SUCK IT UP

A Dedicated Vacuum Pump Has All Sorts Of Benefits

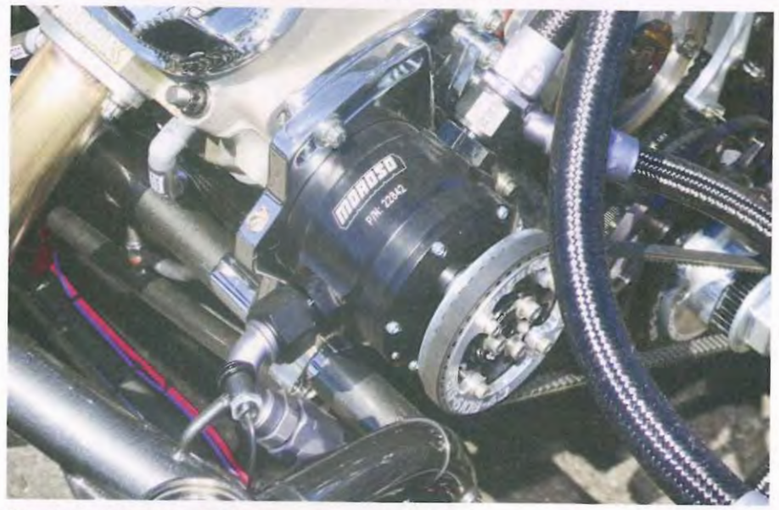
WORDS/PHOTOS JOHN DIBARTOLOMEO

Short of a single cylinder engine, the square inches of area within your crankcase stays relatively the same. Yes, pistons go up and down but as one goes up and increases the area below the piston, another is going down to decrease the area. All that being said, as one or more pistons go up and the others go down, it creates a sort of pressure within the crankcase. Add in the fact of any high pressure combustion gases passing by a ring package and there could be a fair amount of crankcase pressure. Which leads to the necessity of releasing it in some fashion.

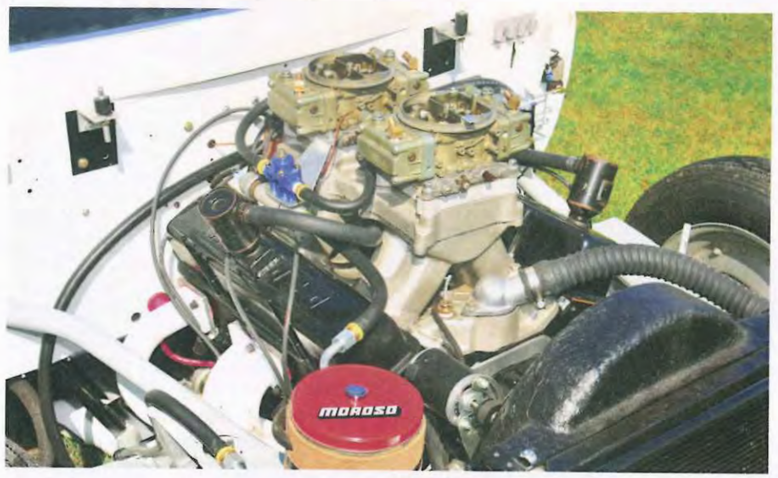
Since the dawn of racing, we've all used some sort of breather on the tops of our engines. Those breathers let the pressure escape out of the crankcase. However, pressure in the crankcase below the piston rings oftentimes forces the ring package to work harder to seal up the combustion chamber. The cure for this is to create a negative pressure in the crankcase.

Ingenious racers years ago connected a hose from

Vac-U-Pan, or evac systems are very popularly used but are they effective?



If you're looking to provide for a consistent crankcase vacuum, nothing beats a dedicated engine-driven vacuum pump.



It was decades ago when racers began using intake manifold vacuum to achieve a negative pressure in a crankcase.

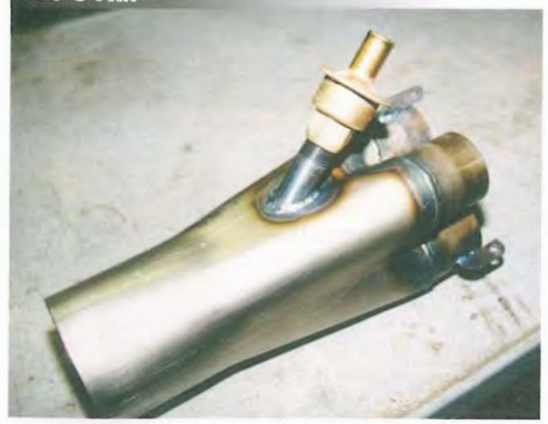
the intake manifold to a breather on the valve cover in a crude attempt to use intake manifold vacuum to provide for a negative pressure in the crankcase. Because intake manifold vacuum varies, additional help was provided by hoses attached to the header collector in the same fashion as today's Vac-U-Pan setups. It was soon learned the only way to provide a consistent negative crankcase pressure was through the use the use of a dedicated vacuum pump. In addition, oftentimes the use of low tension oil and/or second rings can alleviate drag on the cylinder wall allowing the engine to turn over easier which in turn helps horsepower.

While vacuum pumps have been used with great popularity, there are still many more who are using what is termed as a Vac-U-Pan or crankcase evacuation system, a device where a tube is placed inside the header collector and hooked to a breather on the top of a valve cover. The tube is placed in the collector at an angle and as exhaust gases flow past the opening of the tube, it creates a low pressure area, or vacuum, within the hose connected to the valve cover breather. That's the theory, but here are the facts.

First of all, the appearance of a vacuum within a crankcase greatly assists ring seal. We have seen cases where the vacuum pump was inadvertently not hooked up versus a run where it was operating properly to where elapsed times dropped as much as a tenth of a second. Of course all of that depends on a number of variables. However, there are other benefits as well.

We've all been made aware of windage inside a crankcase. Having your rotating assembly sloshing through oil creates drag which can easily be understood. Attempts to alleviate that include scrapers, windage trays and other devices inside an oil pan. In addition, vacuum can also play a role. A simple ninth grade science experiment proves this.

Take a round ball and a feather, each placed inside a tube. Drop each at the same height and you can easily see the ball drops faster due to its weight. Now induce a vacuum into both tubes and you'll notice both the ball and feather dropping at the same speed. Why? With the lack of a pressure inside the tubes, the feather has no restriction of air and therefore will drop at the same speed as



LEFT: As exhaust gases flow through a collector and with a tube welded on a 45-degree angle, a vacuum of sorts is created within that tube.

RIGHT: The concept behind creating a vacuum through exhaust flow is no different than attempting to create a vacuum in a hose by blowing air across the opening in order to siphon fluid.

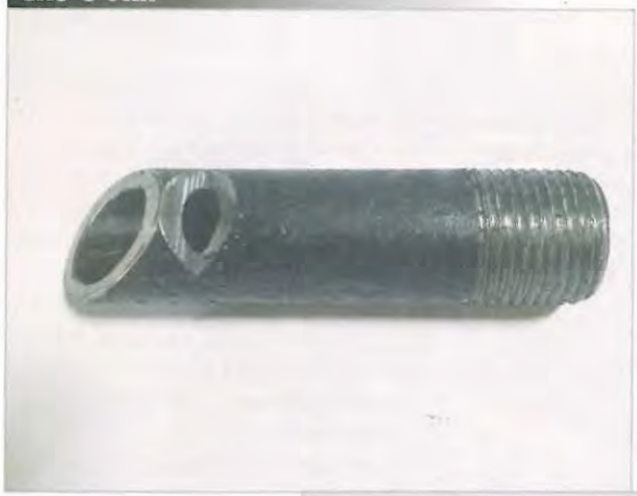
the ball. Google it if you'd like to see a video of that fact.

The same holds true inside your crankcase. An oil droplet will fall faster into your oil pan when there is a negative pressure. "In addition to that," says Scott Hall of Moroso, "the presence of a vacuum in a crankcase will help to eliminate oil aeration."

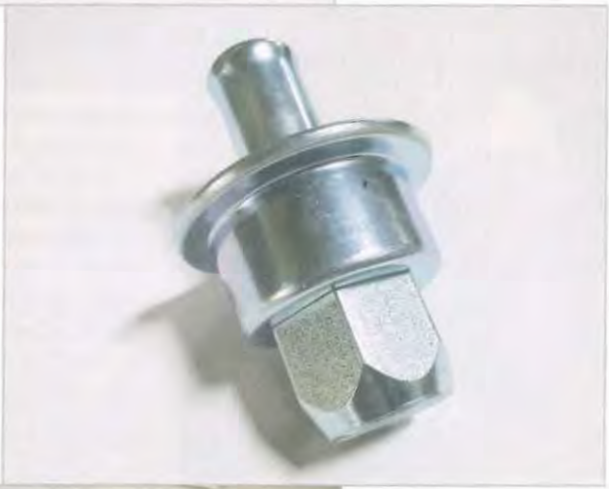
Most engine builders will agree that anywhere from 10- to 15-inches of vacuum in a crankcase is sufficient enough to make a difference. So does a Vac-U-Pan system work?

Understand first that vacuum is generally measured in inches of mercury, or Hg which is the chemical symbol of mercury. Roughly speaking, thirty inches of mercury, or Hg, is the maximum vacuum available at sea level.

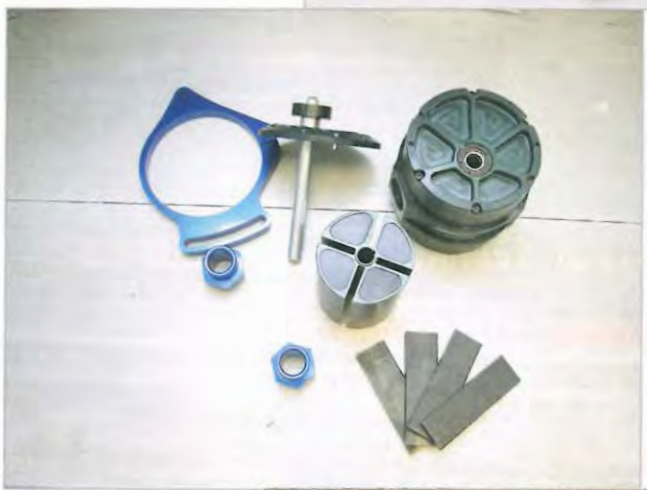
In order to create a vacuum, or negative pressure, requires a source of adequate capacity to do it. A Moroso engine driven Vacuum Pump has the capability to generate a vacuum of 23-inches when dead-headed, meaning that if you were to run a gauge directly attached to the inlet side of the pump, spinning the pump to 4,500 rpm, it would read rough-



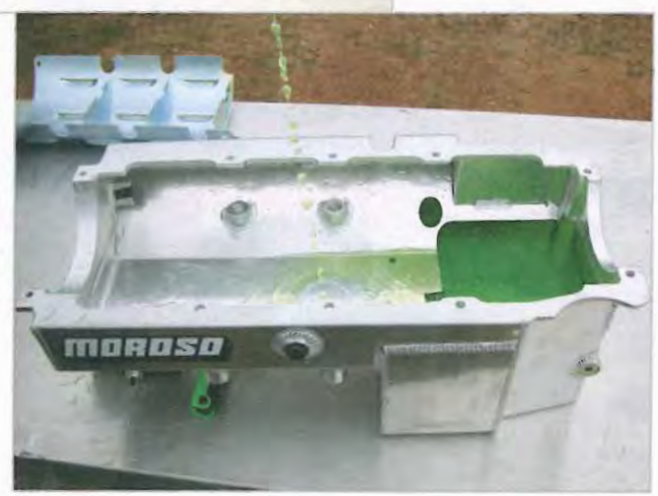
LEFT: A part of the Moroso Crankcase Evac System is this tube which utilizes a special cut to act as a whistle of sorts to aide in creating a negative pressure in the tube.



RIGHT: This one-way check valve must be installed at the header collector in case of a backfire in the collector.



LEFT: While a dedicated engine-driven vacuum pump is rather simple, it does take three- to four-horsepower to spin but more than makes up that difference in the power it can help to provide.



RIGHT: Besides helping with ring seal, a negative pressure within a crankcase can have an effect on oil return and scavenging.

ly 23-inches of vacuum.

The idea behind creating a vacuum through exhaust gases passing by an inlet is no different than if you were to attempt to create a siphon by sticking a hose in a jar full of liquid. By blowing air across the end of the hose, it would create a low pressure area in the hose thereby beginning to start the siphoning process. As long as the opening of the hose is kept below the level of the liquid, siphoning would continue.

The problem with a Vac-U-Pan system is that you can't expect the negative pressure created by exhaust flow past an opening to be anywhere near what you can achieve with a dedicated vacuum pump. In addition, the correct placement of the tube inside the header collector plays a role in determining how much vacuum you can achieve. In most cases, a Vac-U-Pan system does not have the ability to create more than two- to six-inches of vacuum as measured directly at the header collector but that usually occurs only at high rpm. Because of that, it's impossible to believe that it can actually create a negative pressure condition within your crankcase.

This is not to say that a Vac-U-Pan system is totally useless. "I actually prefer the Vac-U-Pan system in one regard as it uses the natural engine's ability to produce an effect rather than an engine driven unit," says Hall. "However, through our testing, we know the use of a dedicated vacuum pump on an engine with roughly 10- to 12-inches of crankcase vacuum will produce a two to four-percent increase in horsepower. Conversely, a vacuum pump takes roughly three- to four-horsepower to turn depending on which of our pumps you use. While there is no power loss with a Vac-U-Pan system, there really is a benefit to a dedicated vacuum pump."

The fact is a Vac-U-Pan system does create a slight vacuum which will enable an engine to breath easily rather than just venting any crankcase pressure through a set of valve cover breathers. In some cases, that may be enough to satisfy some, but ultimately a sealed crankcase with a dedicated vacuum pump will be of the utmost in efficiency.

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