

Lecture №6 Cracking of Straight Run Residue

The thermal cracking of the straight run residue was for many years the most important process supplementing the straight run gasoline, and many such units were built in various countries.

This position was lost as FCC, which produces a much higher octane number gasoline, became widespread. However, many such units still exist in less developed countries, for instance in Eastern Europe, and their conversion and improvement is an important problem for these countries.

•**Feedstock:** vacuum distillation residue, sometimes heavy gasoil and gasoil recycle stock from cracking unit.

•**Products:** Thermo gas oil (fraction 200-480 °C), gases, gasoline u cracking-residue .

•**Basic parameters of quality thermo gas oil:** the sulfur content, Coking ability, fractional composition, viscosity and pour point.

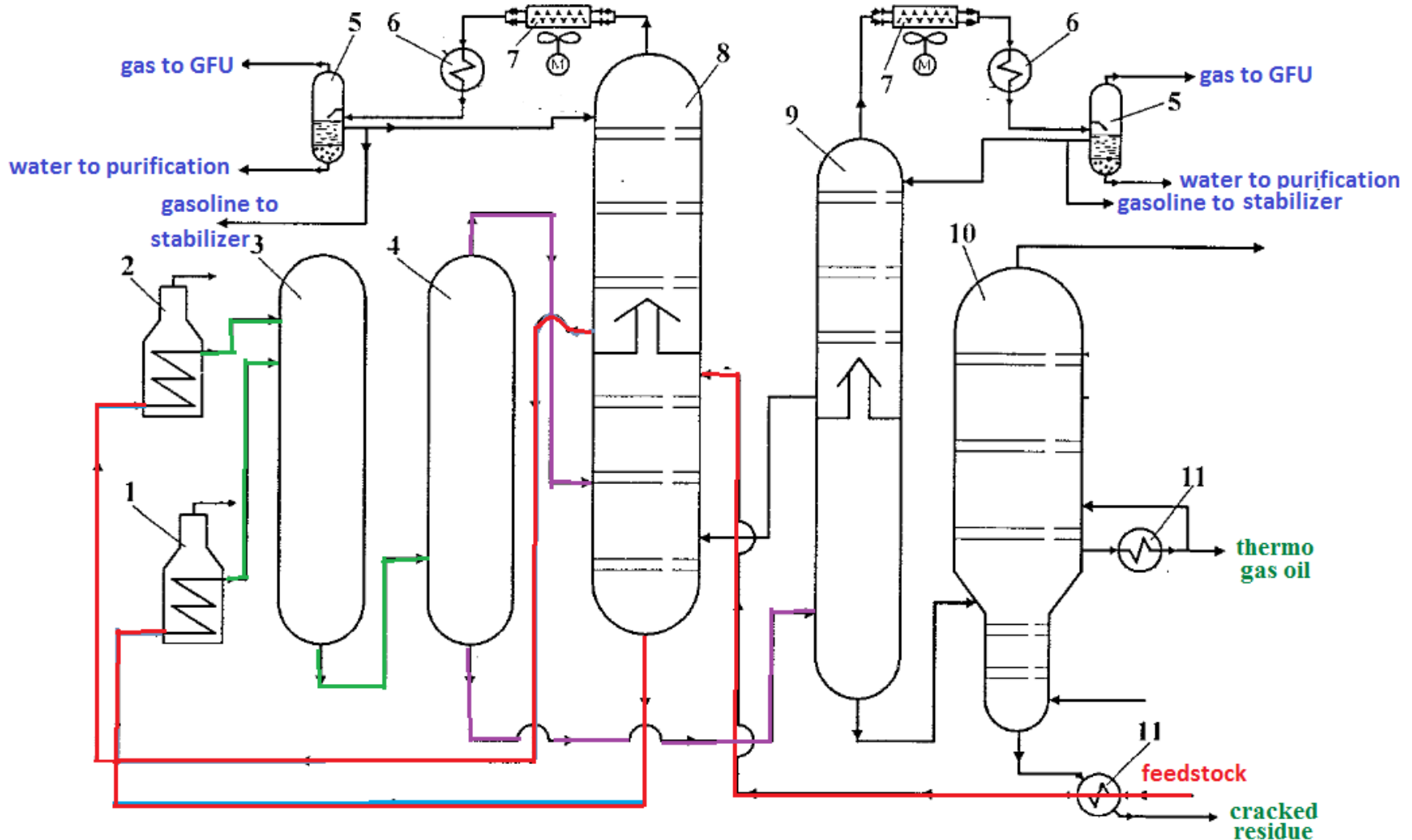
•**Temperature** - 455-540 °C.

•**Pressure** – 100-1000 psi

Installation of two furnace cracking

- The reactor section (furnaces of light and heavy feedstock, reaction chamber);
- Section of separation of the reaction products (high and low pressure flasher, stripper, fractionation column, gas separator);
- Section of heat exchange equipment (heat exchangers, refrigerator, water cooler)

Thermal cracking of straight run residue



1 - furnace of heavy feedstock; 2 - furnace of light feedstock; 3 - reaction chamber; 4 - high pressure flasher; 5 - separator; 6 - refrigerator; 7 - air cooler unit; 8 - fractionation column; 9 - low pressure flasher; 10 - stripper ; 11 - heat exchanger .

Description of scheme

After heating in the heat exchanger the feedstock 11 is entered to lower section of the fractionation column 8. Light distillate fractions are removed from the upper section of the column and directed to furnace of light feedstock 2. Heavy distillate fractions are removed from the lower section and pumped to furnace of heavy feedstock 1. Higher temperatures are used to crack the more refractory light distillate fraction. The streams from furnaces are combined and sent to the reaction chamber 3, where additional time is provided to complete the cracking reactions. Then the cracked products are separated in the high pressure flasher 4, where a cracked residue from the lower section of the flasher is entered to the low pressure flasher 9 and gas, vapor gasoline-kerosene fractions are sent to the lower section of the column 8. The gas, vapor gasoline fraction are removed from the upper section of the column and low pressure flasher 9, then they are cooled in the air cooler unit 7 and refrigerators 6 and sent to the separator 5. Gases are fed to the gas fractionation unit and gasoline is directed to stabilizer.

The cracked residue are sent from the lower section of the low pressure flasher 9 to the stripper 10, where it is exposed to distillation on vacuum thermo gas oil and cracked residue .

Material balance of Thermal cracking of straight run residue,% (mass)

	Cracked residue	Thermo gas oil
Gas	5,0	5,0
Vapor of gasoline	1,3	1,3
Stable gasoline	20,1	20,1
Thermo gas oil	24,2	52,6
Distillate cracking residue	48,3	19,9
Losses	1,1	1,1