

# Coal Catalogue

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## **New World Resources Plc – a Central European hard coal producer.**

New World Resources Plc ('NWR') is Central Europe's hard coal producer. NWR produces good-quality coking coal for the steel and energy sectors in Central Europe through its subsidiary OKD, a.s. ('OKD'), the largest hard coal mining company in the Czech Republic.

OKD, a.s.



OKD is the only producer of hard coal (bituminous coal) in the Czech Republic. Its coal is mined in the southern part of the Upper Silesian Coal Basin, in the Ostrava-Karviná district. The coal is mined at four mines – Karviná, Darkov, ČSM and Paskov. OKD is engaged in coal prospecting, mining, processing, refining and selling. The company sells hard coal with a low content of sulphur or other contaminants. Such quality of hard coal can be used in particular in the coking process as well as in other steel and chemical industries or other sectors.



# Coal

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## Informative data – fuel properties

The Czech part of the Upper Silesian Coal Basin (more than 75% of the basin's area is in Poland) contains coal reserves that are of good quality in terms of both coking characteristics and sulphur content. The actual utilisation of the extracted raw material is determined by its specific qualities, according to which it is used as either coking coal or thermal coal.

**Cokeability** of a coal is determined by demonstrable plasticity within a certain temperature range where the coal's structure and chemical composition change (while releasing some of the coal constituents). The end product of these changes is a fuel of an entirely new quality – coke. The cokeability is given by the degree of coalification and petrographic composition of the coal.

**Degree of coalification** – This quality is usually expressed as the content of volatile matter ( $V^{daf}$ ), or as the light reflectivity of the vitrinite content (a hard coal constituent visible under the microscope). The greater the volatile matter content  $V^{daf}$ , the lower the degree of coalification. In the case of vitrinite light reflectivity, the lower the reflectivity, the lower the degree of coalification.

**Petrographic composition** is determined by the given composition and qualities of the original plant material and by the conditions that influenced the formation of the coal stratum and the process of its coalification.

The above properties determine whether a coal is suitable for coking (coking coal) or for use in the energy sector (thermal coal).

## Coke production - coking coal

The following “coking parameters” are monitored for coal suitable for coking:

- Swelling index (SI)
- Dilation (dil.b)
- Volatile matter content ( $V^{daf}$ )

Coal can be further classified according to the particular values of the above parameters.

**Coking coal** – Typical for its low volatile matter content with a high swelling index. It is indispensable in the manufacturing of blast-furnace coke and foundry coke.

**Fat coal and fat coking coal** – Typical for its high degree of dilation and plasticity. It is in high demand for coking blends.

**Gas coal** – This type of coal has a high volatile matter content and negative dilation.

## Coal for the energy sector – thermal coal

A coal's suitability for use in the energy sector is primarily determined by the following parameters:

- Calorific value ( $Q_i^r$ )
- Sulphur content ( $S^d$ )

### Processing of thermal coal

**Washed thermal coal mix** – This is a product of coal washing used in large energy facilities, cement mills, blast furnace and PCI (pulverised coal for injection) facilities.

**Washed and sorted thermal coal** - This is a washed coal sorted by grain size (10-30 mm, 30-50 mm, 30-80 mm, 50-200 mm) to be used in the municipal sector, for household use and in sugar refineries.

**Coal dust** - This product is produced by separating the 0-20 mm coal grains off before the coal enters the coal washing plant. It is used in large power generation plants and large energy-consuming operations.

**Middlings** - A product of coal washing, with a higher ash content and lower net calorific value (NCV).

**Coal preparation** - The market value of coal depends not only on its innate properties but also on the degree of preparation. At OKD, coal is processed in coal preparation plants. The main task of the preparation plants is to approximate the ash and moisture contents of the supplied coal to the requirements of individual customers.

**Coking coal** - Run-of-mine coal is processed in coal preparation plants in order to remove any tailing residues and to decrease the ash content to less than 10%, which is crucial for the quality of the final product – coke.

**Thermal coal** - It is prepared in accordance with the needs of its end users, and particularly in accordance with the characteristics and technical specifications of their combustion facilities.

## OKD mines coal from

**Karviná strata** - Coal of medium coalification. The Karviná strata contain both coking and thermal coals.

**Ostrava strata** - Coal of medium to high coalification, mostly suitable for coking purposes. This coal is currently produced at the Lazy site only.

The main difference between Karviná and Ostrava strata is their seam thickness and degree of coalification.

# Qualitative parameters of produced coal

## Thermal coal

Type	Grain size	$W_t^r$	$A^d$	$V^{daf}$	$Q_i^r$	$S_t^d$
		Average				Max.
	(mm)	%			(MJ/kg)	(%)
Washed thermal coal mix	0-30(60)	8.0-10.0	7.5-8.5	27.0-30.0	28.00-29.00	0.50-0.60
Washed and sorted thermal coal	10-30 30-50 50-200	4.0-6.0	5.0-6.5	28.0-32.0	31.00-32.00	0.60-0.70
Coal dust	0-20	8.0-10.0	20.0-26.0	25.0-32.0	23.00-25.00	0.60-0.70
Middlings	0-30	10.0-14.0	38.0-45.0	29.0-30.0	15.00-18.00	0.60-0.80

## Coal suitable for coking

Grain size	$W_t^r$	$A^d$	FSI	dil.b	$S_t^d$	$P^d$	Fmax	CSR
	Average		Min.		Max.	ddpm	Avg.	
	%		%				%	
0-50(80)	9.5-11.5	7.5-9.0	4.5-7.5	25-70	0.60-0.70	0.010-0.090	50-500	45-69

## Explanation of symbols used

### Designation of analytic indicators

The analytic indicators are comprised of the following:

- a symbol describing the basic indicator of the fuel
- lower index, supplementing the description of the basic indicator
- upper index, specifying the condition of the fuel in relation to the indicator
- original condition of the fuel – upper index “r” (from the term “received”)
- analytic condition of the fuel – upper index “a”
- moisture-free condition of the fuel – upper index “d” (“dry”)
- combustible content of the fuel – upper index “daf” (“dry ash free” – for fuel free of ballast materials, i.e. ash and water)

### Explanation of symbols:

$W_t^r$  - total water content in the original sample (as received) – lower index “t” = “total”

$A^d$  - ash content in moisture-free condition

$V^{daf}$  - volatile matter content (content of volatile substances in the combustible component)

Dilation  $b$  - the degree of change in volume during the heating of the coal under specific conditions until it reaches plasticity

$F_{max}$  - maximum fluidity (maximum RPM speed of the rheometer plate)

SI - swelling index - the capacity of coal to increase its volume in its plastic state

$Q_i^r$  - calorific value (combustion heat minus the heat of water evaporation)

$S_t^{dmax}$  - maximum content of sulphur in any form

$P^d$  - phosphorus content

## OKD laboratories and quality control

The production of solid hard coal fuels at all four of OKD's mines is subject to quality control starting from the moment when the development of coal panels is commenced underground, through coal mining and haulage up to the coal's processing in coal preparation plants and its distribution to customers.

These activities are performed by employees of the Quality Control Department situated at each of the mines. In order to ensure the best quality control process possible, the Quality Control Department has a state-of-the-art laboratory at its disposal. This laboratory is located at the Lazy site and conforms to the Czech standards

(ČSN EN ISO/IEC 17025). The laboratory is equipped with modern equipment and appliances providing analyses of elementary as well as specific coal specifications.

The laboratory consists of two main units – a fuel laboratory and a gas laboratory. The fuel laboratory analyses the fuel, i.e. determines the content of water, ash, volatile matter, sulphur, combustible heat, carbon, hydrogen and nitrogen as well as the swelling index and dilatometric properties. It also determines the temperature of ash fusibility, granulometric analyses and other specifications.



Fuel analysis laboratory





Gas analysis laboratory

The other unit – the gas laboratory – focuses on analysing gases in the underground air and in drained mine gas, such as  $O_2$ ,  $CO$ ,  $CO_2$ ,  $CH_4$ . As it is also a certified dust exposure laboratory, it determines and evaluates the dust exposure. All analyses performed at the OKD laboratory are carried out in line with Czech standards (ČSN and ČSN ISO); the accuracy of the laboratory's analyses is verified by international inter-laboratory analyses.

Elementary coking, chemical and calorific properties of coal are verified on samples collected at underground sections and subsequently analysed in accordance with relevant standards.

Based on the results obtained, a decision is made whether after being processed at the coal preparation plant the extracted commodity is to be used as coking coal or as thermal coal.

As the coal flows through the coal preparation facilities, the production processes and quality are continuously checked by control systems that monitor the conditions of the operating equipment in real time and provide performance and quality data from commercial rail and road weigh bridges, ash gauges, conveyor scales, and online analysers used to determine the content of ash, moisture, sulphur and

calorific value, as well as other from other measuring instruments. Measuring devices and analysers are subject to regular checks and reviews in accordance with the relevant metrology codes of operation. The complete information system provides a comprehensive overview of the condition of processes and ensures consistency in maintaining qualitative parameters of coking coal, as well as of a complete range of thermal coal types.

When loading fuel deliveries for individual customers, sampling takes place in accordance with relevant standards. This process is performed by automatic or mechanical samplers. During loading, samples are continuously checked by online analysers monitoring the quality of the dispatched fuel. The quality of individual coal product shipments to individual customers is analysed in the fuel laboratory. Laboratory results are used as a basis to evaluate the quality of deliveries, or to perform fuel quality reconciliation.

The weight of loaded fuel deliveries is determined by road or rail weigh bridges. In the case of a complaint raised by a customer, this system enables searching the archive for the day, shift, time and place of loading, including the name of the employee responsible for the loading.

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# Coal sales – Contact details

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## **Large customers and industries:**

**Marta Šebková**

Sales manager and CCO Deputy for Coal

OKD, a.s.

Vladislavova 1390/17

110 00 Praha 1

Tel.: +420 225 282 461

Fax: +420 225 282 415

E-mail: [sebkova@okd.cz](mailto:sebkova@okd.cz), [sales@nwrgroup.eu](mailto:sales@nwrgroup.eu)

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## **General contact information:**

OKD, a.s.

Stonavská 2179

735 06 Karviná, Doly

Tel.: 596 261 111

Fax: 596 118 844

E-mail: [info@okd.cz](mailto:info@okd.cz)

[www.okd.cz](http://www.okd.cz)

[www.newworldresources.eu/en](http://www.newworldresources.eu/en)