Constructional Improvements of FGX-1 Air Concentrating Table Aiming at Optimization of Operation

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Abstract

The article contains information on operation of the air concentrating table of FGX-1 type. On the basis of the personal experience and reports in the literature the problems encountered during the operation of FGX units have been described. The causes of an excessive amount of refuse in the coal and an excessive amount of coal in refuse, as well as the excessive amount of the feed on the table's deck and the impact of the changes in quality of raw coal feed on the effectiveness of the separation process have been discussed in detail. As a result of observation of the deshaling process the constructional changes of the FGX-1 air concentrating table were designed and implemented. These changes concerned: a new constructional solution of discharge dampers, installation of a curtain helping in separating waste fractions from middlings, increasing air flow, installation of a regulating flap on a feeder and covering the feeder with galvanized metal sheet. The implemented constructional changes resulted in significant improvement of effectiveness of the run-of-mine deshaling.

Keywords: air concentrating table, irregularities in table deck operation, constructional changes of FGX-1 unit

Introduction

Institute of Mechanized Construction and Rock Mining – Branch in Katowice at the end of 2012 implemented a purchased in China air concentrating table unit dedicated to dry separation of raw coal. This is a mobile research unit with a capacity of several tons that aims at determining the susceptibility of different kinds of raw coal from the coal mines and waste coal landfills on the dry separation process. This type of unit is the first one in Poland and in the countries of the European Union [8,10]. It should be mentioned that at present there are globally about 1,500 industrial units with a capacity from 20 to 1000 Mg/h working with success. The main tasks of this technology is dry separation of raw coal, removal of the pyritic sulfur and separation – in the form of an additional product – of the partial grain class below 0,5 mm (that during the jig get to the water-slurry circuit). The principles of separation on the air concentrating table were described in the papers [1,3,4,5,12,14,15,19].

The FGX-1 research unit had been located in the "Sobieski" Coal Company belonging to TAURON Wydobycie S.A. and recently it was moved to the "Janina" Coal Company. In the first period some works were carried out that aimed at mastering the ways of adjusting the unit operating parameters. This required conducting the multiple series of attempts in various configurations of settings and after earning the necessary experience it involved making some adaptive changes in order to obtain favorable results. In the subsequent periods the tests on the deshaling process of the coal samples from the several coal mines were conducted. The results of certain works were presented in many publications of the authors of this article [2,6,11,13,16, 17,18,21].

This paper also describes the constructional changes of the FGX-1 concentrating table possessed by IMBiGS. The experience of the industrial units working worldwide also was used [20,22,23].

Problems occurring during operation of the air concentrating table

Mining and geological conditions as well as exploitation of several coal fields of different technological characteristics causes the significant changes in quality parameters of the run-of-mine coal. Therefore, the degree of contamination of the run-of-mine coal with dirt is also big changes. In this case the positioning parameters of the table deck (bed plate) have to be changed, i.e. horizontal and vertical angles and the height of the discharge damper to maintain the stability of dry separation process.

In reality the unit is designed to work with the feed of fixed grain size and content of rocks. For this reason, making above-mentioned adjustments

each time requires stopping the feeding process and clearing the surface of the table deck. The conducted adjustment works require the additional time and are carried out manually what affects negatively the continuity of the deshaling process. During the research works some phenomena were observed that had negative influence on the quality of the obtained separation products. These problems were also described in the Chinese publications [20,22,23].

Analysis of these phenomena has helped to distinguish the reasons causing deterioration of the quality of the coal and rocks.

Main reasons of overmuch refuse (rocks) content in cleaned coal section

The main reasons of overmuch refuse (rocks) content in cleaned coal section include:

- insufficient air from the main air fan in the case of serious abrasion of the main air fan's impeller,
- insufficient air in the case of serious dirt on the air section duct wall of the cyclone dust collector,
- foreign matters (contaminants), i.e. plastic bag, powder paper, etc. in the channel or overmuch stock in the air chamber of the main separator, which blocking the bottom air hole of the bed plate and thus resulting in insufficient air, but no obvious indication on the ammeter of the air fan,
- over-low discharge damper in cleaned coal section, over – fast material falling in the same section, poor delamination of materials on the bed face and the coal refuse falling out of the separation bed face without separation,
- serious abrasion of rubber plate of the bed face in cleaned coal section or over low and seriously abraded trigonal iron guide rail division bar.

There are many minor reason tom cause excess refuse content in the cleaned coal such as ultra large horizontal inclination of bed face or ultra large exciting force of the vibration motor, all which in general will become very stable after the once for all adjustment without change basically.

Main reason of over standard coal content in refuse section

The main reason of over standard coal content in refuse section include:

- Over-high damper in cleaned coal and middling sections or the bed face locating in cleaned coal and middling faces and serious abrasion of rubber plate,
- ultra large vertical inclination of the bed face,
- unsatisfactory adjustment of turning plate of discharge cute, trending to the middlings,
- one of the four slings for suspending the separating bed is not tensioned, resulting in uneven vibration of the bed face.
- over standard moisture content in coal, poor delamination of the dry separator and unstable materials on the bed face resulting the runway of the coal.

Main reasons of over flow at materials inlets

Excessive amount of the feed of the bed plate may be caused by:

- sudden exceeding standard of moisture content in coal and sudden increase of cleaned coal result in abnormal operation of the separation bed in which case the material inlets of the main separator will overflow from more to less and it should recover to normal condition automatically after passing through of the "wet coal",
- not opening or insufficient opening of the air inlet adjustment value also case quick overflow,
- abnormal operation of vibration motor.

In the case of an excessive amount of the feed on the bed plate there is a necessity to reduce the amount of the feed material or stop the process.

Lack of reaction in such situation can cause permanent, irreversible damage to the unit.

Changes in coal and insufficient improvement of coal quality

Such default can cause the most economic loss of the coal mine and is the most difficult for the coal mines technicians to grasp. It is required that the technicians must enter the site frequently and observe the change track and delamination situation of the coal day by day.

When this phenomenon occurs it is necessary:

- to re-adjust the horizontal and vertical inclinations of the separating bed in two times, one for observing the effect and another for adjusting to the optimum,
- to re-collocate the air, mainly adjusting turning plate of air door in cleaned coal and middling section,
- to re-adjust the amplitude of the vibrating motor.

The above mentioned refers to some experiences summed up by the technicians through long term exploration and in the practices concerning various defaults which have occurred to impact coal quality and production during the four years use of air concentrating tables of FGX type. They

are also confirmed by the already existing national practical experience.

Constructional changes of the test air concentrating table of IMBiGS

The FGX-1 unit purchased in China has a warrantee of contactor. In order not to lose it the unit should not be subjected to any considerable modifications that could lead to the withdrawal of the producer from the obligation of repairing the defects that could theoretically occur. The manufacturer of the air concentrating tables of FGX type – Tangshan Shenzhou Manufacturing Co. Ltd. produces the units with the appropriately selected variable technical parameters whose setting is dependent on the characteristics of tested raw coal. During installation and commissioning of the unit for dry separation the instructions and recommendations of the producer must be respected in order to achieve the desired effect. Maintenance and service the unit requires – as for each equipment – a fully qualified personnel. In general, after installing the unit, personnel's of the factory service develop a schema of unit operation taking into account quality of local coal and existing infrastructure. After installation of the unit the representative of the producer carries out a series of necessary start-up tests for achieving the required technological assumptions imposed by the customer. Subsequently the documented transfer of the unit to the purchaser takes place alongside with the operation card that takes into consideration the quality of coal and existing infrastructure.

During the purchase of the FGX-1 unit by IMBiGS the producer offered sending an expert that would adjust the operation of the table. Due to the fact that the purchased unit was meant to be a test unit the Institute did not take advantage of this proposal. It was clear that raw coals of different quality will be subjected to the tests, therefore the adjustments of the unit would be carried out on a regular basis depending on the intended purpose of the test. However, nearly three-year studies on deshaling of raw coal on the FGX-1 table showed that some constructional changes of the table are necessary. They were carried out by the IMBiGS staff and based on their previous experience and observation of the unit. The constructional changes that were made as well as the reasons of their introduction are described below.

Installation of a new solution of discharge damper in cleaned coal section

The process of dry separation of coal takes place in a continuous stream of air and involves the gradual release of the feed grains of a certain density. At the same time the separation of grains in terms of size occurs. In the first separation section the concentration of grain both of the smallest density and biggest size takes place. These grains are transported to the discharge damper for coal product and in this place they should leave the working plate of the table's deck. Such process did not always take place. Only a small number of the biggest coal grains left the working plate. The remaining (bigger) amount of coal grains under the influence of the vibrating movement of the plate was directed to the back plate. This resulted in their mixing with the grains of the new feed and disrupting the process of their separation. Coal grains of the biggest size were transported along the back plate to the discharge section for middlings product. Under the influence of the riffles on the surface the grains were directed to the section of the discharge damper for middlings product. During the separation process they were leaving the working plate, getting to the middlings product. As a result of described grain movement the middlings product was characterized by better parameters than coal product. Unnecessary return of coarse coal grains caused additional load of the working plate, reducing its capacity. The grains took up space in the middle part of the working plate what resulted in pushing smaller coal grains located on the working plate to the waste section. Thus the surface of the plate was reduced for the separation process of the smaller coal grains. In result worse parameters of the wastes were obtained. Due to the shortage of space for separation the coal grains were not be able to be separated from the stream of waste grains. Consequently they ended up in the wastes. The process of overflow of coarse coal grains to the wastes products concerned almost each kind of research material. This phenomenon is mainly concerned when in the size grains of less than 20 mm were large quantities of grains class 12–20 mm, and when the feed moisture exceeded 8%. A new construction of the discharge damper for coal product was made. The essence of this change was to create a possibility of adjusting the length of the damper for discharging the coal product. As a result of shortening the length of the damper the free section of the discharge damper is obtained on the working plate. Thanks to this free space the coarse coal grains can freely leave the working plate in the first phase of separation process. This con-

Fig. 1a. Construction of the discharge damper in cleaned coal section

Rys. 1a. Konstrukcja progu przesypowego odbioru produktu węglowego

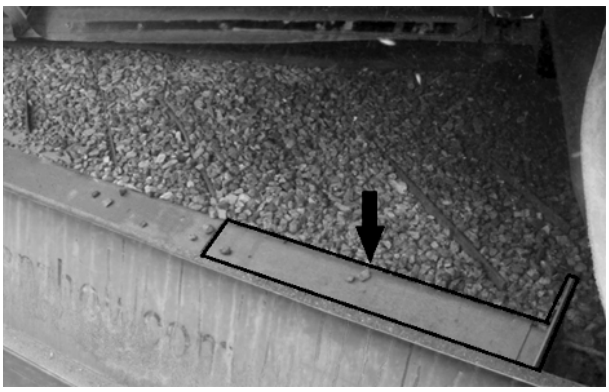

Fig. 1b. Construction of the discharge damper in cleaned coal section

Rys. 1b. Konstrukcja progu przesypowego odbioru produktu węglowego

struction of the discharge damper for coal product limits the return of coarse coal grains to the discharging point for middlings product, eliminates contact of coarse coal grains with the feed, reduces unnecessary additional working plate load and eliminates the reduction of FGX-1 unit capacity. Additional mounting of the discharge damper for coal product of a variable length also contributed to the more effective removal of pyrite particles from the run-of-mine coal. This process was noticed visually in the course of research trials and it was subsequently supported by the analysis of sulfur content in the products of separation. This phenomenon is particularly important in separation of coals with high sulfur content. Figures 1a and 1b show the construction of the discharge damper for cleaned coal section.

Installation of a curtain enabling redirecting part of the separated material from the waste section to the middlings section

While conducting the studies in the back plate the separated product was getting into the wastes. Such a separation of products resulted from the construction both of the plate and collecting point for separated product, meaning from the lack of proper flap enabling total collection of the product separated on the working plate. The conducted quality measurements (ash content and calorific value) of the product from the back plate showed that there was present a material that should not have got to the wastes. This fact was also noticeable during the observation of separation process of any research material. Changes in setting parameters of the plate also did not influence quality of the final product of separation. It had no effect on improvements of the obtained products quality. These observations resulted in decision of installing an additional curtain. Installation of a curtain allowed to direct a narrow, final stream of separated product to the reservoir for the middlings product. Such redirection of the material stream path enabled to improve the quality of separated wastes. This solution can be eliminated in any subsequent test attempt if such need occurs while conducting the studies.

Figures 2a and 2b present installation of a curtain enabling redirecting part of the separated material from the waste section to the middlings section.

Increasing air flow of the main fan

FGX-1 unit is equipped with a fan producing up to the 5000 m3/h of compressed air that is directed to the working plate. In the separation phase the material – under the continuous supply of air stream – should float creating a fluidized bed. In the conducted preliminary studies the phenomenon of floated material on the plate did not occurred. Lack of loosening effect in material in this layer limited and prevented from its density separation. This also resulted in poor effects of separation. Too big amount of feed supplied to the working plate in relation to the air amount caused poor fluidization phenomenon or its local disappearance. Lack of air resulted in moving the separation limit between the coal and waste sections. The operation of the working plate came down to the role of transporting the feed material. In order to conduct again dry separation process on the working plate it was necessary to limit the amount of feed research material. The studies were carried out with a capacity of approx. 0,55Mg/h. The obtained separation effect was disproportionate in relation to the capacity. The producer specified the installation capacity within 8 to 10 Mg/h. The unit

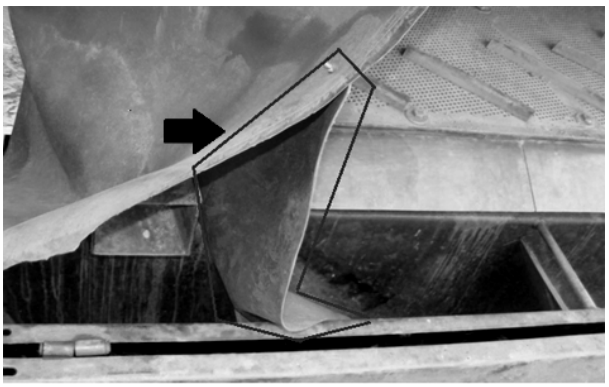

Fig. 2a. Installation of a curtain enabling redirecting part of the separated material from the waste section to the middlings section

Rys. 2a. Zabudowa fartucha umożliwiająca przekserowanie części rozdzielonego materiału ze strefy odpadowej do strefy produktu pośredniego

Fig. 2b. Installation of a curtain enabling redirecting part of the separated material from the waste section to the middlings section

Rys. 2b. Zabudowa fartucha umożliwiająca przekserowanie części rozdzielonego materiału ze strefy odpadowej do strefy produktu pośredniego

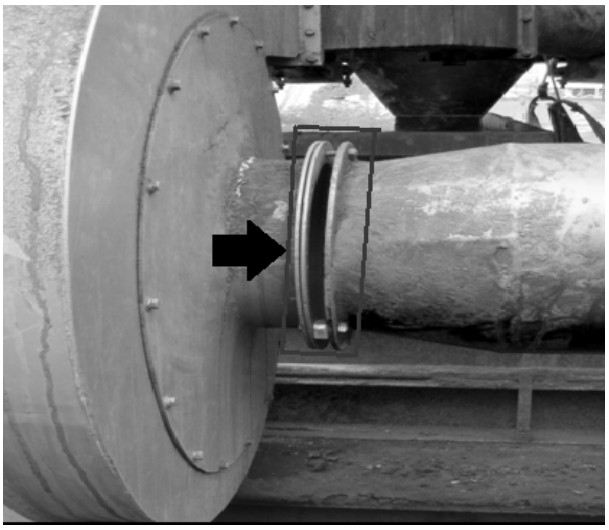

Fig. 3. Depressurized suction pipe

Rys. 3. Rozszczelniony rurociąg ssawny

Fig. 4. Installation of the regulating flap on the feeding chute to the feeder

Rys. 4. Zabudowa klapy regulacyjnej na rynnie podawczej do podajnika

is not equipped with the equipment for controlling the amount of air flow. It also does not have the built-up pressure manometers on the collectors supplying compressed air under the working plate. Lack of control over air distribution that gets into the particular sections of the working plate hinders its appropriate quantitative selection in relation to the thickness of layer of separated material (its capacity). In order to increase the air flow to the fan depressurized suction pipe. This resulted in a constant slot. Thanks to this increased amount of air to feeding to the working plate. Figure 3 shows the operation system with the depressurized suction pipe.

Constructional change significantly improved the fluidization effect of grains on the plate. The obtained additional air flow allowed for increasing the amount of the feed research material. The effectiveness of the coal dry separation process was improved as well as the capacity of the process increased to 2,5 Mg/h. The issue of the way of supplying and measuring the amount of air under the working plate will be the subject to further analysis. This change has had an impact on improving the efficiency of facilitating of capturing the dust emitted the FGX-1 unit.

Installation of regulating flap on feeding chute to the feeder

Feeding material to the working plate is realized by the vibrating feeder. In the initial phase of the conducted research works the capacity of the feeder was regulated through lowering the feeder on the ropes. In practice the adjusting pro-

Fig. 5. Feeder covered with the galvanized metal sheet

Rys. 5. Podajnik wyłożony blachą ocynkowaną

Fig. 6a. Constructional change of discharge damper for receiving waste product

Rys. 6a. Zmiana konstrukcyjna progu przesypowego do odbioru produktu odpadowego

Fig. 6b. Constructional change of discharge damper for receiving waste product

Rys. 6b. Zmiana konstrukcyjna progu przesypowego do odbioru produktu odpadowego

cess turned out to be quite inconvenient. Changing the adjustment was not smooth and followed with a time delay. Observed on the working plate disruption require regulation capacity of the process. In order to eliminate the described nuisance of changes in capacity, the chute on the feeder was cut off and a regulating flap was installed on the front wall. Modified in such a way regulating system – after conducting some research trials – fulfilled his planned function. Figure 4 shows the regulating flap installed in front of the vibrating feeder.

Covering feeder with galvanized metal sheet

According to the producer's documentation of the FGX-1 unit the capacity of dry coal separation was defined at the level of 8–10 Mg/h. In practice the capacity of dry separation of coal equaled 4,5 Mg/h. Further enhancing the capacity of the fed research material was very limited. The vibrating feeder operated at maximum inclination. To achieve further lowering of the feeder, in order to improve unit's capacity, the construction of working plate should be lowered on ropes. An another easier solution would be covering (from the inside) the walls of the feeder with the galvanized metal sheet. After analyzing both of the options, covering the feeder with the galvanized metal sheet was chosen. The applied solution helped to reduce the friction the material on the bottom of the feeder. This enabled to obtain a further gradual increase in the unit's capacity to the level of 6 Mg/h. Figure 5 shows the feeder covered with the galvanized metal sheet.

Constructional change of discharge damper for waste section

Operation of the table deck of FGX-1 unit may be conducted using an additional trough for the collection point of waste product. Then the table deck takes over the function of collecting the coal products and middlings whereas the chute located at the rear part of the table deck is responsible for collection the waste product in total. In order to reduce the coal losses in the waste (mainly fine grains) the additional riffle was installed in the construction of the discharge damper for waste product. Therefore the overflow of coal grains to the waste was eliminated while maintaining very good and stable quality of waste product from the installed additional trough.

This construction does not affect the design of the FGX-1 unit. The conducted tests of waste and middlings quality confirmed the advisability of the introduced constructional changes. This change allowed to improve the flow of the dry separation process through a more precise qualitative separation of the products, reduction of coal losses in waste and at the same time it did not limit the capacity of the FGX-1 unit.

Fig. 6a and 6b show the constructional change of the discharge damper for collection of the waste product.

Summary

The conducted studies enabled to make the decisions facilitating the operation of the air concentrating table. After visual analysis of process flow and on the basis of the laboratory analysis the constructional changes were introduced consisting of:

- installation of a new solution of discharge damper in cleaned coal section
- installation of a curtain enabling redirecting part of the separated material from the waste section to the middlings section,
- increasing air flow of the main fan
- installation of the regulating flap on the feeding chute to the feeder,
- covering the feeder with a galvanized metal sheet,
- constructional change of discharge damper for receiving refuse product.

These facilitations do not affect the basic construction of the unit. However, they resulted in improvement of the products quality and increased the capacity of the FGX-1 unit.

Literatura – References

1. BAIC I., BLASCHKE W. "Analiza możliwości wykorzystania powietrznych stołów koncentracyjnych do otrzymywania węglowych paliw kwalifikowanych i substytutów kruszyw" (Analysis of possibilities of using air concentrating tables for obtaining qualified coal fuels and substitutes of aggregates) *Energy Policy* 16/3(2013): 247–260.
2. BAIC I. et al., "Badania możliwości usuwania kamienia z urobku węgla koksowego na powietrznych stołach koncentracyjnych." Monografia (Tests on the possibilities of rock removal from the coke coal output on the air concentrating tables. Monography) *Innowacyjne i przyjazne dla środowiska techniki i technologie przeróbki surowców mineralnych* KOMEKO 2014 (Innovative and environmentally friendly techniques and technologies of raw materials processing), Publication of ITG KOMAG, Gliwice 2014: 65–79.
3. BAIC I., BLASCHKE W., SOBKO W.: "Ekologiczne oczyszczanie urobku węgla kamiennego za pomocą powietrznych stołów koncentracyjnych. Na mokro czy na sucho?" (Ecological processing of hard coal output using air concentrating tables. Wet or dry method?) *Quarterly Ecology*, *Polish Chamber of Ecology* 69/1(2014):32–24.
4. BAIC I. et al., "Nowoczesne powietrzne stoły koncentracyjne do wzbogacania węgla kamiennego." (Modern air concentrating tables for hard coal processing), Conference Materials „Nowoczesne rozwiązania z zakresu procesów technologicznych przeróbki węgla" (Modern technological solutions of coal processing), Publication of CNP EMAG (CD), Katowice-Szczyrk 2014: 60–71.
5. BAIC I., BLASCHKE W., SZAFARCZYK J. *Dry deshaling of coal. Proceedings of the18th Conference on Environment and Mineral Processing*. Part II. VSB – TU Ostrava 2014: 191–196.
6. BAIC I. et al., "Badania nad wzbogacaniem węgli kamiennych na powietrznych stołach koncentracyjnych" (Studies on hard coals processing on air concetrating tables), *Wiadomości Górnicze* (Mining News) 7–8(2014): 417–421.
7. BAIC I., BLASCHKE W., SZAFARCZYK J. "Dry coal cleaning technology." *Inżynieria Mineralna* 34/2(2014): 257–262.
8. BAIC I., BLASCHKE W., SZAFARCZYK J. "The First FGX Unit in the European Union." *CPSI Journal – a Magazine by the Coal Preparation Society of India*. 16(2014): 5–12.
9. BAIC I., BLASCHKE W., SZAFARCZYK J. "Vyskum testovania sucheho procesu upravy uhlia sliezskej panvy. Zbornik prednasok mezinarodnej konferencie Nova surovinova politika - Progresivne technologie v banictve,geologii a životnom prostriedi" Demanovska Dolina-Slovak Republic, 2014: 101–109.
10. BAIC I. et al., *The first FGX unit in the European Union.in "Thesis Collection of FGX Dry Coal Preparation Technology.* Tangshan Shenzhou Manufacturing Co., Ltd, China, 2014: 21–27.
11. BAIC I., BLASCHKE W., SOBKO W. "Badania nad odkamienianiem energetycznego węgla kamiennego na powietrznych stołach koncentracyjnych." (Studies on steam coal deshaling on the air concentrating tables), *Rocznik Ochrony Środowiska* (Annual Set The Environment Protection), Publication of Central Pomeranian Scientific Association for Environmental Protection, 17(2015): 958–972.
12. BAIC I. et al., "Nowa ekologiczna metoda usuwania zanieczyszczeń skałą płonną z urobku węgla kamiennego." (New ecological method of removing dirt contaminations from the hard coal output) *Rocznik Ochrony Środowiska* (Annual Set The Environment Protection), Publication of Central Pomeranian Scientific Association for Environmental Protection 17(2015): 1274–1284.
13. BAIC I. et al., "Application of Air Concentrating Table for Improvement in the Quality Parameters of the Commercial Product JARET." *Inżynieria Mineralna* 35/1(2015).

14. BLASCHKE W., BAIC I. "Wykorzystanie powietrznych stołów koncentracyjnych do otrzymywania substytutów kruszyw metodą deshalingu." (Using air concentrating tables for obtaining substitutes of aggregates with the application of deshaling method), *Journal.* 3(2013): 48–50.
15. BLASCHKE W. "Nowa generacja powietrznych stołów koncentracyjnych." (New generation of air concentrating tables) *Scientific Papers of the Institute GSMiE PAN* 84(2013).
16. BLASCHKE W., BAIC I. "Otrzymywanie substytutów kruszyw z wykorzystaniem metody deshaling." (Obtaining the substitutes of aggregates with the use of dry dehsaling method) International conference „The new mineral policy and progressive Technologies in Mining, Geology and Environment". Slovakian Mining Society. Demianowska Dolina – Slovakia 2013: 121–125.
17. BLASCHKE W., OKARMUS P., ZIOMBER S. "Skuteczność suchego odkamieniania węgla koksowego metodą separacji na powietrznych stołach koncentracyjnych." (Efficiency of the dry separation of coke coal on the air concentrating tables) Monography - *Innovative and environmentally friendly techniques and technologies of raw materials processing*, Gliwice: ITG KOMAG 2014: 81–91.
18. BLASCHKE W., BAIC I., WITKOWSKA-KITA B. "Badania podatności węgli kamiennych na proces rozdziału metodą suchej separacji. Polityka Energetyczna." (Studies on susceptibility of hard coal to the separation process with the use of dry separation method. Energy Policy), 17/4(2014): 117–126.
19. BLASCHKEW., BAIC I., SZAFARCZYK J. "Układy technologiczne wzbogacania węgla kamiennego z wykorzystaniem procesu deshaling." (Technological Systems of hard coal processing using deshaling process), *Presentation for the Mineral Engineering Conference (MEC) 2014.*
20. PENG XIANHUA, CAI YIXIAN, YANG TIANYIN "Application of FGX-12 compound dry cleaning machine in Cleaned Coal Company of Panzhihua Coal Mining Group Co., Ltd. China." *Coal. Ed. Tangshan Shenzhou Machinery Co., Ltd.* 1(2006): 104–107.
21. SOBKO W., BLASCHKE W., FRAŚ A. "Desulfurization adn ash removal of the commercial product „JARET®" using air-table technology. Monography - Innovative and environmentally friendly techniques and technologies of raw materials processing KOMEKO 2015, Gliwice: ITG KOMAG, 2015: 81-90
22. YU GANG "Application of compound dry coal cleaning machine in the Donghai Mine. China." *Coal. Ed. Tangshan Shenzhou Machinery Co., Ltd.* 1(2006): 83–84, 88.
23. ZHANG SONGTAO, DING KEYU "Analysis on application of compound dry cleaning machine in Changcun Mine." *China Coal. Ed. Tangshan Shenzhou Machinery Co., Ltd.* 1(2006): 95–97.

Usprawnienia konstrukcyjne powietrznego stołu koncentracyjnego typu FGX-1 mające na celu optymalizację jego pracy

W artykule zamieszczono informacje dotyczące pracy powietrznego stołu koncentracyjnego typu FGX-1. Omówiono, na podstawie własnych doświadczeń i doniesień literaturowych, problemy występujące w czasie pracy urządzeń typu FGX. Szczegółowo omówiono przyczyny występowania nadmiernej ilości odpadów w koncentracie i nadmiernej ilości węgla w odpadach, nadmiernej ilości nadawy na płycie stołu, a także wpływu zmian jakości nadawy węgla surowego na efektywność procesu rozdziału. W wyniku obserwacji przebiegu procesu odkamieniania zaprojektowano i zastosowano zmiany konstrukcyjne w budowie powietrznego stołu koncentracyjnego FGX-1. Zmiany te dotyczyły: nowego rozwiązania konstrukcyjnego progów przesypowych, zabudowy fartucha pomagającego lepiej rozdzielać frakcje odpadowe od produktu pośredniego, zwiększenia wydatku powietrza, zabudowy klapy regulacyjnej na podajniku oraz wyłożenia podajnika blachą ocynkowaną. Wprowadzone zmiany konstrukcyjne przyczyniły się do znacznej poprawy efektywności odkamieniania urobku węglowego.

Słowa kluczowe: powietrzny stół koncentracyjny, nieprawidłowości w pracy stołu, zmiany konstrukcyjne, instalacji FGX-1