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Obtaining Oxygenate - Hydrocarbon Mixtures for Target Purpose

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ABSTRACT: The article discusses the receipt of oxygenate-hydrocarbon mixture with a purpose. The results of the technological work performed to obtain light broad hydrocarbon fractions from cotton stalks by the pyrolysis method are presented. The developed scheme of the main apparatus is shown - the installation of the pyrolysis of wood material in the form of cotton stalks. The results of pyrolytic processing of cotton stalks in a laboratory plant with flare heating, where various energy carriers were used, were obtained. The influence of temperature in the reaction zone on the quality of the final product is determined.

KEY WORDS: pyrolysis, oxygenate, compounding, pyrogas, pyrocondensate, pyrocarbon.

I.INTRODUCTION

The process of pyrolysis of cotton stalks makes it possible to obtain hydrocarbons in accordance with the oil fractions. A distinctive aspect of this technology is that since there are no sulfur compounds in the cotton stalks themselves, therefore, sulfur products will also not occur in the products of their processing, unlike fractions obtained from traditional raw materials [1]. Modern requirements defined in the framework of international standards “Euro-4” and “Euro-5” oblige the production of such energy for internal combustion engines (ICE), in which the residual sulfur content should be no more than 10 and at least 1 ppm, respectively. Therefore, the organization of work, originating from compounding research, will receive fuels with improved environmental and operational indicators, is a necessary and urgent direction. In modern conditions, it is highly valued and there are large demands for liquid energy carriers, consisting of hydrocarbon materials with a low content of oxygen-containing compounds, in contrast to solid energy carriers. Therefore, it is considered expedient, both economically and ecologically, to obtain liquid hydrocarbons from bio-plant materials or, as it is commonly called in many literary sources, from non-commercial wood. Energy technology processing of this type of raw material is equivalent to using 0.25-0.5 liters of liquid fuel oil per kilogram of cotton stalks. Taking into account the simultaneous production of a bio-plant profile, a qualified approach to the processing of this type of raw material by modern chemical or petrochemical processes makes it possible to obtain highly efficient energy materials [2]

II. SIGNIFICANCE OF THE SYSTEM

The paper mainly focuses on development of energy efficient and environmentally friendly to the implementation of the technological process for the production of pyrocondensate from cotton stalks to create an environmentally friendly technology of power supply. The study of literature survey is presented in section III, Methodology is explained in section IV, section V covers the experimental results of the study, and section VI discusses the future study and Conclusion.

III. LITERATURE SURVEY

Until recently, the fuel supply of consumers was based on combustible liquid petroleum origin, the use of which for internal combustion engines was most appropriate, due to the relatively high energy concentration per unit of production, as well as ease of transportation, storage and operation, availability and cheapness of its production.

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However, the growth dynamics of fuel consumers required the expansion of motor fuel resources and their restructuring, which was caused by the limited nature fuel reserves, on the one hand, and the constant increase in the cost of oil production and refining, on the other hand. Expansion of motor fuels can be achieved through the use of liquid hydrocarbon substances obtained by pyrolysis of materials of bio-vegetative origin [2].
The prospect of using pyrocondensate of bio-vegetative origin as additives to traditional fuels or their independent use as motor fuels is determined, first of all, by their environmental safety and improved performance, sufficiency of raw materials.
Liquid pyrolysis products consist of the sum of pyrocondensate, water vapor condensate and reaction water. Experimental results show that under certain conditions it is possible to obtain practically broad hydrocarbon fractions from guza-units by pyrolysis. Taking into account the annual renewal of this potential of more than 50-70 million tons, the investigated direction causes interest in the development of work [3].
The implementation of the present recommended technology consists of formations of the final product in the form of a three consistency, like pyrogas, pyrocondensate and pyrocarbon mass. As part of pyrogas, although in small quantities, carbon monoxide may occur. In addition, there is water vapor, both the product of drying cotton stalks - feedstock into the reactor, and the product of the reaction - the chemical transformation of the thermal degradation of high-molecular-weight bio-hydrocarbons. And the rest consists of a mixture of aliphatic hydrocarbons of paraffin and olefin structures. Acetylene structures were not detected by gas-liquid chromatographic analysis. Therefore, pyrogas should be burned at the place of its formation as an energy carrier, while the pyrocondensate can be processed together as a mixture with traditional natural hydrocarbon raw material at the stage of primary oil refining. Depending on the technological need, pyrocarbon can be used as an environmentally friendly briquetted fuel for general consumption, in the form of metal reducing agents, as well as for power supply of the pyrolysis unit [4].

IV. METHODOLOGY

Taking into account the above, in order to ensure minimization up to the elimination of emissions of environmentally harmful components during the pyrolytic processing of wood material in the form of cotton stalks to ensure an environmentally safe technological process, a scheme of the main apparatus, the pyrolysis unit, is developed, which is shown in Fig.1.
THE METHOD AND TECHNOLOGY for qualifying the processing of solid waste of organic origin includes:
1. Protection of the environment from the spread of dangerous infectious microorganisms in places of accumulation of organic waste to their export to designated areas, which prevents the spread of microbes in order to prevent various diseases among the population and air, water and soil pollution.
2. The resulting combustible gases from the organic part of solid waste are directed to the process of thermal processing of the waste itself, which is formed during the recycling process, and the solid part consisting of carbon can be used as briquetted solid fuel.
A sample of gas for pyrolytic processing was selected as an average sample of a transshipment point located in Cukursai.
Experiments on pyrolytic destructive processing were carried out according to well-known methods. In the products of pyrolysis after the release of water vapor, fuel gas (pyrogas) pyrocondensate was released, while pyrolytic carbon remained in the reactor [5].
This installation provides for the use of gaseous, liquid and solid energy carriers as energy carriers, including the starting energy supply of the propane-butane mixture.
The plant is equipped with four blocks, working independently in the process of pyrolysis. The combustion product of energy carriers from the furnace passes into the combustion zone with a temperature of 700–800 ° C, where the reactor loaded with raw materials is heated — certain geometric fractions of cotton stalks; where there is also a reactor with the feedstock loaded and the feedstock is dried at a temperature in the reactor between 150 and 180 °C. In the line of motion of products of incomplete combustion of mixed energy carriers, in the presence of oxygen in the stream, it is oxidized and when exiting the pyrolysis process unit II, without requiring additional gas cleaning operations, are emitted into the atmosphere. The third block is the process of cooling the site and preparing for overload, which at the previous stage proceeded in the form of a pyrolysis process. In the fourth block, preparatory work is carried out on the preparation and handling of the block for drying [6].

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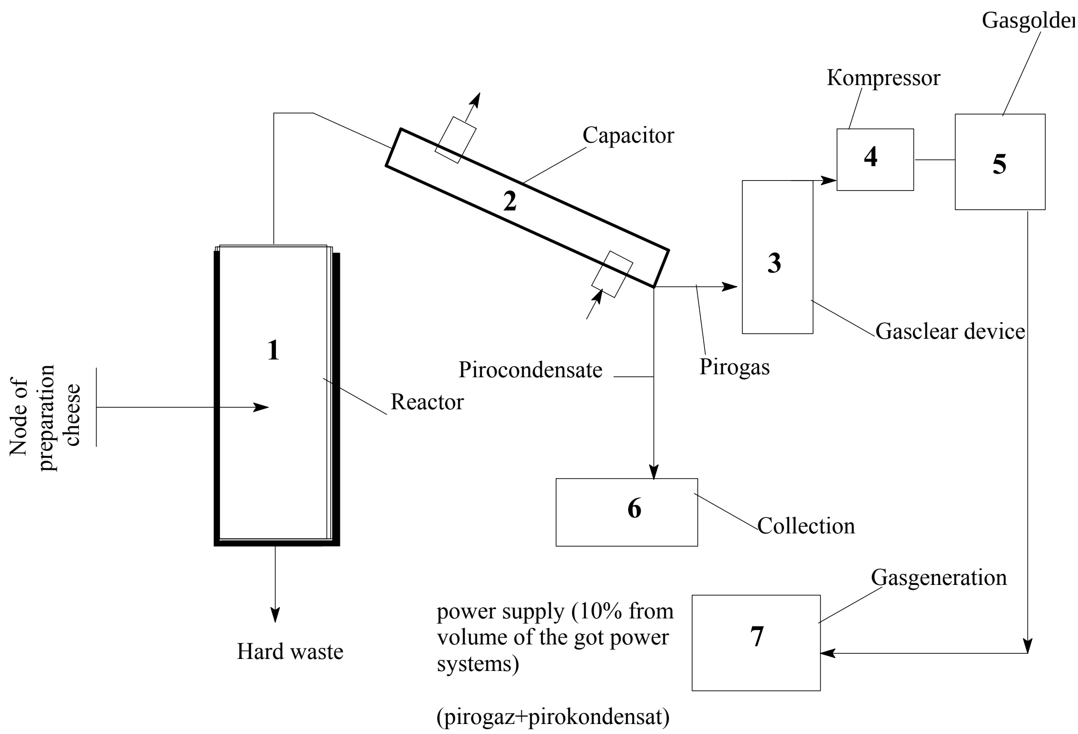

Fig.1. Installation scheme for the pyrolysis of wood material:

1. Gasification reactor for organic parts of cotton stalks 2. Condenser, 3. Gas cleaning plant
4. Compressor 5. Gas tank 6.Collection for liquid products 7. Gas generator of turning pyrolysis gas into electricity or direct transmission of gas to the network

Thus, unlike some solid raw materials in the production of pyrolysis plants, the above described scheme for processing solid hydrocarbon raw materials provides for a continuous-periodic process. The continuity of the process lies in the fact that the unit of the installation's furnace operates continuously with mixtures of energy carriers of its own production, which consist of a mixture of pyrogas, pyrocarbon solid mass, including substandard raw materials.
Water vapor and pyrolysis gases through the condensation and separation system are divided into products with different consistencies. Next, the pyrogas, through the gas flow system 17, enters the furnace 3 for utilization and energy supply of the process of power supply. The condensed mixture of hydrocarbons and water is subjected to separation of moisture and hydrocarbon parts: the mixture is divided into a wide fraction of light hydrocarbons (NGL) to a final boiling point of 350 ° C, and a high-boiling part with an initial boiling point of 360 ° C is used as a binder charcoal. Depending on the task, a wide fraction can be sent to the firebox as a liquid fuel, where almost all technological options for burning various types of energy carriers are provided.

V. EXPERIMENTAL RESULTS

Thus, under laboratory conditions, the reactions of thermochemical destruction of cotton have been studied. The optimum temperature for producing charcoal with a maximum yield meeting the requirements of the established standard for commercial charcoal has been determined [7].
Thermal destruction of cotton stalks used as an energy carrier — a mixture of propane-butane fraction, dry cotton stalks, charcoal, and autotractor kerosene — was tested in the autoclave mode under laboratory conditions.
The laboratory setup consisted of an autoclave with a hermetically closed lid, where 0.5 kg of cotton stalks were loaded after fractionation of 5 ml, with a bulk volume of 0.5 l. The furnace had a brick structure. In the first case, the reactor was heated with a gas burner with the combustion of the propane-butane fraction, in the second case, with cotton stalks,

in the third version with charcoal, and in the fourth version with the combustion of motor kerosene, for which household stove was used. The results are presented in table 1.

Table 1.**The results of the test of pyrolysis of guza-units with flare heat**

№	Types of heat supply	Boiler temperature, °C	Output,% mass.		Pyrogas + water + losses, the sum
			pyrocondensat	pyrocarbon	
1	Propane-butane	520-580	29,5	66	104,5
2	Cottonstalks	480-530	30,0	69	101
3	Charcoal	510-530	30,5	71	98,5
4	AutomotiveKerosene	470-510	32,0	67	101

The loading weight was 200 g of the raw material of the fraction of 5 mm in the air-dry condition. As a result, a mixture of pyrocarbon and pyrocondensate was obtained. The amount of pyrogas and reaction water was not determined. After filtering the mixture of pyrolysis products, a mass was obtained which remained in the device of the Dean and Starkey type. From the results it can be seen that when using propane-butane and motor kerosene as an energy carrier, the content of pyrocarbon is less than when using cotton stalks and charcoal, which is explained by uniform burning, when in the case of propane-butane and motor kerosene hydrocarbons almost did not remain in the residual solid zone. And in the second case, the combustion process proceeded at the supply of portions of energy, which is the basis for the change of the torch, as a result of which the combustion did not occur evenly [8].

VI. CONCLUSION AND FUTURE WORK

The results of the experimental work carried out show that both with electric heating and with the use of various types of energy carriers with a heating torch, no harmful substances are formed, since the raw materials and energy sources used for these purposes do not contain components whose derivatives have a negative impact on the environment.

Pyrogas - the product of the gaseous state of pyrolysis can be composed of a very small ratio of carbon monoxide, as well as hydrocarbons of aliphatic and olefin structures. Since pyrogas is immediately sent to auto supply, the combustion product consists of carbon dioxide and therefore no harmful substances are formed [9].

Thus, an oxygenate - hydrocarbon mixture was obtained with a target use from the products of pyrolysis production - cotton stalks, taking into account the formation of toxic gases emitted into the atmosphere. The technological route of pyrogas was revealed, which, passing through the power supply system, is completely neutralized and only CO_2 and H_2O will take place in the combustion products. A scheme has been developed for an energy-efficient and environmentally safe implementation of the technological process for obtaining pyrocondensate from cotton stalks. The possibility of obtaining pyrocondensate using environmentally friendly power supply technology has been experimentally shown.

REFERENCES

[1] F. Luo, C. Pan, P. Qian, J. Cheng. Carboxylic acids as substrates in homogeneous catalysis. Synthesis 2010, 2005.
Nishimura Shigeo. Handbook of heterogeneous catalytic hydrogenation for organic synthesis.Wiley, 2001. pg no: 720.
[2] Chinchilla R. and Najera C. The Sonogachira reaction: A Booming Methodology in Synthetic Organic Chemistry// Chem. Rev. - 2007. pg no: 874-922.
[3] Eshmukhamedov M.A., Safaev M., Abdumajidov A.I., Muxiddinov B. Economic and ecological possibilities of the extraction manganese from low-grade ore tart leaving gas to industry// Proceeding of the Conference. The XXIII International Scientific and Practical Congerence “INNIVATION-2018”. Tashkent. Uzbekistan. 2018. pg no: 64-66.
[4] Eshmukhamedov MA, Yodgorov M. Prospects for obtaining synthetic fuels from natural raw materials.// Journal of Oil and Gas of the Republic of Uzbekistan. 2005. Section №4. pg no: 24-26.
[5] Eshmukhamedov M.A., Mukhamedzhanov M.M., Safaev M.M., Nosirov F.N. Receiving products from underground coal gasification resins. IX International Scientific and Technical Conference: "Achievements, problems and current trends in the development of the Mining and Metallurgical Complex" Navoi June 12-14, 2017. Section II. pg no: 76.
[6] Toshev O.E., Eshmukhamedov M.A. The mechanism of action of surfactants on the dispersion of rocks. International Conference. Chemistry and dedicated to the 100th anniversary of the modern university Modern innovations: chemistry and chemical engineering of acetylene compounds. Petrochemistry. Catalysis. November 14-17 National University of Uzbekistan. 2018.
[7] Safaev M.M., Mukhamedzhanov M.M., Khayrullaev P.H., Oripova L.N., Alternative compounding of raw materials for producing green hydrocarbons// “Modern technologies for production and processing of composite and nanocomposite materials” Republican Scientific and Technical

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Conference. May 25-26, 2017. Tashkent State Technical University, “Science and Progress” State Unitary Enterprise. -Tashkent, 2017. Pg no: 118-120.
[8] Anvarov A.B., Eshmuhamedov M.A., Tashpulatov M., Muminova L. Production of commercial motor gasoline high motor octane number// Namangan Engineering-Technological Institute "Manufacture of goods on a global scale in the textile, cotton and light industry" at the enterprises of the republic on textile, cotton and light industry at the enterprises of the world, textile and light industry Conference "The importance of technical technologies in the production process." A collection of reports May 24-25, 2017. I-part
[9] Safaev M.M., Eshmukhamedov M.A., Ibragimov N.I. Use of flare energy in the intensification of heat exchange processes using an environmentally friendly scheme // Far Eastern Spring - 2017 Materials of the 15th International Scientific and Practical Conference on Ecology and Safety (Komsomolsk-on-Amur, Russia, June 5, 2017) pg no: 122-124.

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