**Working to develop more efficient lubricants**

Vehicle and equipment manufacturers continue to place high priority on improving energy efficiency and fuel economy. This is in response to government regulations on fuel economy and CO$_2$ emissions as well as customer demands. New, more efficient engine, driveline and power transmission lubricants are playing an important role. The trend to lower viscosity fluids is one approach. An example is the development of new “super fuel economy” SAE 0W-20 engine oils in Japan. Another is the movement to lower viscosity automatic transmission fluids, generally 5.0-6.0 cSt at 100 °C. Lower viscosity manual transmission and axle fluids, like SAE 75W-80 and 75W-85, are also being developed.

Studies show that reducing viscosity during cold start-up (typically -20 to 25 °C) and at normal operating temperature (from 40 to 80 °C) improves mechanical efficiency. Using low viscosity fluids helps efficiency in these temperature ranges but concerns exist about impact on long term durability. Another approach is the use of high viscosity index (VI) fluids. High VI fluids are less viscous at low and normal operating temperatures but, unlike low viscosity fluids, maintain viscosity at higher temperatures. This improves efficiency at cold start and under normal operation without sacrificing protection at high temperatures.

Lubrizol has continued to study potential benefits of higher efficiency lubricants. Two recently reported studies demonstrate the efficiency benefit of higher viscosity index automatic transmission fluids.

**U.S. EPA Cold Temperature FTP Study – High VI vs. Low VI Fluid**

One study was run using a Ford F-150 light truck using the U.S. EPA cold temperature 20 °F (-6.6 °C) FTP protocol. Two transmission fluids formulated to 7cSt @ 100 °C and having VI of 250 and 180 were tested. The viscosity profiles of these fluids are shown in Figure 1. The high VI fluid had lower viscosity at temperatures between -10 °C and 40 °C which is the range of fluid temperatures seen in this test. The high VI fluid showed 0.112 mpg or 0.8% better weighted composite fuel economy compared to the low VI fluid (see Figure 2).

![Figure 1. Viscosity profiles of transmission fluids tested.](image)
New European Operating Cycle Study
A second set of studies was conducted using a European rear drive passenger car running the new European operating cycle. A series of fluids with viscosity of 3.5 and 4.5 cSt @ 100 °C and having VI between 120 and 274 were tested. The results were measured against a reference oil which is the current factory oil for the vehicle. The results from the study, reported as a percent improvement from the reference fluid, are shown in Figures 3 and 4.
The results from the U.S. and European studies show a connection between improvement in fuel economy and increase in viscosity index. Lubrizol continues to develop leading edge performance additive and viscosity modifier technologies that enable the newest generation of high performance, high VI, fuel efficient lubricants.

For more information, please contact us at VMInfo@lubrizol.com.