Petroleomics is the term used to describe the study of all components of crude oil (petroleum) and how these components affect the properties and reactivity of that specific crude oil. This idea is not new to the industry. The composition of crude oil is the cornerstone of molecular-based management of refinery processes. Simply stated, crude oil companies are being forced to drill heavy oils to meet world demand. It is this need to determine and understand a crude oil’s composition that is the force behind all crude oil analysis. Light or heavy are often used to describe different types of crude oils. Although not derived from composition, the terms light or heavy are often used to describe different types of crude oils. Light petroleum (sweet crude oil) is usually rich in low-boiling constituents, whereas heavy petroleum (sour crude oil) is composed of more aromatic, heteroatom-containing constituents with higher boiling points. The decrease in light oil reserves around the world has led to the production of petroleum-based products from the heavy crude oils that are more readily available.

In 2003, the global oil production was at 70 million barrels per day. Oil production is marginal or non-existent in a large amount of countries, notably in Africa. Eight producers, Saudi Arabia, the United States, Russia, Iran, China, Venezuela, Mexico and Nigeria accounted for 59% of the global production in 2003. Oil demand is roughly a function of population and level of development. Seven countries, the United States, Japan, China, Germany, Russia, Italy and France, accounted for 53% of the global demand. It is essential that methods in petroleum production continue to improve in order to meet global demand.

The image below is that of the mass spectrometer results for the same sample using two superconducting magnets. Each peak represents a type of molecule. The numbers running across the bottom of the graph—what’s called the mass to charge ratio, or m/z—refer to the molecule’s atomic mass.

The 14.5 Tesla magnet, it can be seen that it is actually composed of three separate peaks.

The image below is that of the mass spectrometer results for the same sample using two different FT-ICR superconducting magnets. Using the 7 Tesla field magnet, only one peak is seen. However, using the 14.5 Tesla magnet, it can be seen that it is actually composed of three separate peaks.

The problem is relatively new. Oil samples have only been analyzed at the Magnetic Laboratory for Petroleum and Petrochemical Analysis. This ability to differentiate the three separate peaks demonstrates the advantages of using superconducting magnets.

The MAGNETIC LABORATORY FOR PETROLEUM AND PETROCHEMICAL ANALYSIS

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World Crude Oil Production and Consumption, 2003

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