



Republic of Iraq
Ministry of Higher Education
and Scientific Research
Al-Mustaqbal University College
Chemical Engineering and Petroleum Industries
Department

Subject: Fuel Technology
2nd Class

Lecture 8

Cracking

Cracking means heating of higher boiling petroleum fractions like heavy fuel oil at high temperature and pressure to produce lower boiling lighter fractions. It is an endothermic reaction.

The process of cracking, increases the relative amounts of the lower hydrocarbons. During cracking, carbon-carbon bonds get broken, leading to various kinds of products being formed.

There are two types of cracking:

1- Thermal Cracking: Cracking at elevated temperatures in the absence of catalyst. Examples: Visbreaking, delayed coking, Fluid coking.

2- Catalytic Cracking: Cracking in presence of catalyst. Examples: FCC, Hydrocracking, DCC.

1- Thermal cracking

Breaking down large molecules by heating at high temperature and pressure is termed as thermal cracking.

There are three classes of industrial thermal cracking processes:

Classes of industrial thermal cracking processes

- ▶ **Visbreaking** → mild heating is applied to crack the residue just enough to **lower its viscosity** and also to produce **some light products**
- ▶ **Delayed coking** → moderate thermal cracking converts the **residue** into **lighter products**, leaving coke behind
- ▶ **Severe thermal cracking** → part of the **coke is burned** and used to heat the feed in the cracking reactor, as in fluid coking

2- Catalytic Cracking:

Higher hydrocarbons can also be cracked at lower temperature (350-650°C) and lower pressure (2atm) in the presence of a suitable catalyst. The feedstocks ranging from gas oil to heavy crude oil and residuum is heated in presence of catalyst (like, platinum , nickel , iron silica-alumina etc..) to produce lower boiling products and gasoline of higher octane number and therefore this method is used for obtaining better quality gasoline.

Reforming

Reforming means rearrangement of molecules without much affecting the average molecular weight of feed which is generally naphtha and heavy gasoline. Reforming is carried out to produce high quality (octane number) gasoline by heating with or without catalyst.

Feed for Reforming:

The feed is generally naphtha

Reforming Product: Besides the main product (reformate) or reformat gasoline, reforming also produces lighter hydrocarbons (gases), hydrogen and traces of very high boiling materials.

Types of Reforming:

Reforming can be thermal or catalytic as in the case of cracking. Catalyst apart from accelerating the process also enhances the yield and quality (octane number) of gasoline. The gasoline produced by reforming is called reformed gasoline or reformate. Thermal reforming has been almost completely replaced by catalytic reforming.