Technical science and innovation

Volume 2020 | Issue 4 Article 9

11-28-2020

CLEARANCE OF SOLID HOUSEHOLD WASTE WITH THE RECEPTION OF ALTERNATIVE TYPES OF ENERGY CARRIERS

Rakhmatullayev F
TSTU, aqobil1995@mail.ru

Turabdhanov S

Recommended Citation

F, Rakhmatullayev and S, Turabdhanov (2020) "CLEARANCE OF SOLID HOUSEHOLD WASTE WITH THE RECEPTION OF ALTERNATIVE TYPES OF ENERGY CARRIERS," *Technical science and innovation*: Vol. 2020: Iss. 4, Article 9.
DOI: https://doi.org/10.51346/tstu-01.20.2-77-0089
Available at: https://btstu.researchcommons.org/journal/vol2020/iss4/9

Nauch.-Tekhn. Sat. Gazprom. Ser .: Geology, drilling, development and operation of gas and gas condensate fields. - M., 2002. - No. 3. - S. 52-63.
9. Elistarov V.I., Sumskiy B.A. On increasing the scientific and engineering level of projects for the development and construction of gas fields // Scientific-technical. Sat. Gazprom. Ser .: Geology, drilling, development and operation of gas and gas condensate fields. - M., 2003. - No. 2. - S. 68-72.
10. Ermilov OM, Chugunov L.S., Remizov V.V. Improvement of the system of development, production and treatment of gas at the fields of the Far North. - M .: Nauka, 1996 .-- 415 p.
11. Siebert G.K. Improvement of technology and equipment for gas treatment // Scientific-technical. magazine: Gas Industry. - M., 2004. - No. 10. - S. 19-22.
12. Kafarov V.V., Glebov M.B. Mathematical modeling of the main processes of chemical production. - M .: Higher school, 1991 .-- 400 p.
13. Integrated field research at the Orenburg field / K.S. Basniev, A.T. Shatalov, A.I. Shirkovsky, R.I. Vyakhirev, Yu.V. Speransky // OI. Ser. : Development and operation of gas and gas condensate fields. - M.: VNIIEgazprom, 1980. - No. 3. - S. 23-24.
14. Lyugay D.V. The main problems of research of objects of development and production of sulfur dioxide as complex objects // Scientific-technical. review SCST RUz. - Tashkent, 1996 .-- P. 38.
15. Molchanov S.A. Purification of natural gas from moisture and sulfur compounds // Journal: Science and technology in the gas industry. - M., 2004. - No. 4. - S. 25-30.
16. Speransky B.V., Burmistrov A.G., Istomin V.A. Improvement of systems for collecting hydrogen sulfide-containing gases at the final stage of field exploitation // OI. Ser .: Preparation and processing of gas and gas condensate. - M .: VNIIEgazprom, 1988. - No. 10. - S. 3-38.
17. Turevsky E.N. Criterion of the quality of gas preparation for transport // Scientific-technical. magazine: Gas Industry. - M., 1993. - No. 2. - S. 24-27.
18. Khamraeva I.N. The role of the oil and gas complex in the socio-economic development of Uzbekistan // Uzbek Journal of Oil and Gas. - Tashkent, 2005. - No. 4. - P. 4-5.

UDC 504.064.4.

CLEARANCE OF SOLID HOUSEHOLD WASTE WITH THE RECEPTION OF ALTERNATIVE TYPES OF ENERGY CARRIERS

F.N. Rakhmatullaev[1*], S.M.Turabdzhanov[1]
[1]*Tashkent State Technical University, Tashkent, Uzbekistan*

Abstract. *The research is devoted to improving the technology of obtaining alternative types of energy carriers by applying methods of pyrolysis of unclaimed types of solid domestic wastes of biological origin, which also allow solving the tasks of improving the ecological situation in the places of formation. The practical value and relevance of this research lies in the development of advanced technology for obtaining alternative fuels. The proposed pyrolysis unit allows producing gaseous and liquid hydrocarbons in a continuous cycle. In the atmosphere of the gasifying agent (air, oxygen, water vapor, carbon dioxide or their mixture), the gasification process is primarily performed in vortex reactors or fluidized bed furnaces at temperatures of 600-1100°C. Accordingly, the production (extraction) of AT from them requires pre-treatment, often quite serious: separation, grinding, mixing, drying, etc., which ultimately guarantees the consistency of its composition and quality.*

Key words: *alternative fuel, energy, solid domestic waste (SDW), management, gasification, pyrolysis.*

INTRODUCTION. Using solid domestic waste (SDW) as fuel could be one of the most efficient ways to generate energy in the future. The advantage of domestic waste is that it does not need to be found, it does not need to be extracted, but in any case, it must be destroyed - which requires a lot of money [1,4]. Therefore, a rational approach here allows not only to get cheap energy, but also to avoid unnecessary costs. For example, the process of pyrolytic destruction of complex organic molecules is characterized by thermal treatment of the initial raw material to produce gaseous and liquid hydrocarbons.

RESEARCH OBJECTS AND METHODS. The practical value of this work lies in the development of technology to produce energy - an alternative fuel, as part of the processing of organic part of SDW.

Physical and chemical properties of solid waste, regularities of change of these properties are little studied nowadays. The existing information in this area, especially in our Republic, is not complete and not systematized. There are no technologies for neutralization of the majority of toxic products that have been tested in production. To date, not a single specialized plant for their processing has been built. Mostly neutral or low-toxic waste is recycled, so the environmental effect of recycling is insignificant.

Creation of technology for the highly qualified use of the organic part of SDW's regular renewable capacity in the republic's energy balance, consisting of the pyrolysis of the organic part with the processing of pyrogas – for automotive power supply of the unit, pyrocarbon - for production of briquetted solid economically clean energy carriers for wide consumption in the household and industry and pyrocondensate - for use of the corresponding hydrocarbon fractions in the production of fuel compositions for combustion engines - for joint processing of pyrocondensate in a mixture with traditional hydrocarbon raw materials. The specific scientific and technical task within the framework of the problem the project is aimed at is the development of technology for pyrolytic destruction of a mixture of high-molecular organic substances, with the production of energy carriers of gaseous, liquid and solid consistency of auto energy supply technology [5,6,7,8,9,10,11].

The scientific and technological importance lies in the scientific substantiation of the ecological and economic dimensions, as well as in the technological expediency of attracting secondary and alternative hydrocarbon capacity for hydrocarbon raw materials and energy resources from technological turnover. And also in the supply of alternative and secondary items to the domestic energy resources market. Energy production from secondary and alternate raw material resources in the technical target community.

In the atmosphere of the gasifying agent (air, oxygen, water vapor, carbon dioxide or their mixture), the gasification process is primarily performed in vortex reactors or fluidized bed furnaces at temperatures of 600-1100°C. Synthesis gas (H_2, CO), liquid resin mist, benzopyrene and dioxins are formed by the reaction. The gasification reaction takes place in a medium with reduction properties, such that there is virtually no formation of nitrogen and sulfur oxides. Up to 30 percent of the mass of synthesis gas will reach the mass of fog at 600 C. The share of mist in the mass of synthesis gas decreases as the gasification temperature rises and is close to zero at temperatures above 1100°C. The hydrogen and carbon monoxide combustible mixture are burned at 1400-1600°C on burners or used in the methyl alcohol synthesis catalytic process. Residual carbon and heavy metal salts soluble in water may contain the ash left after

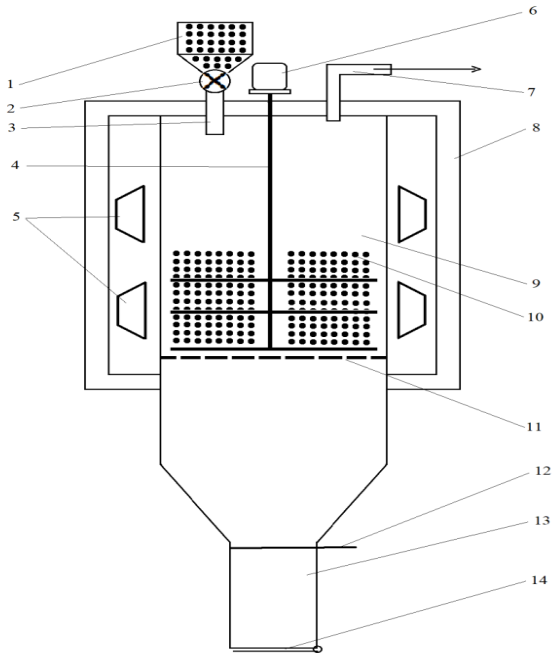
gasification. Once the ash has been checked in mobile form for the absence of benzopyrene, dioxins and heavy metals, it can be submitted for disposal [2,12,13,9,14,].

RESEARCH RESULTS AND THEIR DISCUSSION. The most studied method is the pyrolytic destruction technology of organic compounds, which is commonly used for the manufacture of different energy carriers. Pyrolysis of oil-containing waste is conducted with reactor vacuuming at a temperature of 600-800°C. Coke and resin formation reactions, decomposition of high-molecular compounds into low-molecular, liquid and gaseous fractions take place and sulfur, hydrogen sulfide and mercaptans are also formed if hydrocarbon waste contains sulfur. There is virtually no formation of nitrogen and sulfur oxides [15,16].

Figure 1 shows the proposed reactor for thermal decontamination and processing of the organic part of solid waste with subsequent production of gaseous and liquid hydrocarbons in a continuous cycle.

The following tasks should be taken into account before considering the probability of production and use of this or that form of alternative fuel to produce an alternative fuel:

- selection of wastes suitable for their physical and chemical properties;
- carrying out a wide morphological and physicochemical analysis of wastes;
- development of technology for preliminary waste preparation; in fact, production of alternative fuel (separation of fuel fractions from waste mass, drying, gasification, etc.) for feeding them to the burner.



1 - feed hopper; 2 - loading unit; 3 - branch pipe; 4 - tedder; 5 - heating element; 6 - gear motor; 7 - gas duct pipe; 8 - lining; 9 - pyrolysis chamber; 10 - SDW; 11 - locking perforated partition; 12 - gate; 13 - discharge chamber; 14 - gate.

Fig. 1. Reactor for thermal processing of organic part of solid domestic waste.

A wide range of wastes are used as a basis for obtaining alternative fuel. Wastes can be solid, liquid or pasty, which is determined by their origin. Accordingly, the production (extraction) of AT from them requires pre-treatment, often quite serious: separation, grinding, mixing, drying, etc., which ultimately guarantees the consistency of its composition and quality.

Obtaining energy from the organic part of SDW has two important advantages of management as environmentally friendly waste management and recycling, as well as the generation of clean electricity [2]. Waste into the energy of the company produces clean, renewable energy sources through thermochemical methods. The increasing use of waste for

energy generation as a way to get rid of solid and liquid waste and to generate power will lead to a significant reduction in the environmental impact of solid waste management, including greenhouse gas emissions. Waste to energy conversion allows reducing greenhouse gas emissions in two ways. Electricity is generated to reduce dependency on electrical products from fossil fuel based power plants. Greenhouse gas emissions are significantly reduced by preventing methane emissions from landfills. In addition, waste into plant energy is highly effective in harnessing unused energy sources from various wastes.

CONCLUSION. Therefore, it can be concluded that obtaining energy from the organic part of SDW has two important management advantages as environmentally friendly waste management and recycling, as well as the generation of gaseous and liquid hydrocarbon energy. The increasing use of waste for the production of alternative and renewable energy as a way to get rid of solid and liquid waste and to generate power will lead to a significant reduction in the environmental impact of solid waste management, including greenhouse gas emissions.

References

1. Rakhmatullayev F.N., Abdullayev U.S., Turabjanov S.M., Ponamaryova T.V., Rakhimova L.S. // Ecological aspects of solid domestic waste management // VIII All-Russian conference "Actual issues of chemical technology and environmental protection". Cheboksary. April 16-17, 2020 (in Russian).
2. Shaimova A.M., Nasyrova L.A., Yagafarova G.G., Faskhutdinov R.R. Obtaining LFG - Saving Primary Natural Energy Resources [Text]: Collected Theses of the International Scientific and Practical Conference // Oil and Gas Processing and Petrochemistry - 2006.- Pages 246-248 (in Russian).
3. Shaimova A.M., Nasyrova L.A., Yagafarova G.G. Utilization of Solid Domestic Waste of Large Cities at Dumps and Landfills as a Means of Obtaining LFG [Text]: Proceedings of the 57th Scientific Conference of Students, Postgraduate Students and Young Scientists - Ufa, USTU Publishing House, Volume II, 2006, p – 46 (in Russian).
4. GrechkoA.V. Analysis of energy costs and ecological safety and thermal methods of solid domestic waste processing [Text] // Industrial energetics. - 2001. - № 3, pages – 55-63 (in Russian).
5. Weber, B. Minimierung von Emissionen der Deponie. Veroffentlichung des In-stitutes for Siedlungswasserwirtschaft und Abfalltechnik der Universitat Hannover, Heft 74, - 1990, p – 46.
6. Zainullin, K.N., Abdrakhmanov, R.F., Savichev, N.A. Industrial and household waste utilization Ufa: USC RAS, 1997, p – 235 (in Russian).
7. Fyodorov L., Mayakin A. Heat and Power Station on Household Waste / "New Technologies", № 6 (70), 2006 (in Russian).
8. Sachkov, A.N.; Nikolskiy, K.S.; Marininin, Y.I. About high-temperature processing of a solid waste in Vladimir // Information collection. Urban Ecology, M., 8, 1996, pages – 79-81 (in Russian).
9. Lam M., Lee K., Mohamed A. (2010) Homogeneous, heterogeneous and enzymatic catalysis for transesterification of high free fatty acid oil (waste cooking oil) to biodiesel: A review. Biotechnology Advances. 28: 500–518.

10. Laskorin B.N., Gromov B.V., Tsygankov A.P., Senin V.N., Wasteless Technology in Industry, M., Stroyizdat, 1986, pages – 109-158.
11. Herd C.D. Pyrolysis of Carbon Compounds. M.-L., 1938;
12. Antonova N. S., Mikheenko O. P., Strom F. K., Reshetov A. I. The problem of waste utilization in the Kaliningrad region and ways to solve it. Population Health and Habitat: N 5, 2001, pages – 11-14 (in Russian).
13. Strategy for the development of scientific, technical and innovation activities in the field of environmental protection and rational use of natural resources for 2014 - 2015 and for the period 2025. Board decision of the Ministry of Natural Resources and Environmental Protection of the Republic of Belarus, 26.11.2014 № 112-P (in Russian).
14. Kuchkina A.Y., Sushchik N.N. Sources of raw materials, methods and prospects of biodiesel production. Siberian Federal University Russia, 660041, Krasnoyarsk. Journal of Siberian Federal University. Biology 1 (2014 7), pages – 14-42 (in Russian).
15. Marleena Hagner "Potential of the slow pyrolysis products birch tar oil, wood vinegar and bio char in sustainable plant protection pesticide effects, soil improvement and environmental risks" Academic Dissertation in Environmental Ecology p. 42 (2013);
16. Marticorena Â., Attai A., Comacho P., Manem G., Hesnault D., Salmon P. Prediction rules for biogas valorization in municipal solid waste landfills. /AVat. Sci. Tech., v. 27, [1]2,1993, pages - 235-241.

UDC: 644.612: 622.235.432.54: 681.32

REMOTE WATER QUALITY MONITORING SYSTEM USING WIRELESS COMMUNICATION TECHNOLOGY ON THE BASIS OF ATmega328 MICROPROCESSOR

Z. Akbarhodjayev[1*], G.Talipova[1], E.Ozodov[2]
[1]Tashkent Chemical Texnology Institute
[2]Tashkent Institute of irrigation and agricultural mechanization engineers

Abstract. The *article discusses the use of LoRa wireless technology for continuous monitoring of water quality using water quality sensors such as a conductivity meter and a pH sensor with a common data exchange gateway. The article presents the primary measurement indicators, the control board diagram, the system operation algorithm and further work prospects.The results of the work dealing with the issue of integrating the wireless technology and its operation using the wireless transceiver LoRa Ra-02 on an SX1278 chip with Atmega 328 microprocessor to water purification devices for creating a remote monitoring and decision-making system are presented on the experimental stand.*

Key words. *Remote control, monitoring, LoRa, decision-making system.*

c) Introduction

Water quality control is an urgent task. According to the World Health Organization (WHO), about 5 million people die every year in the world due to poor water quality. Infectious morbidity associated with water supply reaches 500 million in a year. This gives reason to call the problem of water supply in pleasant quality in sufficient quantities one of the primary problems of humanity.[1]–[3]