

Oil Refining—Terminology

Petroleum Refining Facilities

Atmospheric distillation unit

Crude oil is composed of a variety of hydrocarbon compounds. The atmospheric distillation unit takes advantage of the different boiling points of these compounds to “crack” crude oil into separate fractions—gasoline, kerosene, diesel fuel, fuel oil, and other components—at normal atmospheric pressure. In general, the scale of an oil refinery is defined by the process capacity of its atmospheric distillation unit.

Vacuum distillation unit

A unit that distills under reduced pressure. When oils with a high boiling point, such as heavy fuel oils, are heated, they may break down before vaporization can happen. By reducing the pressure in the unit, the boiling point of the oil is reduced, allowing for efficient cracking of fractions.

Hydrodesulfurization unit

This unit uses a catalyst to make the sulfur compounds in the petroleum react with hydrogen, converting the sulfur to hydrogen sulfide, which is then removed. Desulfurization can be performed for each fraction, such as naphtha, kerosene, diesel fuel, and heavy fuel oil, etc.

Industry has installed new gas oil desulfurization units to respond to tougher regulations on sulfur content and to meet voluntary targets. Heavy fuel oil desulfurization units are further divided into residue and vacuum gas oil (VGO) desulfurization units. The former removes sulfur from heavy oil fractions that have been cracked in an atmospheric distillation unit. The latter removes sulfur from heavy oil fractions after the asphalt fractions have been cracked in a vacuum distillation unit.

Catalytic reformer

A unit that raises the octane number of naphtha that has been cracked by the atmospheric distillation unit, producing a basic ingredient for gasoline. Hydrogen, a by-product of chemical reactions in this unit, is used in desulfurization.

Fluid catalytic cracker

This unit uses a minute-particle catalyst to crack heavy fuel oil. The cracked oil is divided into LPG, gasoline, diesel fuel and heavy fuel oil. The gasoline component produced by this unit has a high octane number, and accounts for a high proportion of ingredients mixed in other products.

Sulfur recovery unit

The unit collects sulfur from hydrogen sulfide with

other by-product gases emitted by the hydrodesulfurization unit or other refinery facilities. Large quantities of sulfur oxide gas are emitted when gases containing hydrogen sulfide are directly used in fuel. Oil refineries therefore use sulfur recovery units to remove hydrogen sulfides from the by-product gases so they can be used as fuel.

Sour water treatment unit

The wastewater discharged from hydrodesulfurization units and other refinery equipment contains hydrogen sulfide and other odorants. This unit uses steam injection to remove odorous materials. The hydrogen sulfide removed by this unit is then processed by the sulfur recovery unit.

Blending unit

In this unit, gasoline, heavy fuel oil and other petroleum products are blended with a variety of manufactured components, adjusted to the desired qualities for the given application, then shipped. Each component flows at a fixed volume, mixed on a continuous basis using pipes, then is moved to a tank and mixed further.

Petroleum Product Quality

Octane number

The octane number is one gauge of motor gasoline quality. The higher the octane number, the less engine knocking will occur. JIS standards specify an octane number of at least 89.0 for regular gasoline, and at least 96.0 for premium gasoline.

Other Topics

Conversion to distillates

Distillates are the general term for gasoline, kerosene and diesel fuel. The process of conversion to distillates produces more distillates by the decomposition of heavy fuel oil, or black oil. The proportion of white and black oil depends on the type of crude oil, but various equipment at the refinery can be used to increase the production ratio of distillates.

Barrel

The unit of volume for petroleum. One barrel is approximately 159 liters.

Aromatics

Compounds (toluene, xylene, etc.) that have benzene and benzene rings as part of their chemical structure. They may have two or more condensed aromatic rings, or the hydrogen atoms on the ring may be substituted by a member of the alkyl group.