

TREATMENT OF SOLID WASTE

¹*Sherzodbek Abdullayev*

²*Safayev Mirzokhid*

¹*Junior scientific researcher, Master of the Faculty of Oil and gas, Tashkent State Technical University.*

²*docent, scientific researcher in the department of the processes and instruments of Oil and gas refining.*

It is important that processes household waste disposal does not violate the environmental safety of the city, the normal functioning of the urban economy from the viewpoint of public sanitation and hygiene, and living conditions of the population as a whole.

As you know, the overwhelming majority of solid waste in the world is still piled in dumps, natural or arranged in the form of landfills. However, it is the most inefficient way of dealing with solid waste, as landfills, occupying vast territories of fertile lands and characterized by a high concentration of carbon-containing materials (paper, polyethylene, plastic, wood, rubber), often burn, polluting the environment of exhaust gases. In addition, landfills are a source of pollution of both surface and ground waters through drainage, landfill precipitation.

Overall in the world under the landfill alienated about 5 million ha of land, including not only vacant lots, ravines and quarries, but also fertile soil. Experience the use of advanced technologies shows that rational processing of solid waste allows you to use several options of ways of getting energy from waste:

1. The possibility of using as fuel solid waste;
2. The opportunities of biogas technology for processing animal waste;
3. Energy use of waste water treatment in combination with fossil fuels.

But for the purpose of revealing of directions of study we have limited ourselves to study only the first method of obtaining energy, it is possible to use as fuel solid waste.

The relevance is confirmed by the fact that, in accordance with the priorities of the national level this area is used in the industries of clean energy and alternative renewable origin.

The aim of the study is to develop elements of strategic management th museumrussia wastes, aiming at increasing the relative share of use of secondary material resources (BMP), reducing the need for extraction of raw materials, reduction of negative impact of waste on the environment, improving the efficiency of resource saving.

To achieve this goal the following tasks were solved:

1. Identification of the main organizational and economic aspects of recycling management.
2. Definition of directions of perfection of organizational-economic and methodological support of resource-saving management and waste management.
3. The justification of models of organizational and methodical support of strategic management of waste disposal.
4. Formation of scientific-practical recommendations on increase of efficiency of works in the field of resource-based rationalization of recycling management at all levels.

The basic concept of application of the developed technology policies comes from the fact that the majority of low-grade solid fuels, it is expedient to process, taking each of the liquid products, and in some cases and scarce chemical products, including that from oil to receive either can't, or in this case, they are more expensive.

Put forward to the implementation of the technology will allow to convert almost any organic material: of unsorted municipal solid waste, wood waste, agricultural residues, polymers.

Solid waste processing will allow to withstand the dangerous tendencies of the accumulation of waste, spontaneous combustion, spontaneous combustion, ingress of huge quantities of toxic substances formed in the atmosphere, rivers and reservoirs.

In cities and other human settlements is most intense accumulation of solid waste which, if improperly and untimely removal and disposal can pollute the environment. Seasonal changes in the composition of MSW is characterized by increased content of food waste with 20 - 25% in spring to

40 - 55% in the autumn of that is due to the large consumption of vegetables and fruits in the diet in Winter and autumn reduced the content of small dropouts (street estimates) from 20 to 5% RH. The rate of accumulation of solid waste is the amount of waste generated in the calculation unit of the average person – 1, 2 kg/day.

On the rate of accumulation and the composition of MSW is influenced by such factors:

- degree of improvement of the housing stock (stock of garbage disposal, gas water supply, Sewerage, heating system),
- number of floors, type of fuel for domestic heating,
- development of public catering, culture, trade, the degree of well-being the population etc.
- climatic conditions (different duration of heating period - from 150 days in the southern zone up to 300 days in the North),
- specific food, etc.

The quality in the processing of MSW organic fertilizer or biofuel depends on the chemical composition of raw MSW. An important indicator of the physical properties of MSW is the density. The density of MSW of modern comfortable housing in the spring-summer season (in containers) amounts to 0,18 - 0,22 t/m³ in autumn-winter - 0,20 - 0,25 t/m³.

MSW have a mechanical (or structural) connectivity because of its fibrous fractions (textile, wire, etc.) and the couplings due to the presence of wet sticky components. Due to the connectivity of solid waste have a tendency to svobodovets and not Wake up in a stationary lattice with the distance between the rods 20 to 30 cm of solid waste may stick to a metal wall with an angle of inclination to horizon up to 65 - 70°.

Municipal solid waste (MSW) represent a coarse mechanical mixture of a variety of materials and rotting products differing in physical, chemical and mechanical properties and dimensions. Before processing the collected solid waste must be subjected to separation into groups, if it makes sense, and after separation each group of MSW have to be recycled. MSW can be divided into several compounds:

The composition of solid waste materials are subdivided into organic and inorganic origin.

While handling of MSW is necessary to consider that they contain valuable waste components. In table. 1 presents a tentative morphological and physico-chemical composition of MSW.

As seen from the above data, MSW contain valuable components such as paper, cardboard, glass, plastics and metals.

In connection with the growth of urban populations is becoming increasingly important problem of waste disposal in the long distance.

The average distance disposal of solid waste varies between 20 -35 km, in the major cities with a population of more than 500 thous. Inhabitants, it rises to 45 km and more.

One effective way of producing energy in the future may be used as fuel solid waste. The advantage of waste is that they do not look, do not produce, but in any case they must be destroyed - that requires a lot of cash. Therefore, a rational approach is not only to get cheap energy, but also to avoid unnecessary costs.

Targeted industrial use of solid waste as a fuel began with the construction of the first "incineration places" near London in 1870. However, extensive use of solid waste as an energy raw material began only in the mid 1970_h years in connection with the deepening of the energy crisis. It has been estimated that by burning one ton of waste can be obtained 1300-1700 kW / hr of thermal energy or 300_550 kW / h of electricity. The company "Boeing" 60% of its energy resources need to cover in the use of solid waste as energy. Thus it began in other countries build large incinerators in Madrid, Berlin, London, and also in countries with a relatively small area and high population density. By 1992, worldwide there were about 400 plants, which use combustion of MSW with steam and power generation. By 1996, their number reached 2400. In many cases, involved the use of heat produced by burning municipal solid waste to generate electricity.

Much more efficient use of solid waste as a fuel to generate electricity and to achieve specific indicators close to the standard used TPP, apparently can be achieved by partial substitution of energy fuel household waste.

Another important economic factor is the fact that the energy fuels, including lignite, which has virtually equivalent energy performance of municipal solid waste, it is necessary to buy, and SDW, on the contrary, adopted a monetary surcharge.

Table 1. The averaged morphological and physico-chemical composition of MSW, % by mass

Morphological composition of MSW		
Nos.	Components	Content
1	Food waste	40...49
2	Paper, cardboard	22...30
3	Tree	1...2
4	scrap metal	2...3
5	Nonferrous scrap metal	0,5...1,5
6	textiles	3...5
7	Bone	1...2
8	Glass	2...3
9	Leather, rubber	1
10	Stones, plaster	1
11	Plastic	3...6
12	Others	3...4
13	Dropouts (less than 15 mm)	6...8
Physico-chemical composition of MSW		
14	Ash on slave. mass %	10...21
15	Ash content on dry. weight %	20...32
16	Organic matter on dry basis, %	68...80
17	Moisture content, %	35...60
18	Density, kg/m ³	190...200
19	Heat of combustion at working the lower m Mass, kJ/kg	5000...8000
Agrochemical indicators, % dry weight		
20	total Nitrogen N	0,8...1
21	Phosphorus P ₂ O ₅	0,7...1,1
22	Potassium K ₂ O	0,5...0,7
23	Calcium CaO	2,3...3,6

The low-temperature pyrolysis - is the process by which the pulverized waste material is thermally decomposed. The process of pyrolysis of municipal waste has several options:

1. Piroliz organic part of the waste by heat in the absence of air;
 2. Piroliz in the presence of air, providing an incomplete combustion of the waste at a temperature of 760 ° C;
 3. Piroliz using oxygen instead of air to produce a higher calorific value gas;
 4. Piroliz wastes without separation into organic and inorganic fractions at 850 ° C and others.
- Increasing the temperature increases the gas yield and reduce the yield of liquid and solid products.

The advantage of pyrolysis compared with direct incineration is above all its effectiveness from the point of view of preventing environmental pollution. C can be recycled by pyrolysis of waste constituents that are difficult to recovery such as tires, plastics, waste oils, slop substance. After pyrolysis remains biologically active substances, so the underground storage of waste pyrolysis does not harm the environment. The resulting ash has a high density, which dramatically reduces the amount of waste undergoing underground storage. When pyrolysis is no recovery (smelting) of heavy metals. The advantages include pyrolysis and the ease of storage and transport of the products obtained, and also that the equipment has a small capacity. The whole process requires less capital investment.

High-temperature pyrolysis - the method of solid waste disposal, essentially, is nothing more than a gasification of garbage. Flowsheet of this process involves obtaining from a biological component (biomass) waste secondary synthesis gas for the purpose of using it to produce steam, hot water and electricity. A part of the high-temperature pyrolysis solid products are in the form of slag, t. E. Nepirolizuemye residues. The technological process of this recycling circuit comprises four successive stages:

1. Otor of bulky waste items, non-ferrous and ferrous metals by an electromagnet and by induction separation;

2. Pererabotka prepared with gazofikator waste to produce synthesis gas by chemical compounds \approx chlorine, nitrogen, fluorine, and the range in melting metals, glass and ceramics;

3. Ochistka synthesis gas to increase its energy consumption and environmental properties, cooling and its arrival in the alkaline scrubber solution from contaminants chlorine compounds, fluorine, sulfur, cyanide;

4. Szhiganie purified syngas in recovery boilers to produce steam, hot water or electricity.

During processing, for example, wood chips syngas contains (in%): moisture \approx 33.0; Carbon monoxide \approx 24,2; hydrogen – 19.0; Methane \approx 3,0; carbon dioxide \approx 10,3; \approx 43,4 nitrogen, as well as 35 – 45 g / Nm tar.

From 1t solid waste consisting of a 73% TBT, 7% rubber waste (primarily tires) and 20% of coal is prepared of 40 kg of the resin used in the boiler, and 1500-2000 m³ wet gas. The volume fraction of dry gas following components (in%): hydrogen 20, methane, 2, 20, carbon monoxide, carbon dioxide, 8, 1 oxygen, nitrogen – 50. The NCV 5,4 – 6,3 MJ / m³. Slag obtained 200 kg / m.

The combustion of the organic portion of municipal solid waste is practically at least an order of magnitude less than the products of incomplete combustion are formed and harmful acid gases; as oxides of nitrogen and sulfur, including oxygen-containing halogen compounds and metal oxides - the solid particles, as in the structures of the components of municipal solid wastes occur oxygen up to 5% by weight. In various forms, all of which favorably affect the complete combustion of organic material. Other acid gases and oxides of metals, especially heavy, emissions do not have a place for a very simple reason that the substances in the mixture of the components of municipal solid waste is minimized by the nature and status of solid waste.

Our proposed scheme for joint use of the organic part of municipal solid waste at the existing power plants and thermal power sectors highly environmentally friendly way within the framework of recycling – recycling of organic matter.

The technology of processing organic part of municipal solid waste include pyrolysis of municipal solid waste. Characterized aspect of the technology is that, for medium temperature pyrolysis of the organic part of solid wastes use the heat of exhaust gas flows fuel burning power plants. At the same time obtained in the process of pyrolysis of a gas mixture is fed into the furnace of a power plant for co-combustion with traditional fuel mixtures. Pyrocondensate formed is collected in a separate collection and is sent to the refinery for co-processing with traditional hydrocarbons. And the rest of the solid briquetted and fed as a briquetted environmentally friendly high-energy fuel for the consumer, including life.

Our proposed technology mini-compact modular processing plant organic part of municipal solid waste after the wind sorting MSW is designed to introduce into production for processing of solid waste high-performance and environmentally friendly way of processing (waste-processing) organic compounds by high-speed pyrolysis. We have developed a modular installation scheme can solve the problem of destruction of municipal and industrial waste, using environmentally friendly technology to produce the output of useful products suitable for use in the field of energy and transport.

The basic concept put forward to implement technology comes from the fact that the majority of low-grade solid fuels expedient process yield of these liquid products - high-energy engine and boiler fuels, high-calorie fuel gas, and in some cases, deficient chemicals, including those which are of oil obtained either fails, or in this case, they are more expensive. The technology has been tested in a larger scale in the laboratory.

The offered technological scheme is highly profitable and efficient in terms of the timely return on investment. They can handle virtually any organic substance: unsorted municipal solid waste, wood waste, agricultural residues, polymers.

It is expected that the scheme is designed modular installation for waste treatment plants will allow to confront tendencies dangerous accumulation of debris, its spontaneous combustion, spontaneous combustion, getting huge amounts of toxic substances produced in the atmosphere, rivers and reservoirs. Mechanical sorting of solid waste is technically difficult and is not widely used. We have developed an aerodynamic sorting unlike all the proposed technology options, is more economically, environmentally and technologically acceptable and effective Direct recycling or burning huge amounts of waste technically very problematic, environmentally dangerous and

economically inefficient. Therefore, a solution of solid waste through the implementation of our mini-plant economically and environmentally efficient. Since their use recycling is to produce useful products.

The technology provides a modular scheme allows the flexibility to adapt to a different volume of recyclable waste, changes in their composition, which is integrated production. The modular scheme allows to develop waste processing production stages. Furthermore, there may be used various items of production equipment. At the initial stage of start-up and during operation of the installation stage in the process uses the heat of the exhaust gas stream of the power plant.

The operations take place in the modular unit has the following order:

1. Aerodynamic sorting and drying.
2. Crushing and screening otrganicheskoy part of MSW after wind drying and sorting.
3. The pyrolysis unit.
4. The module producing distillates (pyrocondensate).
5. Produce pyrolysis unit.
6. The module of producing a carbon-solid hydrocarbon fuel.

A mixture of geometric fractions of organic components of solid waste after drying and crushing in its composition comprises a physical moisture (air-dry state). Screw feeder with a residual moisture content of the mixture fed to the humidity in the low-temperature pyrolysis step to full dehydration - to the absolute drying. Dehydrated compost is fed to the high-speed pyrolysis, where it is mixed with a high-flow (500-550oS) gas mixtures, which are products of the combustion of traditional energy in the rotating reactor. Here organic sorted, dried and crushed mixture leaving an organic part of municipal solid waste is heated in the absence of oxygen to a temperature 460-480oS, and it emits vapor-gas mixture containing hydrocarbon vapors are not condensable gases such as H₂, CO, N₂, H₂S, CH₄ and other to form coke in the reactor. This installation is quick (almost instantaneous) heating the dehydrated mixture. With such rapid heating is not time to be physical and chemical processes of transformation of raw materials. The rate of temperature rise of raw materials during the pyrolysis process should be about 700 -800 deg / sec. The high speed of the process is provided by high-energy input that reduces heat losses to the environment. In this method, the transition of the organic portion of the feedstock to gaseous and vaporous state.

Gas-vapor mixture is given to the condensation device where the hydrocarbon vapors are condensed to form a synthetic liquid pyrolysis fuel combustion heat from 25 to 38 MJ / kg, depending on the component composition of MSW. Note that at the attainable superheating linear polymers undergo 100% pyrolysis and sewn - in part decompose, forming uglepodobny sediment.

Semi-coke is non-condensable gas calorific value of 25 to 48 MJ / Nm³ (determined by the composition of solid waste). Remaining after condensation of the gas sent for incineration. The distinctive ability of the proposed technology is the possibility of recycling of solid waste produced in the combustion of the pyrolysis gas. This allows us to solve many of the environmental, economic and energy challenges.

If the gaseous reaction products are sent to a subsequent partial condensation, while their presence at high temperature should be as limited. By increasing the holding time at this temperature, the gaseous substance may be subjected to further modification. The combustion gas residence time limit gas at high temperature does not really matter, because the calorific value is determined by the elemental composition mixture burned and not burned structure compounds. Sometimes observed some dependence of heat generated from combustion at a constant elemental composition is determined by the dependence of the combustion rate and complete combustion of the combustible building materials. The remaining gas can be burned to produce heat. The combustion gas cooling is not necessary. Upon cooling, followed by partial condensation of the gas produced in a separation of the pyrolysis of materials for individual applications. When the partial condensation of the gas is collected liquid substances emitted in a certain temperature range. Pyrolysis gas is sent to the condensation unit (condenser) to produce liquid pyrolysis fuels (Pyrolyzates).

Coke is withdrawn from the reactor in the air-fountain pyrolysis furnace where it afterburned organic compounds in an air stream. While stressing the heat is used to heat the coolant fly. In a second embodiment, solid carbon-hydrocarbon mixture is discharged and pelletized for ease of transport, where it may be used as a clean fuel. The proposed process can serve for processing waste containing polymer components as waste oil (bitumen, asphalt). The technology can be used for heavy oil.

One of the main tasks of all countries of the world is a rational and economical use of energy. Due to the high prices and limited reserves of oil, gas and coal problem research other energy

resources. One effective way of producing energy in the future may be used as fuel solid waste. Using the heat produced during combustion of municipal solid waste, also provides for the generation of electricity.

The proposed new energy model is advantageous in that it makes the country's energy system more sustainable, dramatically expanding the raw material base of energy, solves the problem of accumulated waste, and, most importantly, makes rely on its own scientific and technical potential. Energy development in this way makes really innovate widely introduce new technologies, improve and develop them. Such a development would require a rapid revival of energy and mechanical engineering industries, as well as related industries. Develop and implement a plan for the reconstruction of power in accordance with the above proposals would lead to enormous changes in the industry and the economy. Exhaust experience of energy development on a new path can be replicated in other countries and export related to the described methods of energy recycling equipment. This could be a long-term basis to strengthen the country's energy policy.

REFERENCES

1. Safaev M.M., Anvarov A.A., Ismoilov T.Sh., Shamsiddinov E, Safaev M.A. Options for recycling the organic part of municipal solid waste Herald Tashkent State Technical University. №-1. Page. 191-196.(Варианты переработки органической части твердых бытовых отходов Вестник ТашГТУ. №-1. Стр. 191-196.)
2. Badretdinova F.M., Mamatov S. Safayev M.M., Ashurov E.A., Gulyamova C. Disposal of the organic part of municipal solid waste Topical issues in the field of technical and socio -economic sciences. Republican Interuniversity collection. Part -II, Tashkent.s33-35. (Утилизация органической части твердых бытовых отходов Актуальные вопросы в области технических и социально – экономических наук. Республиканский межвузовский сборник. часть –II,Ташкент.с33-35.)
3. Safayev M.M., Anvarov A.B. The conversion of high molecular weight hydrocarbons The Ministry of Higher and Secondary Special Education of the Republic of Uzbekistan. Tashkent State Technical University. 2015 collection of professors and teachers of higher educational institutions//printed by printing house of “BROK CLASS SERVICE” pages 321-322. (Конверсия высокомолекулярных углеводородов ЎЗР ОваЎМТВ. ТошДТУ, Олий ўқув юртлари профессор - ўқитувчиларининг ишлар тўплами-2015 // “BROK CLASS SERVIS” МЧЖ босмахонасида чоп этилди. 321-322-бетлар.)
4. Safayev M.S., Turobzhonov S. new technology for production of gaseous and liquid hydrocarbons from recycled materials of organic origin. "Green chemistry" - one of the factors of sustainable development. Republican scientific-practical conference, Samarkand 2012. March 26-28. 131-133 pages. (Новая технология получения газообразных и жидких углеводородов из вторичных материалов органического происхождения. “ЯШИЛ КИМЁ” – Баркарор ривожланиш омилларидан бири. Республика илмий-амалий анжумани, Самарқанд-2012й. 26-28 март.131-133 бетлар.)
5. Safayev M.A., Turobzhonov S.M. Prospects of production of complex fuel mixtures of the alternative source of Proceedings of the conference "Innovation-2010" Tashkent-2010.str. 76-80. (Сафаев М.А. Туробжонов С.М Перспективы получения комплексных топливных смесей из альтернативного источника Материалы научно-практической конференции “Инновация-2010” Ташкент-2010.стр. 76-80.)
6. Akbarov M.U., Sabitov E.A., Isakov A, Safayev M. Nazarov A.R. The development of new and innovative methods and technologies for the production of fuels for internal combustion engines. International scientific-technical conference "Modern problems and ways of development of oil and gas potential of mineral resources." Tashkent 2013. 89-92 pages. (Акбаров М.У.,Сабитов Э.А.,Исаков А.,Сафаев М.,Назаров А.Р. Разработка новых нетрадиционных методов и технологий получения топлив для двигателей внутреннего сгорания. Международная научно-техническая конференция «Современные проблемы и пути освоения нефтегазового потенциала недр». Ташкент-2013. 89-92 стр.)