

A NOTE ABOUT OIL

Oil is a combustible liquid generally considered to have been formed by geochemical processes acting on the remains of organisms buried in the geologic past. Although oil basically consists of only two elements, carbon and hydrogen, it is characterized by an enormously complex variety of molecular structures – no two crude oils from different sources are identical. Despite this almost unlimited complexity, most crude oils contain 84% to 87% carbon by weight and 11% to 14% hydrogen.

In addition to carbon and hydrogen, there are small amounts of other elements present, typically in amounts aggregating less than 3% by weight of the oil. Sulphur, nitrogen and oxygen are the principal "contaminants", although traces of sodium chloride, phosphorus and heavy metals such as vanadium and nickel are common. Heavy oils and natural asphalt may have a sulphur content of 5% or more.

The conversion of organic material contained in sediments into petroleum is a function of temperature (in turn related to depth of burial) and time.

Deeper burial by continuing sedimentation, increasing temperatures, and advancing geologic age result in the mature stage of petroleum formation during which the full range of petroleum compounds is produced from kerogen and other precursors by thermal degradation and cracking (the process by which heavy hydrocarbon molecules are broken up into lighter molecules). Depending on the amount and type of organic matter, oil generation occurs during the mature stage at depths of about 760 to 4,880 metres (2,500 to 16,000 feet) at temperatures between 65° and 150°C. This special environment is called the "oil window". In areas of higher than normal geothermal gradient (increase in temperature with depth), the oil window exists at shallower depths in younger sediments but is narrower. Maximum oil generation occurs from depths of 2,000 to 2,900 metres. Below 2,900 metres primarily wet gas, a type of gas containing liquid hydrocarbons known as natural gas liquids, is formed. (Riva, 1987a, p. 590)

At the end of the mature stage and at depths greater than about 4,900 metres (16,075 feet), depending on the geothermal gradient, crude oil becomes unstable and the main hydrocarbon product is dry gas (methane). At sediment temperatures greater than about 250°C (482°F), hydrocarbons cease to be generated from organic matter. Depending on its geologic history then, a sedimentary formation may be oil prone, gas prone, both or neither.

Oils are usually characterized by their API gravity, on a scale adopted by the American Petroleum Institute to measure the specific gravity of crude oils. This scale arbitrarily assigns an API gravity of 10° to pure water. Oils lighter than water have an API gravity greater than 10°; those heavier than water have a value less than 10°.