PCV Bypass

Theres a right and a wrong way to bypass your PCV (Positive Crankcase Ventilation) system. Before we show you the how to, lets first understand the function of the PCV system. The PCV system is intended to relieve the crankcase of any positive pressure by allowing it to vent through the free flow of air, either into or out of the crankcase. Prior to advent of emissions, the crankcase was just vented through a breather on the valve covers or intake manifold to the environment. Emissions requirements necessitated a "cleaner" way to vent the crankcase to prevent the hot oil laden vapors from damaging air quality. That led to the inclusion of today's modern PCV systems. Current PCV systems are still pretty simple, consisting of an air inlet, a valve, and an outlet. The air inlet (the vent tube) supplies filtered and metered airflow into the crankcase. The PCV valve, which when opened by either internal intake manifold vacuum or positive crankcase pressure, vents into the intake manifold, allowing the now oil contaminated but otherwise filtered and metered crankcase ventilation airflow to be consumed by normal combustion processes.

Its important to note 2 significant issues:

1) The crankcase ventilation airflow is metered since the vent tube is located after the MAF. Because the airflow is metered, it must make it into the intake manifold to assure that the air/fuel ratio is correct. Therefore, if we bypass the PCV system, it must done in such way that no unmetered air can reach the intake manifold, for if it does, the air/fuel ratio will be adversely affected. Similarly, any metered airflow in the PCV system must make it all the way to the intake for the same reason. What this means is, if you bypass the PCV system, it must be bypassed completely, both the inlet and the outlet air transfer paths must be blocked. You just can't block off one and not the other.

2) The PCV valve is intended to be opened by intake manifold vacuum (negative pressure), but can also be opened by positive crankcase pressure. Therefore, whenever vacuum is present in the intake manifold, the crankcase pressure will vent into the manifold and the ventilation air is "drawn" into the intake manifold through the PCV valve all the way through the crankcase, vent tube, MAF, and air filter. Furthermore, when positive crankcase pressure is present, it will be vented through the PCV valve into the intake manifold. There's no problem at all under most circumstances, but there can be very significant issues in certain applications, especially if substantial cylinder blowby is present, if the PCV system is overly effective, or if supercharged.

Who needs to bypass the PCV system? In most applications, the PCV system works just fine, but certain hipo applications may run better with the PCV system bypassed, even though your car will no longer be emissions legal. In that case, the decision is yours, bypass the PCV or remain emissions legal? High compression engines setup with low tension oil control rings are a real good application for PCV bypass. Engines with poor ring seal and substantial blowby will also benefit because the incoming air charge will not be oil laden, which effectively lowers the octane of the air/fuel mixture and increases susceptibility to pre-ignition, detonation, etc. The 99-up models seem to have acute issues with overly effective PCV systems, just about every intake manifold we've seen has been thoroughly soaked with oil. In fact, Ford issued a service bulletin for valve cover replacement reportedly using revised baffling to minimize oil contamination of the air charge. However, we think that has been ineffective. More on that later.

OK, lets do it.

94-98 3.8L V6 Mustang using dual breathers: Remove the air inlet tube that runs from the convoluted intake tube to the driver's side valve cover. Plug or cap the hole left in the intake tube. Insert a small .75" K&N breather in the hole left in the valve cover. Remove the upper intake manifold, the PCV valve, and the line to the port underneath the plenum of the upper intake. Insert another small breather into the hole left in the passenger side valve cover by the removal of the PCV valve, and cap off the port in the intake manifold. Extend the evap cannister purge vent line past the solenoid to a tee that you'll instal into the primary vacuum line at the upper intake manifold. The PCV system is now completely removed and blocked off such that the air/fuel ratio is unaffected.

99-up 3.8L V6 Mustang using dual breathers: Remove the air inlet tube that runs from the convoluted intake

tube to the passenger side valve cover. Plug or cap the hole left in the intake tube. Insert a small breather into the hole in the valve cover. Remove the PCV valve and line from the driver's side valve cover. Cap the fitting in the upper intake manifold and insert another small breather into hole left in the valve cover. Extend the evap cannister purge vent line past the solenoid to a tee that you'll install into the primary vacuum line at the upper intake manifold.

94-up single breather: Remove the air inlet tube that runs from the convoluted intake tube to the valve cover vent. Plug or cap the hole left in the intake tube. Cut off the tube an inch or so from the plastic valve cover fitting, and cap off the valve cover fitting. Remove the oil filler cap and install a screw-on K&N breather. Disconnect the line running from the PCV valve to the intake manifold at the PCV valve. Cap the PCV valve outlet and plug the line. Leave the evap cannister purge line connected to the PCV valve line as it is.

You have a 99-up model with overly effective PCV system that contaminates the intake manifolds and impairs performance? If you intend to leave the PCV system intact, here's a potential quick fix that you may try. Remove the PCV valve cover. Enlarge the drain back hole in the baffle. Stuff the baffle with coarse stainless steel wool but don't pack it too tightly. The steel wool should help by "straining" the oil from the air flow.

Lets talk about supercharged or turbo applications. We think the dual vent system is the way to go in any high boost or blowby application because the general flow requirements through the PCV system are restricted by the small size of the lines and the small aperatures of the vent and PCV valve. This is especially critical on the 99-up models which already have PCV systems which may be seriously diluting the air/fuel octane with oil vapor.

A word of caution regarding the use of one-way valves in the PCV system of supercharged applications. We don't recommend it. Here's why. Lets say you have a problem with blowby that deposits oil into the compressor inlet from the vent line, pretty common problem. Stop and remember how and why the PCV system works. Engine vacuum (negative pressure) opens the PCV valve, and draws ventilation supply flow, i.e., metered air, through the engine and into the intake manifold. Now, in boosted applications, the intake manifold will be under vacuum only at very low rpms. Most of the time, the intake manifold will actually be under boost and therefore will be under positive pressure. Therein lies the problem. Even though the PCV will open under positive crankcase pressure, that positive pressure created in the crankcase by blowby is acting against a greater or equal positive pressure in the intake manifold. When both sides of the PCV valve are at the same pressure (pressure is acting on opposite sides of the diaphragm), there will be zero flow because the valve can't open. That means that you've now positively pressurized the crankcase by blowby. Now, the PCV system has to act in reverse. The flow and pressure will be vented the wrong way through the vent line over to the supercharger inlet. This is the point where one theory recommends the use of a one way valve. The theory is to orient the valve to only allow flow into the crankcase, but not out from the crankcase. While that might be acceptable on a really tight engine, the fact is that most supercharged engines run a fair amount of blowby. The problem is, with the one-way valve installed, there is no path to vent the blowby, which is going to pressurize the crankcase since there can now be no path to relieve the positive pressure except around seals and gaskets, which will cause them to leak. Also, remember that positive cranckase pressure also hurts performance.

The drawback to venting an engine's blowby is that the breathers will eventually become oily and start to drip. The answer is not pretty but it is effective. Periodically remove the breathers, wash them in solvent or K&N filter cleaner to remove the oil, reinstal them, and wipe off your valvecovers.