IJIAET International Journal of Innovative Analyses and Emerging Technology

| e-ISSN: 2792-4025 | http://openaccessjournals.eu | Volume: 1 Issue: 5

The Diligence of Drying the Coal Dust in the Process of Obtainig the Coal Brickets

Khakimov Akmaljon Akhmedovich

PhD in Technical Sciences, Associate Professor Ferghana Polytechnic Institute

Vokhidova Nasiba Khabibullo qizi

assistant, Ferghana Polytechnic Institute, Republic of Uzbekistan

ANNOTATION

In the process of obtaining the coal briquettes from the coal dust were analyzed the methods of maximum moisture loss in its composition. This was aimed at reducing the amount of toxic gases released during the combustion of briquettes for consumption.

Keywords: coal composition, briquettes, sediment, anthracite, moisture, concentration, sulfur, exportable, drying drum, temperature, is gas.

Introduction:

Coal is a sedimentary rock formed over time by a plant, consisting mainly of carbon and a number of other chemical elements.

The composition of coal depends on how many years it has been stored, i.e. its age. In terms of coal classification, brown coal is the youngest coal, followed by hard coal and finally the oldest anthracite. Depending on how much coal is stored underground, there is a decrease in the carbon concentration, volatile components and moisture content. These figures show that the moisture content of lignite is 20-40% and that of volatile components is more than 30%. In anthracite coals, both rates are 5-7%. The moisture content of coal used by consumers today is 25% [1].

Research methods:

In addition to the main constituents of coal, coal contains various non-combustible ash-forming additives. This condition resists environmental pollution and complete combustion of coal. In addition, the presence of rock in the coal composition reduces the specific combustion temperature of the coal. In the classification and extraction of coal, the amount of minerals in it varies. The ash content varies from 6 to 30%, depending on the time interval between which the coals are stored in the ground. The maximum ash content of brown coal intended for use by consumers is not required to exceed 10% [2].

TABLE-1 Physicochemical properties of Angren brown coal

Name of raw material	Humidity,%	Ash content,%	Organic matter,%
Angren brown coal	25	13.7	61.3
Coal briquettes	7.9	8.5	83.6

Another harmful component of coal is sulfur. During the combustion of sulfur, oxides are released from its composition, which are converted into sulfuric acid in the atmosphere. It poisons and pollutes the environment and forms acidic condensate that breaks down stoves used by consumers. According to environmental requirements, the amount of sulfur in coal is usually allowed in the range of 0.1-1% [3,4].

Brown coal has a much lower strength than other types of coal and anthracite. Currently, 80-90% of the coal used by consumers is brown coal. This coal is easy to decompose due to low strength in mining, transportation and operation. Crushed coal grains cause inconvenience to consumers. In order to overcome these problems, various types of briquetting methods are currently being used. In our country, mainly brown coal powder is used in the briquetting process. In Angren coal deposits, this type of coal powder accounts for 50-60%. In these cases, it is convenient to process the resulting coal grains [5].

One of the important issues is the removal of moisture from the fine coal particles before briquetting. In this case, the fine pieces of coal separated in the process of obtaining briquettes are first crushed in the grinder until they are less than

IJIAET International Journal of Innovative Analyses and Emerging Technology

| e-ISSN: 2792-4025 | http://openaccessjournals.eu | Volume: 1 Issue: 5

5 mm. Compared to drying the moisture in the briquette, it is more convenient to remove the moisture from the coal in the powder state. If the charcoal powder is not dried before bonding, this moisture will combine with the binder moisture during the briquetting process, leading to an increase in the moisture content of the mixture and the formation of residual moisture even after the drying process. The briquette obtained by this method leads to an increase in the amount of ash without complete combustion and the formation of toxic gases during combustion.It does not fully ensure the quality and exportability of the briquettes produced. Research was conducted using the systematic analysis method to identify existing problems[6].

Research results:

The optimal solution to the problem studied is to select a suitable furnace for drying coal powder and to improve its design. Currently, a lot of research is being done in this area, and the design of the drum dryer is shown as a promising option.

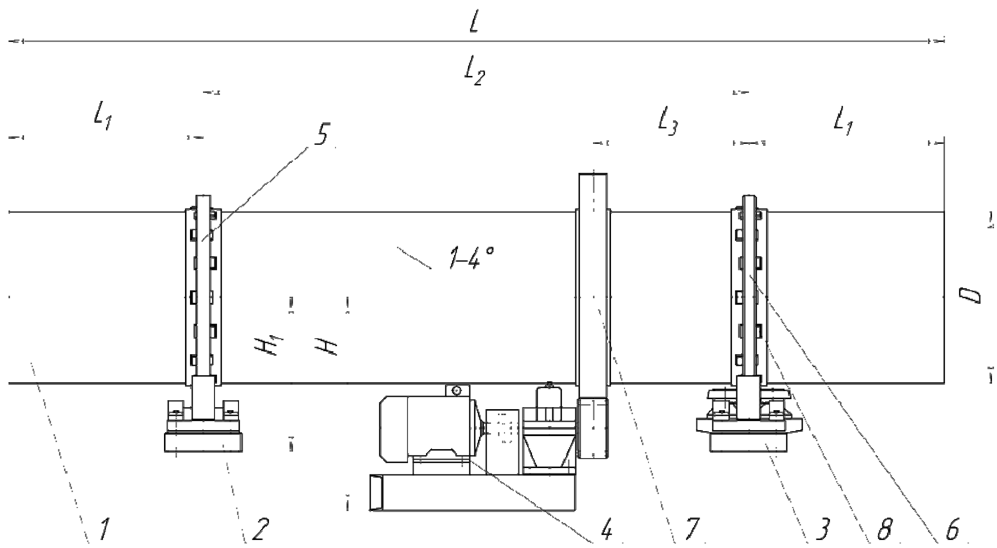
Such devices are used to dry various spraying materials continuously with atmospheric pressure. The drum dryer consists of a cylindrical drum with a small angle of inclination relative to the horizon at 3 ÷ 6o (Fig. 1). The drum is held in place by means of bandages and rollers and rotated by means of an electric motor and a reducer. The ratio of the length of the device to the diameter is L / D = 5-6. The number of revolutions of the drum is 5 ÷ 6 min-1 Wet material is fed through the feeder to the screw receiving nozzle, where the material dries slightly under the influence of mixing. The material then passes to the inside of the drum. The degree of material filling of the drum does not exceed 25%. Nozzles are placed along the entire length of the drum. The nozzles ensure even distribution and mixing of the material along the section of the drum.

In order to prevent the material from overheating inside the drum, the material and the drying agent (smoke gases or heated air) are in the correct direction relative to each other, because under such conditions high temperature hot gases come into contact with the material with high humidity. The air velocity inside the drum should not exceed 0.5–1.0 m / s for fine-grained materials and 3.5–4.5 m / s for coarse-grained materials. Exhaust gases are cleaned of fine dust in a cyclone before being released into the atmosphere. The dried material is removed from the drum by an unloading device.

Depending on the size and properties of the grains of the dried material, different nozzles are used in the devices (Fig. 2). Drying nozzles are used for drying large-piece and viscous materials, and sector nozzles are used for drying large-piece materials with poor dispersion and high density. Distribution nozzles are widely used in the drying of small, fast-breaking materials. It is advisable to dry the finely crushed powder materials in drums with closed-cell passage nozzles. In some cases, complex nozzles are used [10.11].

In drum dryers, good mixing of materials is achieved, resulting in continuous contact between the solid and gas phases. In such dryers, the diameter of the drum is 1200 ÷ 2800 mm. These types of dryers are used to dry a large number of products. Air or smoke gases are used as heat exchangers [12].

Based on the above, the design of the drum dryer was studied and the results were obtained.



ISSN 2792-4025 (online), Published under Volume: 1 Issue: 5 in October-2021

IJIAET International Journal of Innovative Analyses and Emerging Technology
| e-ISSN: 2792-4025 | http://openaccessjournals.eu | Volume: 1 Issue: 5

1-cylindrical body, 2,3-base, 4-electric motor, 5,6-bandage, 7-crown wheel, 8-centering;L – the length of the drum body; L1 – the distance from the end of the drum to the bandage; L2 – the distance between the bandages; L3 – the distance from the bandage to the crown wheel; H– the distance from the center of the drum to the electromotor frame; H1 – the distance from the center of the drum to the base.

Figure 1. Constructive scheme of the drying drum.

It is known that carbon monoxide (SO) is a colorless, odorless, the most common toxic compound in industrial settings, formed as a result of incomplete combustion of coal and fuels.

Smoke contains 3%, exhaust gas 13%, and explosive gases 50-60%. Is gas affects the human body through the respiratory system.

Based on the analytical results obtained below, a graph of the increase in toxic gases due to the increase in humidity was constructed.

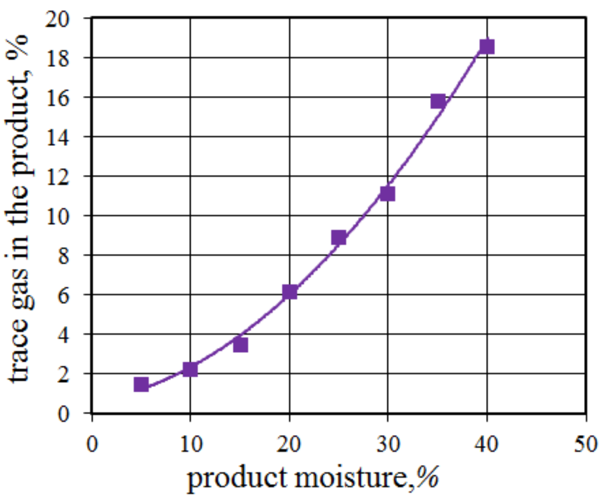


Figure 2. Toxic due to increased humidity

increase in gases

It can be seen from this graph that as the moisture content of the briquette increases, its flammability decreases and an increase in toxic gases is observed.

The graphical relationships shown in Figure 2 can be expressed by the following empirical formula determined by the least squares method [16];

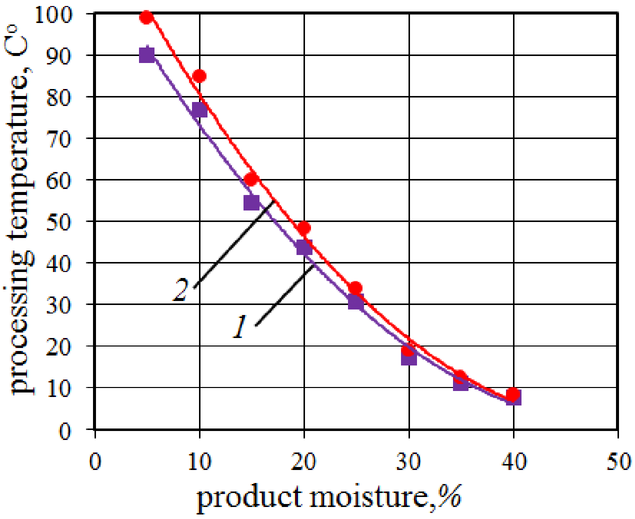
$y = 0.0093x2 + 0.0866x + 0.5596$ $R^2 = 0.9947$ (1)

In order to overcome this process, we used a drying drum in our research work. The drying drum was brought to a temperature of 70-90^{o}C and charcoal powder was added to it. In the drying chamber, the moisture content of the coal powder was removed and the resulting briquettes were minimized by releasing toxic gases during combustion [7].

The drying drum recommended by us is widely used for drying products in many industries. The main working part of the device is the drum, which rotates 0.5 ÷ 20 times per minute.

During the experiment, the results were obtained by applying different temperatures to the composition of coal powder using a muffle furnace (muffle furnace SNOL "CHOL" 8.2 / 1100. Temperature 50 to 1100^{o}C). The results obtained showed that the increase in temperature at the normal level had a positive effect on the quality level of the briquette obtained. However, when the coal powder is exposed to a temperature above 90oC, its composition changes, and in the final case, the combustion process of the powder is observed [8].

Below is a graph of the temperature dependence of briquette and coal moisture.



1 – coal briquette, 2 – coal.

Figure 3. Temperature dependence of briquette and coal moisture

It can be seen from this graph that the decrease in moisture content of coal and coal powder was achieved due to the gradual change of temperature in the drying chamber. An increase in temperature above 900C led to dislocation and combustion of coal and coal dust. Therefore, the maximum temperature was limited to 900S.

The graphical relationships shown in Figure 2 can be expressed by the following empirical formula determined by the least squares method [16];

$y = 0.0434x2 - 4.4063x + 112.99$ $R^2 = 0.994$ (2)

$y = 0.0478x2 - 4.8475x + 124.3$ $R^2 = 0.992$ (3)

In this moisture loss, a drying drum on the production process line is recommended [9].

TABLE-2 Technical characteristics of fuel briquettes obtained for analysis

Name of raw material	Mechanical force in compression, mpa	Humidity,%	Ash content,%	Volatile substances,%	Sulfur content,%	Heat of combustion	
						Traps MDj / kg	High MD j / kg
Coal briquettes	12.0	7.9	8.5	6.3	0.43	27.75	33.44

Conclusion:

In order to protect the environment from toxic gases and protect human health, it is important to carry out the drying of coal dust, which is used as a raw material in briquette production plants. The maximum temperature during the drying process should be 900C. Otherwise, the coal powder can be dislocated again, in which the combustion process can be observed. According to the results obtained after drying, the content of sulfur in the briquettes was reduced from the permissible 1% to 0.43%.

References:

1. Хакимов А. А., Салиханова Д. С., Каримов И. Т. Кўмиркукуниданбрикетлартайёрлашнингдолзарблиги //Фарғона политехника институтиилмий техника журнали.-2019.-№. – 2019. – Т. 23. – №. 2. – С. 226-229.

2. Хакимов А. А., Салиханова Д. С., Каримов И. Т. Кўмиркукунинибрикетловчиқурилма //Фарғона политехника институтиилмий техника журнали.-2018.-№ спец. – 2018. – Т. 2. – С. 169-171.

3. Хакимов А. А. и др. Связующее для угольного брикета и влияние его на дисперсный состав //Universum: химия и биология. – 2020. – №. 6 (72). – С. 81-84.

4. Хакимов А. А.,Вохидова Н. Х. Использование местных отходов в производстве угольных брикетов //Универсум: химия и биология. – 2020. – №. 4 (70).

5. Axmedovich X. A., Saidakbarovna S. D. Research the strength limit of briquette production //ASIAN JOURNAL OF MULTIDIMENSIONAL RESEARCH. – 2021. – T. 10. – №. 5. – С. 275-283.

6. Хакимов А. Технология брикетированного угля //Матеріаликонференцій МЦНД. – 2020. – С. 76-78.

7. 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. – С. 264.

8. KhakimovA. A., Salikhanova D. S., Vokhidova N. K. Calculation and design of a screv press for a fuel briquette //Scientific-technical journal. – 2020. – Т. 24. – №. 3. – С. 65-68.

9. Хакимов А. А. и др. Определение показателей качества угольного брикета //Universum: химия и биология. – 2021. – №. 5-2 (83). – С. 40-44.

10. Вохидова Н.Х. Хакимов А.А., Салиханова Д.С., Ахунбаев А.А. Анализ связующих из местного сырья для брикетированния углольной мелочи // Научно-технический журнал ФерПИ. – 2019. - Scientific-technical journal (STJ FerPI, ФарПИ ИТЖ, НТЖ ФерПИ, 2019, Т.23, спец. №3). – С. 69-74.

11. Тожиев Р. Ж. и др. Оптимизация конструкции сушильного барабана на основе системного анализа процесса //Universum: технические науки. – 2020. – №. 11-1 (80).

12. Тожиев Р. Ж., Ахунбаев А. А., Миршарипов Р. Х. Сушка тонкодисперсных материалов в безуносной роторно-барабанном аппарате //Научно-технический журнал ФерПИ,-Фергана. – 2018. – №. 2. – С. 116-119.

13. Ахунбаев А. А., Ражабова Н. Р., Вохидова Н. Х. Исследование гидродинамики роторной сушилки с быстровращающимся ротором //Экономика и социум. – 2020. – №. 12-1. – С. 392-396.

14. Тожиев, Р. Ж., Ахунбаев, А. А., Миршарипов, Р. Х., Муллажонова, М. М. К., & Йигиталиев, М. М. У. (2021). Анализ процесса сушки минеральных удобрений в барабанном аппарате. Universum: технические науки, (8-1 (89)), 31-36.

15. Тожиев, Р. Ж., Ахунбаев, А. А., & Миршарипов, Р. Х. (2018). Сушка тонкодисперсных материалов в безуносной роторно-барабанном аппарате. Научно-технический журнал ФерПИ,-Фергана, (2), 116-119.

16. Хакимов А.А.Совершенствование технологии получения угольных брикетов с использованием местных промышленных отходов: Дисс. … PhD. – Ташкент, 2020. – 118 с.

ISSN 2792-4025 (online), Published under Volume: 1 Issue: 5 in October-2021