Determination of Total Aromatics and Total Saturates in Lube Base stocks

- One method for determination of total aromatics and total saturates
- Provide excellent chromatographic separation, and support high-speed, high-separation analysis
- Assured reliability and reproducibility
- ASTM D6379, ASTM D6591 and ASTM D7419

Lubricant/lube is a class of oils used to reduce friction, heat and wear on the engine's moving parts. The use of lubricating oils in vehicles is vital to their operation. When an engine is properly lubricated, it needs to put less work into moving pistons as the pistons glide easily. In the long run, this means that the car is able to operate while using less fuel and run at a lower temperature. Overall, the proper use of lubricating oil in a car improves efficiency and reduces the amount of wear and tear on moving engine parts.

Lubricants are primarily made up of base oil (base stock) depending on the application of the formulation, and comprising saturates and remaining aromatics. Saturates are divided into paraffins (or aliphatics) and naphthenes (or cyclic-aliphatics), and aromatics into mono-aromatics, di-aromatics, and poly-aromatics. Along with polyaromatic hydrocarbons (PAHs), some polar compounds (sulfur, nitrogen, and oxygen-containing) are also present. Also, additives are being used to enhance the performance of lubricants. However, the effectiveness of lubricants is dependent on their base oils. Base oils are refined from selected crude oils, re-refined from used oil, synthesized from specific organic compounds, or extracted from renewable resources, such as seed oils. Their properties have a direct impact on the overall performance and lifetime of lubricants. Base oil analysis and characterization is important for understanding how the physical and chemical properties of these materials relate to performance in finished lubricants. It is also essential for maintaining quality control (QC) over the manufacturing process, for quality assurance (QA) of the finished product, and for setting specifications between buyer and seller. Given the limitations of GC, HPLC is preferred for total aromatics and saturates in lube base stocks analysis.

Aromatic Hydrocarbon Analyser uses an accepted method for the determination of total aromatics and total saturates in additive-free lube base stocks using high performance liquid chromatography (HPLC) with refractive index (RI) detection. This test method is applicable to samples containing total saturates in the concentration range of 74.9 % to 100.0 % by mass and aromatics in the concentration range of 0.0 % to 25.1 % by mass. The precision is expressed in terms of the total saturates. Polar compounds are combined with the total aromatics. Precision was determined for base stocks with polars content <1.0 % by mass.

Test Method & Result:

A known mass of sample is diluted in the mobile phase and a fixed volume of this solution is injected into a calibrated high performance liquid chromatograph. The separation column set has little affinity for the saturates while retarding the aromatic hydrocarbons and the polars. As a result of this retardation, the aromatic hydrocarbons and polars are separated from the saturates. At a predetermined time, after the elution of the saturates, the column is backflushed to elute the aromatics and polars as a single sharp band. The column set is connected to a refractive index detector that detects the components as they elute from the column.

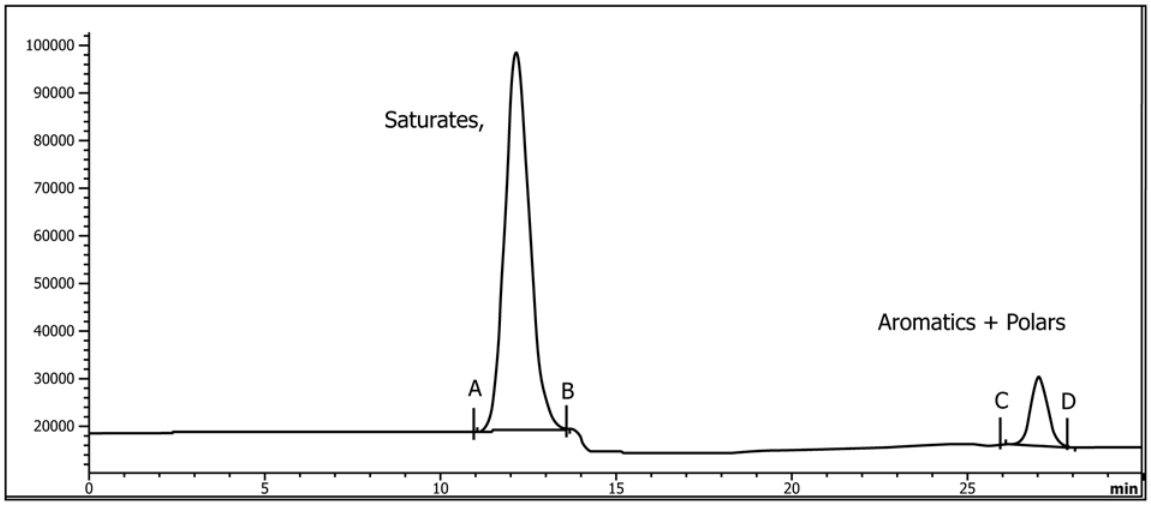

Fig.1 Chromatogram of base stock Sample 2: 7.8 % Aromatic