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cen·pe·co® LUBRICANTS

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New and Improved!

CenPeCo Synthetic and PV Synthetic Blend Oils

By Blaine Ballentine

Central Petroleum Company has upgraded its line of passenger car motor oils. CenPeCo Synthetic Oil is available in SAE 0W-20, SAE 5W-20, and SAE 5W-30, and as the name implies, is fully synthetic. CenPeCo PV Synthetic Blend Oil is available in SAE 5W-30 and SAE 10W-30, which is a blend of synthetic base oil with paraffin base oil for Personal Vehicles.

The trend in passenger vehicles is toward turbocharged direct injection gasoline engines, and we discussed the challenges in lubricating them in the July 2016 *Central News*. The changes in Synthetic and PV Synthetic Oils are aimed directly at these engines. However, the improvements that make our passenger car oils well suited to turbocharged direct injection engines also enhance their performance in naturally aspirated and port injected engines.

Low Speed Pre-Ignition

The biggest challenge in lubricating turbocharged direct injection engines is low speed pre-ignition. This is a random event with several contributing factors that occurs during high load, low RPM operation. In severe cases it breaks pistons and rings.

Pre-ignition is when the fuel ignites before the spark plug fires. It is caused by a hot spot in the cylinder, such as a deposit holding heat, which is a good reason to use CenPeCo Gas O Klenz.

Oil is a contributing factor. It is not fully understood, but one of the leading theories is that a droplet of hot fuel and oil mixture is thrown up into the cylinder from the crevice above the top ring during the compression stroke, and that lights the fuel-air charge. Regardless of whether the theory is correct, testing shows that oil formulation is a factor in low speed pre-ignition.

General Motor's dexos1 Gen 2 specification includes a low speed pre-ignition test. The API specification under development (GF-6) includes a similar test in a Ford engine. Both tests are looking for abnormal spikes in cylinder pressure, as opposed to every little pre-ignition. In other words, the tests measure serious knock and ignores ping.

The single biggest factor in oil formulation is calcium detergent, which promotes low speed pre-ignition. Magnesium detergent is neutral, and in some combinations with calcium seems to suppress pre-ignition. Viscosity improver and viscosity grade are pre-ignition neutral.

There is some evidence to suggest that mineral oils are less prone to pre-ignition than synthetic oils (tendency toward pre-ignition increases as we move from Group I to Group IV base oils)[1]. Of course, there is little choice but to use synthetic base oils when making SAE 0W-20 or SAE 5W-20 to meet volatility and oxidation requirements, so using mineral oil is not an option for most new cars.

The anti-wear additive, ZDDP, suppresses low speed pre-ignition[2]. This is another interesting fact, where more is not an option. The "P" in ZDDP is phosphorus, which is limited to 800 ppm to protect catalytic converters.

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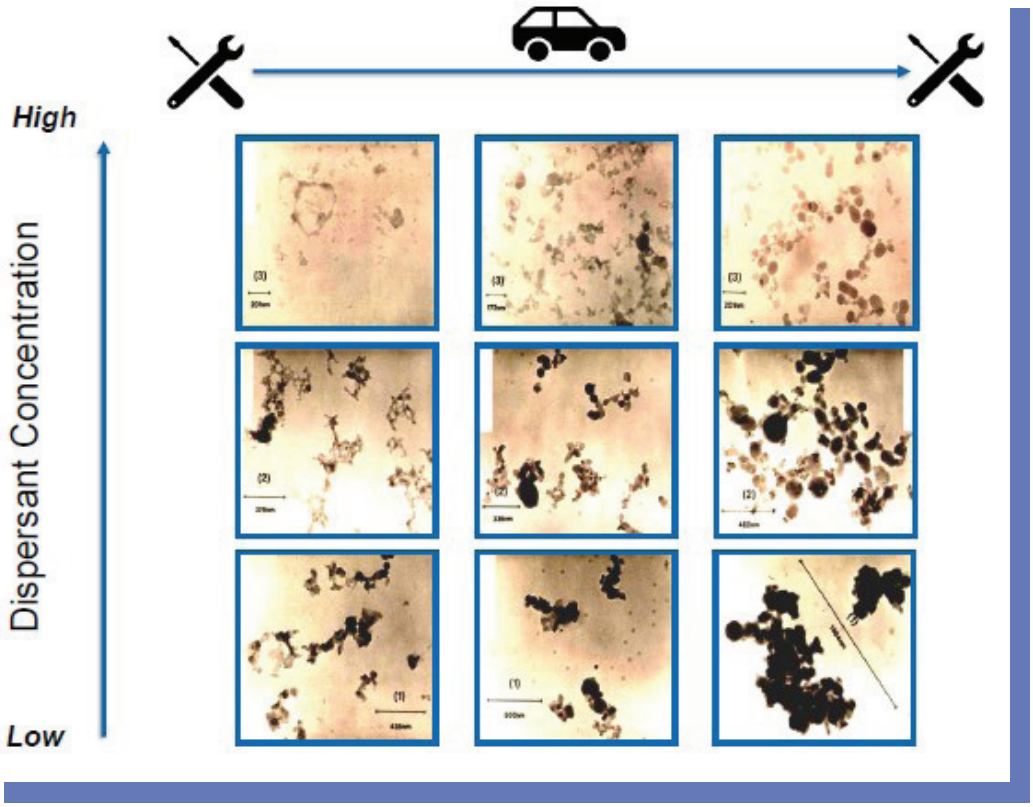

Deposit Control

Each API specification begins with a needs statement from the engine manufacturers. One of the needs for the specification still under development (GF-6) is better deposit control, particularly to prevent turbocharger failure.

Soot

As mentioned earlier, gasoline that is sprayed directly into the cylinder does not always have time to evaporate as completely. Therefore, the fuel does not burn completely. Some of the resulting soot is dragged down into the oil.

The problem with soot is that it wants to agglomerate, or stick together like snowballs. When it does, oil viscosity increases and the soot interferes with anti-wear additives, increasing wear. The additional wear has shown up in recent years as timing chain wear. The upcoming API spec (GF-6) includes a timing chain elongation test in a Ford engine.

Here is where dispersant additives come in. If the soot particles are dispersed and remain separated, their effect on viscosity and wear is minimized.

API SN Plus

The API has been working on GF-6, which will probably be released as an API SP in mid-2020. When they started working on it, they predicted it would have been released by now, but some of the engine tests are not cooperating.

In the meantime, low speed pre-ignition is the biggest problem facing manufacturers of turbocharged direct injection engines. They needed the new specification now.

The work on the Ford low-speed pre-ignition test was done, so the API released an interim spec that was released May 1st called SN Plus. It is API SN, plus the Ford pre-ignition test.

Fuel Dilution

Direct injection engines experience roughly twice the amount of fuel dilution as port injection engines. When gasoline is injected into the intake runner, it has more time to evaporate than when it is injected directly into the cylinder. During high load use, fuel droplets can hit the cylinder wall before they have time to evaporate. This liquid fuel is dragged into the crankcase. In extreme cases, fuel dilution above 15% has been measured. Scary stuff when manufacturers are specifying oils that are already as thin as water.

CenPeCo's Approach

CenPeCo endeavors to make the best products possible. GM's dexos 1 specification is more challenging than API SN Plus and involves additional engine tests. The dexos volatility requirement is also more stringent than SN Plus, which is why we recommend our CenPeCo Synthetic Oil for dexos 1 applications and not PV Synthetic Blend. Even though our PV Synthetic Blend oils are not recommend for dexos applications, we use the more robust dexos additive package to make a better SN Plus product.

As you can imagine, the most challenging viscosity grade to pass the various engine tests is SAE 0W-20. Many, if not most manufacturers use additional

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additives in their 0W-20 as compared to their thicker grades. In other words, they use an SAE 5W-30 passenger car additive package, but they have to use a booster to defeat the engine tests with SAE 0W-20. One would think that the booster is an anti-wear additive, but it is primarily dispersant. By keeping the soot particles dispersed more completely the anti-wear additives are better able to do their job.

CenPeCo PV Synthetic Blend Oils use the same additive package as CenPeCo Synthetic Oils, and at the same amount. Our chemistry is very robust, and we do not have to use a booster to exceed the specs in SAE 0W-20. They exceed API SN Plus specifications, and CenPeCo Synthetic Oils exceed all the wear requirements of dexos 1 Gen 2.

We built extra performance into them because we think we can avoid reformulating when GF-6 becomes the next API spec is in 2020.

CenPeCo Synthetic and PV Synthetic Oils contain additional dispersant compared to other brands, which is why our SAE 0W-20 does not require a booster. These oils are made with the same star-shaped polymer as their predecessors for unparalleled shear stability (see July 2017 Central News). Particularly when you start with a really thin oil, you cannot afford to lose much viscosity.

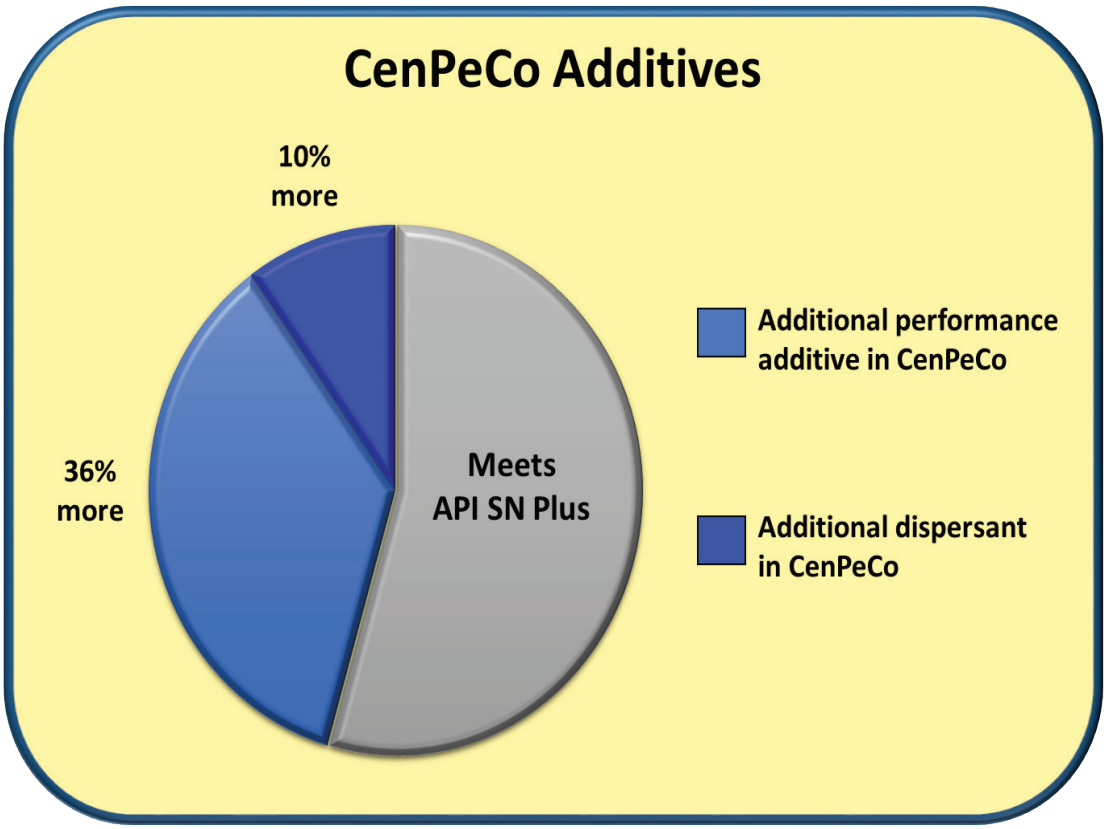
Practical Advice

Now that we have the facts, we can make some logical choices for turbocharged direct injection engines. Since calcium detergent is a contribution to low speed pre-ignition, CenPeCo Extreme Duty Oil is a poor choice for these engines, and CenPeCo S-3 Oil is even worse. We make CenPeCo Synthetic Oil and CenPeCo PV Synthetic Blend Oil for passenger vehicles and they are our only recommendations for turbocharged direct injection engines.

Octane is a measure of gasoline's resistance to pre-ignition. Do not risk a catastrophic engine failure by trying to save a few cents on low octane gasoline. If the manufacturer recommends 91 octane gasoline, use it.

Combustion chamber deposits hold heat, and can be the source of pre-ignition. So, a gasoline additive that controls combustion chamber deposits, such as CenPeCo Gas O Klenz, can help prevent pre-ignition.

Driver habits can go a long way toward protecting the turbo. Give the engine a minute to pump oil to the turbo before revving or putting the vehicle in gear, especially if you decide on an oil that is thicker than recommended or ambient temperatures are low.



Conversely, let the engine idle for half-a-minute before shutting down. The turbo can continue to spin whether the engine is pumping oil to cool it or not. Heat can breakdown the oil in the turbo, forming deposits and shortening turbo life. So, letting the turbo wind down before shutting off can prolong its life.

Use reasonable drain intervals. Resistance to breakdown diminishes and detergents wear out

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with use. So, deposits in the turbo bearings are more likely if you try to wring every last mile out of your oil drain.

Also consider that fuel dilution and soot are much worse in direct injection engines than their predecessors. Both of these contaminants hurt the oil film, but are expelled with an oil drain.

As dispersants wear out, soot particles begin to cling together. The clumps of soot interfere with anti-wear additives, which also wear out during an extended drain interval, causing additional wear in areas where there is metal-to-metal contact. This mechanism causes timing chains to stretch in some engines.

An oil change reboots your oil properties. Overextending the drain interval can be a costly mistake, which is easily avoided.

Finally, use a high quality oil. CenPeCo Synthetic Oil and CenPeCo PV Synthetic Blend Oil are made with additional dispersants, both zinc and non-zinc anti-wear additives, synthetic base oils that resist heat, and a polymer with shear stability that is not matched by other oils. They are the best available for direct injection gasoline engines.

Reference Notes

1. "LSPI and Lubricant Auto-Ignition" *Infineum Insight* June 14, 2017 www.infineuminsight.com/insight/jun-2017/lspi-and-lubricant-auto-ignition
2. Beercheck, Richard, "Quenching LSPI in Modern Engines" *Lubes'N'Greases* 24:5:41.

More Moly in Mega Moly

By Blaine Ballentine

The moly content in CenPeCo Mega Moly grease has increased from 3% to 5%. We began shipping the improved Mega Moly in February.

Moly has a laminar structure that pulls apart under pressure and sliding action, reducing friction and wear. It is particularly well suited to sliding under pressure, such as chassis lubrication and bucket pins in construction equipment.

To put 5% moly into perspective, a couple of our competitors market their oils around moly, and the word moly is in the product names. Analysis reveals 150 ppm or so molybolenum. We are now using 5% moly in Mega Moly grease, which is 50,000 ppm. It is not just a moly additive or moly derivative, but 5% solids molybdenum disulfide.

Due to its viscous base oil)SAE 140 bright stock) and high solids content, we do not recommend Mega Moly in high speed bearings. Moly is great for sliding action, but it is hard to make a claim performance for moly in a rolling action. Our Mega Moly could lead to overheating in high speed bearings.

So it is risky to pack the wheel bearings of a trailer with 10-inch wheels with Mega Moly. Syntho Lube, Double Duty, and HTLD are much better choices when those little wheels are spinning at 70 miles per hour.

On the other hand, Mega Moly works just as fine in slow speed bearings, such as wheel bearings on ag equipment. It allows farmers, truckers, and construction workers to use one grease for practically all of their greasing.

CenPeCo Mega Moly is now 5% moly. A good grease got even better.

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