INNOVATIVE TECHNOLOGICA
METHODICAL RESEARCH JOURNAL
ISSN: 2776-0987 Volume 4, Issue 3 Mar. 2023

ANALYSIS OF INDUSTRIAL WASTE WITH BINDING PROPERTIES

Akmaljon Khakimov
PhD, Docent, Fergana Polytechnic Institute,
Fergana, Republic of Uzbekistan
E-mail: ferpi_info@edu.uz

Nasiba Vokhidova
PhD student, Fergana Polytechnic Institute,
Fergana, Republic of Uzbekistan
E-mail: ferpi_info@edu.uz

Abstract
The results of briquetting technology and composition development of low-quality lignite waste using waste modified with mechanically activated organo-mineral binders as a binder are presented.

Keywords: lignite, mining deposits, lignite powder, fuel briquette, mechanical activation, ash content, the heat content of combustion.

Introduction

Chemical, food, construction materials, and similar wastes released from large industrial enterprises located in the territory of our republic in various directions through the production of products are found in various situations.

According to the type of origin, all waste generated by mankind is divided into consumer waste and production waste.

A second is a large number of useless raw materials formed as a by-product of the production cycle with some substances or their mixtures, thermal or chemical processing of various natural raw materials.

Such wastes may not have any value at this stage of the production process (garbage, packaging residues, scrap, etc.), but they can be processed for further use.

According to the state of collection, there are small and large tons of industrial waste:

– solid state;
– liquid;

ISSN: 2776-0987 Volume 4, Issue 3 Mar. 2023

– in the form of gases.

Liquid industrial waste

Liquid industrial wastes released as a result of the processing of various raw materials include:

– liquids with radioactive additives;
– oils and lubricants;
– emulsions;
– oils.

The least harmful of them are petroleum refining products, and the most dangerous is explosive sulfuric acid.

We will consider the solid waste of production materials.

Solid industrial waste is represented by the following groups:

– waste rock extracted in the process of mining;
– outdated machines and mechanisms that have expired;
– solid fraction compounds obtained as a result of chemical, physical or mechanical processing of industrial raw materials.

The solid waste generated during production:

– as substances in different physical states in the chemical and petrochemical industry;
– in metallurgy in the form of coke, slag and scraps of metal moulds;
– as slag and ash in power stations;
– sawdust, twigs, sawdust and shavings from wood processing industry waste.

Solid waste is classified according to four main characteristics:

– according to the nature of toxicity for the environment and human health;
– according to industrial sectors as their source of origin (woodworking, chemical, coal);
– by general physical qualities - density, composition;
– according to the state of the fraction - gas, solid, liquid.

Toxic industrial waste.

According to the classification of industrial waste generally accepted in the country, their physicochemical properties, as well as the necessary conditions for further disposal, are divided into five hazardous classes:

– highly toxic (mercury);

INNOVATIVE TECHNOLOGICA
METHODICAL RESEARCH JOURNAL
ISSN: 2776-0987 Volume 4, Issue 3 Mar. 2023

– highly toxic;
– moderately toxic (oils);
– low harmfulness;
– almost safe, inert (chalk, alumina, gypsum).

For each of the wastes, a type of passport is drawn up, indicating its hazard class, accumulation in production and volume of disposal into the environment.

Many industrial wastes are highly toxic compounds. For example, anhydrous aluminium chloride, a toxic waste from titanium production, must be treated with calcium carbonate to neutralize it before it is disposed of in a landfill.

All hazardous production waste is characterized by the following characteristics:

– the presence of harmful substances for the viability of humans, animals and plants;
– the presence of infectious disease agents, compounds that cause poisoning of living organisms or corrosion of natural materials;
– the presence of explosion and fire hazards, toxicity or radiation.

What can be done from industrial waste?

Basically, large tons of waste produced by the industry, millions of tons per year, are used for further processing.

These seemingly useless substances are positively recycled and turned into combustible briquettes, biogas and building materials.

A large amount of solid industrial waste is directed to:

– repair of road surfaces, elimination of potholes and filling of dams;
– restoration of excavated lands in the mining industry;
– for various needs of agriculture.

Processing and disposal of industrial waste

In theory, any waste, including production, can be recycled as a desired product to obtain secondary raw materials for industrial needs.

However, the decisive factor, in this case, is the economic feasibility of further processing (financial and labour costs of the recycling process) and the hardness of the waste (the more difficult it is to process the waste, the more difficult it is to recycle it).

ISSN: 2776-0987 Volume 4, Issue 3 Mar. 2023

A certain part of secondary production waste, taking into account the loss of consumer quality, provides the possibility of reproduction.

Each type of production waste is collected separately and disposed of according to the processing technology adopted for a certain fraction.

Nevertheless, the collection of all industrial waste, and their transportation to the place of disposal and disposal is carried out by specialized organizations that have a license for the type of disposal and are regulated by the requirements of the relevant ministry.

Disposal of industrial waste.

All waste that is not intended for recycling is placed in large areas that are technically equipped to prevent environmental pollution.

In addition to disposal in landfills in the protection of agriculture from waste, energy-yielding waste is sometimes disposed of by burning in thermal plants, poisoning the air with combustible products (gases, ash and soot).

Before disposal of waste, the following is done:

– burning in fuel furnaces or reactors;
– neutralization with chemical compounds;
– thickening liquid waste mixed with soil.

Waste transportation.

Waste disposal from enterprises and organizations is carried out in different ways.

The specific method of waste disposal affects their physical state:

– solid household waste is removed in specially designed containers;
– liquid - in hermetically sealed containers.

Processing of industrial waste and its sale.

Recycling production waste is not only environmental protection but also a source of additional income.

Processing of production waste and organization of their sale will serve well in increasing the profitability of the enterprise.

Of course, not all raw materials or waste materials and semi-finished products can become secondary raw materials.

As a material for recycling, it is processed only in plants specially equipped for the processing of recyclable waste.

INNOVATIVE TECHNOLOGICA
METHODICAL RESEARCH JOURNAL
ISSN: 2776-0987 Volume 4, Issue 3 Mar. 2023

As one example, we consider briquette products made using coal waste and industrial waste as a binder to process waste and transfer it to consumption in the form of a quality product.

About 60% of the coal mined during mining and transportation works in Angren coal mines is coal powder. This is an obstacle to the full use of extracted solid fuels. In order to overcome these problems, 2 different methods of briquetting the generated waste were studied. Organic and inorganic waste from industrial enterprises was used as a binder.

The two samples obtained as a binder show that the briquette sample obtained by adding an inorganic binder has higher durability but lower flammability, while the organic binder has lower durability but higher flammability compared to the inorganic binder.

Therefore, the use of a solution of sodium silicate in water (liquid glass) as a binder in the preparation of briquettes from coal powder allows comparing the efficiency of the selected local binders with the standard (control).

Figure 1 illustrates the change in mechanical strength of removable briquettes when the recommended binders are added. A mixture of sodium silicate with a concentration of 5% in water was used as a controlled binder. It can be seen from Figure 1 that high-strength coal briquettes are formed when binders are added up to 15% gossypol pitch and 20% beer vat. Depending on the effect of the mechanical strength of the binders, the coal briquette changes in the following descending order:

a mixture of sodium silicate 5% in water > gossypol resin > beer wort.

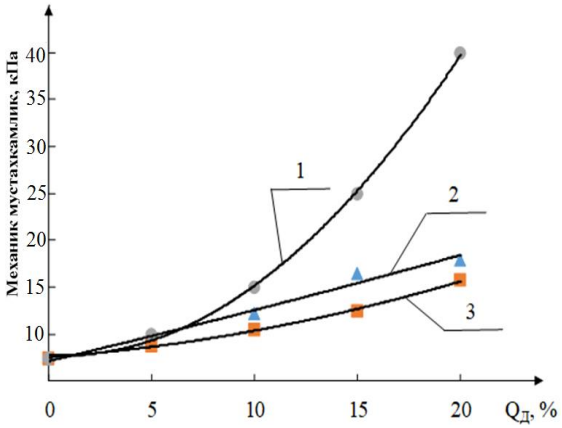

Figure 1. Changes in the mechanical strength of the obtained coal briquette depending on the amount of binders: 1 – a mixture of sodium silicate with 5% water; 2 – gossypol tar; 3 – a beer bar

INNOVATIVE TECHNOLOGICA
METHODICAL RESEARCH JOURNAL
ISSN: 2776-0987 Volume 4, Issue 3 Mar. 2023

We studied the influence of the amount of binder addition on the combustion temperature of the obtained coal briquettes (Fig. 2).

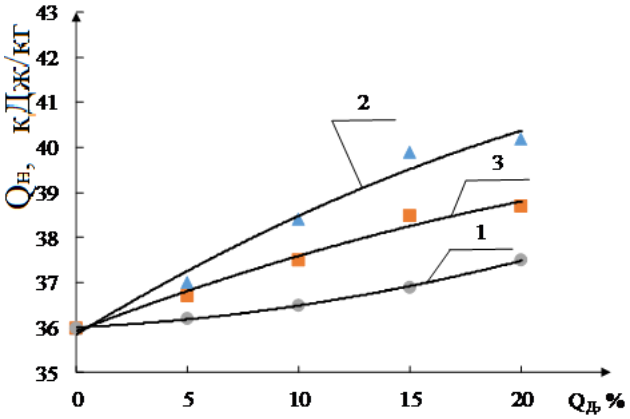

Figure 2. Change in the calorific value of the obtained coal briquettes depending on the amount of binders: 1-5% solution of sodium silicate in water; 2-gossypol tar; 3 - a beer bar

Figure 2 shows that the highest calorific value of the resulting charcoal briquettes was obtained by adding up to 15% gossypol tar and up to 20% pitch. A control sample using a 5% solution of sodium silicate in water hardly changed the calorific value of the resulting charcoal briquettes.

In conclusion, it can be said that high colour graphics values were achieved in charcoal briquettes obtained using organic binders. It was found that the amount of ash released after the combustion process is small compared to coal briquettes obtained using inorganic binders.

References

1. Хакимов, А. А. (2022). Технология Получения Качественных Брикетов С Использованием Горючих Вяжущих Компонентов. *Central Asian Journal of Theoretical and Applied Science*, *3*(6), 459-463.
2. Xakimov, A., Voxidova, N., & Rajabov, B. (2021). Analysis of collection of coal brickets to remove toxic gas. *Barqarorlik va yetakchi tadqiqotlar onlayn ilmiy jurnali*, *1*(5), 85-90.
3. Xakimov, A., Voxidova, N., Rustamov, N., & Madaminov, U. (2021). Analysis of coal bricket strength dependence on humidity. *Barqarorlik va yetakchi tadqiqotlar onlayn ilmiy jurnali*, *1*(5), 79-84.

4. Xakimov, A., Voxidova, N., Rajabova, N., & Mullajonova, M. (2021). The diligence of drying coal powder in the process of coal bricket manufacturing. *Барқарорлик ва Етакчи Тадқиқотлар онлайн илмий журнали*, *1*(5), 64-71.
5. Xakimov, A., Voxidova, N., & Xujaxonov, Z. (2021). Analysis of main indicators of agricultural press in the process of coal powder bricketing. *Barqarorlik va yetakchi tadqiqotlar onlayn ilmiy jurnali*, *1*(5), 72-78.
6. Akhmedovich, K. A. (2021). The Diligence of Drying the Coal Dust in the Process of Obtainig the Coal Brickets. *International Journal of Innovative Analyses and Emerging Technology*, *1*(5), 111-115.
7. Xakimov, A., & Vohidova, N. (2021). Relevance of the choice of binders for coal briquettes. *Scientific progress*, *2*(8), 181-188.
8. Хакимов, А. А. (2021). Определение показателей качества угольного брикета. *Universum: химия и биология*, (5-2 (83)), 40-44.
9. Ахунбаев, А. А., Ражабова, Н. Р., & Вохидова, Н. Х. (2020). Исследование гидродинамики роторной сушилки с быстровращающимся ротором. *Экономика и социум*, (12-1), 392-396.
10. Хакимов, А. А., Вохидова, Н. Х., & Нажимов, Қ. Кўмир брикети ишлаб чиқаришнинг янги технологиясини яратиш. *ўзбекистон республикаси олий ва ўрта махсус таълим вазирлиги Заҳириддин Муҳаммад Бобур номидаги Андижон давлат университети*, *264*.
11. Хакимов, А. А. (2020). Связующее для угольного брикета и влияние его на дисперсный состав. *Universum: химия и биология*, (6 (72)), 81-84.
12. Вохидова, Н. Х., Хакимов, А. А., Салиханова, Д. С., & Ахунбаев, А. А. (2019). Анализ связующих из местного сырья для брикетированния углольной мелочи. *Научно-технический журнал ФерПИ*, 69-74.
13. Ахунбаев, А., Ражабова, Н., & Вохидова, Н. (2021). Механизм движения дисперсного материала при сушке тонкодисперсных материалов. *Збірник наукових праць SCIENTIA*.
14. Nasiba, V. (2022). High-pressure coal dust pressing machine. *Universum: технические науки*, (7-4 (100)), 17-19.
15. Хакимов, А. А., Салиханова, Д. С., & Каримов, И. Т. (2019). Кўмир кукунидан брикетлар тайёрлашнинг долзарблиги. *Фарғона политехника институти илмий техника журнали.-2019.-№*, *23*(2), 226-229.

ISSN: 2776-0987 Volume 4, Issue 3 Mar. 2023

16. Axmedovich, X. A., & Saidakbarovna, S. D. (2021). Research the strength limit of briquette production. *Asian journal of multidimensional research*, *10*(5), 275-283.
17. Хакимов, А. А., Салиханова, Д. С., Абдурахимов, А. Х., & Жумаева, Д. Ж. (2020). Использование местных отходов в производстве угольных брикетов. *Universum: химия и биология*, (4 (70)), 17-21.
18. Хакимов, А. (2020). Технология брикетированного угля. *Матеріали конференцій МЦНД*, 76-78.
19. Хакимов, А. А. (2020). Совершенствование технологии получения угольных брикетов с использованием местных промышленных отходов: Дисс.… PhD.
20. Khakimov, A. A., Salikhanova, D. S., & Vokhidova, N. K. (2020). Calculation and design of a screv press for a fuel briquette. *Scientific-technical journal*, *24*(3), 65-68.
21. Saidakbarovna, S. D., Akhmedovich, K. A., & Abdusattor o‘g‘li, D. A. (2022). The current state of technologies for the production and activated clay adsorbents. *International Journal of Advance Scientific Research*, *2*(04), 25-28.
22. Saidakbarovna, S. D., Akhmedovich, K. A., & O‘G, E. U. T. L. (2022). The study of the composition and properties of water-oil emulsions formed from local oils and methods for their destruction. *European International Journal of Multidisciplinary Research and Management Studies*, *2*(04), 143-146.
23. Saidakbarovna, S. D., Akhmedovich, K. A., & Ziyovutdin o‘g‘li, A. S. (2022). The Flotation Methods of Industrial Wastewater Treatment. *Eurasian Research Bulletin*, *7*, 80-85.
24. Ахунбаев, А. А., & Хакимов, А. А. (2022). Сушка угольной мелочи перед брикетированием. *Universum: технические науки*, (9-1 (102)), 29-33.
25. Vokhidova N. (2022). High-pressure coal dust pressing machine. *Universum: технические науки*: электрон. научн. журн. 7(100). URL: https://7universum.com/ru/tech/archive/item/1402 (дата обращения: 21.03.2023).