International Journal of Advance Scientific Research
(ISSN – 2750-1396)
VOLUME 03 ISSUE 10 Pages: 238-243
SJIF IMPACT FACTOR (2021: 5.478) (2022: 5.636) (2023: 6.741)
OCLC – 1368736135

Journal Website: http://sciencebring.com/index.php/ijasr

Research Article

STUDY OF THE PROCESS OF PRODUCING FUEL BRIQUETTES FROM INDUSTRIAL WASTE

Submission Date: October 15, 2023, **Accepted Date:** October 20, 2023,
Published Date: October 25, 2023
Crossref doi: https://doi.org/10.37547/ijasr-03-10-38

Dilafruz Kholmurodova
Doctor of Technical Sciences, Professor, Department of Medical Chemistry, Samarkand State Medical University, Samarkand, 140104, Uzbekistan

Dilfuza Kiyamova
Assistant, Department of Medical Chemistry, Samarkand State Medical University, Samarkand, 140104, Uzbekistan

ABSTRACT

The article discusses the process of recycling industrial waste by using coal fines in briquetting. The expediency of briquetting of coal fines is shown, which is due to its finely dispersed state and the complexity of transportation, the impossibility of burning in standard grate furnaces.

KEYWORDS

Fuel briquettes, waste from the coal industry, oil and fat industry, coal briquettes, processing, disposal, filler, binder.

INTRODUCTION

Currently, the problem of finding alternative energy sources and promising ways to save resources is relevant and is becoming one of the main ones for the economic development of states. In this regard, it is important to research and develop technologies that ensure the integrated use of raw materials and the environmental safety of production [1].

The coal industry of Uzbekistan has a 72-year history. The basis of the resource base of the republic's coal industry is the lignite “Angren” and two smaller coal deposits – “Shargun” and “Baysun”. It is worth noting that 85% of the coal

International Journal of Advance Scientific Research
(ISSN – 2750-1396)
VOLUME 03 ISSUE 10 Pages: 238-243
SJIF IMPACT FACTOR (2021: 5.478) (2022: 5.636) (2023: 6.741)
OCLC – 1368736135

mined in Uzbekistan comes from the Angren open-pit mine.

In Central Asia, the Angren coal basin is considered the largest. The coal mined here is delivered throughout the country. The activities of the joint-stock company are carried out on the territory of the Angren coal basin. There are open coal mines "Angren", "Apartak" and a coal mine. The main production site is the Angren coal basin. Currently, many specialists in Uzbekistan, Russia and abroad are working on the problem of recycling coal fines. Vast experience has been accumulated in the preparation and use of fine-grade coal waste. Dozens of methods for their processing, with varying degrees of efficiency, have been developed [2,3].

Therefore, our goal in this study is to briquet fines from the coal industry with production waste.

Materials and methods

The objects of the studied pressing material were fines of brown coal from the Angren coal mine of the Republic of Uzbekistan, stems of annual plants, waste from the oil and fat industry and carboxymethylcellulose.

During the extraction, enrichment and transportation of fossil coals in the Angren deposit, a significant amount of fine classes is formed, which, according to the most approximate estimates, reaches 6–8%. Some of the fine coals are blown out and spilled out of the cars during transportation, lost and intensively crushed during loading and unloading operations. Reducing the level of losses in the form of sludge and fines by direct combustion is difficult due to the complexity of their transportation to the place of use. At the same time, fine coal, due to its quality characteristics, can be used to produce high-quality briquette fuel, but its processing is difficult due to the complexity of organizing briquette production and the need to perform a large volume of construction and installation work.

Table 1 shows the characteristics of Angren coal.

Table 1. Main characteristics of Angren coal

The name of the indicators	*Designation*	*Magnitude*
Coal grade indicating size class, mm	2BR	up to 300.00
Ash content, %	A^d	8.40-12.00
Highest calorific value, kcal/kg	Q^{daf}	2854
Net calorific value,kcal/kg	Q^d	1624

International Journal of Advance Scientific Research
(ISSN – 2750-1396)
VOLUME 03 ISSUE 10 Pages: 238-243
SJIF IMPACT FACTOR (2021: 5.478) (2022: 5.636) (2023: 6.741)
OCLC – 1368736135

Mass fraction of total moisture in working condition, %	W_t^r	32.70
Yield of volatile substances, dry ash-free state, %	V^{daf}	48.00
Sulfur content, dry state, %	S_t^d	0.40
Carbon content, dry, ash-free state,%	C^{daf}	73.44
Mass fraction of chlorine, %	Cl^d	0.08
Mass fraction of arsenic, %	As^d	0.004
Piece size, mm	mm	0.00-300.0
Mass fraction of fines, no more	%	15
mass fraction of mineral impurities, no more	%	2

Gossypol resin (GR), a waste product from the oil and fat industry, was used as a binder [4].

Domestic and modern foreign experience opens up the opportunity to extract all valuable components from oilseed raw materials processed in the republic, utilize waste, and produce several by-products for both food and technical purposes for various sectors of the national economy. In this regard, it is important to identify and use all the reserves for increasing the technical level of the oil and fat industry, to justify the need to accelerate the implementation of the most important achievements of scientific and technological progress, especially completed scientific developments that can obtain a significant economic effect.

Carboxymethylcellulose was used as an adhesive agent

Carboxymethylcellulose (CMC), cellulose glycolic acid, [C6H7O2(OH)3-x(OCH2COOH)x]n, where x = 0.08–1.5) is a derivative cellulose, in which the carboxymethyl group (–CH2–COOH) is connected by the hydroxyl groups of glucose monomers. The solutions are colourless. Appearance: light beige crystalline powder. It should be noted that the effectiveness of the adhesive ability of Na-CMC is directly dependent on the quality of the chemical reagents used.

To obtain wood fillers, we selected a cotton stem and found that the stems of cotton, annually renewed annual plants such as kenaf, rice, sunflower husks, and groundnuts, have more woody parts and are

International Journal of Advance Scientific Research
(ISSN – 2750-1396)
VOLUME 03 ISSUE 10 Pages: 238-243
SJIF IMPACT FACTOR (2021: 5.478) (2022: 5.636) (2023: 6.741)
OCLC – 1368736135

relatively easy to grind. Compared to other annual plants, they are closer to wood in chemical composition, structure and properties [5-9].

Because of this, chemical reagents are subject to certain requirements regarding their physical, chemical and technological properties.

Discussion

One of the main processes for producing briquettes is pressing. To obtain a high-quality briquette, specific pressing pressure is necessary; it depends on the design of the press and the nature of the compression (one- or two-way). With one-sided pressing, uniform compaction of the briquette in height is not ensured. Therefore, double-sided compression is used, which ensures a more uniform compaction of the material. In this case, the height of the briquettes should be as small as possible, for example, for cylindrical briquettes the ratio of height to diameter should be 1:2 [9-12].

The briquetting process occurs as a result of the adhesion of particles to a binder. This process consists of three stages:

- adsorption of the binder by the briquetted material and the formation of a thin film of the binder on the surface of the particles;
- pressing of the charge;
- briquette hardening upon cooling.

One of the main operational characteristics of coal briquettes is the mass fraction of total moisture.

The mass fraction of total moisture in briquettes is determined according to GOST 11305, ash content - according to GOST 11306, and mechanical strength - according to GOST 18132.

The content of partially destroyed briquettes is determined according to GOST 11130.

The content of partially destroyed briquettes, Mr, %, is determined by the formula:

$Mp=mp\cdot100/m$

where, mp is the mass of the oversize product, kg;

m – mass of the total sample, kg.

Sampling and preparation of samples - in accordance with GOST 10742.

The combustion heat of briquettes is determined according to GOST 147.

The heat of combustion is the most important indicator of the quality of energy fuel and characterizes the thermal value of coal. In addition, the calorific value is one of the classification parameters of coals, which are divided into types according to the value of the higher calorific value of the wet, ash-free state.

The mass fraction of fines in a briquette is determined according to GOST 1916-75.

Ash content was determined according to GOST 11022-95.

Table 2 shows the test results of the developed coal briquettes.

Table 2. Test results of brown coal briquettes

International Journal of Advance Scientific Research
(ISSN – 2750-1396)
VOLUME 03 ISSUE 10 Pages: 238-243
SJIF IMPACT FACTOR (2021: 5.478) (2022: 5.636) (2023: 6.741)
OCLC – 1368736135

Indicator name	*according to ND*	*Fact*
Mass fraction of total moisture in briquettes, no more than, %	20.0	10.0
Ash content of briquettes, no more, %	45.0	25.4
Low calorific value of briquettes, average, kcal/kg	2700	3834
Mass fraction of pieces of size less than the lower limit (fines content), no more, %	10.0	8.0
Mechanical strength,%	46.1-76.0	58.2
Height, mm	50-150	100
Diameter, mm	50-120	60

CONCLUSIONS

Thus, the feasibility of briquetting fine coal is due to its finely dispersed state and the complexity of transportation, the impossibility of combustion in standard grate furnaces.

REFERENCES

1. Грачев, А. Н., Исхаков, Т. Д., Башкиров, В. Н., & Иманаев, Р. М. (2008). Утилизация отработанных деревянных шпал методом пиролиза. Вестник Казанского технологического университета, (5), 166-170.
2. Нифонтеев, Ю. А. (2000). Научные основы создания ресурсосберегающих технологий использования отходов добычи и переработки углей Печорского бассейна. СПб.: Санкт-Петербург. гос. горн. инст-т. им. ГВ Плеханова.

International Journal of Advance Scientific Research
(ISSN – 2750-1396)
VOLUME 03 ISSUE 10 Pages: 238-243
SJIF IMPACT FACTOR (2021: 5.478) (2022: 5.636) (2023: 6.741)
OCLC – 1368736135

3. Zhong, Q., Yang, Y., Li, Q., Xu, B., & Jiang, T. (2017). Coal tar pitch and molasses blended binder for the production of formed coal briquettes from high volatile coal. Fuel Processing Technology, 157, 12-19.
4. Аллаеров Э.Ш. (1989). Исследование и применение госсиполовой смолы и ее производных в эластомерных композициях: Дис. канд техн. наук. Ташкент: 165 с.
5. Антимонов, С. В., Булатасов, Э. О., & Рузавина, Л. Ю. (2013). Получение опилок в дисковой рубительной машине отечественного производства. Роль прикладной биотехнологии и инженерии в развитии инновационного потенциала региона, 922.
6. Методические указания к выполнению лабораторной работы по дисциплине «Обогащение полезных ископаемых» для студентов, обучающихся по специальности 130400 «Горное дело» очной формы обучения. сост.: А.В. Анучин; Юргинский технологический институт (филиал) Томского политехнического университета. Юрга: Типография ООО «Медиасфера», 2014. 18 с.
7. Аскаров, К. А., Киямова, Д. Ш., & Холмурадова, Д. К. (2021). Исследование процесса получения топливных брикетов из отходов производств. Композиционные материалы, (3), 148-150.
8. Negmatov, S. S., Holmurodova, D. K., Abed, N. S., Negmatova, K. S., Boydadaev, M. B., & Tulyaganova, V. S. (2020). Development of effective compositions of composite wood-plastic board materials based on local raw materials and industrial waste. Plasticheskie massy, 1(11-12), 28-32.
9. Kholmurodova, D. K., Kiyamova, D. S., & Nurmanova, I. M. (2022). Study of the structure, physico-chemical properties of the selected organic and non-organic ingredients on the basis of local and secondary raw materials, as related to the development of coal briquettes. Thematics Journal of Chemistry, 6(1).
10. Негматов, С. С., Киямова, Д. Ш., & Холмурадова, Д. К. (2022). Исследование влияния связующего на эксплуатационные характеристики угольных брикетов. Universum: технические науки, (1-3 (94)), 15-17.
11. Холмуродова, Д. К., Негматов, С. С., Саидов, М. М., & Туляганов, Б. Х. (2010). Факторы, влияющие на формирование и величину физико-механических свойств композиционных древесно-пластиковых материалов и плит. РНТК Композиционные материалы на основе техногенных отходов и местного сырья: состав, свойства и применение, 15-16.
12. Холмуродова, Д. К., Негматов, С. С., Лысенко, А. М., Саидов, М. М., Туляганов, Б. Х., & Мухитдинов, З. Н. (2011). Методика определения физико-механических свойств композиционных древесно-пластиковых плитных материалов. МНТК Новые композиционные материалы на основе местного и вторичного сырья, 5-7.