Filter Manufacturers Council

Technical Service Bulletin 94-2R1

Positive Crankcase Ventilation (PCV)

Positive Crankcase Ventilation is a system that was developed to remove harmful vapors from the engine and to prevent those vapors from being expelled into the atmosphere. The PCV system does this by using manifold vacuum to draw vapors from the crankcase into the intake manifold. Vapor is then carried with the fuel/air mixture into the combustion chambers where it is burned. The flow or circulation within the system is controlled by the PCV Valve. The PCV Valve is effective as both a crankcase ventilation system and as a pollution control device.

PCV systems have been standard equipment on all new cars since the early sixties. Prior to 1963 PCV was only used in California. There are a variety of PCV systems used on various makes and models of cars produced since 1963, but all function essentially the same.

PCV systems can be described as either open or closed. The two systems are quite similar. However, the closed system in use since 1968 is more effective at air pollution control. The systems differ in the manner in which fresh air enters the crankcase and excessive vapor is expelled.

Open PCV Systems
The open system draws fresh air though a vented oil filler cap. This presents no problem as long as the vapor volume is minimal. However, when the crankcase vapor becomes excessive it is forced back through the vented oil filler cap and into the open atmosphere. The open PCV system, though successful at removing contaminated vapors from the crankcase, is not completely effective as a pollution control device.

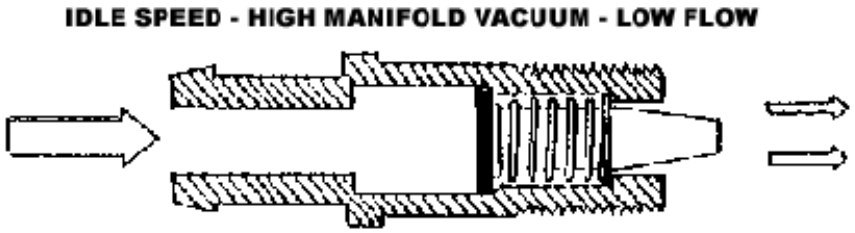
Closed PCV Systems
The closed PCV system draws fresh air from the air filter housing. The oil filler cap in this system is NOT vented. Consequently, excess vapor will be carried back to the air filter housing and from there into the intake manifold. The closed system prevents vapor, whether normal or excessive, from reaching the open atmosphere. The closed system is very effective as an air pollution control device.

The PCV Valve
The most critical part in the PCV system is the flow control valve, commonly referred to as the PCV valve. The purpose of the PCV valve is to meter the flow of the vapor from the crankcase to the intake manifold. This is necessary in order

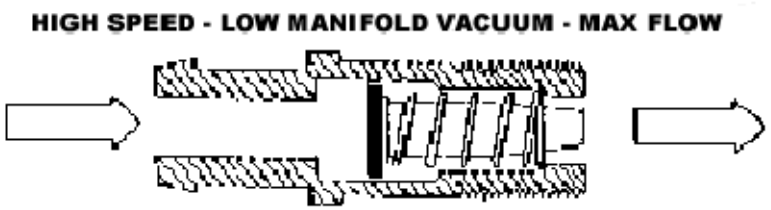
to provide proper ventilation for the crankcase, while not upsetting the fuel/air mixture for combustion.

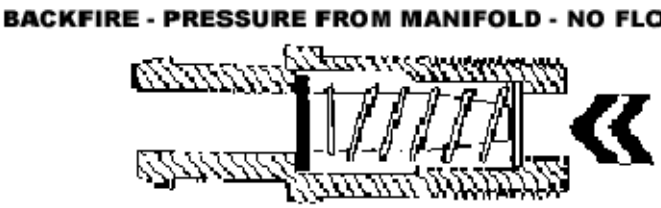
Blow-by gases and vapor should be removed at about the same rate they enter the crankcase. Since blow-by is minimal at idle and increases during high speed operation, the PCV valve must control the flow of vapor accordingly. The PCV valve is designed to compensate for the engine ventilation needs at varying engine speeds. It is operated by manifold vacuum which increases or decreases as engine speeds change.

For example, at low or idle engine speeds manifold vacuum is high. This pulls the plunger to the extreme forward position, or manifold end of the valve. Due to the shape of the plunger, vapor flow is reduced to a minimum. The low rate of the flow is adequate for ventilation purposes and will not upset the fuel/air mixture ratio.



At high speeds manifold vacuum is decreased. The plunger is only drawn to a point about midway in the housing. This allows a maximum flow of vapor. Since the engine needs more fuel/air mixture at high speeds, the introduction of more vapor does not affect performance. In the event of a backfire, pressure from the intake manifold forces the plunger to the closed or engine-off position. This prevents the backfire flame from reaching the crankcase and exploding the combustible vapor.





A neglected PCV system will soon fail to function and the result can be expensive as well as troublesome for the car owner. If the crankcase is not adequately ventilated, the motor oil will quickly become contaminated and heavy sludge accumulations will begin to form. Internal parts, not protected by the motor oil, will begin to rust and/or corrode due to the water and acids that will become trapped within the crankcase. If the PCV system is not functioning properly, the flow of crankcase vapor into the intake manifold will not be properly metered.

This, in turn, will upset the fuel/air mixture for combustion and cause rough idling or even stalling of the engine. Furthermore, intake and exhaust valves, in addition to spark plugs, may well be burned and rendered useless, prematurely affecting performance and requiring expensive repairs. To assure trouble-free performance of the PCV system and, in turn, the engine and vehicle, routine maintenance of the PCV system is absolutely recommended and required.

A PCV valve should never be cleaned and placed back into service. Cleaning a PCV valve will result in a clean PCV valve; not a new PCV valve. There are contaminants that will remain in the PCV valve that can never be flushed out. Additionally, there is an amount of wear that will be experienced by the spring that cleaning cannot replace. The recommended replacement intervals are a maximum of 12 months or 10,000 miles (16,000 km). Since vehicles and operating conditions vary, the valve may have to be serviced more frequently. If it is suspected that the valve is sticking or if there is evidence of sludge, the valve should be replaced.

All hoses or tubes used in the PCV system should be cleaned and inspected. If any cracks or breaks are noticed in the hose, it should also be replaced. All hose connections should be inspected to assure an air-tight seal.

Proper servicing of the PCV valve system will help reduce overall vehicle emissions.

For additional information, contact:

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