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THE PROCESS OF PYROLYSIS AS AN ALTERNATIVE TO CONVENTIONAL ENERGY SOURCES TYPES AND BENEFITS

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Abstract
As one of the fastest developing countries, Uzbekistan expected to face certain problems on the sphere of natural resources used for energy production due to increasing high demand. Alternatives to conventional energy resources should be proposed and developed before running out of minerals totally. Team of researchers suggests the process of pyrolysis as a tool to get an alternative energy resource. The target pyrolysis product is some gas rich in unsaturated hydrocarbons: ethylene, propylene, butadiene. On the basis of these hydrocarbons, polymers are obtained for the production of plastics, synthetic fibers, synthetic rubbers and other important products.

Keywords: Pyrolysis, alternative energy, dry purolysis,oxidative pyrolysis, hydrocarbon pyrolysis, wood pyrolysis, waste pyrolysis.

Pyrolysis (from the Greek pyr - fire, heat and lysis - decomposition, decay) - thermal decomposition of organic compounds (wood, oil products, coal, etc.) without air access. Less complex particles, molecules of simple organic compounds and ash are formed from molecules of organic waste as a result of pyrolysis; pyrolysis products can be used as raw materials for chemical production and as fuel. Pyrolysis is one of the most important industrial methods for obtaining feedstock for petrochemical synthesis. The target pyrolysis product is a gas rich in unsaturated hydrocarbons: ethylene, propylene, butadiene. On the basis of these hydrocarbons, polymers are obtained for the production of plastics, synthetic fibers, synthetic rubbers and other important products.

Pyrolysis Types

Oxidative pyrolysis is the process of thermal decomposition of industrial waste during partial combustion or direct contact with fuel combustion products. This method is applicable for the disposal of many wastes, including those “inconvenient” for incineration or gasification: viscous, pasty waste, wet sediments, plastics, sludge

with a high ash content, soil contaminated with fuel oil, oils and other compounds, and highly dusty waste.

In addition, wastes containing metals and their salts, which melt and ignite at normal combustion temperatures, waste tires, crushed cables, car scrap, etc., can undergo oxidative pyrolysis. The method of oxidative pyrolysis is a promising direction for the elimination of solid industrial waste and wastewater.

Dry pyrolysis. This method of thermal treatment of waste ensures their highly efficient neutralization and use as fuel and chemical raw materials, which contributes to the creation of low-waste and non-waste technologies and the rational use of natural resources. Dry pyrolysis is a thermal decomposition process without oxygen. The result is a pyrolysis gas with a high calorific value, a liquid product and a solid carbonaceous residue. Depending on the temperature at which the pyrolysis proceeds, it differs:

1. Low-temperature pyrolysis or semi-coking (450–550 ° C). This type of pyrolysis is characterized by a maximum yield of liquid and solid (semi-coke) residues and a minimum yield of pyrolysis gas with a maximum heat of combustion. The method is suitable for the production of primary resin - a valuable liquid fuel, and for the processing of substandard rubber into monomers, which are the raw material for the secondary creation of rubber. The semi-coke can be used as energy and household fuel.
2. Medium-temperature pyrolysis or medium-temperature coking (up to 800 ° C) yields more gas with lower calorific value and less liquid residue and coke.
3. High-temperature pyrolysis or coking (900–1050 ° C). Here, there is a minimum yield of liquid and solid products and a maximum production of gas with a minimum calorific value - a high-quality fuel suitable for long-distance transportation. As a result, the amount of resin and the content of valuable light fractions in it decreases.

The method of dry pyrolysis is becoming more and more widespread and is one of the most promising methods for the disposal of solid organic waste and the isolation of valuable components from them at the present stage of the development of science and technology.

Hydrocarbon pyrolysis

The process of pyrolysis of hydrocarbons (800 900 ° C) (gas hydrocarbons, straight-run gasoline, atmospheric gas oil) is the main source of ethylene production and one of the main sources for the production of propylene, divinyl, benzene and a number

of other products. The process of pyrolysis (cracking) of oil and gas raw materials was patented in 1877 by a Russian engineer, chemist Alexander Aleksandrovich Letniy.

Wood pyrolysis

During the pyrolysis of wood (450-500 ° C), a number of substances are formed, such as: charcoal, methyl alcohol, acetic acid, acetone, resin, etc. In countries like Russia which is one of the richest countries in forests, the world's best wood pyrolysis schools were formed and operated in Russia. Their contribution has received worldwide recognition.

Waste pyrolysis

There are projects for the destruction of household waste using pyrolysis. Difficulties with the organization of pyrolysis of tires, plastics and other organic waste are not associated with the technology of pyrolysis itself, which does not differ from the technology of thermal processing of other solid materials.

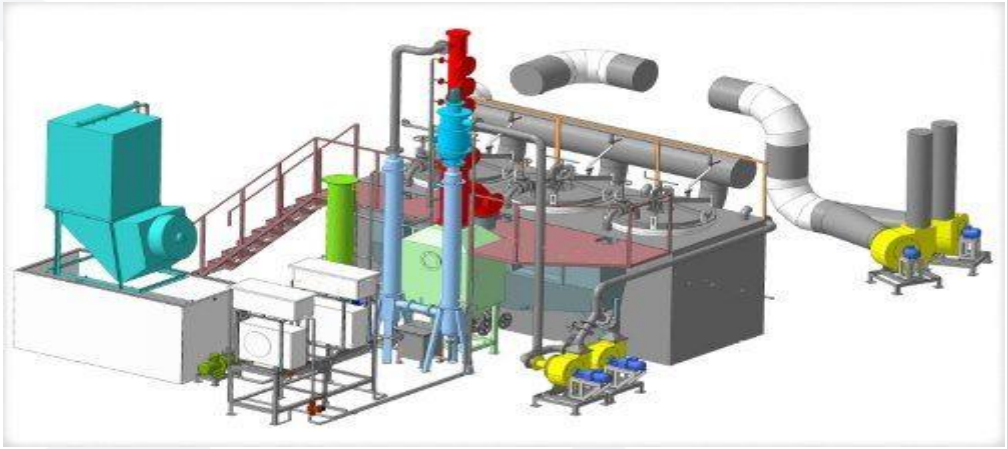

Figure.1. Pirotex - pyrolysis recycling mini-plant for processing of car tires, processing of plastics, polyethylene and rubber

The problem is that most waste contains phosphorus, chlorine and sulfur. Sulfur and phosphorus in oxidized form are volatile and harm the environment. Chlorine actively reacts with organic pyrolysis products with the formation of persistent toxic compounds (for example, dioxins). Capturing these compounds from smoke is not cheap and has its own complexities. The problem of recycling worn-out automobile tires and out-of-service rubber products is of great ecological and economic importance for all developed countries of the world. And the irreplaceability of natural petroleum raw materials dictates the need to use secondary resources with maximum efficiency.

Tires and polymers are valuable raw materials, as a result of their processing by low-temperature pyrolysis (up to 500 ° C) liquid hydrocarbon fractions (synthetic oil), carbon residue (carbon black), steel cord and combustible gas are obtained. At the same time, if 1 ton of tires is burned, 270 kg of soot and 450 kg of toxic gases will be released into the atmosphere.

Advantages of pyrolysis plants:

1. Practically complete utilization of material and energy resources of solid waste and energy autonomy of the entire technological cycle are achieved.
2. Since thermal decomposition occurs without air access, there are no conditions for the formation of toxic compounds such as dioxin, furan, benzopyrene, etc.
3. The closed nature of the circuit, compactness of equipment and environmental friendliness determine the possibility of locating such an enterprise within the boundaries of any city.
4. Considering that the mineral component of MSW - ecologically clean slag after heat treatment - can be used for road works, this technology can be classified as completely waste-free.
5. These installations make it possible to profit from the sale of manufactured products (steam, electricity), in contrast to the production facilities operating today, where operating costs significantly exceed the income from sales, and the profitability of enterprises is based on payments from the population for waste processing.

For pyrolysis plants, there is no need to build capital structures and high chimneys. The units can be mounted under a shed or in light hangars on a concrete base.

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