

Your Oil's Best Friend – The Piston Ring

Have you ever wondered why automatic transmission fluid is “fill-for-life” and motor oil still has to be changed every 5,000 to 10,000 miles? The simple answer is contamination.

In an engine, combustion is a powerful but dirty business. While combustion produces the heat energy that powers the engine, it also creates super heated gases filled with carbon monoxide, nitrogen oxides, vaporized moisture and partially burnt fuel. Those same exhaust gases that we don't want to breathe (because they can kill you), leak past the piston rings, which we call blow-by. These harmful gases chemically attack the motor oil. (Need photos of dirty engines and clean turbines)

As a Certified Lubrication Specialist, Oil Monitoring Analyst and member of the Society of Tribologists & Lubrication Engineers, I can state unequivocally that lubricants will do exactly what they are designed to do unless they are contaminated or chemically degraded. Guess what combustion blow-by gases do?

Now don't get me wrong, motor oils are designed to withstand the assault of these intruders, but the fact remains that combustion blow-by gases contaminate and chemically degrade motor oil. This is why a high performance motor oil can contain up to 14 different chemicals and a jet turbine oil might contain only 4 different chemicals.

In fact, the same base oil used to make motor oils is also used to make stationary turbine engine oils. While a motor oil might live 10,000 miles in a 4 cycle engine, these turbine oils will live more than 10 years! What is the difference? Turbine engines never expose the lubricant to combustion gases. Both internal combustion engines and turbines generate lots of heat, but only internal combustion engines expose the lubricant to combustion blow-by gases.

So what does all of this mean? Simply put, your piston rings are your motor oils best friend! Motor oil is the lifeblood, the sole source of lubrication for your motor. The job of the motor oil is as follows:

1. Cool the lubricated parts in the engine.
2. Clean the lubricated parts in the engine.
3. Protect the lubricated parts in the engine.
4. Transfer power in the hydraulic parts in the engine.

Fuel dilution, moisture, soot and heat all affect the motor oils ability to do it's job, so it pays to keep your motor oil cool, clean and dry. With that said, your piston rings are the only line of defense between combustion gases and your motor oil.

Invented by John Ramsbottom in 1854 (before the internal combustion engine was even invented), the piston ring is a type of seal. The job of the piston ring is to:

1. Seal the combustion chamber and minimize the loss of gases to the crank case.
2. Improve heat transfer from the piston to the cylinder wall.
3. Help maintain the proper quantity of oil between the piston and the cylinder wall
4. Regulate engine oil consumption by scraping excess oil from the cylinder walls

When you look at the job of the motor oil (to cool, clean and lubricate the engine) and the job of the piston rings (to seal, transfer heat and meter the oil), it is easy to see how they play complimentary roles. The better the piston rings do their job, the easier it is for the motor oil to do it's job, and vice versa.

In over 15 years of reviewing used oil analysis reports, I've never seen low engine wear when the oil contamination levels are high. In fact, the bad wear results generally coincide with high levels of fuel dilution and other combustion related contamination.

However, when is the last time you thought of motor oil and immediately thought about piston rings?

When you think about motor oil today, the first thing that probably comes to mind is Zinc (ZDDP), and that is understandable. The issues related to ZDDP level changes in motor oil have been the headline story in the industry for over 15 years, so it is understandable to think zinc at the mention of motor oil. However, there is more to motor oil than just ZDDP – just as there are other parts in an engine besides a camshaft.

In simple terms, the better the piston rings seal the gap between the piston and cylinder wall, the less combustion blow-by gas (which is hot, full of moisture, fuel and other nasty chemicals) gets into the oil. The bottom line is that better ring seal means better oil life and performance, which means longer engine life. That is why your piston ring is your motor oils best friend!