Table of Contents

Go To Technical Menu

REF: Engine Mechanicals - Sub-07B

Affects of the 45° Rod / Piston Arrangement

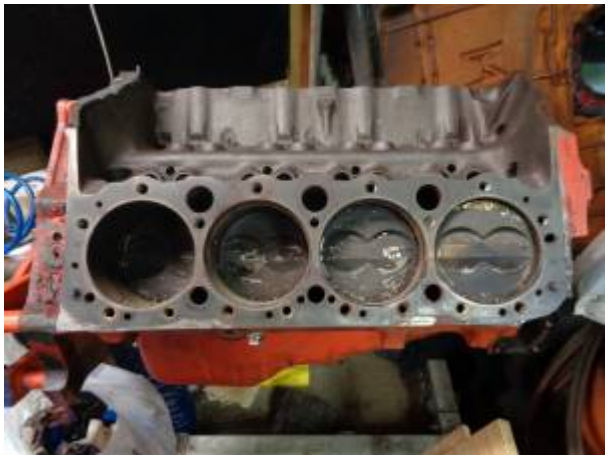
Piston / rod positions are relative to positive or negative pressure in the crankcase. Forget about valve opening for a second.

1. With the piston rising up,
    - The top of the piston is compressing or expelling air pressure in the cylinder but bottom of the piston is pulling in air (vacuum) into the crankcase.
2. With the piston descending down,
    - The top of the piston is pulling air (vacuum) in the cylinder but the bottom of the piston is both expelling air vacuum and turning it into air pressure.

These two conditions create pulsating air in the crankcase from vacuum pressure (negative) to air pressure (positive).
How crankcase pressure moves inside the engine does or doesn't contribute to wetsumping.

Intake vacuum is relative to piston / rod positions.
An example with on carbed models with VOES / MAP: (although this is the same for all Sportsters)
Vacuum is created in the cylinders which pulls vacuum from the carb.
This vacuum is tapped into and used to operate ignition timing through the VOES / Map.
So a vacuum gauge plugged into the vacuum line at the carb does reflect the position of the two pistons.
I.E. the gauge moves when the pistons are on the way down and goes toward the resting position when the pistons are coming up.
(of course, you'd then have to take in accountancy if the intake or exhaust valve was open at the time)
So a gauge there would not reflect an absolute vacuum.
It would reflect more of an average vacuum based on running conditions with all the change variables working on the air pressure simultaneously.

Some time and tune older V-8s with a vacuum gauge instead of a timing light.
For each piston going up, there is a piston going down.
And intake vacuum stays (more) constant in the middle of the push / pull.
A vacuum gauge shows a more steady dynamic condition.
Likewise are the forces in the crankcase (crankcase pressure).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The rods \ piston action in the Sportster engine are close together (45° apart) and there is 360° around the flywheels.
If the rods were 180° apart instead, one piston would be going up at the same time the other is going down.
Just as in a V-8, crankcase pressure would be more equalized between them.

Since Sportster piston movement is not equalized, we get the potato, potato sound we all love but the equilibrium in the crankcase is off by design.
Take the PCV off the valve cover on the V-8 while running and it just smokes a little. Take the breather valve off the Sportster and oil pukes out.

Likewise, a vacuum gauge on the carb vacuum line will be erratic and not a very useful test.
Hook up a vacuum gauge to it and the gauge bounces from vacuum to no vacuum pretty wildly at idle.
Crankcase pressure is doing the same thing. But with the addition of the breather valve, it is a more controlled chaos in the bottom end.

Go To Technical Menu

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