

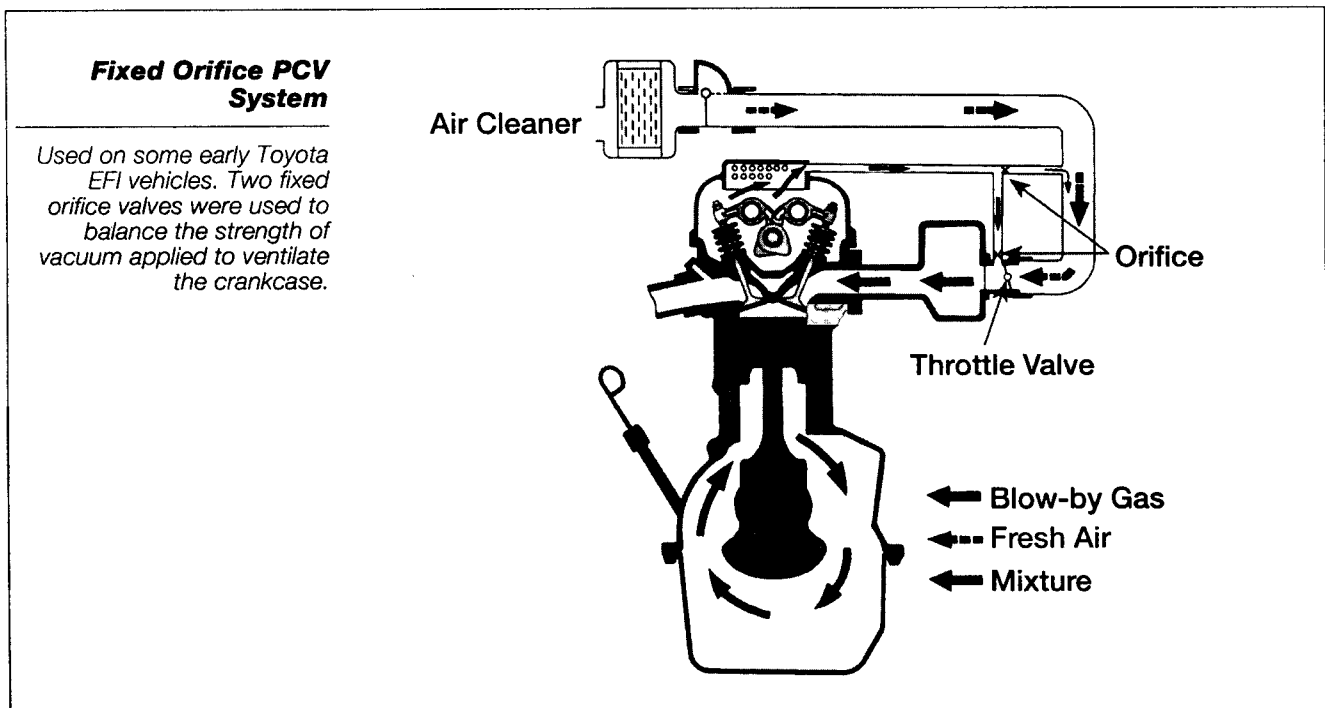
EMISSION SUB SYSTEMS - Positive Crankcase Ventilation System

Positive Crankcase Ventilation System

During normal compression stroke, a small amount of gases in the combustion chamber escapes past the piston. Approximately 70% of these "blowby" gases are unburned fuel (HC) that can dilute and contaminate the engine oil, cause corrosion to critical parts, and contribute to sludge build up. At higher engine speeds, blowby gases increase crankcase pressure that can cause oil leakage from sealed engine surfaces.

The purpose of the Positive Crankcase Ventilation (PCV) **system is to remove these harmful gases from the crankcase** before damage occurs and combine them with the engine's normal incoming air/fuel charge. Fuel injected Toyota vehicles use two different types of closed PCV systems to prevent the escape of crankcase vapors into the atmosphere:

- Fixed Orifice PCV System
- PCV System Using Variable Flow PCV Valve



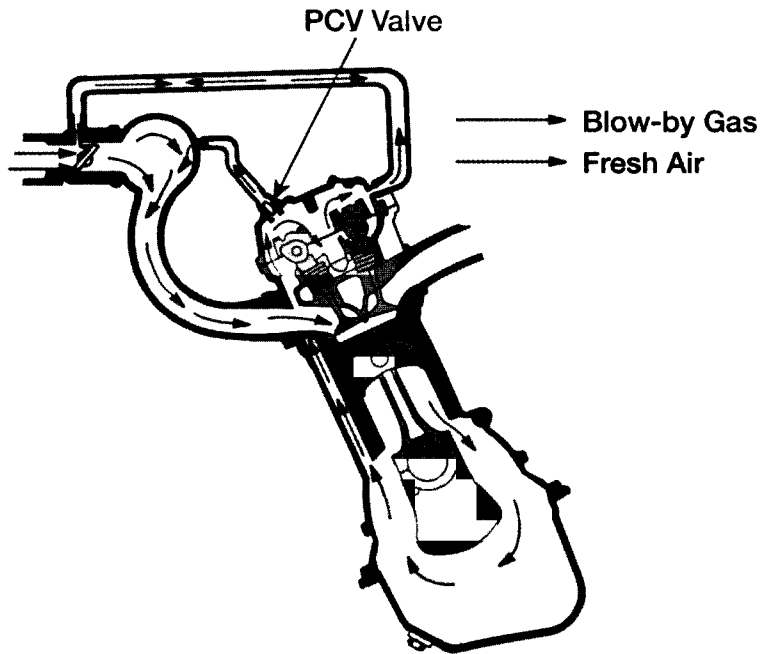
Fixed Orifice PCV System

On some early Toyota EFI vehicles, a fixed orifice PCV system is used to meter blowby from the crankcase into the intake manifold, where they would be consumed during normal engine operation. This system is simple in design and construction, and provides crankcase ventilation based on the size of the fixed orifice valves and the normal operating characteristics of intake manifold vacuum. The two fixed orifice valves are used to balance the strength of vacuum applied to the crankcase as engine operating conditions change. The biggest drawback of this type system is that blowby production does not always match intake manifold vacuum characteristics.

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PCV System (With PCV Valve)

Used on all current Toyota vehicles. A PCV valve is used to accurately regulate blowby flow back into the intake manifold.

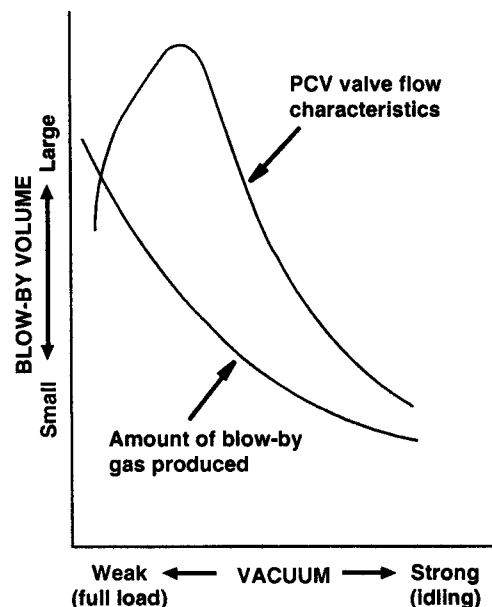


PCV System Using Variable-Flow PCV Valve

Unlike fixed orifice type systems, PCV systems that use a variable-flow PCV valve more accurately match ventilation flow with blowby production characteristics. By accurately matching these two factors, crankcase ventilation performance is optimized, while engine performance and driveability remains unaffected.

PCV Valve Flow Characteristics

As shown, the PCV valve flow characteristics closely match blowby production characteristics.



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PCV System Components

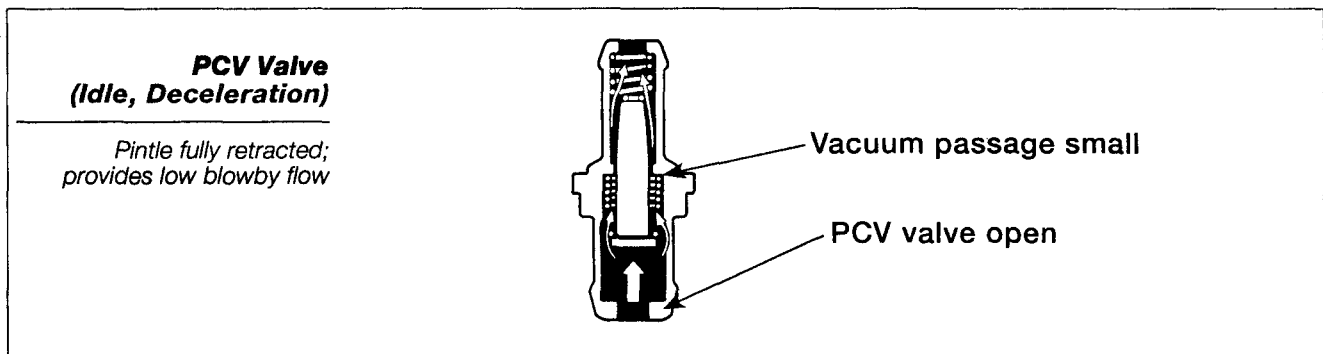
The variable-flow type PCV systems are also very simple in design and consists of the following components:

- PCV Valve
- PCV purge hose
- Breather hose

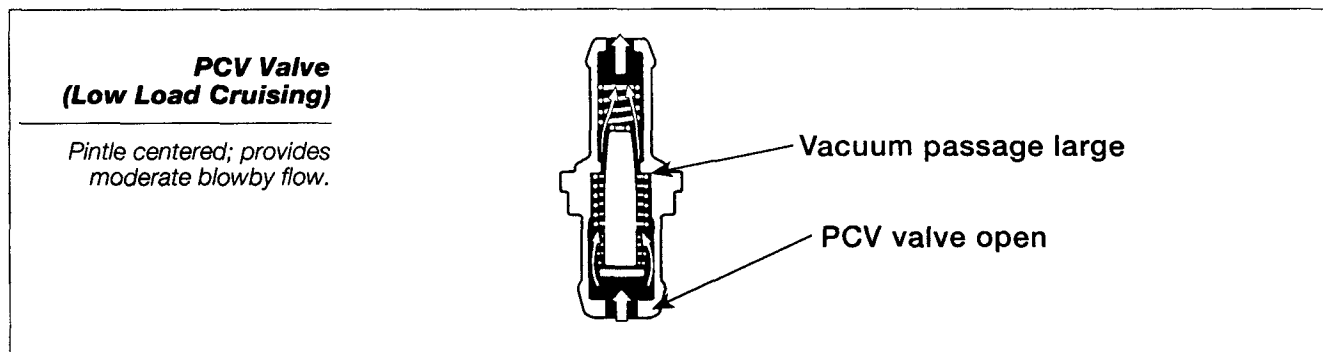
PCV System Operation

Like the previous system, this system also uses manifold vacuum to draw crankcase vapors back into the intake manifold. Typically, blowby production is the greatest during high load operations and very light during idle and light load operations. Since the characteristics of manifold vacuum do not match the flow requirements needed for proper crankcase ventilation, a PCV valve is used to regulate blowby flow back into the intake manifold.

- **During idle and deceleration**, blowby production is very low, but intake manifold vacuum is very high. This causes the pintle inside the PCV valve to fully retract against spring tension. The positioning of the pintle provides a small vacuum passage and allows for low blowby flow to the combustion chamber.

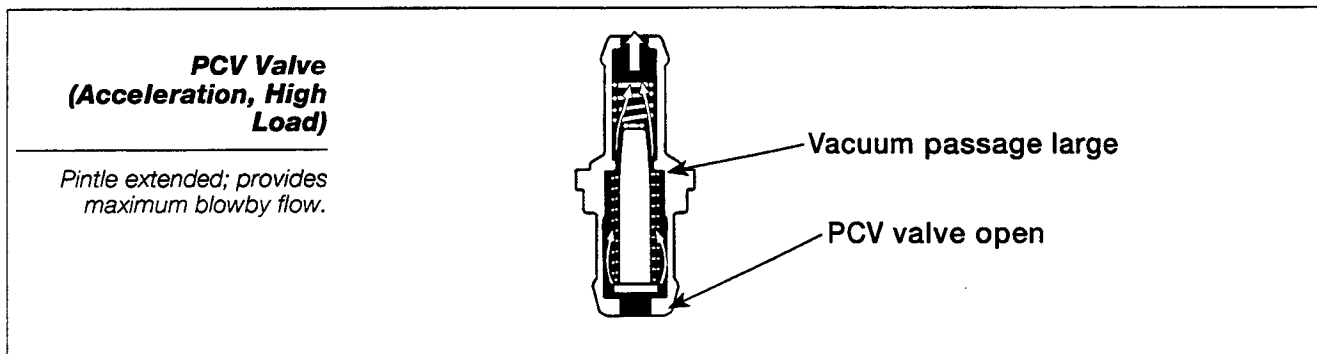


- **During low load cruising**, the pintle inside the PCV valve is positioned somewhat in the center of its travel. This positioning allows a moderate volume of blowby flow into the combustion chamber.

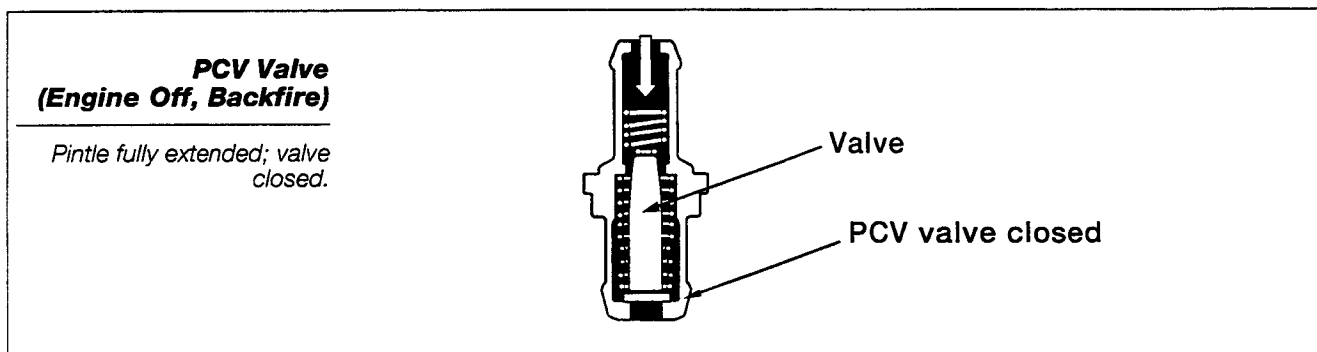


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- **During acceleration and high load operations**, blowby production is very high. The pintle extends out further from the restriction allowing the maximum flow of blowby into the combustion chamber. During extremely high engine loads, if blowby volume exceeds the ability of the PCV valve to draw in the vapors, the excess blowby flows through the breather hose to the air cleaner housing where it can enter the combustion chamber.



- **When the engine is off or it backfires**, spring tension closes the valve completely preventing the release of blowby into the intake manifold. The valve closes during a backfire to prevent the flame from traveling into the crankcase where it could ignite the enclosed fuel vapors.



PCV System Effects on Emissions and Driveability

Because PCV operation is factored into the proper operation of the feedback control system, problems with the PCV system may disrupt the normal air/ fuel ratio balance. A plugged PCV valve will prevent the normal flow of crankcase vapors into the engine and can result in a richer than normal air/fuel mixture. A plugged crankcase breather hose may cause the engine to consume oil because of the increased level of crankcase vacuum.

In addition, depending on the location of the fresh air breather hose, a nonfunctional valve or restricted vacuum hose can cause oil contamination in the air cleaner housing or throttle bore coking. Always suspect and check the PCV system if you find traces of oil in the air intake system.

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If the crankcase becomes diluted with fuel, carbon monoxide (CO) levels will likely increase because the PCV system will meter extra fuel vapor into the intake system. Always replace fuel diluted engine oil and identify and resolve the problem causing the fuel contaminated.

Although there are no mandatory maintenance intervals for the PCV system, periodically check the system for a plugged or gummed PCV valve and damaged hoses. Replace suspect components as necessary. Since PCV flow rates differ between vehicle models, it is important to use the correct replacement PCV valve to ensure proper operation. The installation of an incorrect valve may cause engine stalling, rough idle and other driveability complaints. Thus, never install universal type PCV valves!

PCV System Functional Tests

The following **RPM Drop Test** may be used as a basic quick check to confirm that the PCV system is functioning:

- Start the engine and allow it to reach operating temperature
- On TCCS equipped vehicles, connect TE to E1 at the diagnostic connector
- Allow the engine to stabilize at idle
- Pinch or block the hose between the PCV valve and vacuum source
- Typically, engine rpm should drop around 50 rpm. If engine rpm does not change, check the PCV valve and system hoses for blockage. Replace components as necessary and then retest the system.