

# OIL

**Definition:** A group of liquid hydrocarbons of fossil origins comprising Crude (that is, unprocessed) oil, liquids extracted from natural gas (NGL) and fully or partly processed products from the refining of Crude oil.

**Remark:** Functionally similar liquid hydrocarbons and organic chemicals from vegetal or animal origins are identified separately under liquid biofuels.

## **Consultant's comments**

This could be named 'Fossil Oil' and the remark removed.

# CRUDE OIL

**Definition:** A mineral oil of fossil origin extracted from underground reservoirs and which comprises liquid or near-liquid hydrocarbons and associated impurities, such as sulphur and metals.

**Explanation:** Crude oil exists in the liquid phase under normal surface temperature and pressure and usually flows to the surface under the pressure of the reservoir.

**Remark:** The various crude oils may be classified according to their sulphur content ('Sweet' or 'Sour') and API gravity ('Heavy' or 'Light'). There are no rigorous specifications for the classifications but a Heavy crude oil may be assumed to have an API gravity of less than 20° and a Sweet crude oil may be assumed to have less than 0.5% sulphur content.

# UNCONVENTIONAL OILS

**Definition:** Oils obtained by unconventional production techniques.

**Explanation:** Unconventional oils are extracted from reservoirs containing extra heavy oils or oil sands which need heating or treatment (for example, emulsification) *in situ* before they can be brought to the surface for refining/processing. They also include the oils extracted from oil sands, extra heavy oils, coal and oil shale which are at, or can be brought to, the surface without treatment and require processing after mining (*ex situ* processing).

Unconventional oils may also be produced from natural gas.

They may be divided into two groups.

Oils for transformation.

Examples are synthetic crudes extracted from:

- Extra heavy oils
- Oil sands
- Coal
- Oil shale
- Oils for direct use.

Examples are:

- Emulsified oils (for example, Orimulsion)
- GTL liquids

**Remark:** Oil sands are also known as tar sands. Extra heavy oils are also known as bitumen. This is not the petroleum product of the same name which is made from vacuum distillation residue.

## Consultant's comments

The classification 'unconventional' oils has been removed from the definition of crude oil and generalised. Some of the primary feedstocks may be used directly as well as converted to oils consequently the manner in which these oils are reported and presented within balances needs careful consideration.

## NATURAL GAS LIQUIDS (NGL)

**Definition:** Natural gas liquids are a mixture of ethane, propane, butane (normal and iso), (iso) pentane and a few higher alkanes collectively referred to as pentanes plus.

**Explanation:** NGL are removed from associated and non-associated natural gas in field facilities or gas separation plants before sale of the gas.

**Remark:** The definition given above is the most commonly used. However, some oilfield practice limits the term NGL to those compounds which are liquid at the surface or can be liquefied without refrigeration. This would exclude ethane. In this case, natural gas liquids may also be classified according to their vapour pressures as low (condensate), intermediate (natural gasoline) and high (liquefied petroleum gas) vapour pressure.

NGL may be distilled with crude oil in refineries, blended with refined petroleum products or used directly.

### **Consultant's comments**

Another definition and terms used to describe the components of NGL have been mentioned in the remark as they are also in use.

## REFINERY FEEDSTOCK

*Definition:* Oils or gases from crude oil refining or the processing of hydrocarbons in the petrochemical industry which are destined for further processing in the refinery excluding blending.

*Explanation:* Typical feedstocks include, naphthas, middle distillates, pyrolysis gasoline and heavy oils from vacuum distillation and petrochemical plants.

## ADDITIVES AND OXYGENATES

*Definition:* Compounds added to or blended with oil products to modify their properties (octane, cetane, cold properties, etc.).

*Remark:* Examples are: oxygenates, such as alcohols (methanol, ethanol), ethers (such as MTBE (methyl tertiary butyl ether), ETBE (ethyl tertiary butyl ether), TAME (tertiary amyl methyl ether); esters (e.g. rapeseed or dimethylester, etc.); chemical compounds (such as TML, TEL and detergents).

Some additives/oxygenates may be derived from biomass, others may be of hydrocarbon origin.

### **Consultant's comments**

The definition is limited to the use of additives/oxygenates for the modification of the properties of oil products. The possible separation of the biomass derived contribution is a reporting point. The definition of biofuels used directly or after blending with fossil fuel is covered within the 'Renewables' chapter.

## OTHER HYDROCARBONS

*Definition:* Unconventional oils, liquid fuels produced from the conversion of natural gas and hydrogen.

*Remark:* Although not a hydrocarbon hydrogen is included unless it is a component of another gas.

### **Consultant's comments:**

If the supply of all of the primary oils and proxies for primary oils present at levels 1.1 to 1.6 of this hierarchy is to be balanced by the total uses and losses of the products within level 1.7 then 'Other Hydrocarbons' will have to also include recycled petroleum products, in practice, recycled lubricants.

## PETROLEUM PRODUCTS

*Definition:* Products obtained from crude oil, unconventional oils or wet natural gas.

*Explanation:* They may be produced through the refining of crude and unconventional oils or from wet natural gas by separation processes.



## REFINERY GAS

*Definition:* Refinery gas includes a mixture of non-condensable gases mainly consisting of hydrogen, methane, ethane and olefins obtained during distillation of crude oil or treatment of oil products (e.g. cracking) in refineries or from nearby petrochemical plants.

*Remark:* It is used mainly as a fuel within the refinery.

# ETHANE

*Definition:* A naturally gaseous straight-chain hydrocarbon ( $C_2H_6$ ) extracted from natural gas at gas separation plants or produced during the refining of crude oil.

*Remark:* Ethane is a valuable feedstock for petrochemical manufacture.

## LIQUEFIED PETROLEUM GAS (LPG)

*Definition:* LPG refers to liquefied propane and butane or mixtures of both. Commercial grades are usually mixtures of the gases with small amounts of propylene, butylene, isobutene and isobutylene stored under pressure in containers.

*Remark:* The mixture of propane and butane used varies according to purpose and season of the year. The gases may be extracted from natural gas at gas separation plants or at plants regasifying imported Liquefied Natural Gas. They are also obtained during the refining of crude oil. LPG may be used for heating and as a vehicle fuel. See also the definition for Natural Gas Liquids. Certain oil field practices also use the term LPG to describe the high vapour pressure components of Natural Gas Liquids.

# NAPHTHA

*Definition:* Light or medium oils distilling between 30°C and 210°C which do not meet the specification for motor gasoline.

*Remark:* Different naphthas are distinguished by their density and the content of paraffins, isoparaffins, olefins, naphthenes and aromatics. The main uses for naphthas are as feedstock for high octane gasolines and the manufacture of olefins in the petrochemical industry.

## AVIATION GASOLINE

*Definition:* High quality motor gasoline prepared especially for aviation piston engines with additives which assure performance under flight conditions.

## MOTOR GASOLINE

*Definition:* A mixture of aliphatic hydrocarbons with 5 to 12 carbon atoms per molecule and some aromatics (for example, benzene and toluene) to enhance octane rating. The distillation range is between 35°C and 215°C.

*Remark:* Additives are blended to further improve octane rating, improve combustion performance, reduce oxidation during storage, maintain cleanliness of the engine and improve capture of pollutants by catalytic converters in the exhaust system. Traded motor gasoline may also contain biogasoline products.

## GASOLINE TYPE JET FUEL

*Definition:* This includes all light hydrocarbon oils for use in aviation turbine power units, distilling between 100°C and 250°C. They are obtained by blending kerosenes and gasoline or naphtha in such a way that the aromatic content does not exceed 25% in volume, and the vapour pressure is between 13.7 kPa and 20.6 kPa.

# KEROSENE

**Definition:** Middle distillate oil products having carbon numbers predominantly in the range  $C_9$  to  $C_{16}$  and boiling over the temperature interval  $145^{\circ}\text{C}$  to  $300^{\circ}\text{C}$  but not usually above  $250^{\circ}\text{C}$  and a flash point above  $38^{\circ}\text{C}$ .

**Explanation:** The chemical composition of kerosenes depends on the nature of the crude oils from which they are derived and the refinery processes that they have undergone. Kerosenes obtained from crude oil by atmospheric distillation are known as straight-run kerosenes. Such streams may be treated by a variety of processes to produce kerosenes that are acceptable for blending as jet fuels.

**Remark:** Kerosenes are primarily used as jet fuels. They are also used as domestic heating and cooking fuels, and as solvents.



## KEROSENE TYPE JET FUEL

*Definition:* A kerosene suited to flight conditions with particular specifications (such as freezing point) which are established by the International Air Transport Association (IATA).

**Consultants comments:**

The remark in the previous definition is relevant only for reporting purposes.

## OTHER KEROSENE

*Definition:* Kerosene which is used for heating, lighting, solvents and internal combustion engines.

*Remark:* Other names for this product are burning oil, vaporizing oil, power kerosene and illuminating oil.

## GAS OIL/DIESEL OIL

**Definition:** Gas oils are middle distillates, predominantly of carbon number range  $C_{11}$  to  $C_{25}$  and with a distillation range of 160°C to 420°C.

**Explanation:** The principal marketed products are:

- Automotive fuels for diesel engines
- Heating oils
- Marine fuel

Gas Oils are also used as middle distillate feedstock for the petrochemical industry and as solvents.

## ROAD DIESEL

*Definition:* Automotive gas (diesel) oil (usually of low sulphur content) for fuel use in compression ignition (diesel) engines fitted in road vehicles. Distillation range is 160°C to 390°C.

*Remark:* Additives are used to ensure a suitable cetane number and cleanliness of the engine. The cetane number describes the combustion quality of diesel fuel during compression ignition.

**Note:**

Transport Diesel is included in the broader definition of Gas/Diesel Oil (Distillate Fuel Oil).

## HEATING AND OTHER GAS OIL

*Definition:* Oils meeting the specifications for Gas/Diesel Oil (see above) which are used as a light heating oil for industrial and commercial uses, in marine and rail locomotive diesel engines and as a petrochemical feedstock.

### **Consultant's comments**

The distillation range is given in the definition of Gas Oil/Diesel oil.

### **Note:**

Heating and Other Gas Oil is included in the broader definition of Gas/Diesel Oil (Distillate Fuel Oil).

## HEAVY GAS OIL

**Definition:** A mixture of predominantly Gas oil and Residual Fuel Oil which distills in the range 380°C to 540°C.

### **Consultant's comments**

A definition separate from those for gas oil has been introduced because this oil is a mixture of a middle distillate and a residual oil and its distillation range is very different from that for gas oils (160°C to 420°C).

## FUEL OIL

**Definition:** Comprises residual fuel oil and heavy fuel oil which is usually a blended product based on the residues from various refinery, distillation and cracking processes. Fuel oils have a distillation range of 350°C to 650°C and a kinematic viscosity in the range 6 to 55 cSt at 100°C. Their flash point is always above 60°C and their specific gravity is above 0.95.

**Explanation:** Heavy fuel oil is a general term and other names commonly used to describe this range of products include: bunker fuel, bunker C, fuel oil No. 6, industrial fuel oil, marine fuel oil and black oil.

**Remark:** Residual and Heavy fuel oil are used in medium to large industrial plants, marine applications and power stations in combustion equipment such as boilers, furnaces and diesel engines. Residual fuel oil is also used as fuel within the refinery. Historically residual fuel oil was the residue from atmospheric distillation and heavy fuel oils the result of blending residual oils from various processes and, possibly, with distillate oils. The distinction is now losing its value as the terms residual and heavy are often applied without discrimination.

### Consultant's comments

This definition has been taken largely from the CONCAWE product dossiers which provide comprehensive details of the products characteristics and their chemical make up.  
<<http://www.concawe.be/Content/Default.asp?PageID=35>>

# WHITE SPIRIT AND SPECIAL BOILING POINT INDUSTRIAL SPIRITS

*Definition:* White Spirit and SBP (Special Boiling Point Industrial Spirits) are refined distillate intermediates with a distillation in the naphtha/kerosene range. They are mainly used for non-fuel purposes and sub-divided as:

- **Industrial Spirit (SBP):** Light oils distilling between 30°C and 200°C.

*Explanation:* There are 7 or 8 grades of industrial spirit, depending on the position of the cut in the distillation range. The grades are defined according to the temperature difference between the 5% volume and 90% volume distillation points (which is not more than 60°C).

- **White Spirit:** Industrial spirit with a flash point above 30°C. The distillation range of white spirit is 135°C to 200°C.

*Remark:* White spirit and Industrial spirits are mostly used as thinners and solvents.



# LUBRICANTS

*Definition:* Oils, produced from crude oil, for which the principal use is to reduce friction between sliding surfaces and during metal cutting operations.

*Explanation:* Lubricant base stocks are obtained from vacuum distillates which result from further distillation of the residue from atmospheric distillation of crude oil. The lubricant base stocks are then further processed to produce lubricants with the desired properties.

## **Consultant's comments**

The definition has been limited to lubricants derived from crude oil. Lubricants are also derived from vegetable oils and silicone oils. Equally, synthetic lubricants are made by several processes using basic chemical feedstocks from the petrochemical industry. Only lubricants derived from crude oil within the refinery need be considered when ensuring an energy balance.

## PARAFFIN WAXES

*Definition:* Residues extracted when dewaxing lubricant oils. They have a crystalline structure which varies in fineness according to the grade and are colourless, odourless and translucent, with a melting point above 45°C.

*Remark:* Paraffin waxes are also known as Petroleum waxes.

# PETROLEUM COKE

**Definition:** Petroleum coke is a black solid obtained mainly by cracking and carbonising heavy hydrocarbon oils and tars and pitches. It consists mainly of carbon (90 to 95%) and has a low ash content.

**Explanation:** The two most important categories are "green coke" and "calcined coke".

- Green coke (Raw coke) is the primary solid carbonization product from high boiling hydrocarbon fractions obtained at temperatures below 630°C. It contains 4 -15 per cent by weight of matter that can be released as volatiles during subsequent heat treatment at temperatures up to approximately 1330°C.
- Calcined coke is a petroleum coke or coal-derived pitch coke obtained by heat treatment of green coke to about 1330°C. It will normally have a hydrogen content of less than 0.1 wt.%.

**Remark:** In many catalytic operations (e.g., catalytic cracking) carbon or catalytic coke is deposited on the catalyst, thus deactivating it. The catalyst is reactivated by burning off the coke which is used as a fuel in the refining process. The coke is not recoverable in a concentrated form.

# BITUMEN

*Definition:* Bitumen is a solid, semi-solid or viscous hydrocarbon with a colloidal structure, being brown to black in colour.

*Remark:* It is obtained as a residue in the distillation of crude oil and by vacuum distillation of oil residues from atmospheric distillation. It should not be confused with the unconventional primary extra heavy oils which may also be referred to as bitumen.

In addition to its major use for road pavements, bitumen is also used as an adhesive, a waterproofing agent for roof coverings and as a binder in the manufacture of patent fuel. It may also be used for electricity generation in specially designed power plants.

Bitumen is also known in some countries as asphalt but in others asphalt describes the mixture of bitumen and stone aggregate used for road pavements.

## OTHER PETROLEUM PRODUCTS

*Definition:* Products of petroleum origin (including partly refined products) not specified above.

*Explanation:* They will include basic chemicals and organic chemicals destined for use within the refinery or for sale to or processing in the chemical industry such as propylene, benzene, toluene, xylene, hydrogen and methane.