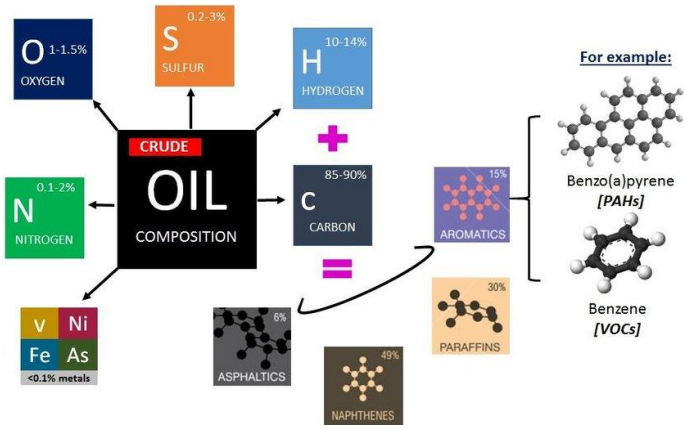
NAKASAWA

UNDERSTANDING HEAVY OIL COMPOSITION

HEAVY OIL ELEMENTAL COMPOSITION

From the chemical point of view heavy oil elemental composition contains **Carbon, Hydrogen, Nitrogen and Sulfur** (CHNS). Typical figures in heavy oils worldwide comprises more than 80% of carbon and about 10% of hydrogen in average. The atomic ratio of hydrogen to carbon (H/C ratio) is frequently used to indicate the quality and value of the heavy oil. **The higher the H/C ratio is, the better will be the quality of the hydrocarbons**. The H/C ratios of various types of heavy oil remain almost constant, within 1.4–1.5, as compared to conventional light crude (1.7–1.8). Also, the content of sulfur and nitrogen plays an important role in the refining industry. For example, the high sulfur content poses a major expense in the hydrotreating process. Similarly, the high nitrogen content (higher than 3,000 ppm) raises a major concern for catalyst activity and environmental emission. Additionally **Nickel and Vanadium** are the two major elements present in heavy, extra-heavy and bitumen; highlighting, the nickel concentration is less than half the vanadium concentration.



HEAVY OIL CHARACTERIZATION

The chemical characterization of heavy oils is commonly supported based on its four major fractions—namely, saturates, aromatics, resins, and asphaltenes. Together, these are referred to by the acronym **SARA**. **Asphaltenes** comprises a heterogeneous and heaviest fraction consisting of largely polycondensed aromatic rings and cyclic naphthenes. It has a major role in the higher viscosities and densities of these types of crude oils, drastic changes in chemical composition (lighter hydrocarbons contact) might cause the agglomeration and precipitation of this component causing obstructions in the reservoir or pipelines. **Resins** along with the asphaltenes are the heaviest components, they contribute to add some chemical stability to the asphaltene molecule. In contrast **Saturates** fraction consist of nonpolar material including linear, branched, and cyclic saturated hydrocarbons (paraffins) they represent the lightest fraction of crude oils, highlighting its low proportion in heavy oils. **Aromatic** hydrocarbons are those hydrocarbons that possess the special properties associated with the nucleus or ring of benzene, in which there are six carbon-hydrogen groups attached to each of the vertices of a hexagon.

CANADA			VENEZUELA
1-2	SATURATES (wt%)	5-7	
5-8	AROMATICS (wt%)	45-50	
50-55	RESINS (wt%)	25-28	
30-35	ASPHALTENES (wt%)	15-18