

## **Lecture №10. Modern pyrolysis unit. The technological scheme of the process.**

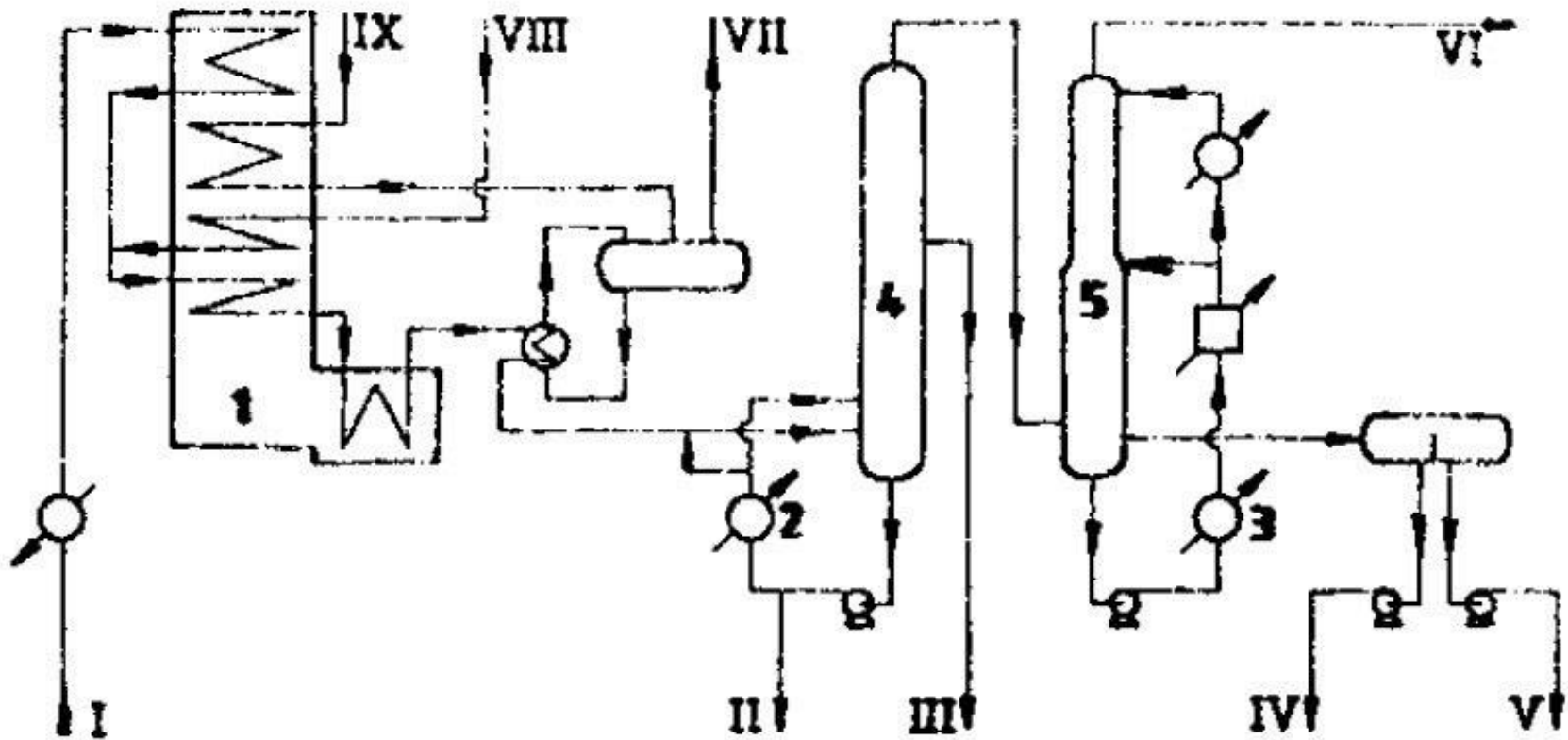
A modern pyrolysis unit, also known as a pyrolysis plant or facility, is an industrial system designed to thermally decompose organic materials, typically waste or biomass, into useful products like biochar, bio-oil, and syngas. Pyrolysis is a process that occurs in the absence of oxygen and involves heating the feedstock to high temperatures, typically in the range of 400 to 800 degrees Celsius. This process breaks down the organic matter into its constituent components.

Here are some key features and components of a modern pyrolysis unit:

- **Feedstock Handling:** These units are capable of processing a variety of feedstocks, including plastics, tires, wood, agricultural residues, and more. The feedstock is prepared and fed into the pyrolysis reactor.
- **Pyrolysis Reactor:** The heart of the pyrolysis unit is the reactor where the feedstock is heated in the absence of oxygen. There are different types of reactors, such as rotary kilns, fixed-bed reactors, and fluidized bed reactors, each with its advantages and suitability for specific feedstocks.
- **Heating System:** Modern pyrolysis units often use various heating methods, including electric heating elements, natural gas burners, or microwave heating, to reach the required operating temperatures.
- **Gas Cleaning System:** The gases generated during pyrolysis, known as syngas, contain volatile organic compounds and other impurities. A gas cleaning system is used to remove these impurities to produce a cleaner and more valuable syngas.

- **Condensation System:** Pyrolysis oil, or bio-oil, is a valuable product obtained from the pyrolysis process. It needs to be cooled and condensed from the hot gas and then collected for further processing.
- **Biochar Collection:** Biochar is the solid carbon-rich residue left after pyrolysis. It can be used as a soil amendment and for carbon sequestration. Modern pyrolysis units often have systems for collecting and handling biochar.
- **Control System:** Advanced automation and control systems are used to monitor and optimize the pyrolysis process for efficiency, safety, and product quality.
- **Energy Recovery:** Some modern pyrolysis units incorporate systems to recover and reuse the heat generated during the process to improve energy efficiency.
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Modern pyrolysis units have gained attention as a sustainable solution for converting various types of waste into valuable products, contributing to waste reduction and energy recovery. They can play a significant role in addressing environmental issues and promoting a circular economy by converting waste materials into useful resources. The choice of pyrolysis technology and feedstock depends on the specific goals and local conditions of the facility.



**Fig.1. Hot section of a pyrolysis unit.**

1—furnace, 2, 3—heat exchangers, 4—primary column, 5—water quench column; I—feed, II—fuel, III—gas oil, IV—process water, V—gasoline, VI—gases, VII—high pressure steam, VIII—dilution steam, IX—boiler feed water.