

that it’s a chore to access for inspection or replacement.

- To test the valve, blow air through either port. The valve is open and air should flow freely through both ports when in its normal position as mounted on the tank. When positioned up-side-down as shown, the valve should close and permit no airflow through the

ports.

3. **Gas caps** changed to non-vented on EVAP equipped cars. In the early seventies, the caps were stamped “SEALED.” The cap’s gold dichromate coating is fragile. Replacing an old tarnished cap with new is an inexpensive way to brighten up those gas station stops.
4. The **hoses** in the EVAP system (#353252) should be labeled “FUEL VAPOR” or “PCV/EEC.” It takes a tougher rubber to handle fuel vapors than that designed to handle just gas, oil or coolant.
5. **EVAP hoses with clamps** (#353252 and #353254) are available for connecting the vapor line on the frame to the canister and at the other end for connecting to the fuel separator valve.
    - Decades of exposure to engine compartment heat and fumes take a toll on the rubber hoses of the EVAP system. Tip: use a razor blade or utility knife to cut an axial slit in the hardened hoses. That can prevent breaking the plastic nipples on the vapor separator valve or PVC T

fitting.

6. Air is drawn through the canister into the intake manifold via the T fitting at the PCV valve. **The PCV valve** serves the same function as the EVAP system by preventing hydrocarbons from venting to the atmosphere. Check these hoses and their connections. Engine compartment heat and fuel vapors can harden and crack the rubber causing vacuum leaks.
7. Also inspect the **rubber grommets** that seal the PCV valve and the breather pipe to the valve covers. When these harden or crack, fumes can escape and dirt can get into the motor. On the right is a grommet for steel valve covers which has a narrower groove than grommets for aluminum covers.
8. When accessing the canister, it's a good idea to order new **seals for the splash shield**. This rubber is likely to be in sad shape too. Use weatherstrip adhesive to attach the rubber to the shields and, if originality is a concern, reinstall the factory seal staples. Black oxide-finished body bolts with captive washers are also available for the shield and canister bracket.