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SHEAR STABILITY

By Blaine Ballentine

It is often stated that viscosity is the single most important lubricant property. This is certainly true for tractor hydraulic oil.

If the oil is too thick, usually due to cold temperatures, response is slow and operation sluggish. If the oil is too thin, wear accelerates, temperatures run high, and efficiency declines.

To provide adequate cold temperature flow and at the same time have enough viscosity to support heavy loads when it is hot, nearly all the tractor manufacturers require multi-grade hydraulic oils, which are made with polymer additives. The challenge is that gears and pumps tend to rip polymers apart, causing high temperature viscosity to drop. Therefore, the beginning viscosity of a new tractor hydraulic oil is not a good indication of its viscosity in use. The viscosity during use can be much lower.

"Too much viscosity loss in a tractor hydraulic oil means more wear and a loss of efficiency."

Shear Understanding

Polymers used as viscosity index improvers are made up of huge molecules. Where an oil molecule will have 4 or 5 carbon atoms, a polymer molecule may have 600 to 2000. When they are cold, polymer molecules shrink and coil up. They just go with the flow of oil and have very little effect on viscosity. When they are heated, they stretch out and tangle with other polymer molecules. The entangled polymer molecules trap the relatively tiny oil molecules, inhibiting their flow. That is how a relatively small amount of polymer can dramatically reduce the rate of thinning as the oil is heated, allowing us to produce multi-viscosity oils.

As the polymer molecules stretch out and entangle, they become more vulnerable to shearing stress. Think of shearing stress as oil being forced through a tight passage combined with pulling or cutting action, such as between the ring and cylinder in an engine, or worse yet, gear action. These shear forces can rip the massive polymer molecule apart, leaving them in smaller pieces that are less effective at slowing oil flow. This is known as "permanent shear" and is how a cheap SAE 10W-40 oil can quickly become SAE 10W-30 after only a few miles of use.

Polymer, as the name suggests, is plastic dissolved into the oil. Just as different plastics can be harder or stronger or more brittle than others, polymers used in oils can have very different properties. Some polymers, and therefore some oils, are much more shear stable than others.

There are several test standards to measure polymer shear, but most of them are variations on the same theme. The test oil is cycled, usually 30 or 90 times, through a diesel injector nozzle to shear the polymer. Before and after viscosity at 100°C is compared, and shear stability is expressed as a percentage of viscosity loss.

Although tractor hydraulic systems produce more shear, injector shear test are a good indicator of direction and good for comparisons. In other words, tractor hydraulic oils will usually lose more viscosity in actual use than in injector shear tests, but the oils that perform best

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in the injector shear tests perform best in tractors. That is why some tractor manufacturers include injector shear tests in their specifications, and all the chemical manufacturers use injector shear tests, at least as a screening test.

Comparisons

Recently we had the sear stability of Cen-Pe-Co Multi-Purpose Hydraulic & Wet Brake Oil compared with that of John Deere HyGard® and Cenex Quicklift HTB® using the Orbhan Shear Stability Test (ASTM D7109) Because of the varying properties of different polymers, they were tested at both 30 cycles and 90 cycles. The results are shown in Figure 1.

Although the 30 cycle test is more of an industry standard, the 90 cycle test provided additional information. Looking at only the 30 cycle testing, one would believe the John Deere product had roughly twice the shear loss as the Cenex product. However, the 90 cycle test reveals that although the John Deere fluid may lose its viscosity more quickly, in the end it is not far from the Cenex fluid. Cen-Pe-Co Multi-Purpose Hydraulic & Wet Brake Oil is by far the most shear stable, showing only about 20% of the viscosity loss of the other two.

To put the numbers in perspective, Case specifications MS1204, MS1205, and MS1210 allow no more than a 10% loss in injector shear stability tests. New Holland spec 134D permits no more than a 16% loss in a 30 pass test. (It should be noted that the above injector shear stability requirements do not specify the same procedure and none specify ASTM D7109 used in our testing).

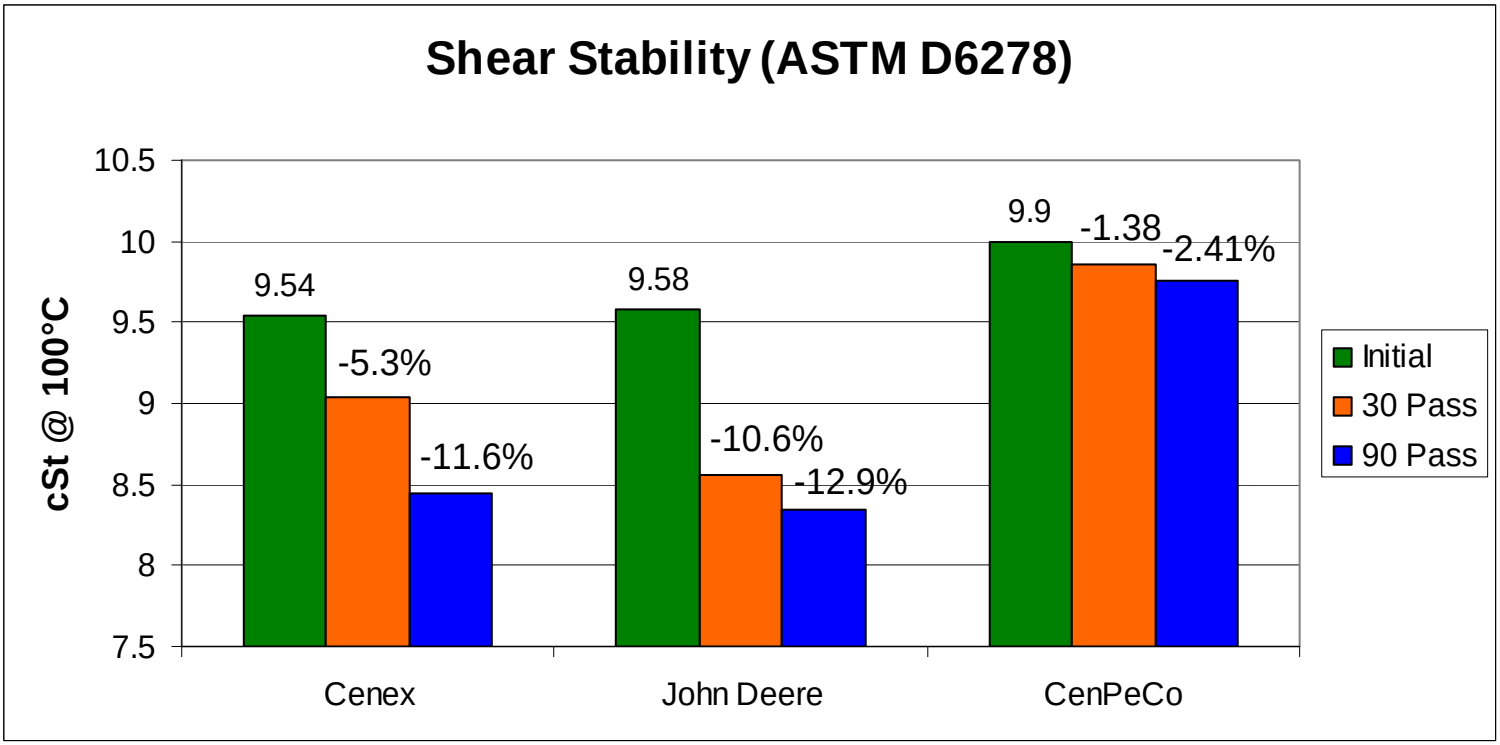
Choosing a Tractor Oil

What a significant loss of viscosity can mean is clear. John Deere's J20C specification requires a minimum viscosity of 9.1 cSt and is recommended for most of their tractor hydraulic systems. They also have a J20D specification with a minimum viscosity of 7.0 cSt. This thinner oil is recommended for better flow in cold climates (down to -40°F). J20D is not recommended at temperatures above 68 or 86°F, depending on the tractor model, because it can cause excessive gear wear. Too much viscosity loss in a tractor hydraulic oil means more wear and a loss of efficiency.

Please notice that Cen-Pe-Co Multi-Purpose Hydraulic & Wet Brake Oil was compared with two premium products. Much cheaper tractor hydraulic oils are available, and nobody is policing them to make sure they meet any of the manufacturers specs. They can offer a false economy due to efficiency, performance, and wear.

Central Petroleum Company endeavors to make the very best heavy duty lubricants available, and Cen-Pe-Co Multi-Purpose Hydraulic & Wet Brake Oil is a shining example of that commitment.

*HyGard is a registered trademark of John Deere. Quicklift HTB is a registered trademark of Cenex.



seal compatibility

Seals and the oil they contain must be compatible with each other. If the seal experiences excessive shrinkage, leaks occur. Excessive swelling shortens seal life, and then leaks occur. If you have ever wondered how seal compatibility is tested, read on.

The two primary parameters in seal compatibility testing are hardness and volume changes. Hardness is measured by an instrument indenting a rigid ball into the seal material. The indentation caused by a small initial force is compared with that of a greater force. The result is expressed in International Rubber Hardness Degrees (IRHD) with a range of 0 for the hardest and 100 for the softest materials.

The new seal is measured for hardness and size. Then, to accelerate the process, it is aged in hot test oil. The temperature and duration varies by manufacturer and the seal material being tested. Measures are taken on the aged seal and compared with new. Manufacturers limit the percentage change, which can be as much as 25% in hardness and 45% in volume or as little as 4% and 5% respectively depending on manufacturer and material. In most cases, little or no change is the objective.

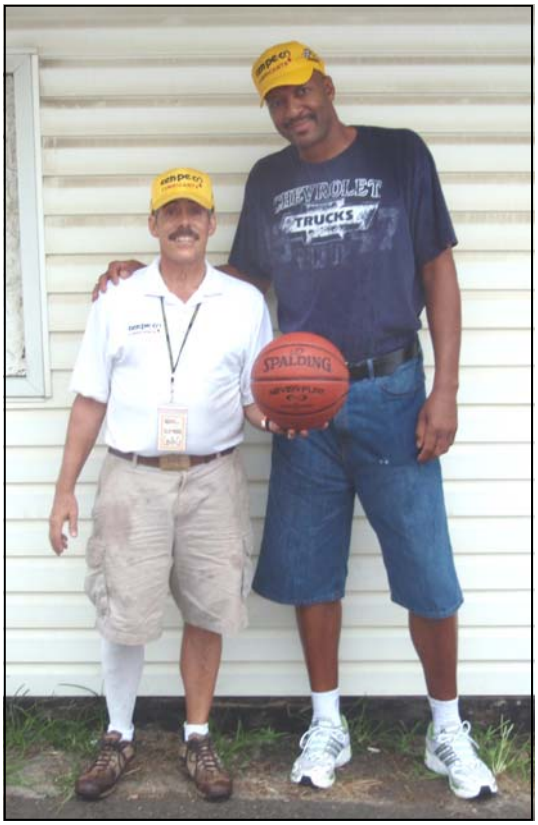
Case Study

Recently, Cen-Pe-Co Multi-Purpose Hydraulic & Wet Brake Oil was tested for compatibility with a polyacrylate seal. Six hardness measurements were made on each side of the D-ring seal and averaged. Thickness measurements were also taken. The seals were twisted and suspended in a beaker, which was then filled with Cen-Pe-Co Multi-Purpose Hydraulic & Wet Brake Oil. The whole thing was put in an oven for 70 hours at 150°C (302°F). Measurements were taken and the changes were as follows:

IRHD Hardness	2.8%
Volume	0.1%
Thickness	1.0%

Obviously, it passed.

Perhaps this article will provide some insight next time “seal compatibility” comes up.



MAKE-A-WISH®

NORTHWEST OHIO CHAPTER

Through the efforts of Paul Webster, Larry Nance, former 3-Time NBA All-Star from the Cleveland Cavaliers joined Team Cen-Pe-Co at the National Tractor Pulling Championships in Bowling Green, OH to raise money for the Make-A-Wish Foundation. Larry spent four hours on Saturday (in the rain) shooting hoops or throwing corn bags with young and old alike who contributed to Make-A-Wish. Paul was credited with over 450 assists as he rebounded for the shooting. All in all, the event was a great success and the Make-A-Wish people were very grateful for Paul's generosity and the Wish Kids in attendance were overwhelmed by Larry's size and kindness. Through their combined efforts, Larry and Team Cen-Pe-Co raised over $1,700 for Make-A-Wish!

THE THREE-LEGGED SALES STOOL

Daryl R. Lehman

Selling is like a three-legged stool. If it is missing one or two legs it may still be used, but it is certainly unstable and shaky, requiring more effort and energy and is less effective. The three legs of the "sales stool" are:

1. **Product & Business Knowledge** (the foundation)
2. **Sales Skills & Management** (the process) Demos, Approaches, Closes, organization
3. **Attitude** (the energy): Focus, Perspective, Persistence etc.

Having thorough **product knowledge** builds your confidence. This will be reflected in your presentation. This will foster confidence in the prospect/customer. John Ballentine, "Mr. Cen-Pe-Co", use to tell us to choose a product focus for a week. The weekend prior, read all the information you have on that product. Monday, talk with every contact about that product. That evening, review the product info again and repeat the process Tuesday - Friday. By week's end, you will have a solid foundation in that product.

Secondly, **sales skills and territory management**. Regular reading of inspirational books on sales, life management, and the Bible, stimulates mental, spiritual and emotional growth, fostering a proper and balanced perspective on life.

Territory management: Cover your territory systematically by township, section or zip code. This will assure that you see each customer regularly and predictably.

Keeping **good customer records** is part of management. Having a record in hand - on a card for example – you can look back over it to see what was bought in the past. This prompts you to ask about his supply of those products that otherwise may have been overlooked. If he discovers two months after you call that he needs a product, he may go to the local dealership to buy.

Thirdly, **Attitude!** Know your own strengths and be confident in them. Acknowledge and be honest about your weaknesses and work at strengthening them. We all have weak areas. Keep them in proper perspective. Do not allow them to be so big in your mind that you think "I'm not good enough" or "I can't do it like so and so". Such thoughts will hinder you in reaching your full potential.

We cannot deny the effects of a poor economic climate and downturns in certain markets. Yet, we can cultivate a positive approach, exploring new markets and ways to help our customers. Exercising faith is not denying reality, rather, pressing forward with expectation in the face of reality, looking for opportunities.

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If you are strong in any one of these "legs" and lacking in the others, you can still sell product but not as effectively. Build strength in all three and you will realize greater success!