INNOVATIVE TECHNOLOGICA
METHODICAL RESEARCH JOURNAL
ISSN: 2776-0987 Volume 4, Issue 4 April 2023

THE REASONABLE USE OF LIGNITE IN INDUSTRY AND RELEVANCE OF OBTAINING BRIQUETTES

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Abstract
In the article, the internal composition of coal extracted from mines, its use, combustion properties and the amount of ash produced as a result of combustion are studied. Based on the obtained results, the solutions were analyzed.

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

Introduction

The results of the study of coal mines located on the territory of Uzbekistan show that the largest part of the reserves (85%) corresponds to the Angren coal mine. The remaining part (15%) corresponds mainly to Shargun and Boisun coal mines. The Angren coal basin is the first large coal basin in Uzbekistan and is located in a convenient location for logistics operations [1-7].

Coal is one of the most important elements of electricity and heat supply. It makes up the main part of its share in the production of electricity. It should be noted that one of the main tasks to be solved during coal processing is the integrated use of its energy and chemical potential. Lignite is not only an energy raw material, but also a valuable chemical product: it is a raw material for obtaining hydrocarbons, phenols, pyridine bases. In order to solve the question of the possibility of using lignite for the production of humic acids and bitumen, it is necessary to study the group composition of lignite [8-11].

The purpose of this work is to analyze the group composition of lignites from the Angren coal mine and to choose the most optimal way of using them in industry.

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The Main Part

The study of lignite of the Angren coal mine of the Uzbek coal basin was carried out according to four main indicators: moisture, ash content, bitumen yield, humic acid yield and residual coal were considered. The results of the work are presented in tables 1, 2, 3.

Table 1. Determination of moisture content of initial samples of coals from Angren mine

Naming of the object	No	General buksa, g.	Weight of pants with slit, g	Slot, g.	Weight after drying., g.	Controlled drying, g.	Moisture loss, g.	Wa, %	Wasr, %
S-2-4	7	23.5434	24.6039	1.0605	24.4716	24.4714	0.1325	12.49	12.3
S-2-4	51	22.6855	23.7578	1.0723	23.6276	23.6278	0.1302	12,14	
S-2-12	120	23.3260	24.4294	1.1034	24.3200	24.3123	0.1171	10.61	10.8
S-2-12	027	28.0697	29.0046	0.9349	28.9078	28.9017	0.1029	11.01	
S-3-5	007	28.0269	29.0646	1.0377	28.9790	28.9756	0.0890	8.57	7.6
S-3-5	231	25.5997	26.6281	1.0284	26.5621	26.5598	0.0683	6.64	
S-4-21	160	22.4861	23.4691	0.9830	23.3205	23.3180	0.1511	15.37	15.4
S-4-21	341	22.8884	23.9058	1.0174	23.7520	23.7496	0.1562	15.35	

Moisture is present in all solid fossil fuels. Of the types of moisture, hygroscopic moisture is of greatest scientific importance and is roughly defined as the moisture content (Wa) of the analytical sample. The moisture content of solid fossil fuels significantly affects their quality and practical use, affects coal oxidation and freezing in winter. The burning heat of coal, their mass density and crushing ability depend on the moisture content [12-19]. The negative effect of moisture leads to the need to develop methods and equipment for drying solid fuels.

Results and Discussion

Brown coals according to analytical moisture content Aronov S.G. and Nesterenko L.L. divided into the following types according to: Soil coals (Wa = 12.2 - 25.4%); dense coating coals (Wa = 6.0 - 10.0%); dense semi-bright coals

ISSN: 2776-0987 Volume 4, Issue 4 April 2023

(Wa = 5.0 - 8.0%). Based on the obtained data, the studied coals of samples S-3-5 and S-2-12 can be attributed to the brand of coals with a dense covering, and coals of the samples S-2-4 and S-4-21 with the brand of earthy coals.
Depending on the ash content of solid fossil fuels, the content of mineral substances in them is estimated - ballast, which reduces the combustible mass and reduces the thermal effect.

Table 2. Determination of ash content of initial samples of coals from Angren mine

Naming of the object	No. vessel, crucible	Crucible weight, g.	Weight of the crucible with a notch, g.	Slot g.	Weight after washing, g	Fire control, g.	Amount of residual ash, g.	Ah,	Ahcp	Wowcp	Adcp
								%			
S-2-4	01	29.4909	30.5689	1.0780	29.5847	29.5853	0.0944	8.72	8.8	12.3	9.9
S-2-4	8	37.9593	39.0016	1.0423	38.0564	38.0507	0.0914	8.81			
S-2-12	01	29.6993	30.7357	1.0364	29.8913	29.8895	0.1902	18.35	15.5	10.8	17.4
S-2-12	03	28.3727	29.3496	0.9769	28.4979	28.4960	0.1233	12.62			
S-3-5	03	28.3693	29.2539	0.8846	28.5849	28.5853	0.2160	24.42	24.6	7.6	26.6
S-3-5	4	44.8947	45.8009	0.9062	45.1199	45.1199	0.2252	24.85			
S-4-21	1	41.9575	42.9449	0.9874	42.0071	42.0072	0.0497	5.03	5.2	15.4	6.1
S-4-21	2	50.9127	51.9295	1.0168	50.9664	50.9670	0.0543	5.34			

According to the obtained data, the ash content of coal varies from 5.2 to 24.6%.

According to GOST 10969-74, coals are used as raw materials for the production of lignite wax with a yield of benzene extract (bitumen). Coal used for the production of lignite wax must meet the following parameters: ash content (Ad) no more than 32%, moisture content (Wr) 55-58%, average bitumen output (Bd) at least 6% [12].

Table 3 shows a summary table of the group composition of coal, % daf.

Sample number	Average output of bitumen B^{daf}_{sr}, %	( ) , %	( ) ,	Residual output of coal,%
S-2-4	0.4	23.9	22.7	72.9
S-2-12	1.2	20.4	16.5	73.8
S-3-5	0.4	35.1	10.1	59.3
S-4-21	0.6	33.3	23.3	65.9

From the data presented in Table 3, it can be seen that the yield of benzene extract in these samples is between 0.4 and 1.2%. According to GOST 10969-74, in order to use coal as a raw material for the production of bitumen, their content must be at least 6%. Thus, we can conclude that the studied samples of lignite are unsuitable for bitumen production.

According to the obtained data (Table 3), coal samples S-2-4 and S-2-12 from the Angren mine with total (23.9 and 20.4%) and free (22.7 and 20.4%) productivity stands out (16.5% respectively). Humic acids, which indicates their high level. Based on this, it can be concluded that these coals cannot be used for the industrial production of humic growth stimulants, because for this the high content of humic acids should be at least 30% with a single extraction [20-24]. However, for these purposes, coal samples S-3-5 and S-4-21 are suitable, the yield of humic acids is 35.1 and 33.3%, respectively (the yield of free humic acids is 10.1 and 23.3%).

Carbon-alkaline reagents are real and colloidal solutions of sodium humates and free alkalis, complex colloidal systems of a labile nature, consisting of suspended coal particles, as well as coarse coal residues and mineral impurities included in their composition. Coal-alkaline reagents are used to obtain drilling fluids used in difficult conditions [25-29].

Table 4 lists the criteria that determine the suitability of coal for obtaining a coal-alkali reagent.

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ISSN: 2776-0987 Volume 4, Issue 4 April 2023

Table 4. Criteria for the suitability of coal for the production of UshchR [13]

Criteria	Designation	Required values
Brand, technology group	1B, 2B, 3B (earthy, burnt) D, G (oxidized)	-
Genetic type	Gelity, gelity (W,%)	>50
(GK) total dry fuel	(HA)d , % t	≥ 35
Dry fuel ash	Name, %	≤ 25

Thus, taking into account the data presented in Table 3.4, we can conclude that not all samples of lignite are suitable for the production of coal-alkaline reagents, since the dry efficiency of humic acids in them varies from 17.8 to 31.0 %.

Based on the information obtained during the work, it is possible to recommend the following directions for the use of the studied coals:

- in accordance with world standards, the ash content of coal used in industrial energy should not exceed 12 - 15%, in this regard, coal samples S-2-4 and S-4-21 (ash content 8.8 and 5.2%, respectively) suitable for use in the direction. Coal sample S-4-21 is also suitable for use in the domestic sector, where the ash content of coal should not exceed 8%. Samples S-3-5 and S-2-12 (ash content 24.6 and 15.5%, respectively) do not meet these requirements and cannot be used in the energy sector;
- for the production of coal briquettes without the use of a binder, coals with an ash content of no more than 20% are suitable, therefore, coals of all samples except S-3-5 (ash content of 24.6%) are suitable for use in this direction.

Table 5 shows the requirements for lignite for technological purposes.

Table 5. Examples of assessment of the possibilities of technological use of lignite

Type of technological use	Technological indicators			
	T^{daf}_{sK}, %	Name, %	Qr , i MDj/k	Sd, % t
High temperature lignite coking	-	<10	-	-
Gasification of briquettes by pressure	-	≤19.9	-	-
Gasification in piece	-	≤29.9	-	-
A fire burning in a colosnik grill	-	≤29.9	≥8	-
Combustion in a pulverized coal furnace	-	<39.9	≥8	-
Fluidized bed combustion	-	≤70	≥8	-

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METHODICAL RESEARCH JOURNAL
ISSN: 2776-0987 Volume 4, Issue 4 April 2023

The net calorific value (Qri) of Angren mine coal is 12 MJ/kg.

Conclusion

Based on the data obtained from the results of the study of the samples and the data presented in Table 5, we can make the following conclusions about the technological aspects of the use of the studied coals: coals of samples S-2-4 and S- 4-21, coal of sample S-3-5 are used in all the indicated processes possible, except for the production of briquettes for high-temperature lignite coking and gasification under pressure, because the ash content of coals of this sample exceeds 10% and 19.9%, respectively. Coal sample S-2-12 can be used in all technological processes except high-temperature coking of lignite.

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.
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. Khakimov, A., & Vokhidova, N. (2023). Analysis of industrial waste with binding properties. *Open Access Repository*, *4*(03), 113-120.
26. Хакимов, А. А., Вохидова, Н. Х., & Нуриддинов, М. Ж. (2022). Способ выбора и значение прессующего устройства в производстве горючих брикетов.
27. Хакимов, А. А., Салиханова, Д. С., & Каримов, И. Т. (2018). Кўмир кукунини брикетловчи қурилма. *Фарғона политехника институти илмий техника журнали.-2018.-№ спец*, *2*, 169-171.
28. Rukhiddinovna, N. Y., & Akhmedovich, K. A. (2021). Simulated Additional Computer System-As an Information and New Educational Environment in the Vacuation of Future Specialists. *International Journal of Innovative Analyses and Emerging Technology*, *1*(7), 30-33.
29. Салиханова, Д. С., Эшметов, Р. Ж., & Хакимов, А. А. (2022). Изучение ассоциатов сопутствующих нефтям веществ и их влияние на стабильность ВНЭ. *European Journal of Interdisciplinary Research and Development*, *9*, 88-93.