

# ***Monitoring and Control Systems for Industrial Processes***

***MIP, spol. s r. o. (Ltd.) Velká nad Veličkou***

***"Complex information on production and automation  
of its management guarantees your success!"***

***motto***

## **COMPANY REFERENCES**

**We supply complex services to our customers pertaining to the projection, creation, application and other development of information (monitoring) and control systems for industrial processes.**



## □ List of applications in the field of coal quality control

(application of our company products - Complex system for the monitoring of coal quality KSSK, Calorimeter, Balancing System SyBi).

**Severočeské doly, Doly Nástup Tušimice, Česká republika (Northern Czech Mines, Nástup Tušimice Mines, Czech Republic)** - system for the control of mining, processing and expedition of coal on the mine location (KSSK, SyBi).

This system for the control of mine operations processes information from the geological and mine models of the locality and compares them to the actual state of the technology as well as the coal quality and volume requirements on exit from the mine (supply by wagon to small-scale buyers and electrical power plants, by conveyer belt to the Tušimice 1 and Tušimice 2 Electrical Power Plants). The system determines the requirements for the extraction and processing of the coal, such requirements are determined according to the momentary technological situation. The technological equipment and the coal reserves are monitored, expedition documents and production protocols issued, the system supports the work of the mine laboratory, evaluates the period of operation and the failure rate of the technological equipment, etc.

Information from the technology is collected by a technological network of processing stations (network with ProfiBus communication protocol - world standard for networks in an industrial environment, ProfiBus is standardized as German National standard DIN 19 245 and European Standard pr EN 50170) 14 km long, the cable system is made up of classic telephone cables (RS485) laid along the mine. This involves distributed collection of data because the individual processing stations are linked to the distribution network for the input signal sources (the stations are equipped with Siemens processors, FRG, industrial design with IP54 covers). For measuring the quality of the coal 9 gamma sensors are installed to measure ash content and calorific value on the heavy mining machinery, 1 set on the dumping gear and 10 sets on the conveyer belts in the coal processing section, 1 gamma sensor to measure sulphur content. A total of 290 states of the technological equipment are registered. Information from the heavy mining machinery and the dumping gear as well as the mining requirements on the operator are transmitted from the control room by wireless (radio) transmission.

Information is processed and distributed through a Novell computer network (optic cable transmission to a maximum distance of 4 km, the cable is laid on the construction of the conveyer belts). System workplace:

- main quality control room for the control of mining, processing and expedition of coal,
- control room for the crusher and coal preparation plant,
- mining control room for Libouš open pit mine,
- mining control room for Merkur open pit mine,
- loading control room for NZI wagon loader-bins,
- loading control room for NZII wagon loader-bins,
- sampler stations for NZI wagon loader-bins,
- sampler stations for NZII wagon loader-bins,
- Geologist's station,
- production control,
- chief quality control supervisor.

The scheme of the technological and information network for this operation is given on the diagram showing the installed workplaces.

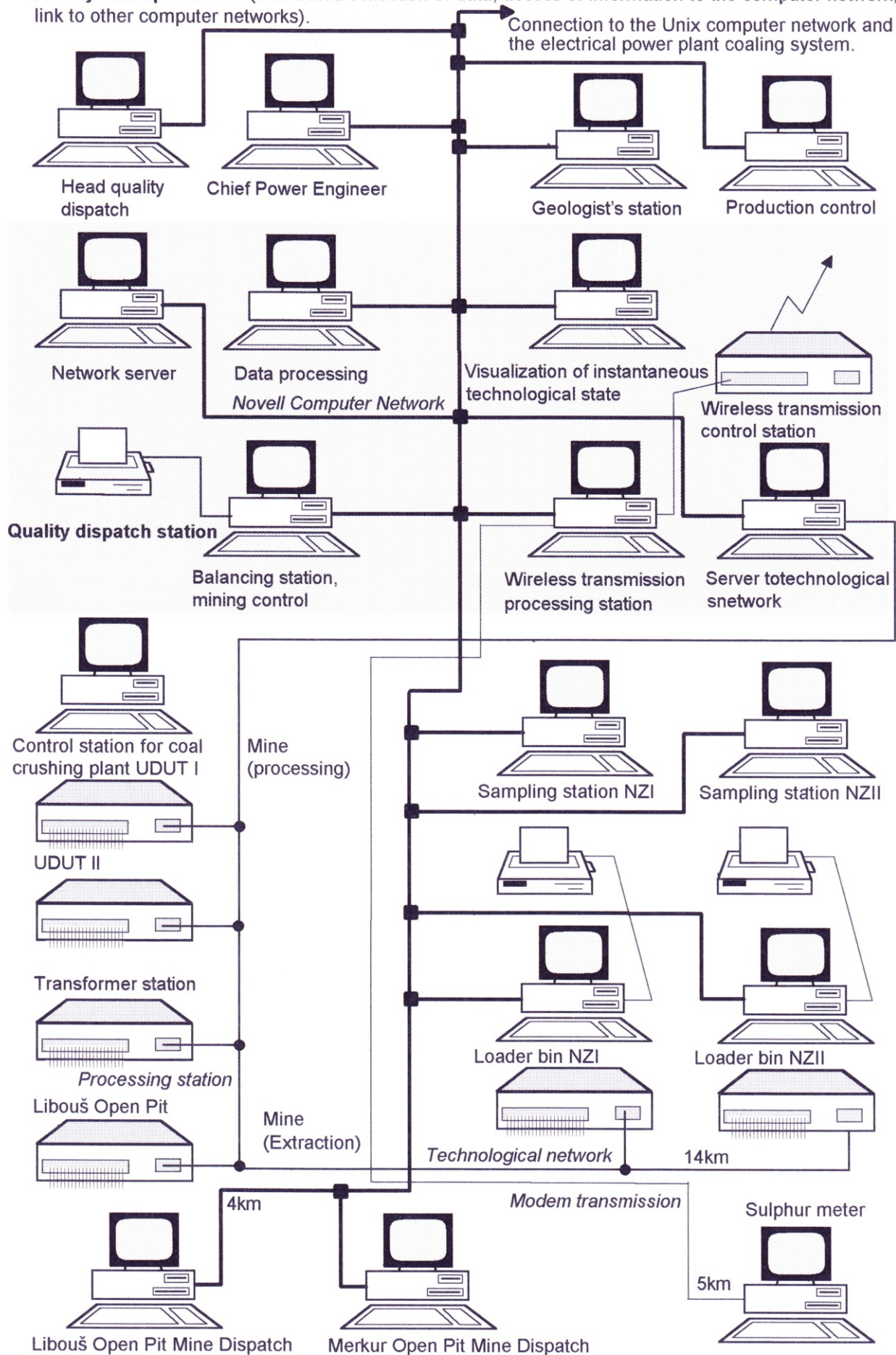
Information from the system is further distributed to the information-control computer system for the control of mining operations of the Unix type (sales, chief electrician, laboratory, production preparation, chief mine geologist, chief mining control dispatcher, etc.).

The computer technology is in industrial or office design as per requirements of the individual workplaces, a product of Kontron (FRG) and Hewlett-Packard (USA).

**Mostecká uhelná společnost, závod Kopisty, Česká republika (Most Coal Company, Kopisty Division, Czech Republic)** - monitoring of the volume and quality of the extracted, processed and expedited coal (KSSK, SyBi).

Information from the technology is collected by the processing stations. This involves central collection of data, as the signals are transmitted to one central switching station (the processing stations are equipped with Siemens processors, FRG, industrial design with IP54 covers). To determine the quality of the coal 3 gamma sensors are installed to measure ash content and calorific value in the coal processing section, 2 sets of conveyer belt scales from Transporta (Czech Republic [CR]), 1 conveyer belt scale from Schenck (FRG), 1 gamma sensor to measure Sulphur content. A total of 20 technological states of the equipment are registered.

- Example solution of processing and presentation of information from the technology - Application at Doly Nástup Tušimice (distributed collection of data, access of information to the computer network, link to other computer networks).



The information is processed and distributed by a computer network of the Novell type (network with ProfiBus communication protocol) 2 km long, the cable system is made up of classic telephone cables (RS485) laid along the mine.

System workplaces:

- control room for technological operations,
- main control room for mining operations.

The computer technology is in office design, supplied by NOWATRON ELEKTRONIK (CR).

**Mostecká uhelná společnost, lom Vršany, Česká republika (Most Coal Company, Vršany Open Pit, Czech Republic)** - monitoring of the volume and quality of the extracted, processed and expedited coal (KSSK, SyBi).

The system monitors the volume and quality of the coal extracted by the excavators, operation and setting of the technology as a whole, coal reserves on the dump sectors and the coal output from the technology. Archives the measured variables and processes them using the balancing system.

Information from the technology is collected by the processing stations (central collection of data, FPC405 stations supplied by FESTO, Austria, is in industrial design with IP54 covers. For the measurement of the quality of coal, 5 gamma sensors are installed to measure the ash content and the calorific value of coal on the heavy mining machinery, 1 set on the dumping gear and 4 sets on the conveyer belts in the coal processing section, 1 gamma sensor to measure the Sulphur content, 6 sets of conveyer belt scales supplied by Transporta (CR). In all 40 technological positions are registered from the technology. Information received from the heavy mining machinery and the dumping gear is transmitted by wireless radio.

The information is processed and fed to the quality control station. The computer technology is in industrial design, produced by PCQT (Austria).

**Důl Petřvald (Petřvald Mine), Ostrava, Czech Republic** - monitoring of volume and quality of coal expedited at the mine (the system was installed in cooperation with ENELEX Chvalatice).

For the monitoring of the quality of coal, 1 gamma sensor is installed to measure ash content and calorific value on the conveyer belt in the coal expedition section. Information is processed and fed to the dispatcher station.

**Baňa Záhorie, š.p. (state company) Holíč, Slovak Republic** - semi-finished system for the control of mining operations and preparation of coal at the mine (Calorimeter).

**Pořerady Electrical Power Station, Czech Republic** - system for monitoring the quality of coal in the coaling of electrical power stations (system KSSK and SyBi installed in cooperation with ORGREZ Brno).

The system monitors the volume and quality of coal coming to the dump and the boiler bins. Monitors the coal reserves at dumps as well as the complete operation of the technology, evaluates the period of operation, archives the measured values and processes them using the balancing system.

Information from the technology is collected by the processing stations (central collection of data, FPC405 stations from FESTO, Austria, in industrial design and with IP54 covers). For registration of the quality of coal 8 gamma sensors are installed to measure the ash content and calorific value of the coal on the conveyer belts before exit to the dumps and at the access points to the boiler bins, 3 sets of conveyer belt scales from Schenck (FRG). In all 120 technological states are registered. The scheme of the distribution of the technological sensors and the conveyer belt scales is given on the diagram.

Information is processed and fed to the electrical power station coaling control station. The computer technology is in industrial design, from PCQT (Austria).

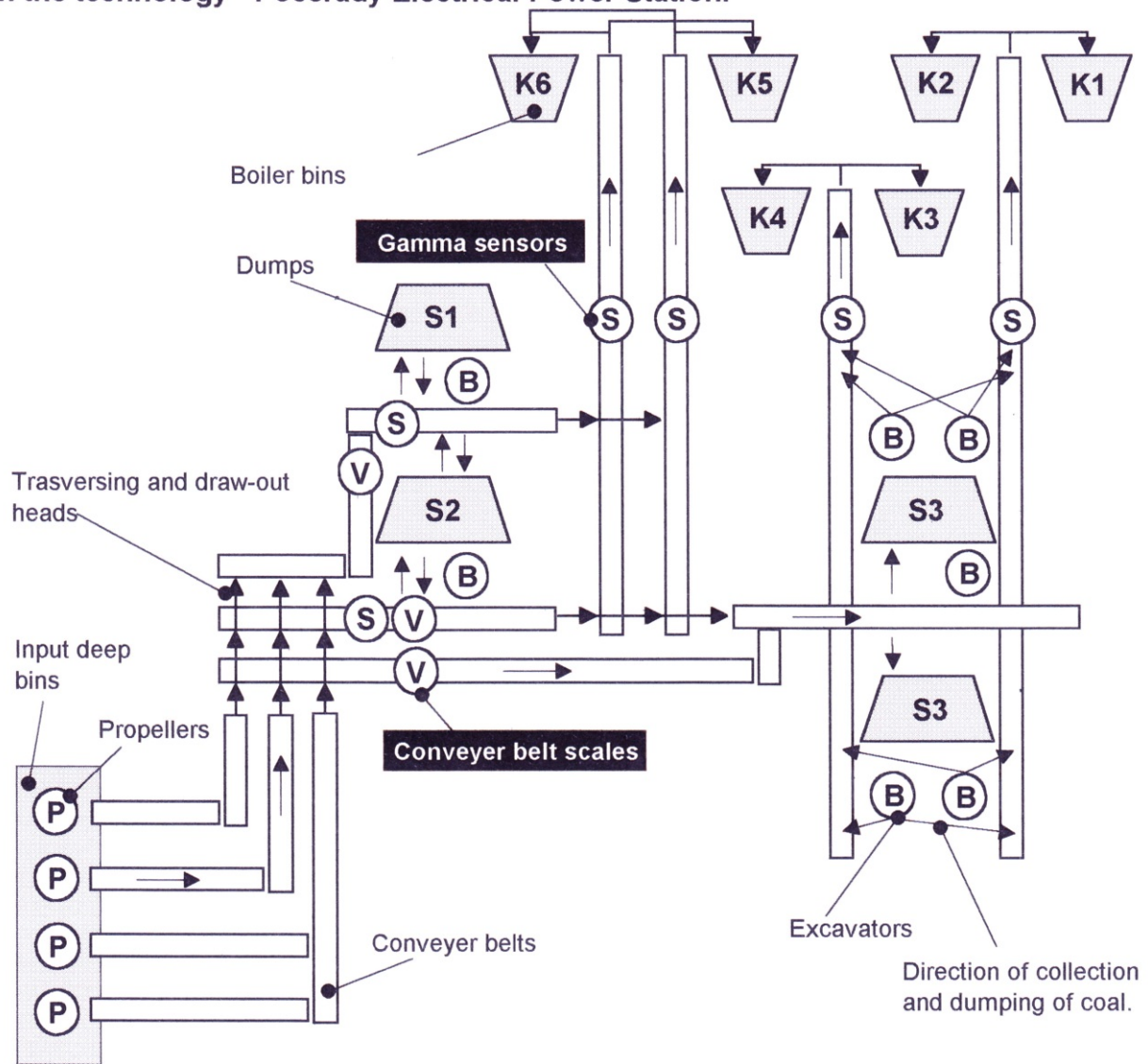
**Elektrárna Tušimice (Tušimice Electrical Power Station), Czech Republic** - semi-finished control system to monitor the coaling of the electrical power station (KSSK).

The input is information on the volume and quality of the supplied coal from our company's system on the locality of Doly Tušimice Nástup /Tušimice Nástup Mines/. This therefore involves the link of two systems - mine control system on the mine and the electrical power station coaling control system. Further, input information is obtained from 6 conveyer belt scales located before and after the fuel dump.

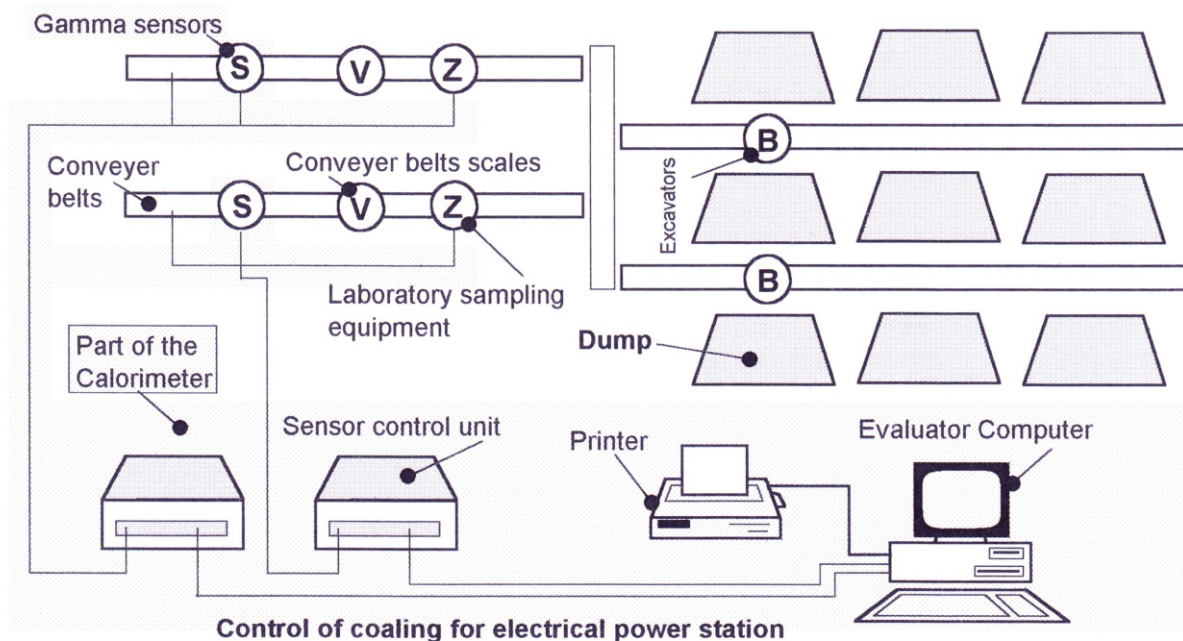
**SOMA Electrical Power Station, Turkey** - semi-finished system for monitoring the quality of coal in the coaling of the electrical power station (Calorimeter).

The equipment monitors the volume and quality of the coal coming on to the dump. The operators on the basis of the instantaneous values of the quality of the incoming coal guide the coal to the desired dump sectors and keep a record, in the so-called, dump maps, which serve to the mixing of the coal for boiler bin coaling purposes. The equipment issues quality certificates for the supplied coal and archives such document.

□ **Example solution for the location of the sensors (conveyor belt scales)**  
in the technology - Počerady Electrical Power Station.



□ **Example solution for Calorimeter - SOMA Electrical Power Station (Turkey).**



In view of its small volume, information from the technology is collected on a card in the evaluator computer (central collection of data, card from ADVANTECH). For purposes of evaluating the quality of the coal, 2 gamma sensors are installed to measure the ash content and the calorific value on the conveyor belts before the dump, 4 technological states are registered from the technology. The scheme of the distribution of the sensors in the technology, the individual registered signals, cables and other parts of the Calorimeter in this application are shown in the diagram.

Information is processed and fed to the coaling control station for the electrical power plant, product of KONTRON (FRG).

**Cementárna Rohožník (Rohožník Cement Works), Slovak Republic** - semi-finished system for monitoring the quality of coal in the coaling of the cement works (Calorimeter).

**Škoda Praha, Czech Republic** - programme applications for the monitoring of energy systems.

**ORGREZ Brno, Czech Republic** - programme applications for the monitoring of energy systems.

## □ A word from the customers on our products

... The use of the **Complex Quality Monitoring System** at our mine has advanced the management of mining operations and the preparation of coal by a generation as compared to the present. This fact is supported by the instantaneous and continuous information on the volume and quality of the transported coal, which makes it possible for the operator to react immediately to an arising situation in the process of production, and not after the coal has been dumped, stored or even expedited, as was the case in the use of classic laboratory samples. Since the sensors do not require any specialized equipment, their installation is not financially costly and can be located at any point of the technology, even directly on the heavy mining equipment, from where the information on the quality and volume of extracted coal is of paramount importance for the further control of mining operations and the homogeneity of the dump.

Apart from the actual control of the system, it also makes possible the detailed counter-check of the time behaviour of mining operations as well as the operators of the heavy mining machinery, also the accuracy of the locality's geological model and the that of the mining procedure model. Huge economic advantages have manifested themselves in that the coal is supplied within the contracted calorific value range which reduces the occurrence of penalty payments. Further, this prevents the supply of coal of a quality in excess of that desired. Wagons loaded with our coal leave the mine with a certificate of quality for the loaded coal, which has made it possible for us to win new custom from the field of electrical power stations and cement works, which use the information on the quality of the incoming coal in the coaling of input bins and dumps ...

Dipl.ing. Miroslav Zwettler  
hlavní energetik (Chief Power Engineer)  
Severočeské doly, Doly Nástup Tušimice

... The use of the **Complex Quality Monitoring System**, concretely the continuous measurement of the sulphur content, contributes to the limitation of the harmful effect of the coal combustion process on the living environment. Our firm supplies the very much desired low-sulphur ecological coal with a certification of sulphur content, respectively, moderate sulphur content.

At the same time minimization of the deviations in the calorific value of coal supports stability in the combustion process at electrical power plants, heat plants and cement works, which is manifested, not only, in the economy, but also in the ecology of operation ...

Dipl.ing. Jiří Cívín  
Quality Control  
Mostecká uhelná společnost

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**Severočeské doly a.s., Doly Bílina, Česká republika (Northern Czech Mines, Bílina Mines, Czech Republic)** - semi-finished system for the control of mining, processing and expedition of coal on the mine location (KSSK, SyBi).

**Sokolovská uhelná a.s., Divize Jiří, Vřesová, Česká republika (Sokolovská Mines, Jiří Mines, Czech Republic)** - system for the control of mining, processing and expedition of coal on the mine location (KSSK, SyBi).

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**SOMA Electrical Power Station, Turkey** - semi-finished system for monitoring the quality of coal in the coaling of the electrical power station (Calorimetr).

**ČEZ, a.s., Czech Republic** - programme applications for the monitoring of energy systems on the electrical power station (KSSK).

**Škoda Praha, Czech Republic** - programme applications for the monitoring of energy systems.

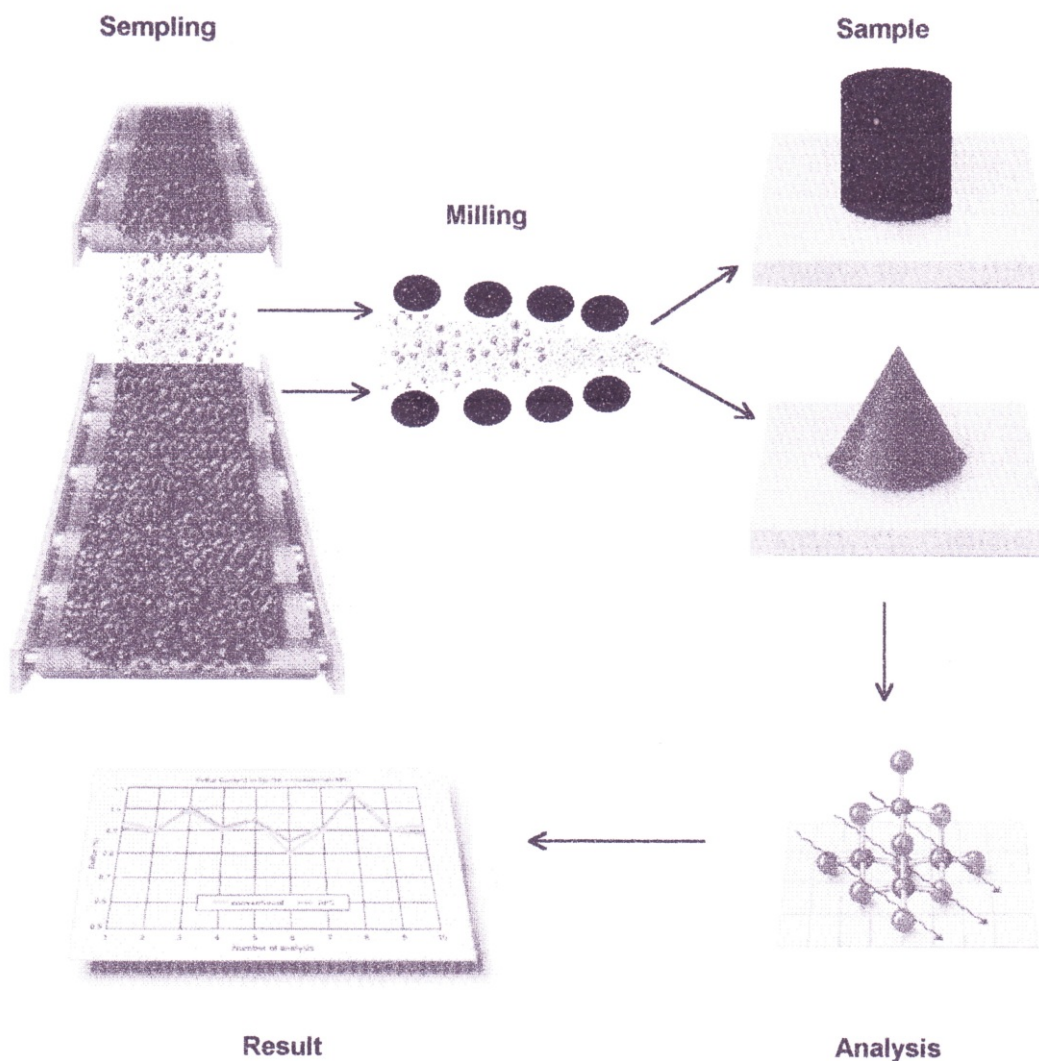
**ORGREZ Brno, Czech Republic** - programme applications for the monitoring of energy systems.

## Automatic sampling station

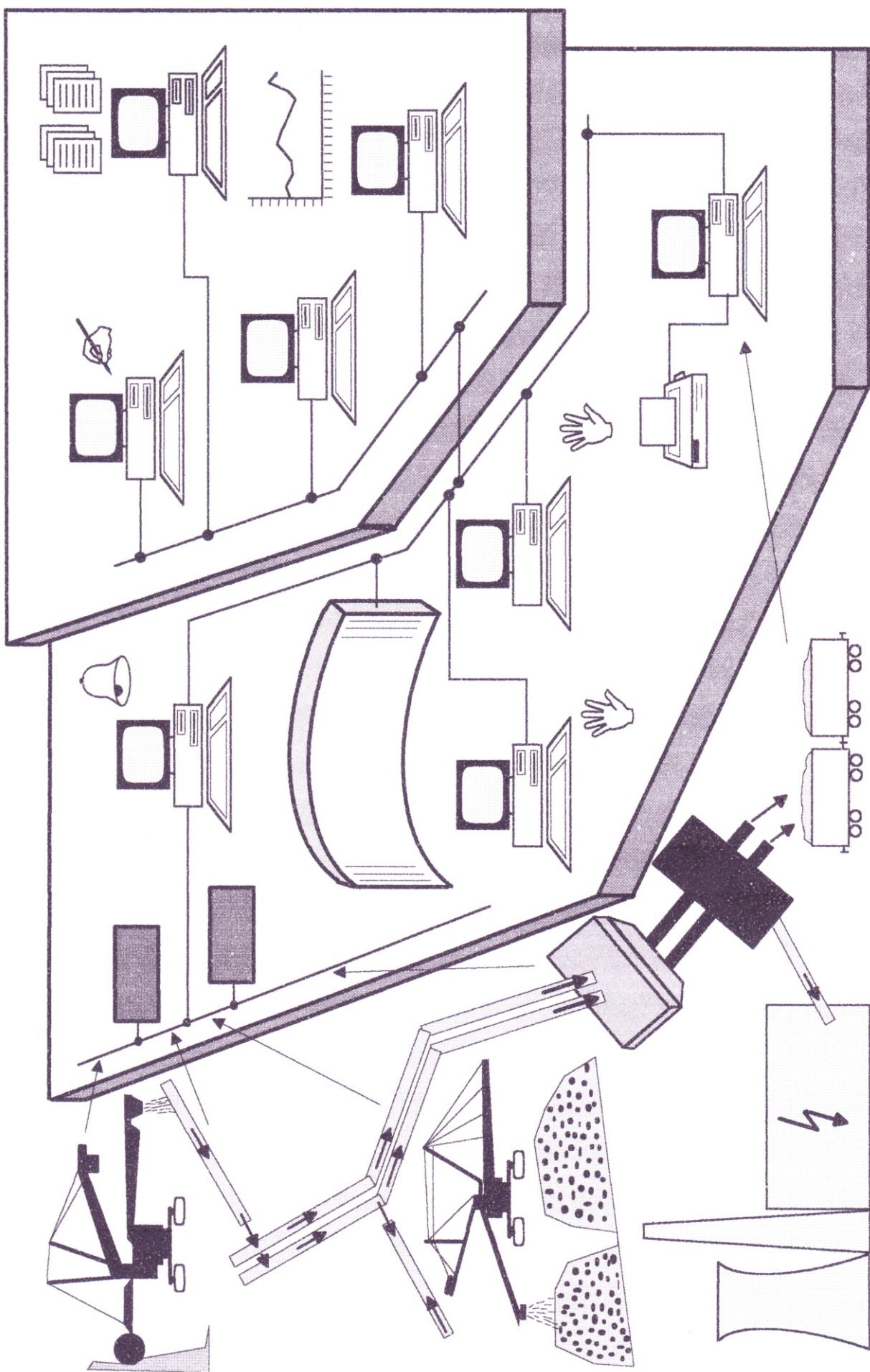
is a mechanical equipment serving for regular taking away of samples of material, which is passing continuously alongside (for example coal).

## Soft milling line

is a mechanical equipment serving for processing of rough coal sample in accordance with the required standards. It can be located directly inside the coal sampler.



# Control of coal extraction at mines



Control of cooling for electrical power plants, heat plants  
and cement works

