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Apparatus of installations with fluidized layer of pulverized catalyst

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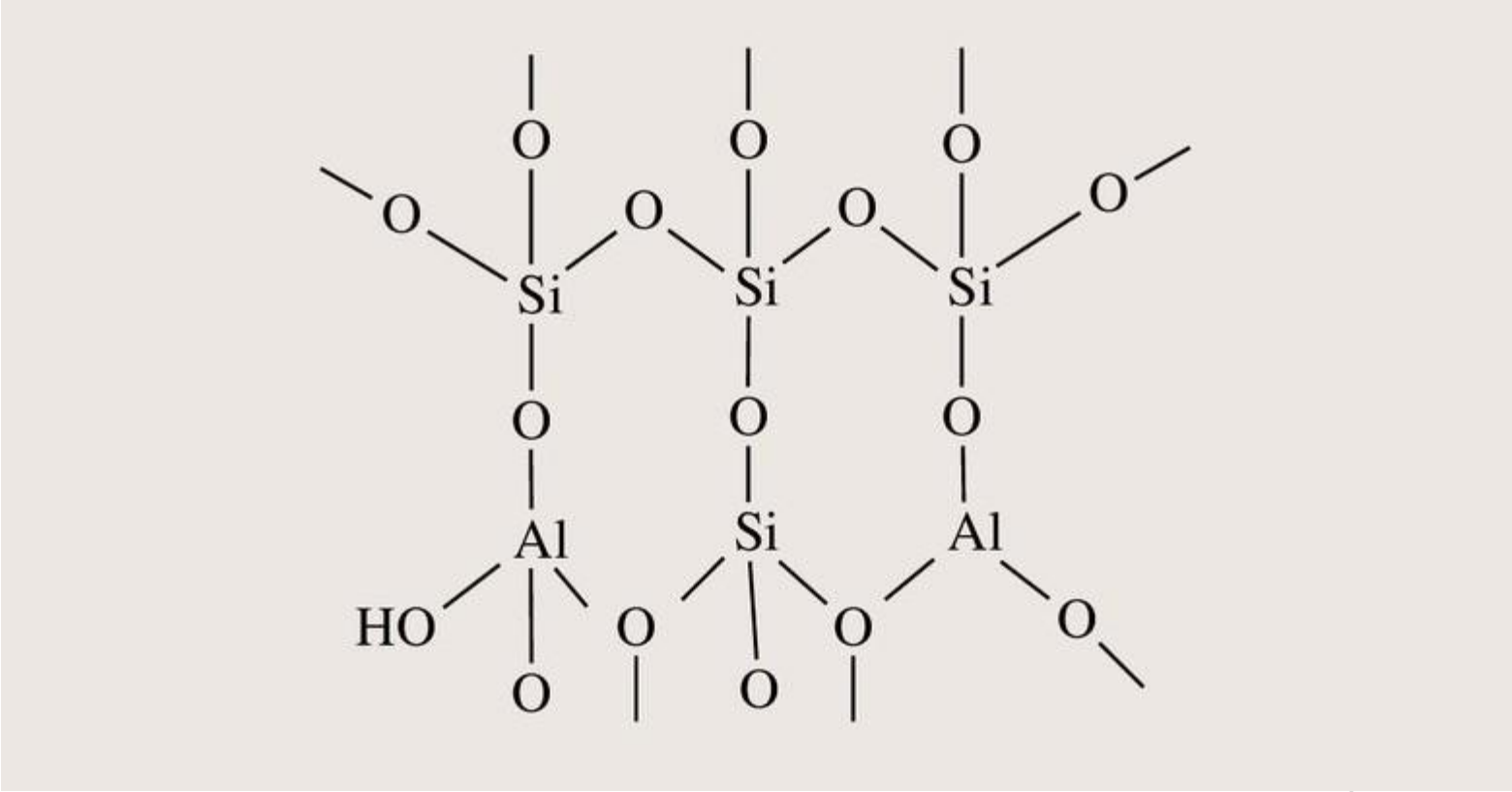
Plan

- Introduction;
- Main features of the process;

- Conclusion;

Catalytic cracking units with a fluidized bed of a pulverized or microspherical catalyst operate on a synthetic or natural activated aluminosilicate catalyst whose particle size is 20 ... 80 Micrometers.



Main features of the process

The advantages of this type of cracking compared to cracking, which uses a ball catalyst, are:

- possibility of simple regulation within wide limits of degree of transformation of raw materials and circulation of the catalyst;
- intensive mixing in the reactor and regenerator, eliminating local overheating and providing high heat transfer coefficients;
- lower energy costs for catalyst transport;
- simpler designs of the main devices.

The disadvantage of cracking in a fluidized bed is that due to the intensive mixing of the raw material in the reactor is mixed with the reaction products and regenerated catalyst in the regenerator with the coked catalyst, i.e. no backflow and more complete regeneration processing of a catalyst.

Cracking in the fluidized bed occurs:

- temperature of 460-510 °C
- excess pressure of 0.18 Mpa
- the flow rate of the catalyst in the fluidized bed is 0.3-0.75 m / s, and $1m^3$ of the mixture contains 400-660 kg of catalyst.

There are four main schemes of the reactor unit:

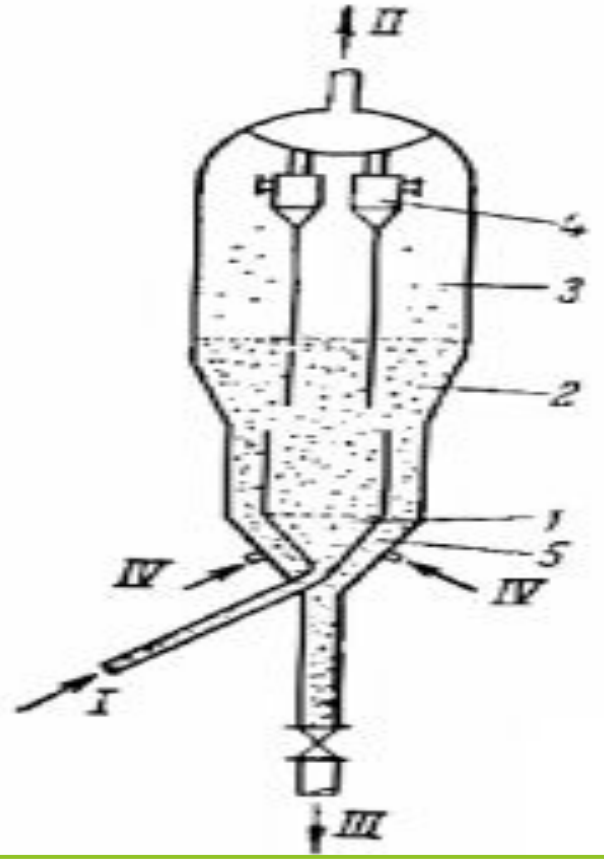
- The scheme with a double rise of the catalyst, when the regenerator is located above the reactor and the catalyst is transported in the diluted phase. The process is carried out at an overpressure of 0.15...0.3 MPa in the reactor and 0.5...1.0 MPa in the regenerator. The regenerator is placed at such a height relative to the reactor that the weight of the catalyst in the discharge riser provides overcoming the pressure in the reactor. Under this condition, the catalyst is transported continuously.

- Scheme with two-fold rise of the catalyst at the location of the reactor and the regenerator at the same level. The reactor unit operates at the same pressure in both devices, which leads to an increase in energy consumption for air compression.

- Scheme with the location of the reactor and regenerator on the same level. The catalyst is transported in a dense phase under the action of the weight difference in the descending and ascending branches, taking into account the catalyst column inside the apparatus. The amount of circulating catalyst is regulated by changing its density in the lifting risers, for which the amount of water vapor or air supplied to the risers is varied.
- Scheme of a coaxial arrangement of the reactor and regenerator and single lifting of catalyst in the diluted phase. According to this scheme, the reactor can be placed above or below the regenerator in a single unit.

Reactors of modern cracking plants with a fluidized bed of the catalyst are vertical cylindrical apparatus with conical or hemispherical bottoms with a diameter of 2500 ... 12 000 mm, a height of 27 000 mm. the temperature of the medium in the working reactor is usually 450...480 °C. the Body of the apparatus is made of carbon steel or bimetal.

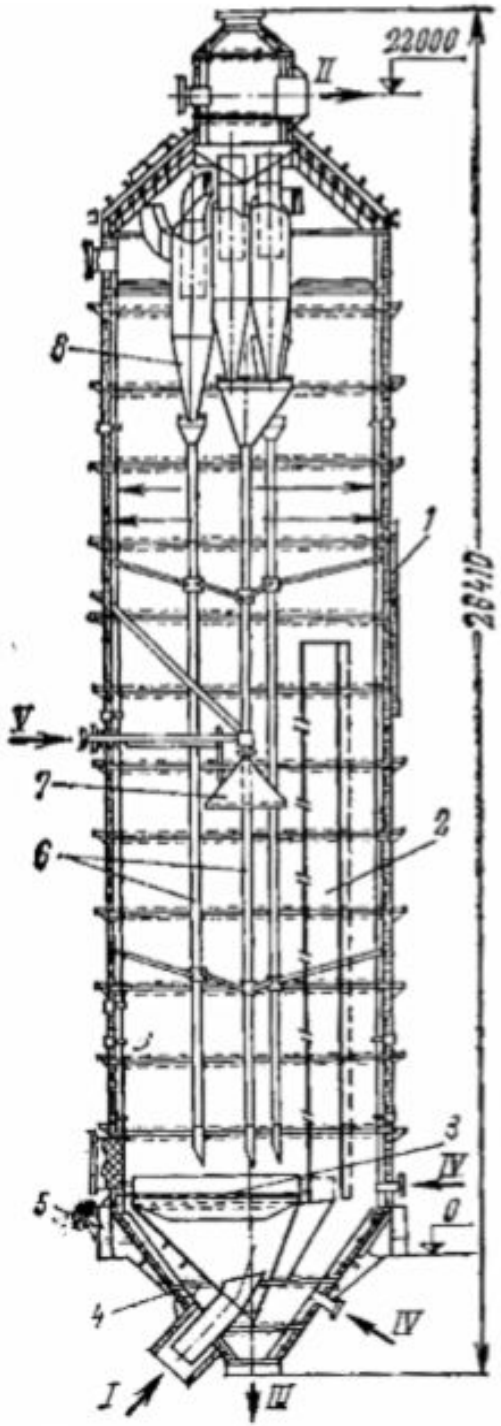
Scheme of the reactor with a pulverized catalyst



1-raw material and catalyst distribution zone; 2-reaction zone; 3-settling zone; 4-cyclones; 5-Stripping zone; I-raw material and catalyst; II-reaction products; III-catalyst output, IV - water vapor

Cracking plant reactorwith pulverized catalyst

The diameter of the device is 5350 mm, the height is 26 400 mm. the Body of the device inside is insulated with slag and covered with a lining of refractory brick, lined with sheet steel. The upper bottom of the reactor is also lined with refractory brick, suspended by t-beams welded to the body.



I - input of raw materials and catalyst; II-input of reaction products; III-output of catalyst; IV-input of water vapor; V - input of residue from the column; 1-body; 2-partition; 3-distribution grid; 4-support table; 5-support; 6-risers; 7-cone; 8-cyclones