PCV Valve

With air/oil separator system for Ford four-cylinder engines 1928 – 1934

by Gary Bartman, October 2023

Synopsis:

PCV VALVE - HELPS KEEP OIL CLEAN

First, I suggest you read the articles on the Wagner website at https://mewagner.com/?p=444. Plus, there are a ton of technical articles available there. Specifically, go to: https://mewagner.com/?p=1130

This technical study shows the ineffectiveness of "stock pcv valves" and dress up pcv's with the Wagner being effective (crankcase under vacuum) 99% of the time. For general information about PCV valves and their properties, internet search: "PCV Valves", "Engine Blowby", etc. I am not an expert, only experienced. But I know where the experts are, and they are at Wagner.

It is important to understand the fundamentals of why an engine should have a PCV (Positive Crankcase Ventilation) valve. Keep in mind that for many years, hotrodders rejected the idea of PCV valves as potential horsepower robbers. That turns out to be only partially true in some racing. The benefits to engine life and the environment are huge relative to not using one.

SOME OF THE BENEFITS ARE LISTED AS:

- Reduced crankcase pressure means less oil seeps / seal failure.
- Reduced contamination of lube oil with blowby and raw fuel especially from cold start up. Fuel contamination reduces the oil's capacity to lubricate. You will be able to smell the difference in your oil after running.
- Reduced water vapor buildup means less corrosion. Water vapor comes from compression blowby mixing with the oil. Water is a byproduct of combustion and combustion gases contain a good deal of water. The result is water vapor in the engine which condenses and forms water droplets. I have seen it on the underside of valve covers on V8 engines. The PCV valve pulls the water vapor out *(check the corrosion on your 90-year-old distributor drive shaft?)*.
- Sulfuric acid forms from water in contact with oil and blowby gases *(there is sulfur in fuel and lube oil)*. The pH (acidity) of the water vapor varies from around 3 (very acidic) to around 6 (close to neutral) depending on the contact time of the vapor with sulfur. Rich running, cold engines increase the amount of water and contact time thereby making more acid.
- Extended oil life based on oil analysis. Concerns from various Model A forums addressed in this article: ? Too much vacuum will pull the oil mist from the valve chamber thus reducing valve stem lubrication.

CONCERNS FROM VARIOUS MODEL A FORUMS ADDRESSED IN THIS ARTICLE:

- Too much vacuum will pull the oil mist from the valve chamber thus reducing valve stem lubrication.
- Too much vacuum will cause seal failure.
- PCV system will draw lube oil into the intake manifold and foul plugs.
- PCV system will reduce performance by drawing much needed vacuum from the intake manifold.

SET UP:

Requirements:

1. Filtered air inlet on one side of the engine to allow fresh air to sweep through the crankcase and valve cover.

2. A vacuum source such as intake manifold or under carb plate or designated port on the carb. The evacuated blowby gases will enter the manifold at this port. Ideally, the evacuated blowby gases should be distributed evenly to each cylinder. No problem if you use the Model A intake vacuum port.

3. A location from which to evacuate the blowby gases on the opposite side of the engine from the fresh air source to provide air sweep through the entire engine.

4. Optional but preferred air/oil separator to remove liquid oil from the blowby gases to prevent entering the intake manifold.

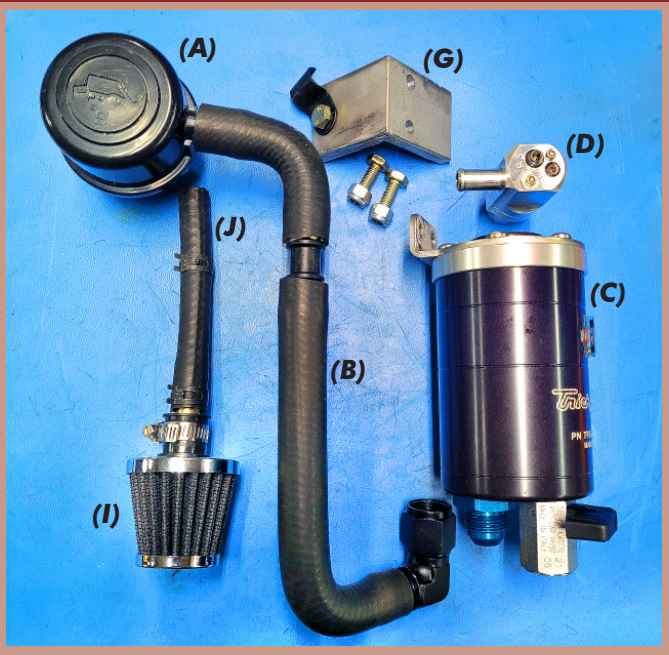
5. A valve (PCV Valve) to regulate vacuum signal and flow to optimize removal of blowby gases without reducing performance in the intake.

On the Model A system described, the filtered air inlet is on the valve chamber cover, the vacuum source is the intake manifold fitting, the blowby gases are evacuated via a cap on the oil filler tube, the air/oil separator is from TrickFlow, the PCV valve is from Wagner and is fully adjustable both in vacuum signal and air flow to match any specific engine.

FULL STORY

My first exposure to the Wagner PCV valve system came when I pulled the valve covers on my Ford 347 cu-in race engine to do a quarterly valve adjustment check. This was a very expensive race engine I had recently rebuilt for continued road racing in a '65 Mustang coupe. On the underside of the valve covers, I discovered a considerable amount of water droplets having condensed from the water vapor in the oil (yes, I checked for head gasket leaks). I had a catch can installed (but no PCV valve) that allowed each valve cover to breathe but obviously, that was not enough. Through some research, I contacted Wagner for a solution. I installed the Wagner adjustable PCV valve on top of a TrickFlow air/oil separator and success followed. After several years' experience with the Wagner system running that engine for hundreds of hours between 5,000 and 6,500 rpm at all levels of load, there was never any water formation inside the engine and the oil lost its distinctive polluted race fuel smell and no main seal or pan seal leaks. Further, the new air oil separator only accumulated a few drops of oil after a weekend of running vs more than 1 cup of oil with just the original catch can.

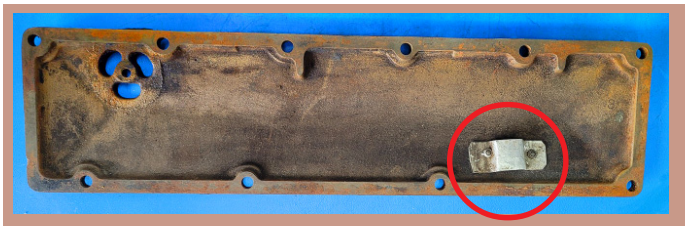
The race car is gone, and I am now focused on 1928 – 1934 Ford four-cylinder engines including stock and high performance. There have been several articles within the Model A / B community written about the benefits of PCV valves so I will not repeat that information except to add that any engine that sits idle in a temperature and humidity changing environment with an open breather may breathe in and out with change in temperature. That air coming into the crankcase may add to the water vapor that may already be in the engine from the combustion process.



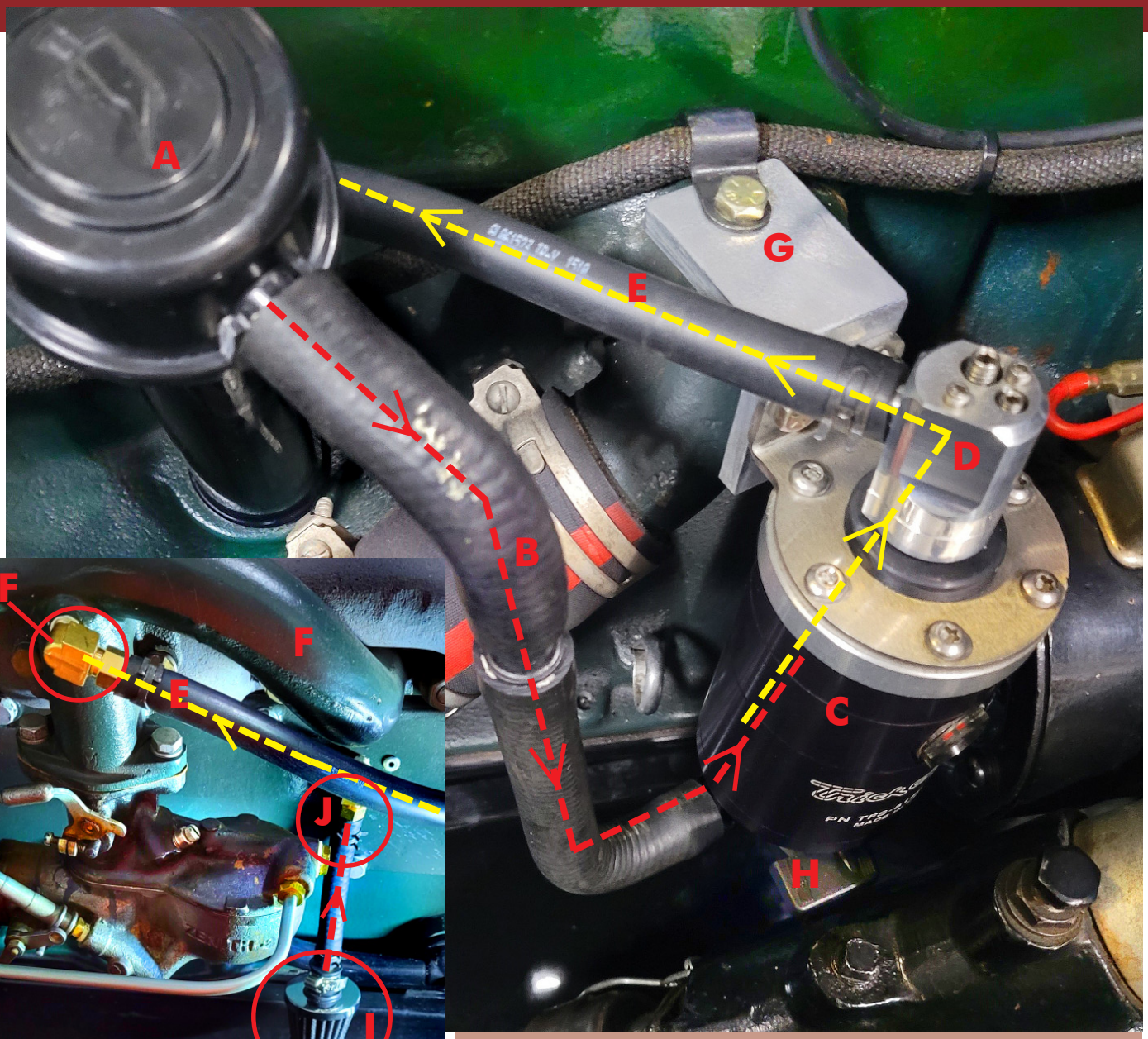
Clockwise top: oil filler cap from 1970s Ford Pinto ***(A)*** *(thanks to George Scott), homemade "L" bracket* ***(G)****, Wagner adjustable PCV valve* ***(D)****, TrickFlow air/oil separator* ***(C)****, hose from Pinto cap intake to bottom of separator* ***(B)****, intake filter* ***(I)*** *to be installed on the valve cover* ***(J)*** .

BASICS OF PCV SYSTEM:

Positive Crankcase Ventilation involves a vacuum source and a filtered fresh air source. The vacuum source is normally sourced from intake manifold vacuum but there have been several racing systems that use the vacuum created by exhaust



1929-1931 Valve Cover (side plate) with a drilled and tapped hole and crude riveted aluminum baffle installed inside. This hole is now my new fresh air inlet ***(J)*****.**



Fresh air inlet with filter ***(I)*** *attached to the valve cover* ***(J)****, vacuum line* ***(E)*** *is connected to the intake manifold* ***(K)*** *and wraps around from the driver's side Wagner PCV valve (****D****). Arrows show air flow direction.*

Arrows show flow direction of gases. Ford ***Pinto*** *plastic sealed cap* ***(A)*** *is installed. The hose* ***(B)*** *pulls fumes from the* ***Pinto*** *cap into the bottom of the "****Trick Flow****" separator* ***(C)****. Mostly oil free blowby gases move upward through the* ***Wagner*** *adjustable aluminum* ***(D)*** *PCV valve and flow through* ***(E)*** *upper hose around engine into the intake manifold* ***(F)****. The homemade L-bracket* ***(G)*** *is attached to the top of the water-inlet return with a longer bolt. There is a drain valve* ***(H)*** *at bottom of the Trick Flow Separator for occasional draining.*

flow which discharges the blowby out to atmosphere with thexhaust gases. The difference is that using manifold vacuum provides for disposal of the crankcase gases through the combustion process. The manifold vacuum is connected to somewhere in the crankcase and pulls the blowby from the crankcase and returns it to the intake manifold allowing it to burn in combustion. To provide a continuous sweep of blowby from the crankcase a fresh air source must be established usually on the other side of the engine.

Next, there needs to be some sort of valve arrangement that controls the amount of vacuum signal being used for PCV. Otherwise, the engine would not idle properly because of uncontrolled vacuum leak and might interrupt operation of other vacuum controlled devices such as the Model A wiper motor. The valve is called a PCV valve or "Positive Crankcase Ventilation" valve. PCV valves have

been in wide use since the 60s and limited use since WWII. They were mandated in CA in the 60's and now all cars use them in one form or another. They keep the crankcase cleaner, extend oil change frequency, and reduce air emissions. They are each designed for specific engines based on engine size and rpm range. Modern PCV systems assist in lengthening the time between oil changes.

FORD 4 CYLINDER FROM 1928 – 1934:

A vacuum source needs to be established. I use the intake manifold vacuum port normally used for the windshield wiper. Because the Wagner PCV has a very low vacuum consumption, a tee could be used such that the vacuum wiper could continue to be used. With the Wagner PCV valve, vacuum and flow rate are adjustable to regulate the flow rate used to evacuate the crankcase without losing manifold vacuum. I used Wagner's standard set up instructions with no issues or further adjustment needed. Note: my Model A has over 20" Hg vacuum at idle and the Wagner valve decreases vacuum signal less than 1" Hg.

Next, a filtered fresh air source is required. Many newer cars use a port inside the intake air filter as the fresh air source. I used a hole drilled into the valve cover side plate with a baffle on the inside along with an inlet filter. I was fortunate to find a side plate already drilled and tapped and baffled on ebay for cheap but it is very simple to do myself. Wagner suggests keeping all fittings at least 3/8" inside diameter which means some 3/8" fittings should be drilled out to 3/8". Note that I have seen other owners place the PCV valve directly into the valve cover with air intake on the driver's side. In that case, the suction side would be directly attached to the valve cover. I learned the hard way that the baffle inside the valve cover at the suction point (see my photo) should be at least ¾" from the entry port to prevent over consumption of oil. See https://mewagner.com/?p=1221 For me, it was easier to move the PCV valve suction side to the oil filler tube with inlet air ventilation on the valve cover such that the fresh air would sweep from right to left side of the engine. The oil filler tube offers a source of blowby gases with far less oil droplet contamination.

Next, I strongly suggest you use an air/oil separator. This will help prevent liquid oil from entering the intake manifold. I use the TFS Air/Oil Separator as shown. The remaining parts are hoses and fittings and a bracket for the separator which I made from a scrap piece of aluminum angle. There are other air/oil separators available, but I like this one and it has a drain valve. Alternately, go without the separator but continually watch the vacuum line for oil contamination.

My example is a 1931 Model A Ford 160C with Brumfield 5.9/1 head. 2,500 miles on fresh engine with virtually no oil leaking from the pan or rear main after PCV system installation.

RESULTS:

1,830 miles to Canada and back in May 2023 with almost no oil leakage from the pan area. Oil has no fuel smell to it. No change in performance. Note that my system was initially installed with suction on the valve cover side with filtered air inlet on the oil filler tube. I reversed the system after my return from the trip due to excessive oil accumulation in the separator from the valve cover from improper baffle design. I was getting about a table spoon every 200 miles or so. Now, nothing measurable.

COMPONENT COSTS:

Wagner DF-17 Dual Flow PCV Valve	$129
Trick Flow TFS-51400850 air/oil Separator	$152
70's Pinto oil filler cap with fitting	$15
#8 AN 90deg fitting	$10
Misc. fittings and hoses	$20
	$326

ANSWERS TO CONCERNS FROM VARIOUS MODEL A FORUMS:

- Too much vacuum will pull the oil mist from the valve chamber thus reducing valve stem lubrication. **ANSWER:** Use an adjustable PCV valve with adjustable flow.
- Too much vacuum will cause seal failure. **ANSWER:** Use an adjustable PCV valve with adjustable vacuum well below 1" Hg.
- PCV system will draw lube oil into the intake manifold and foul plugs. **ANSWER:** Use an air/oil separator upstream of the PCV valve.
- PCV system will reduce performance by drawing much needed vacuum from the intake manifold. **ANSWER:** Use an adjustable PCV valve with minimal vacuum on the crankcase (less than 1"Hg).

ALTERNATIVES:

- Buy a cheap PCV valve from a modern car and wonder if it does the job. The Wagner PCV valve produces vacuum in the crankcase 99% of the time under all conditions except wide open throttle.
- Make your own air/oil separator or continually monitor the vacuum line for oil.
- Smell your oil and change it when it smells like fuel.*(GB)*