CURRENT STATE, IMPROVEMENTS AND LATEST TRENDS IN COAL PREPARATION IN POLAND

Wiesław S. BLASCHKE\textsuperscript{1}, Ireneusz BAIC\textsuperscript{1}, Józef SZAFCZYK\textsuperscript{1}

\textsuperscript{1}Institute Mechanised Construction & Rock Mining, Branch in Katowice
CURRENT STATE, IMPROVEMENTS AND LATEST TRENDS IN COAL PREPARATION IN POLAND

Wiesław S. BLASCHKE¹, Ireneusz BAIC¹, Józef SZAFARCZYK¹

¹Institute of Mechanised Construction & Rock Mining, Branch in Katowice

Mineral Engineering Conference
MEC2016
25 -28 September 2016,
Świeradów-Zdrój, Poland

Presentation available at http://www.e3s-conferences.org
INTRODUCTION

Poland is the largest coal producer in Europe. In 2015 the coal output of steam coal amounted to 59.21 million tonnes and 12.98 million tonnes of coking coal.

Poland also has the largest coal resources. They amount to 52.0 billion tonnes (resources supposed economic), but the amount of economic reserve base is deemed to be 3.7 billion tonnes.

Coal can be found in two regions in Poland. These are the Upper Silesian Basin and the Lublin Basin.
Current state, improvements and latest trends in coal preparation in Poland

OCCURRENCE OF HARD COAL DEPOSITS IN POLAND
INTRODUCTION

In the **Upper Silesian Coal Basin** the following coal companies operate (the status on the mid of 2016):

- Kompania Węglowa S.A. (on 1.05.2016 Polish Mining Group) – operating in 11 coal mines,
- Katowicki Holding Węglowy S.A. – operating in 4 coal mines,
- Węglokoks Kraj Sp. z o.o. - operating in 2 coal mines,
- Jastrzębska Spółka Węglowa S.A. – operating in 5 coal mines,
- TURON Wydobycie S.A. – operating in 3 coal mines.

In the **Lublin Coal Basin** - operating in one mine (LW „Bogdanka” S.A.).

There are also the following small mines:

- PG „Silesia” Sp. z o.o. - property of a Czech coal company,
- Siltech Sp z o.o. – private mine,
- ECO-PLUS Sp. z o.o. – private mine.
WASHED COAL PRODUCTION

Approximately 60% of the Polish coal production is washed with some form of coal preparation.

The saleable coal has the following quality parameters:
- coking coal - ash content varies from 5.4% to 8.8% (average 6.8%) and sulphur content varies from 0.51% to 0.89% (average 0.67%),
- steam coal for the power industry - the net calorific value ranges from 15.4 to 25.4 kJ/kg, ash content ranges from 9.9 to 30.1% (average 22.4%) and sulphur content from 0.56 to 2.59% (average 0.83%).

In Poland some power stations are adapted to burn raw coal (non-prepared coal) - its net calorific value can be 19.2 MJ/kg, and sometimes even less, whereas the ash content can be up to 26%, and the sulphur content of 1.57%.
## Current state, improvements and latest trends in coal preparation in Poland

### NUMBER OF COAL PREPARATION PLANTS

<table>
<thead>
<tr>
<th>Coal companies</th>
<th>Number of CPP</th>
<th>Capacity [tph]</th>
<th>Range of size [mm]</th>
<th>Washed production [million Mg]</th>
<th>Type/Distribution of circuits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kompania Węglowa S.A. (Polish Mining Group S.A.)</td>
<td>20</td>
<td>600-2.100</td>
<td>20-0 (85 %) &gt;20 (15%)</td>
<td>~14.4</td>
<td>vibration screens, jaw crushers, (20), dense medium washer (18), grain jigger (2), jig washer (14), dense medium cyclone (1), hydrocyclone (6), spirals separator (4), flotation (7)</td>
</tr>
<tr>
<td>Katowicki Holding Węglowy S.A.</td>
<td>5</td>
<td>600-1.600</td>
<td>20-0 (78 %) &gt;20 (22%)</td>
<td>~3.2</td>
<td>vibration screens, jaw crushers (5), dense medium washer (5), jig washer (1), WĘGLOKOKS KRAJ Sp. z o. o.</td>
</tr>
<tr>
<td>WĘGLOKOKS KRAJ Sp. z o. o.</td>
<td>2</td>
<td>1.500</td>
<td>20-0 (90 %) &gt;20 (10%)</td>
<td>~0.5</td>
<td>vibration screens, jaw crushers (2), dense medium washer (2), jig washer, Barrel washer (2)</td>
</tr>
<tr>
<td>JSW S.A.</td>
<td>8</td>
<td>800-1.600</td>
<td>20-0 (98 %) &gt;20 (2%)</td>
<td>~12.3</td>
<td>Bradford drum crushers, dense medium washer (8), jig washer (8), flotation (8)</td>
</tr>
<tr>
<td>TAURON Wydobycie S.A.</td>
<td>2</td>
<td>900</td>
<td>20-0 (80 %) &gt;20 (20%)</td>
<td>~2.9</td>
<td>vibration screens, jaw crushers (2), dense medium washer (2), jig washer (2), spirals separator (2)</td>
</tr>
<tr>
<td>LW &quot;Bogdanka&quot; S.A.</td>
<td>1</td>
<td>2.400</td>
<td>20-0 (85 %) &gt;20 (15%)</td>
<td>~7.4</td>
<td>vibration screens, jaw crushers (2), dense medium washer (2), jig washer (2)</td>
</tr>
<tr>
<td>PG &quot;Silesia&quot; Sp. z o.o.</td>
<td>1</td>
<td>575</td>
<td>20-0 (82 %) &gt;20 (18%)</td>
<td>~1.2</td>
<td>vibration screens, jaw crushers (1), dense medium washer (1), dense medium cyclone (1)</td>
</tr>
</tbody>
</table>
Current state, improvements and latest trends in coal preparation in Poland

DEVELOPMENT OF COAL PREPARATION PLANT IN LW „BOGDANKA” (2400 t/h)

Photo: MIFAMA OPA CARBO - MIKOŁÓW
Current state, improvements and latest trends in coal preparation in Poland

DEVELOPMENT OF COAL PREPARATION PLANT IN LW „BOGDANKA” (2400 t/h)

Photo: MIFAMA OPA CARBO - MIKOŁÓW
Current state, improvements and latest trends in coal preparation in Poland

DEVELOPMENT OF COAL PREPARATION PLANT IN LW „BOGDANKA” (2400 t/h)

Photo: MIFAMA OPA CARBO - MIKOŁÓW
Current state, improvements and latest trends in coal preparation in Poland

FLOWSheet OF Steam Coal Preparation Plant

1. Oval throw screen
2. Jaw crusher
3. Straight-line vibrating screen
4. Oval throw screen
5. Vor siv conical sieve
6. Straight-line vibrating screen
7. Dense-medium separator
8. Stationary screen 1,0 mm
9. Straight-line vibrating screen
10. Recuperator
11. Recuperator
12. Oval throw screen
13. Oval throw screen
14. Classifying tank
15. Dorr thickener
16. Vacuum disc filter
17. Jaw crusher
18. Straight-line vibrating screen
19. Stationary screen 1,0 mm

Refuse
Circular water
Fines IIA
Nuts
Cubes
Peas to sell or to crush

1-3-4-7-8-9-10-11-12-13-14-15-16-17-18-19
Current state, improvements and latest trends in coal preparation in Poland

FLOWSHEET OF COAL FINES PREPARATION AND DESULPHURIZATION PROCESS
Current state, improvements and latest trends in coal preparation in Poland

FLOWSHEET OF COOKING COAL PREPARATION PLANT
SIGNIFICANT INDUSTRY CHANGES

The main changes in last 3 years:

- setting in order and improvement of particular process circuits:
  - reconstruction of raw coal preparation station,
  - modernisation of heavy-media separation system,
  - modernisation of jig wash,
  - elimination of flotation concentrate drying plant,
  - construction of flocculate measurement installation,
  - modernisation of dispatcher system,
  - modernisation of dust separation system,

- implementation of more efficient dewatering technologies for fine coal to improve the quality of the products and maximise the reduction of slimes disposal outside the water-slurry circuits,

- modern arrangements for preparation of power mixtures, up to date instrumentation of key technological circuits with electronic monitoring measurement equipment:
  - construction of electronic samplers for saleable coal,
  - construction of electronic analysers for qualification of basic qualitative parameters.
Current state, improvements and latest trends in coal preparation in Poland

IMPROVEMENTS

R & D NEEDS
- developing new analyzers of ash, sulphur and moisture contents, which are more accurate for measuring on clean coal, middlings and wastes,
- automation and process control systems for devices of coal preparation technologies to increase productivity and efficiency,
- developing a new method to achieve a quick and accurate data on characterization of coal quality in terms of washability, improving dewatering of finest grains coal (below 0.063 mm) to reduce the load on closed water-slurry systems,
- new alternative utilization waste of mining.

SAFETY
- reduce the risks related to exposure to harmful and dangerous factors by reducing the emission of noise, dust, vibration, etc. derived from the use of machines and other means of production,
- reducing the exposure time of these factors on workers.
Current state, improvements and latest trends in coal preparation in Poland

IMPROVEMENTS

WATER USAGE
- further reduction of water consumption by simplifying the water-slurry circuits,
- improving the efficiency of processes especially clarifying water, thickening and dewatering of products,
- reduction of water losses related to the operation of the settling ponds,
- reduction of the duration of wet processes limiting the grains contact with water,
- use of the underground water as the medium for conducting wet processes in a closed water-slurry system,
- implementing of dry separation technology of raw coal.

EFFICIENCY
- technological possibilities of reducing the cost of preparation through the implementation of CMMS (Computerised Maintenance Management System) and PIMS (Production Information Management Systems), which includes: area of forecasting the quality of production, planning and integration of the extraction process with the preparation and sales process.
LATEST TRENDS

- replacement of thermal drying for mechanical dewatering, which reduce the emission of dust and gases into the atmosphere and consumption of coal or other fuels for their own needs or to reduce employment,
- automation of coal preparation process for the regulation parameters enrichment, changing transport system and method for storing (system of selective storage saleable coal),
- increased production of environmentally friendly coal,
- employment optimization,
- automation and visualization of production processes to help reduce employment and cost of processing.
CONCLUSION

Coal preparation plants existing in the mines fulfil their task in regard to efficiency and technology.

However, they require successive modernisation activities and investments to improve particular process circuits and reduce production costs.

There is need to improve coal quality monitoring and stability of the feed quality and products of coal preparation with particular attention paid to the variety of marketable grades.
REFERENCES

1. Bilans złoź zasobów złoź kopalnich w Polsce, 2015, PIG-PIB, Warszawa,
2. Bilans gospodarki surowcami mineralnymi Polski i świata, 2015, IGSMIE PAN, PIG-PIB, Warszawa,
4. Blaschke W.S., Gawlik L., Blaschke S.A, 2010, Coal Preparation Technologies in Poland. CPSA Journal - The magazine by the Coal Preparation Society of America, vol. 9, no. 1,
5. Blaschke W.S., Baic I., 2013, Coal and Lignite Mining in Poland. The Energy Sector will be the Leading Sector of Growth. Turkey Keyword. Ankara. Turkey,
7. www.mifama.com.pl
Current state, improvements and latest trends in coal preparation in Poland

Thank you for your attention!