

Plow and shearer face control system in two Chinese mines

1 Fully-automated plow control system, NanLiang mine

Coal face	150 m
Extent of headroom	600 m
Conveyor line	Seam 5.6 m x ridge height 2.4 m
Air course	Seam 4.8 m x ridge height 2.4 m
Layer thickness	1.0-1.7 m
Coal hardness	$3 \leq f \leq 3.5$
Face angle of incidence	1 - 3 gon
Hanging walls	12.7 m mainly sandstone
Footwalls	1.35 m mainly clay shale

The plow longwall consists of 96 roof supports with an additional 4 transitional supports and 5 edge supports. The plow face control system includes various sub-control systems:

- control and monitoring for the automatic operation of plow tools
- cooling of motors and gears
- longwall control system
- emergency shutdown system
- start and stop system for machines (crusher, face roller conveyor, plow) in precise order
- automated and central remote control of the mining process



Plane operation: T-junction zone

Longwall control system

The control program was written for the mining process as specified by the customer. This involved extensive days of testing above ground for the fully-automated cutting using plows at coal face edges, ground pressure monitoring and mining progress – after which the equipment was assembled underground and put into operation.

The coal face visualization via MineVis® shows all operating modes including the sensor states and error messages.

Through the integrated remote control, individual functions can be implemented, thus allowing unmanned operation of the longwall face.

The roof support is also visualized and any possible problem areas are visually displayed.

Control of machines

An intrinsically-safe PLC is used to control the plane body.



Intrinsically-safe PLC modules EEP

The frequency-controlled geared motors for main and auxiliary drive are connected via a bus system to the PLC. Via the connected synchronous switch in the assembled sections of the conveyor and on the sprockets, the plow location is determined and instructions issued for chock control.

The frequency control allows the plow system to adjust the plow speed to match the face conveyor load.

This improves the efficiency of the following conveyor and allows continual conveying.

The Ethernet interface included in the console is used as a surface communication link via a single-mode glass fiber cable (9/125µm).

This means that as well as access to the surface network, there is also scope for monitoring, data backup, analysis and downloading programs from various manufacturers via the OPC interface.

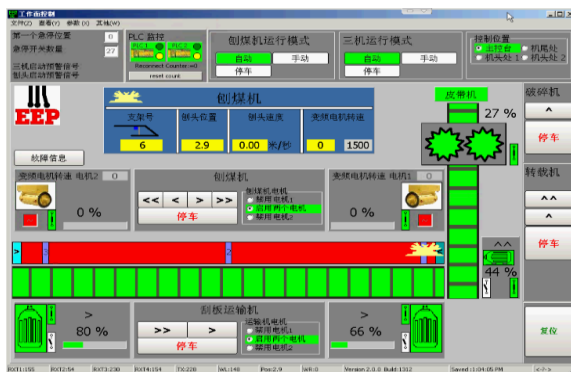


Underground console

Data communication and visualization system

The system unifies the data communication from the subsystem manufacturer into a single user interface on the console, both underground and at the surface.

The console can be integrated into the powertrain as a space-saving solution.



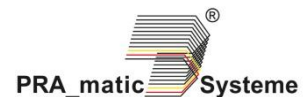
Plow and face visualization

2 Fully-automated shearer face, TangShanGou mine

Coal face	99 m
Extent of headroom	964 m
Conveyor line	Seam 5.4 m x ridge height 2.2m
Air course	Seam 4.5 m x ridge height 2.2m
Layer thickness	1.48 m
Face angle of incidence	1 to 3 gon
Hanging walls	12.7 m mainly sandstone
Footwalls	1.35 m mainly clay shale

The longwall control system used is the PRA_matic® system of company EEP.

Communication between the longwall control units is performed independently, eliminating the need for a master control unit or a control center in the event of a short-term interruption in the data transfer.

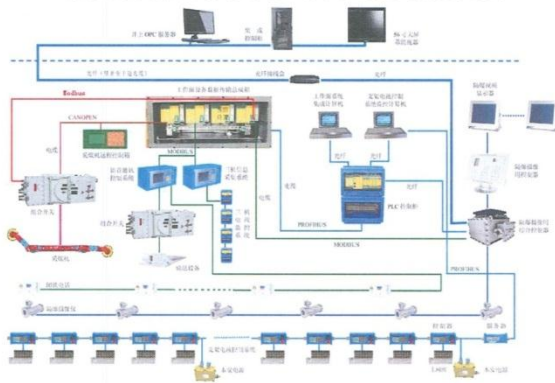


The shearer face consists of 64 roof supports with an additional 2 transitional supports and 2 edge supports.

The face control system includes various sub-control systems:

- control and monitoring for the automatic operation of the shearer
- cooling of the motors and gears
- roof support controls
- face emergency shutdown system
- start and stop system for machines (crusher, face roller conveyor) in precise order
- automated and central remote control of the mining process
- camera system
- pump and filter station

薄煤层自动化滚筒采煤机工作面控制系统集成总图



System overview

Longwall control system

The control program was written for the mining process as specified by the customer. This involved in particular extensive days of testing above ground for the fully-automated cutting drum operation on the coal face edges, diagonal ascent, ground pressure monitoring, dynamic control of the camera system based on the roller position; the equipment for which was then assembled underground and put into operation.



Shearer operation: T-junction zone

Control of machines

An intrinsically-safe PLC is used for the remote control of a cutter drum.

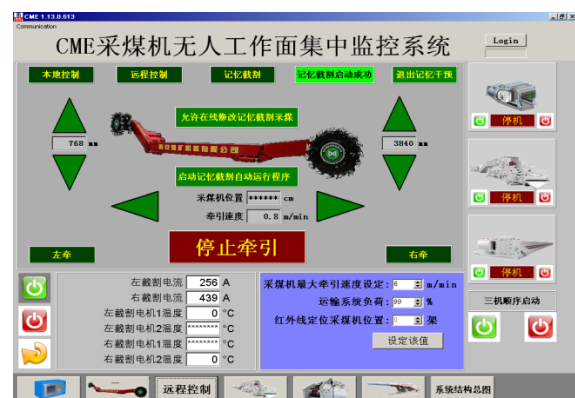
Together with the camera system, this makes it possible to operate the cutter drum via the console in real-time. The cameras are automatically switched on

and off, following shearer operation, which enables continual monitoring and tracking.

The Ethernet interface included in the console is used as a surface communication link via a single-mode glass fiber cable (9/125µm).

This means that as well as access to the above-ground network, there is also scope for monitoring, data backup, analysis and downloading programs from various manufacturers via the OPC interface.

The visualization was completely developed by EEP, closely collaborating with the user and the user-specified criteria.



Data transmission and visualization

EEP Elektro-Elektronik Pranjic was founded in 1989 in Herne by Kruno Pranjic, who has led the company as owner to date.

For over two decades, EEP Elektro-Elektronik Pranjic has been your reliable partner for efficient automation and control technology in mining and industry. As a medium-sized company, we can respond to the requests of our customers flexibly at any time. From us, you can expect innovative, highly secure and cost-effective complete solutions.

Today, the scope of the EEP delivery program includes fully-automated electro-hydraulic face control systems with the entire range of hydraulic equipment required, high-performance data transmission systems, the latest safety engineering as well as complex control technology for machines of all kinds. ■