5th Session of the UNECE Ad Hoc Group of Experts on Coal Mine Methane
Geneve, 12-13 October 2009

SPÓŁKA ENERGETYCZNA
“JASTRZĘBIE” S.A.

With us
  - brighter
    - warmer
    - cleaner
The mission of Spółka Energetyczna "Jastrzębie" S.A.

The mission of Spółka Energetyczna "Jastrzębie" S.A. is to meet our customers' needs and expectations in the scope of the **heating**, **electric** and **cooling energy** as well as **compressed air supply**, simultaneously realising environment protection and labour safety activities **based exclusively on the coal mines’ drainage gas**.

We wish to provide safe and reliable services as well as continuously adjust our offer to individual needs of the current and future customers as well as of the environment protection.
Geographical location
Spółka Energetyczna “Jastrzębie” S.A. was established as a result of Jastrzębska Spółka Węglowa S.A. reorganization and since 01.11.1995 it operates as an independent enterprise.

Jastrzębska Spółka Węglowa S.A. is the founder of SEJ S.A.

The SEJ S.A. incorporates four organization units, which means:

- Heat and power plant „Moszczenica”,
- Heat and power plant „Zofiówka”,
- EEG „Pniówek” including:
  - Heat and power plant „Pniówek”,
  - Heat and power plant „Suszec”.
### SEJ S.A. production capacity

<table>
<thead>
<tr>
<th>Specification</th>
<th>unit</th>
<th>Heat and power plant „Moszczenica”</th>
<th>Heat and power plant „Zofiówka”</th>
<th>EEG „Pniówek” Heat and power plant „Pniówek”</th>
<th>EEG „Pniówek” Heat and power plant „Suszec”</th>
<th>SEJ S.A.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installed thermal output (in boilers)</td>
<td>MW</td>
<td>164.4</td>
<td>344.9</td>
<td>93.1</td>
<td>60.6</td>
<td>663</td>
</tr>
<tr>
<td>Installed electrical power (in generators)</td>
<td>MW</td>
<td>36.6</td>
<td>64.0</td>
<td>10.3</td>
<td>6.6</td>
<td>117.5</td>
</tr>
<tr>
<td>Installed heating capacity (hot water, boilers and exchangers)</td>
<td>MW</td>
<td>139.6</td>
<td>280.9</td>
<td>103.3</td>
<td>66.7</td>
<td>590.5</td>
</tr>
<tr>
<td>Installed cooling capacity</td>
<td>MW</td>
<td>-</td>
<td>-</td>
<td>11.7</td>
<td>-</td>
<td>11.7</td>
</tr>
<tr>
<td>Compressed air production capacity</td>
<td>thous. cub.m/h</td>
<td>-</td>
<td>135.0</td>
<td>-</td>
<td>-</td>
<td>135.0</td>
</tr>
</tbody>
</table>
Jastrzębska Spółka Węglowa S.A. where SEJ S.A. operates is the largest coking coal producer within the area of Europe. The coal deposits are characterized by high volumes of methane CH$_4$ being released during the coal mining operations. This situation results in serious danger for the miners due to high methane explosivity. The gas emission is also very harmful for the environment due to c.a. 21 times higher impact on environment than CO$_2$.

To eliminate this hazard JSW S.A. coal mines are equipped with highly developed drainage systems, which include among the others: underground drainage pipelines network and the surface drainage stations.

The aim of the drainage stations is to extract released methane from the coal mine excavations and to compress it to the pressure enabling its transfer to the gas pipeline network supplying the SEJ S.A. heat and power plants. The remained gas is extracted from the coal mine excavations through the excavations’ ventilation system, together with the ventilation air.
Methane hazard in JSW S.A. based on "Pniówek" coal mine example

- total annual methane bearing capacity 126.7 mln cub. m/year
- ventilation 74.0 mln cub. m/year
- drainage 52.7 mln cub. m/year
Gas fuel supply from JSW S.A.

The methane supply from drainage of JSW S.A. coal mines is directly connected with the coal production output and is also determined by the coal mines excavations ventilation conditions, advancement of the mining development works and by the methane content in the particular hard coal deposits. The facts mentioned above affect the changes in quantity of methane supplied to SEJ S.A. heat and power plants in individual years as well as in shorter periods. Simultaneously in order to provide required safety level in the coal mines, the drainage stations maintain constant negative pressure in the underground network, even if blow of the methane to atmosphere is necessary.
Spółka Energetyczna „JASTRZĘBIE” S.A.

Diagram of SEJ S.A. gas transfer network.

Total methane supplies 123.72 mln cub. m

KWK JAS-MOS drainage station
- Supply 9.3 mln cub. m
  - CH4
    - Heat and power plant Moszczenica boilers
      - Supply 17.94 mln cub. m
        - Gas engines 21.07 mln cub. m
    - CH4
      - Heat and power plant Zofiówka boilers
        - Supply 20.89 mln cub. m
      - CH4
        - Heat and power plant Pniówek engines
          - Supply 25.07 mln cub. m

KWK Borynia drainage station
- Supply 6.46 mln cub. m
  - CH4
    - KWK Zofiówka drainage station
      - Supply 16.99 mln cub. m
      - CH4
        - KWK Pniówek drainage station
          - Supply 44.14 mln cub. m
          - CH4
            - KWK Krupiński drainage station
              - Supply 46.83 mln cub. m

Supply 25.07 mln cub. m

Heat and power plant Zofiówka boilers
- Supply 20.89 mln cub. m
  - CH4
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- Supply 6.46 mln cub. m

Supply 6.46 mln cub. m

KWK Borynia drainage station
- Supply 21.07 mln cub. m

Supply 21.07 mln cub. m

KWK Drainage station
- Supply 4 m ln cub. m

Supply 4 m ln cub. m

KWK Drainage station
- Supply 14.6 mln cub. m

Supply 14.6 mln cub. m

KWK Drainage station
- Supply 1.05 mln cub. m

Supply 1.05 mln cub. m

Heat and power plant Suszec (engines)
- Supply 5.12 mln cub. m

Supply 5.12 mln cub. m

KWK Drainage station
- Supply 15.65 mln cub. m

Supply 15.65 mln cub. m

KWK Drainage station
- Supply 17.94 mln cub. m

Supply 17.94 mln cub. m

KWK Drainage station
- Supply 20.89 mln cub. m

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Total methane supplies 123.72 mln cub. m

Gas engines 14.6 mln cub. m

Gas engines 21.07 mln cub. m

Gas engines 14.6 mln cub. m

Boilers 4 m ln cub. m

Boilers 1.05 mln cub. m

Boilers 4 m ln cub. m

Boilers 1.05 mln cub. m

CH4
From the beginning of operation the power production units of heat and power plants "Moszczenica" and "Zofiówka" were prepared for methane combustion. Steam boilers in the heat and power plants were equipped with gas burners designed for firing up of coal as well as for continuous combustion of methane as the auxiliary fuel. The burners output was designed for maximum use of the available methane.

The next stage in approach to the most effective use of methane was the installation of electricity generating sets driven by piston gas engines. The first unit was launched in 1997 in the heat and power plant "Suszec", another 2 units in EEG "Pniówek" heat and power plant in the year 2000 as the part of Associated Power-Cooling System development. Presently SEJ S.A. is operating 5 gas engines.
The examples of power units supplied with methane

Gas supply system to OP-140 steam boiler installed in the heat and power plant „Zofiówka”

Gas supply system to WP-70 peak water boiler installed in the heat and power plant „Zofiówka”
The examples of power units supplied with methane

Gas supply system to the gas engines in EEG „Pniówek” heat and power plant „Pniówek”
Advanced technical solutions
SUECH (Cogeneration Power-Cooling System)

The latest technical solution using methane from coal mines drainage in SEJ S.A. is the Cogeneration Power-Cooling System supplying the central air-conditioning system in the "Pniówek" coal mine.

At the time of its launching it was the only solution of this type in Europe.
On 15th July 2000 - SEJ S.A. has launched the first Cogeneration Power-Cooling System in Poland connected with the central air-conditioning system in "Pniówek" coal mine.

The system is based on trigenerated production of electricity, hot water as well as cold water for the mine and its transfer underground to the air-conditioning units.
Advanced technical solutions  SUECH

- Drainage station "Pniówek" coal mine
  - 2 x 8.53 MW
  - 1 x 10.39 MW
  - 50-60% CH4

- BHKW engine+generator
  - 2 x 3.47 MWt
  - 1 x 4.4 MWt
  - 2 x 3.2 MWe
  - 1 x 3.9 MWe
  - c.a. 3 x 0.25 MWe

- Absorption and compression refrigerators
  - 3 x 0.15 MWe
  - 1.5/18.0°C – 2 x 149 cub. m/h
  - 2.5/17.0°C

- Fan chillers "Pniówek" coal mine
  - 2 x 6.47 MW
  - 2 x 2.85 MWch
  - 1 x 2.90 MWch(res.)

- Pressure type air lock SIEMAG
  - -853m

- Air-conditioning control room in "Pniówek" coal mine
  - 2 x 2.50 MWch
  - 1 x 2.65 MWch(res.)
  - 3.0/17.5°C
  - 149 cub. m/h

- Electrical System "Pniówek" coal mine
  - 2 x 2.8 MWe
  - 1 x 3.5 MWe

- Cogeneration power-cooling system
  - 2 x 2.50 MWch
  - 1 x 4.4 MWt

- Heat generating plant "Pniówek"

- Rated technological parameters

- Local needs
Installation of the Cogeneration Power-Cooling System enabled to reach the following goals:

- for JSW S.A. "Pniówek" coal mine:

  Development of the miners comfort and labour safety,
  Productivity increase,
  Possibility of the deep coal deposits mining,
  Reaching of high cooling capacity,
  Reliability of the coolant supply at relatively low cost.

- for Spółka Energetyczna „Jastrzębie” S.A.:

  Power production on trigeneration basis,
  Obtaining the necessary origin certificates, so called red certificates,
  Decrease of the pollutant emission to the atmosphere from "Pniówek" heat generating plant,
Energy effects of methane utilization

Conforming to the current trends in power engineering, SEJ S.A. tends to rational and effective utilization of original energy through realization of the following tasks:

- increase of the high efficient power and heat generation technologies participation in the total production capacity based on the gas engines supplied with methane,
- increase the share of the cogeneration power and heat production processes like cogeneration and trigeneration.

The following slides present energy effects achieved in the particular heat and power plants.
Average annual total efficiency and savings of the primary energy „PES” in EEG „Pniówek” heat and power plant „Pniówek” in 2000 - 2008

<table>
<thead>
<tr>
<th>Year</th>
<th>Average Yearly Efficiency [%]</th>
<th>Primary Energy Savings [%]</th>
</tr>
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<tbody>
<tr>
<td>2000</td>
<td>69</td>
<td>35</td>
</tr>
<tr>
<td>2001</td>
<td>68</td>
<td>34</td>
</tr>
<tr>
<td>2002</td>
<td>67</td>
<td>33</td>
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<td>2003</td>
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<td>2004</td>
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<td>2005</td>
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<td>2006</td>
<td>63</td>
<td>29</td>
</tr>
<tr>
<td>2007</td>
<td>62</td>
<td>28</td>
</tr>
<tr>
<td>2008</td>
<td>61</td>
<td>27</td>
</tr>
</tbody>
</table>
Energy effects of methane utilization

Electrical output generated in high efficient cogeneration in EEG „Pniówek” heat and power plant „Pniówek” in 2000 - 2008

Quantity [MWh]

year

Electrical output generated in high efficient cogeneration [MWh]
The most important achievement of SEJ S.A. for the environment protection is utilization of methane in the quantity of c.a. 80 mln cub. m per year. Taking into consideration that methane is 21 times more harmful for the environment than CO₂, the achievement is of significant importance.

The methane utilization provides also additional benefits like lower combustion of hard coal, which is the main fuel used in the SEJ S.A. heat and power plants.
Other environment protection activities realised in SEJ S.A.

- replacement and modernization of electrofilters,
- replacement of cyclone type dust separators with high efficient coreseparator type,
- application of low-emission combustion system for reduction of nitric oxides,
- continuous flue gas emission measurements,
- increase of the coal mines drainage gas utilization,
- combustion of low sulphur content fuels,
- own waste water treatment plant,
- maximization of the cogenerated heat generation.
Awards and distinctions

Spółka Energetyczna „Jastrzębie” S.A.

was awarded with many distinctions and awards
Awards and distinctions

- „Czarny Diament” 2001 ("Black Diamond")
- Distinction in the „Lider Polskiej Ekologii” 2002 competition ("Polish Ecology Leader").
- First Prize in the „Lider Polskiej Ekologii” 2003 competition ("Polish Ecology Leader").
- First Prize in the „Laur Białego Tygrysa”-Energia 2003 competition ("White Tiger Laurels”-Energy).
- First Prize in the „Przyjaźni Środowisku” 2003 competition ("Environment Friendly").
- „Piramida Umiejętności i Kompetencji” 2004r. ("The Skills and Competences Pyramid")
- First Prize in the „Liderzy Świata Energii” 2005 competition ("Energy World Leaders").
- First Prize in the „Ekolaur Polskiej Izby Ekologii” 2005 competition ("Ecolaurels of the Polish Ecology Chamber").
- „Klucz Sukcesu” – Energetyka 2005 ("Success Key - Power engineering").
- Gold honour badge 2005
- „Mecenas Polskiej Ekologii” in „Przyjaźni Środowisku” competition February 2006, ("The Polish Ecology Patron" in "Environment Friendly competition")
  July 2006
- National Bronze Winner - International Green Apple Awards For Environmental Best Practice 2007
- „Europejska Nagroda Ekologiczna” in competition „Firma Przyjazna Środowisku” ("European Ecology Prize" in "Environment Friendly" competition)
  January 2007, January 2008
The Management System

In January 2005
the Integrated Management System
was implemented

Conforming to the following standards:

- **PN EN ISO 9001** Quality Management System
- **PN EN ISO 14001** Environmental Management System
- **PN-N ISO 18001** Labour Safety Management System

Implementation and following certification of the Integrated Management System in the years 2005, 2006, 2007, 2008 - is:

- for our customers
  - the guarantee of maintaining our products' quality
- for our environment
  - the evidence of our care for environment
- for our personnel
  - the assurance of safe working places
Thank you for attention
SEJ S.A.

Zdzisław Matysiak
zmatysiak@sejsa.com.pl

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