



EP and Copper

By Blaine Ballentine, Lubrication Engineer

Central Petroleum has always warned of the potential for excessive yellow metal wear from Extreme Pressure additives. Most EP additives are aggressive toward copper, brass, and bronze.

EP additives are attracted to metal surfaces. When the oil films rupture, pinpoints of contact create heat that causes the EP additives to break down and form a film that prevents welding. This is extremely beneficial for heavily loaded steel-on-steel sliding applications like automotive differentials.

Worm Gears

On the other hand, the more aggressive EP additives launch a corrosive attack against yellow metals. The worst case scenario is a bronze-on-steel worm drive. The EP additive corrodes the bronze gear, and then the steel worm gear rubs off the corrosive layer, leaving a nice fresh surface for the next attack. The process starts over again, and continues with each

revolution of the gear wheel.

The adjacent picture is of a failed worm gear that was filled with an automotive 80W-90 gear lube. The gear box was in a factory with several worm gear boxes, some with bronze gearwheels and some steel-on-steel gear sets. Predictably, they had been experiencing failures among the bronze gears, but not the steel gears.



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Cen-Pe-Co Worm Gear Oil is designed for bronze-on-steel worm gears. It contains a passive EP additive that will not attack metals containing copper. Worm Gear Oil will not support as high of a load as HyTorque Gear Lube, but it is adequate for the EP loads of a worm drive.

Sperm oil was the additive of choice 50 years ago. The lubricity of this natural ester was excellent, and

it was not aggressive toward yellow metals. The problem with it was supply—there were only so many whales, and their numbers were falling fast. The additive used in Cen-Pe-Co Worm Gear Oil was developed to mimic sperm oil's performance and was originally promoted as synthetic sperm oil.

Another passive EP additive is molybdenum disulfide.

Again, it does not carry the load of which Cen-Pe-Co HyTorque Gear Lube is capable, but excels in reducing wear in sliding applica-

tions, and a worm gear is all sliding action. Moly is added to the synthetic sperm oil in our worm gear oil to make Cen-Pe-Co Worm Gear Oil with Moly.

GL4

Worm gears may be the worst case scenario, but they are not the only place to beware. Manual transmissions in cars and pickups usually have brass or bronze synchronizer rings. The industry has mostly transitioned to dedicated manual transmission fluids, but some vehicles, particularly older vehicles, recommend API GL4 gear lubes.

As you know, Cen-Pe-Co HyTorque Gear Lube meets API GL5 requirements, but you may be wondering what is GL4. It is an older gear oil specifica-

tion designed for less severe loads than GL5. It is so old, in fact, that parts for the test equipment are no longer available, so the API considers GL4 to be obsolete. Unfortunately, many consumers do not. Not to worry. Long ago, lubricant manufacturers found they could use the same additives used to qualify gear lubes for GL5 at half of the GL5 rate to meet GL4 requirements. The lower level of EP additives in GL4 allow the synchronizer rings a long



life.

In other words, if you substitute a GL5 lubricant in a transmission calling for GL4, you will shorten the life of the synchronizer rings. Cen-Pe-Co GL4 Gear Lube is one of those rare products that we make, but does not appear on the price list because we do not hold it in inventory. If your customer needs at least 50 pounds of GL4 gear lube and he does not expect it on the next truck, give us a call.

Heavy Duty Transmissions

Manual transmissions on big trucks are another place where aggressive EP additives can cause problems. We recommended Cen-Pe-Co HyTorque Gear Lube in truck transmissions for many years,

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and we have never heard of an issue. However, when the market leader, Eaton, said that a GL5 / MT1 gear lube will “void any warranty,” it got our attention.

At the time of the announcement, the majority of heavy truck transmissions were non-synchronized manual transmissions, and the only significant copper was in the coils of the transmission cooler. Conversations with Eaton indicated some EP additives were so aggressive that the transmission oil coolers would fail. It is funny that Eaton recommendations for Europe and North America are different than for the developing world. GL4 lubricants are not recommended in North America or Europe, but most of the rest of the world is permitted to use GL4 with Eaton’s blessing.

We recommend Cen-Pe-Co Synthetic MTF SAE 50 for transmissions in heavy trucks, which is the type of fluid Eaton prefers. We also recommend Cen-Pe-Co S-3 SAE 50 or Cen-Pe-Co TO-4 SAE 50 with shorter drain intervals for heavy truck transmissions. Customer feedback indicates our mineral oil products make the transmission quieter than synthetic products, and some tell us they notice a smoother shift feel.

Engines

A final heads up is for EP additives used in engine oils. In the early 1980s there were many diesel engine failures traced to an EP additive used in the engine oil. The failing parts were bronze cam follower pins—another situation where the corrosive attack of a yellow metal is followed by rubbing wear that exposes fresh surface to further attack. At least one of the oils producing the failures was sold with a demonstration using a bearing machine.

Bearing machines have a steel race rotating against a stationary steel roller under heavy load, which is an extreme pressure condition. Needless to say, fluids containing EP additives look good in these machines, and may even give an indication of EP performance in a gear box. But performance in bearing machines should throw a red flag for engine oil.

Most people using portable bearing machines to



sell engine oil or engine oil additive are tricksters, and their oil or additive may or may not contain EP additives. The point is to be wary of any oil or additive that is demonstrated with a bearing machine because they may contain EP additives that will accelerate copper wear.

Conclusion

Extreme Pressure additives are vitally important in applications that generate steel-on-steel extreme pressure loads. It is equally important to avoid those same effective EP additives in applications that involve yellow metals.

Reference

“Guidelines for Using Gear Oil in Specific Applications” *Machinery Lubrication*,
<http://www.machinerylubrication.com/Articles/Print/30366>

Cen-Pe-Co Meeting Attendees



Attending the Illinois / Indiana State Sales Meeting were: (Back Row L to R) Ron Yergler, IL; Ron Bayles, IL; Tyron Schaumburg, IL; Bob Nagle, IL; Brian Deck, IL; Eric Rodmaker, IL; Denny Van-Horn, IN; Phil Jolliff, IN; (Front Row L to R) Mike Petri, IL; Dave Conant, IL; Lyle Inyart, IL; Paul Obert, IL; Blaine Ballentine, Walcott Office; Johnny Tucker, IN; Ken Stevens, IN; and Scott Crull, IN.



Attending the Pennsylvania State Sales Meeting were: (Back Row L to R) Steve Moser, PA; Steve Lightner, PA; David Martin, PA; Carl Schmidt, PA; Harry Longenecker, PA; Wayne Sampson, PA; Bob Smith, PA; Blaine Ballentine, Walcott Office; (Middle Row L to R) Ken Horning, PA; Ben Zook, PA; Delton Lehman, PA; Daryl Lehman, PA; Ted Zeiset, PA; (Front Row L to R) Bud Hartman, PA; Norm Leininger, PA.

Attending the Maine State Sales Meeting were: (L to R) Cory Staples, Diesel Fuel Systems, ME; Tim Kennedy, Diesel Fuel Systems, ME; Tom Curtis, ME; Reggie Lacadie, Diesel Fuel Systems, ME; Dave Trundy, ME; Pete Hikel, Diesel Fuel Systems, ME; Dave Mraz, ME.

