

INTELLIGENT MINING SOLUTIONS



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CONTENTS⁺

Open-pit mining

MDS Mining Dispatching System	03
Vehicle anti-collision system	11
Automatic drilling hole arrangement & precise navigation system	13
4G LTE private network multi-media dispatching & communication system	17

Underground mining

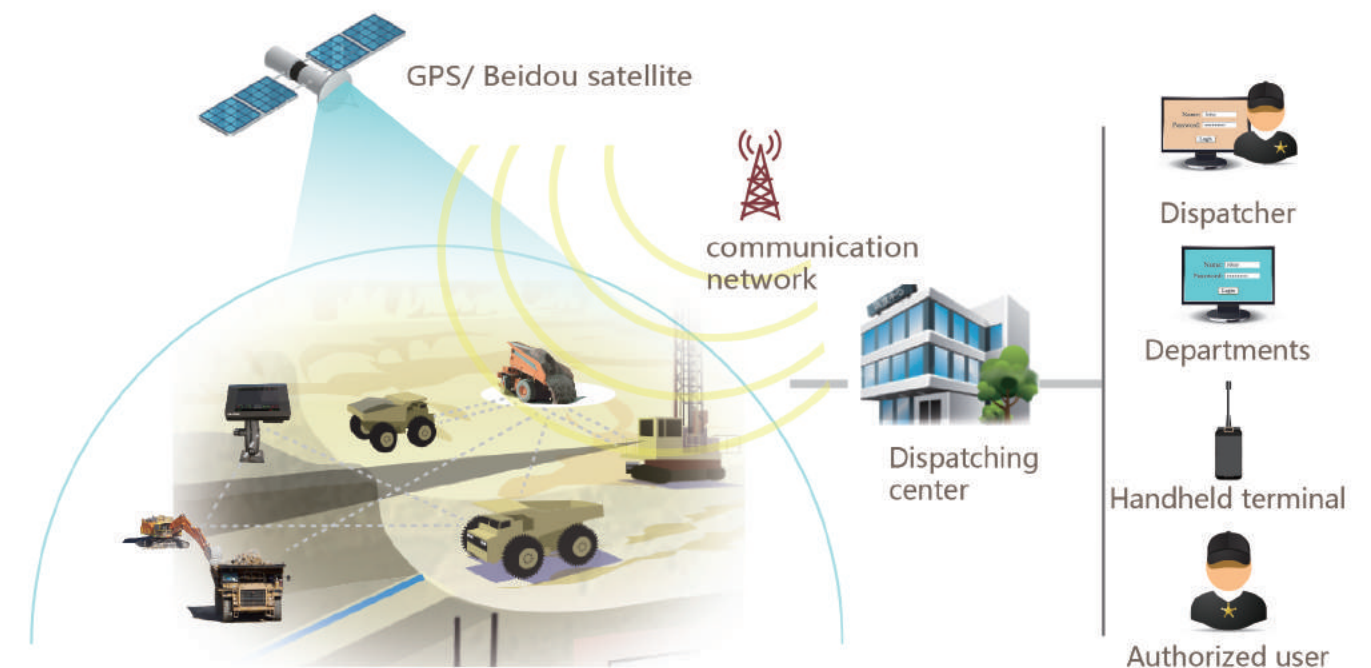
Six safety systems	20
Ramp traffic light control system	23
Underground unmanned electric locomotive driving system	25

Open-pit mining

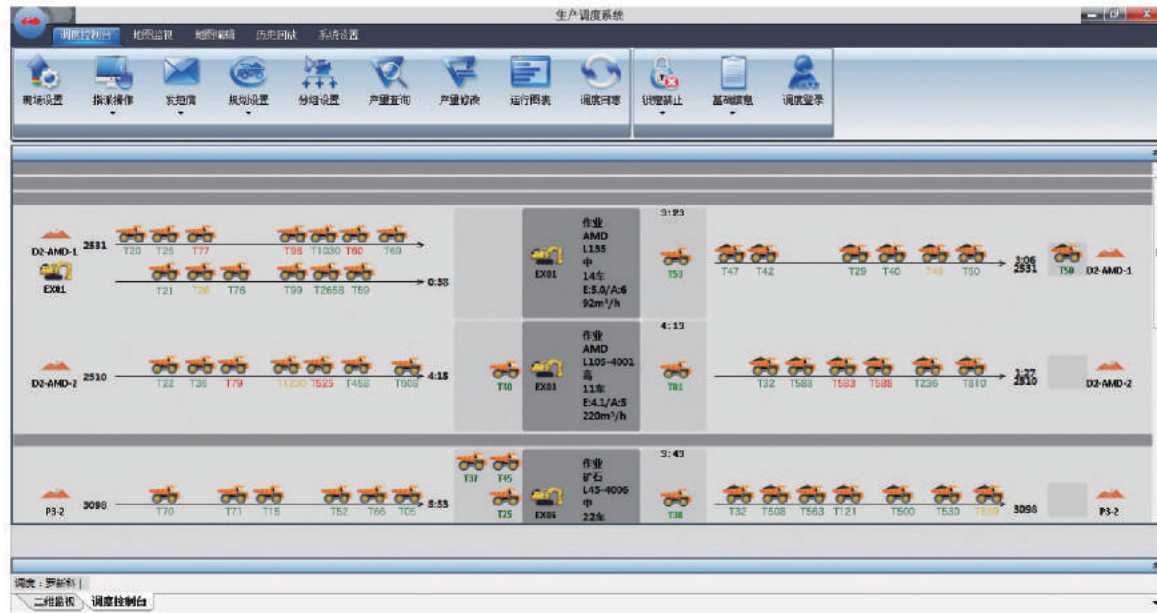
Intelligent truck dispatching & optimization system

SYSTEM OVERVIEW

Comprehensively using the modern high-tech informatization technologies including GPS positioning (GPS/Beidou), GIS, 3D virtual mining, wireless communication, AI, system engineering theory and optimization techniques, etc. It conducts all day long monitoring on the location and working status of main mining equipments in open-pit mine (truck, shovel, driller, watering car, blade machine, bulldozer, fuelling vehicle, etc.), adapts to various kinds of variations during mining production process automatically, and realizes real-time automatic optimization and dispatching on trucks and shovels. Thus to optimize production, improve output, reduce oil consumption and maintain safety. The production monitoring, intelligent dispatching and production commanding management system thoroughly changes the traditional production management mode, it is a revolution of open-pit mine production management mode.



SYSTEM FUNCTIONS



Optimize dispatching

The system collects equipment status and location and make statistics on shovel loading capacity, dump location dumping capacity, path running time automatically. Combining site regulations and production plan which are the data basis for system optimizing technology, it offers optimized dispatching plan according to current conditions.

Equipment management

The system regulates all equipments into 4 status: operating, delay, malfunction, standby. The system can provide real-time equipment status operating chart and equipment information management display to track the real-time status of all equipments and calculate real-time equipment utilizing rate and actual working rate.

Auto counts

Records equipment working condition at real time and automatically calculates and saves it to the server in dispatching center, the system records the loading location, dumping location and running path of each truck, thus to calculates the output at each loading location, each dumping location, each area, each driver, each truck and running t/h, etc. It avoids the error caused by artificial calculation and provides the basis for contractor's payment clearing.

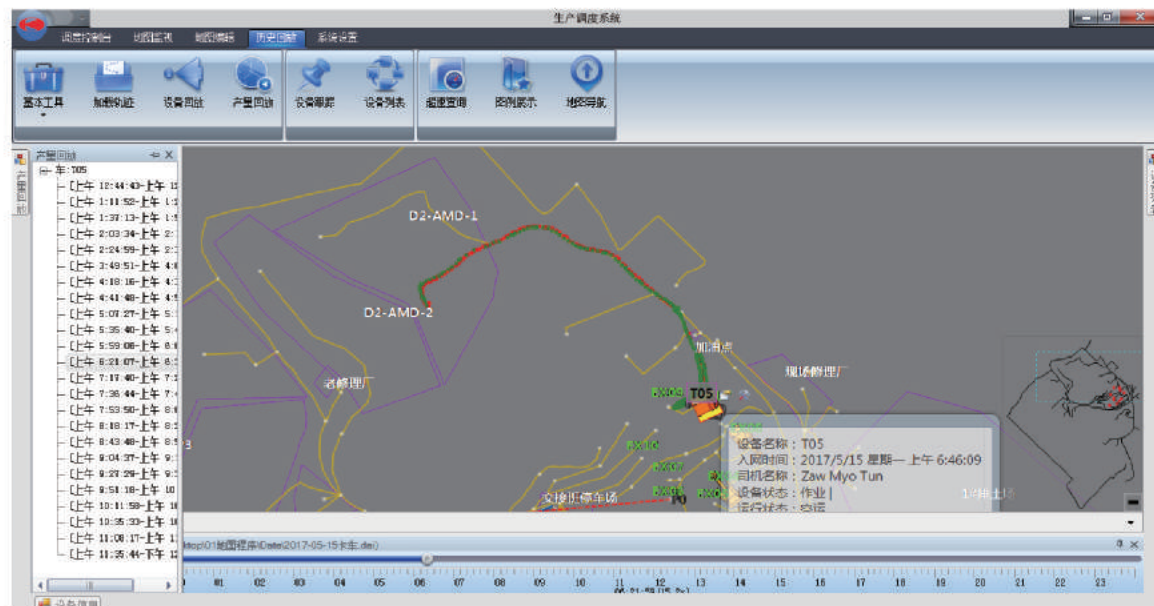


Map Monitoring

Collecting information of production equipments at any time automatically, basic information such as equipment name, current location, positioning status, speed, direction, etc.; operator's job number and name; job material types and grades; 2D monitoring can input CAD drawing of the mine easily, convenient to check the platform of where shovel stands and the condition of materials and grades at each platform.

Map editing

Mine GIS adopts totally self research and developed GIS platform to set up mine map and realizes engineering location data management, realizes route and border line management. The system provides professional map editing tools which is easy for map editing. It can add, edit or modify mine zone routes, area shape and edit description. It can also input, edit or modify key areas such as loading location, dumping location, fueling location, park and maintenance location.



Production playback

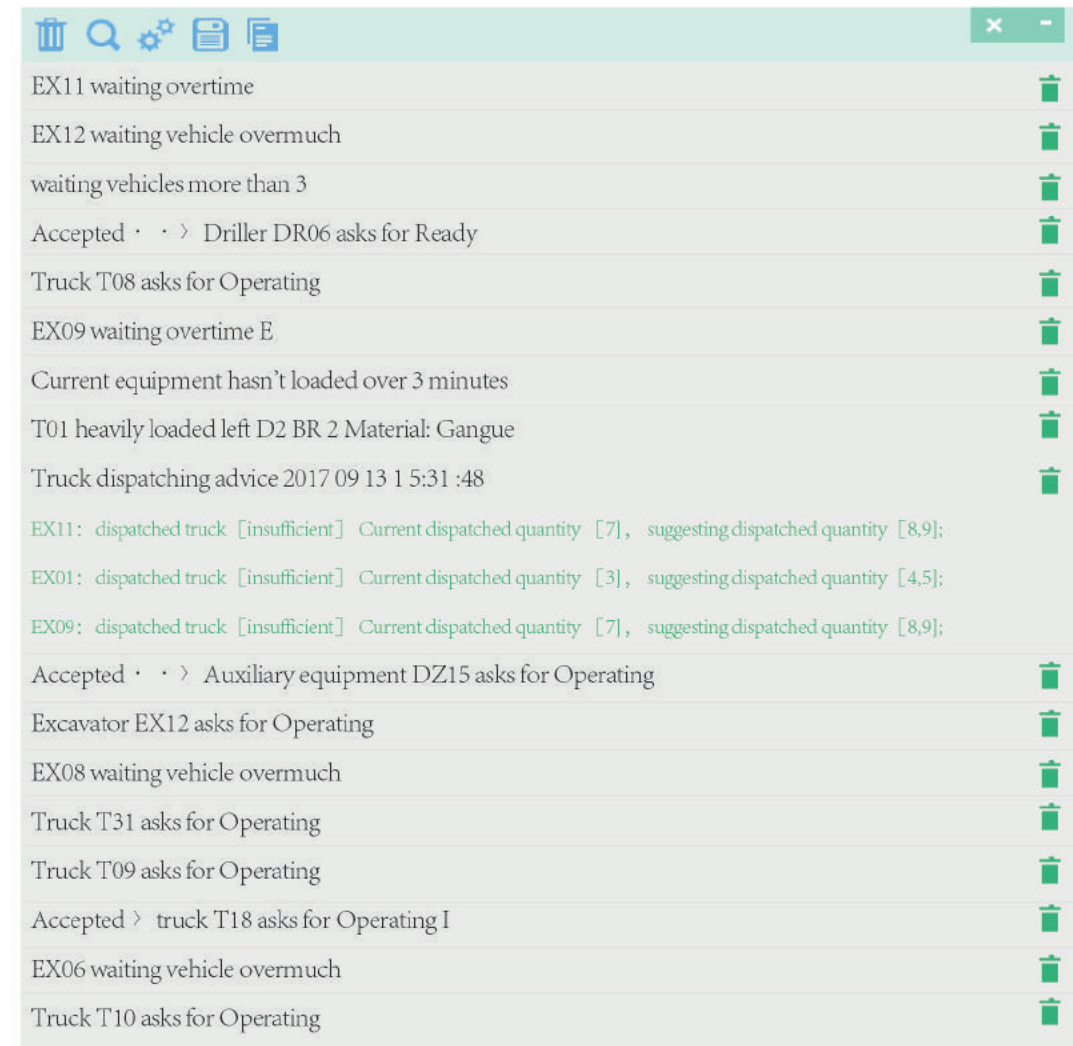
The system provides effective tools to inquire history message record; All equipments, part of the equipments or one equipment is selectable to check playback. Reappear the production condition of any equipment at anytime when the debatable accident occurs, provide objective data as basis for the manager to solve the dispute.

Equipment efficiency analysis

The system analyzes main production equipment efficiency at a real-time, displays the detailed production process of loading equipments and transportation equipments vividly.

Data report

WEB reports: production data generates reports automatically and saves in the data base for a long time, easy for print out.



Alarming system

Summarizes improper production status of mine equipments and gives alarm timely. The alarm includes over-speed, over-boundary, off-path, stop for no reason, lack of loading, delay loading, etc.

Security and authority

Regarding user authority management, the system predefines user groups as system administrator, leadership, dispatcher, visitor, etc. Different users from different groups have different management and access authority. For example, user as visitor can only check part of the information in the system and can't make any modification and setup. User group can be added as required at any time, the administrator gives and modifies authorities.



REFERENCES

State	Company	Site	Mine Type	Time
China	SHENHUA	SHENGLI	coal	Since 2009
China	China Coal	ANTAIBAO	coal	Since 2011
China	SHENHUA	SHENBAO	coal	Since 2012
China	China Coal	JILANGDE	coal	Since 2012
China	SHENHUA	HEIDAIGOU	coal	Since 2014
China	SHENHUA	HAERWUSU	coal	Since 2014
China	SHENHUA	DALIUTA	coal	Since 2015
Pakistan	CMEC	THAR	coal	Since 2017
China	China United Cement Taian Co., Ltd.	LUOHUSHAN	limestone	Since 2014
China	Inner Mongolia North Hauler Joint Stock		coal	Since 2014
China	ANSTEEL	QIDASHAN	iron	Since 2002
China	BAOGANG GROUP	BAIYUNEBO	iron	Since 2005
China	ANSTEEL	YANQIANSHAN	iron	Since 2007
China	BENXI STEEL	NANFEN	iron	Since 2010
China	GUANGDONG GUANGYE	YUNFU	pyrite	Since 2010
China	ANSTEEL	GONGCHANGLING	iron	Since 2012
China	BENXI STEEL	WAITOUSHAN	iron	Since 2012

State	Company	Site	Mine Type	Time
China	HBIS	SIJLAYING	iron	Since 2012
China	TAIYUAN IRON & STEEL Group	YUANJIACUN	iron	Since 2012
China	ANSTEEL	ANQIAN	iron	Since 2014
China	ANSTEEL	ZHUJIABAobao	iron	Since 2015
China	SHOUGANG Group	SHOUGANG	paigeite	Since 2015
China	China Railway Ninth Group	YICHUNLUMING	copper	Since 2013
Congo (DRC)	China Railway Seventh Group China Railway Ninth Group	SICOMINES	copper cobalt	Since 2015
Burma	Wanbao Group	Letpadaung	copper	Since 2016
China	Sichuan Esheng Group		limestone	Since 2017
China	ZIJIN MINING	DUOBAOSHAN	copper	To be started in 2018
China	HUAXIN CEMENT	ZHAOTONG	limestone	To be started in 2018
China	Guangdong Province Dabaoshan Mining Co., Ltd.	Dabaoshan	Multi-metal	To be started in 2018



Vehicle Anti-collision System

SYSTEM OVERVIEW

By using technologies such as GPS, GIS, short distance point-to-point wireless communication and voice intelligent early warning, realize secure anti-collision early warning in open-pit mine, especially for large vehicles against large vehicles and large vehicles against small vehicles.



SYSTEM FUNCTIONS

- Automatically collects, calculates and recognizes the location, speed and direction of vehicles in the open-pit mine.
- Automatically send early warning information to surrounding vehicles with hazard factors by point-to-point method.
- GPS combines with GIS and high precision algorithm to distinguish traffic flow in same or opposite direction.
- Warning in advance, early warning distance is adjustable for 100, 60, 20 meters which leaves enough reaction time for drivers, It gives warning from 8 directions, eliminates drivers' blind zone.
- Unaffected by harsh weather and environment at open-pit mine like rain, snow, fog and sand.
- Voice intelligent early warning, driver doesn't need to look at the monitor which ensures safety driving.
- Driving data automatically save and storage which provides reliable data basis for over-speed and accidents.

APPLICATIONS

SHENHUA, China: Since 2009

SHOUGANG Group, China: Since 2015

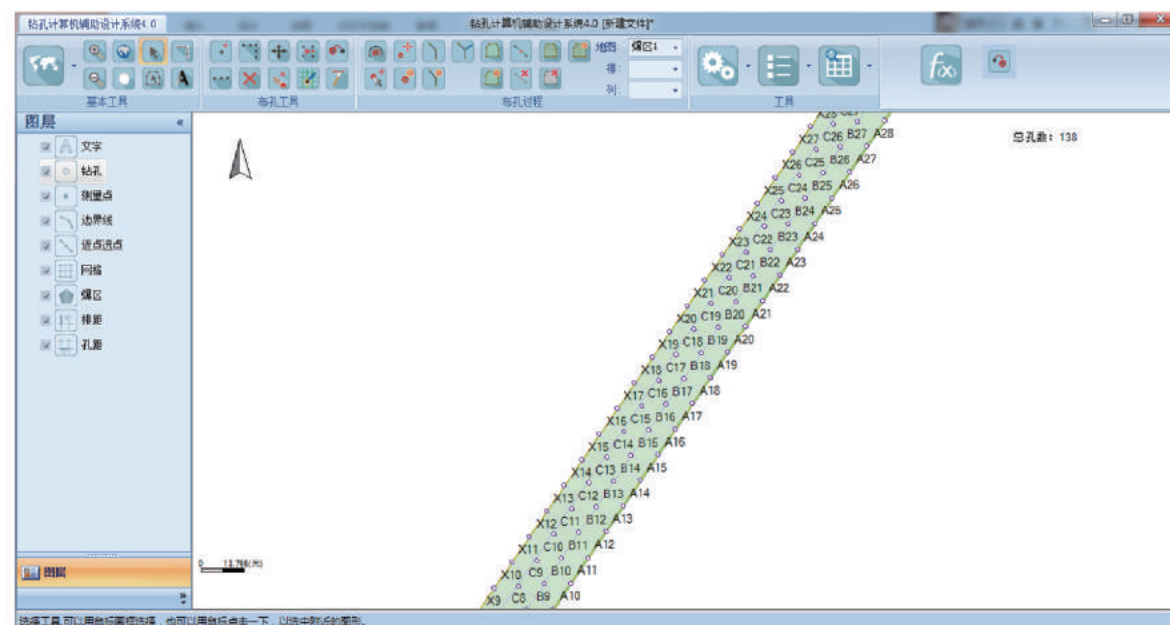
Wanbao Group, Burma: Since 2016

Automatic drilling hole arrangement & precise navigation system

SYSTEM OVERVIEW

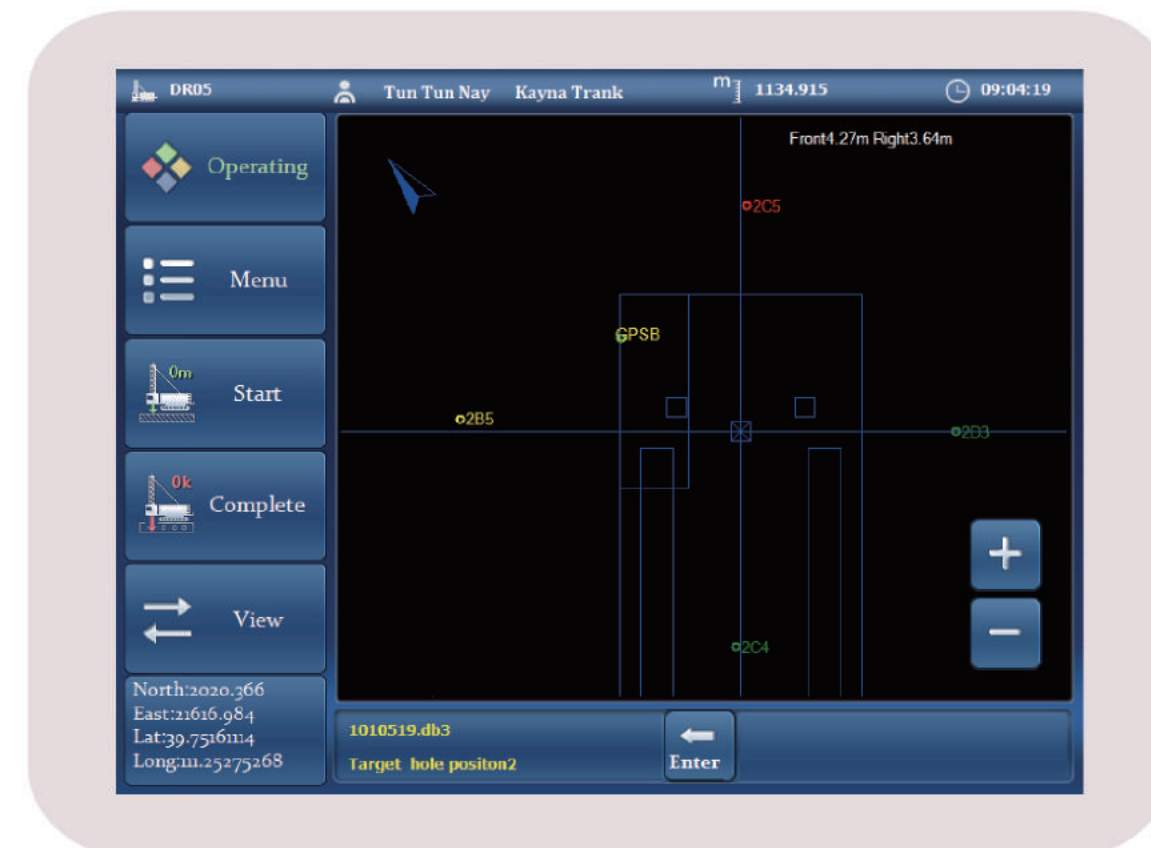
Automatic drilling hole arrangement & precise navigation system is a customized intelligent system integrating high precision GPS positioning, humanized blasting zone design, drilling hole precise navigation and drilling depth realtime precise monitoring together. The system is aimed at simplify production process, easy for operation, save time for blasting zone design, drilling hole arrangement as well as drilling time, improves operating efficiency, convenient for administrator to manage and monitor driller's operation.

SYSTEM FUNCTIONS



Automatic high precision drilling hole arrangement system

- Collects border of blasting zone according to site practical condition, provides reliable data for drilling hole arrangement.
- Operation for hole arrangement is easy and convenient, the designed blasting zone can be sent to operating driller
- directly which saves manpower, material consumption and time significantly and increase operating efficiency.
- The system provides several functions to alter blasting zone, which make it more flexible and

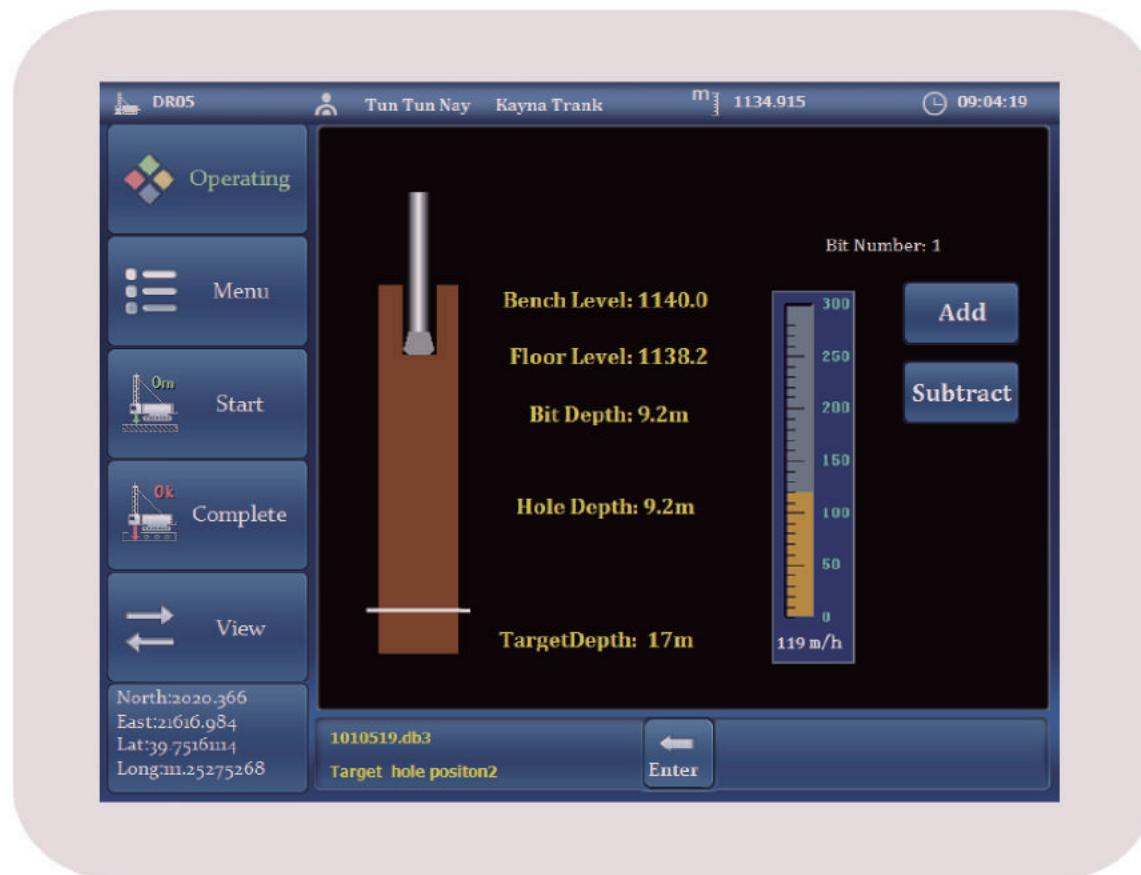


Automatic high precision navigation system

- The system provides many methods to assist alignment through display or voice, etc. which makes alignment easier and funnier.
- The system uses high precision GPS (positioning precision < 2cm) and 3D navigation algorithm to make the alignment



- While ensuring the precision, it reduces the times for alignment adjustment which shorten the time significantly and reduces equipment damaging rate and improves alignment efficiency(According to the statistics, each shift improves 2 hole,whichequals to 7% workload).
- The explosion is more fluent an proved due to high alignment precision ensures holes network parameters of blasting zone.



Depth measruement

- The system provides depth measurement function which can measure the depth of hole in
- real-time and ensures the accuracy of hole depth.

Depth measurement function provides real-time hole depth to drivers and gives hint through display or voice during different phase of drilling.

- Depth measurement is precise (precision < 20cm)and makes the altitude of hole bottom reach standard level, provides basis for explosion and avoids waste of explosives due to unqualified depth, saves cost.

APPLICATIONS

HBIS: Since 2011

China Coal: Since 2013

SHENHUA: Since 2014

China Gold : Since 2014



4G LTE private network multimedia dispatching & communication system

SYSTEM OVERVIEW

4G LTE private network multimedia dispatching & communication system is the highway for digital mine and mine big data, it is an important basic network channel. 4G LTE private network multimedia dispatching & communication system realizes networks combination, it is a high speed fusion network which integrates video, language clusters and data transmission. Video dispatching is sent to cell-phone, mobile video meeting, equipment fault remote video diagnosis, video & voice clusters dispatching, emergency communication insurance, data concentration collecting and transmission, it is the first choice for newly designed truck dispatching system already and the new option for future truck dispatching system upgrading.



SYSTEM FUNCTIONS

- Multi languages communication combine with each other.
- Multi data input transmission for digital mine construction is available(e.g. truck dispatching system, etc.)
- Equipment spot inspection system based on 4G private network.
Wireless HD monitoring

APPLICATIONS

WANBAO Group, Burma: since 2016

THAR Coalfield, Pakistan: since 2017

CHINARAILWAY: since 2017





Underground mining

Six safety systems

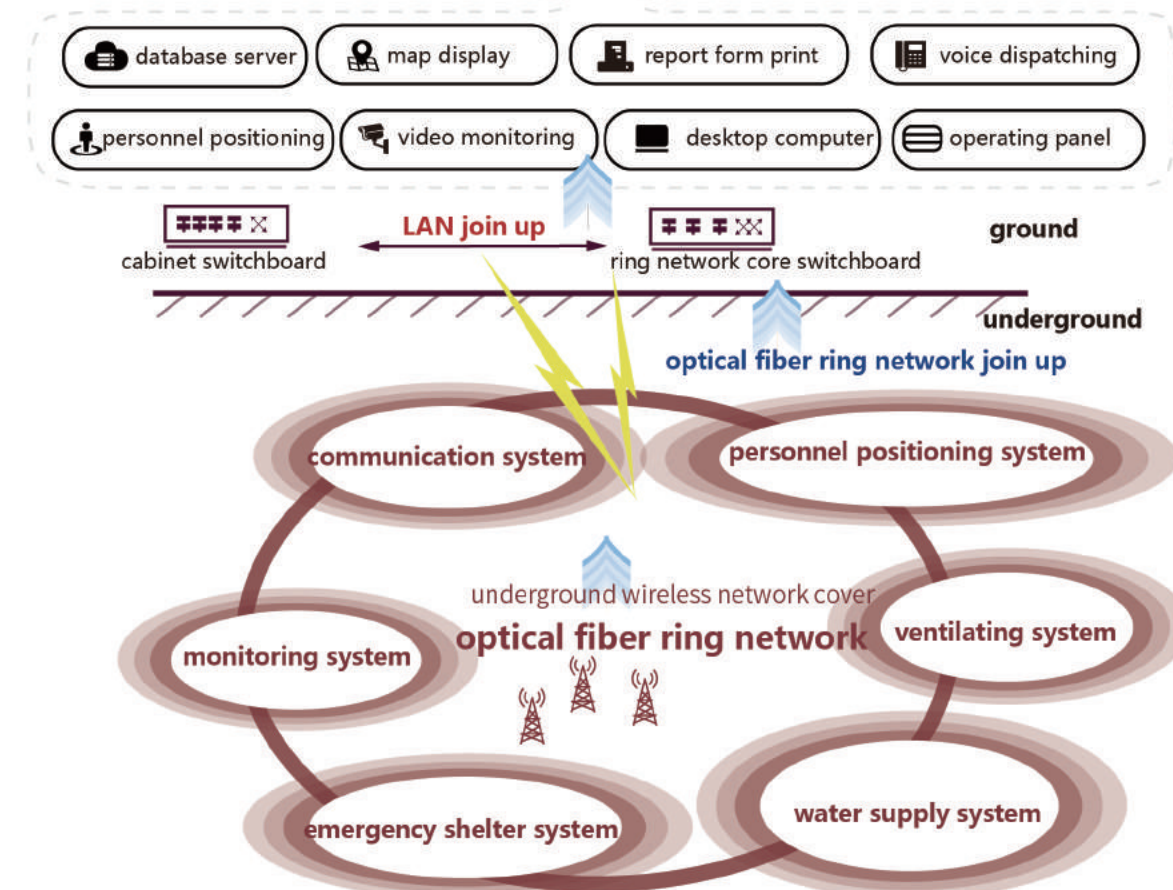
SYSTEM OVERVIEW

Six mine safety & risk avoiding systems including monitoring system, communication system, personnel location system, ventilating system, water supply system and emergency shelter system.

By using high precision positioning and monitoring technology, the six safety systems can monitor the condition of personnel and vehicle underground at real time and collect the quantity and location of personnel and vehicle underground timely, provides decision information for intelligent underground mine operation and saves cost, improves efficiency.



Large screen display system

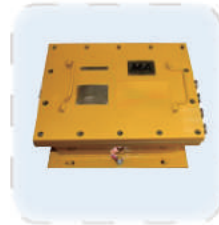




PLS card



Underground comprehensive substation mine cellphone



Anti-explosion power conditioner



industrial cell phone

SYSTEM FUNCTIONS

Underground communication system

Underground communication system uses optical fiber network and wireless WIFI as basis, it forms a complementary safety communication system with wired + wireless, fixed + mobile. It also realizes real time voice communication and broadcast within underground mine and between underground and above.

Underground monitoring system

Video monitoring system: connect the monitoring signal to information network and upload to monitoring center to realize guidance on production of whole mine.

Environment monitoring system: adopt high precision sensor technology, use high sensitive analog quantity to collect, the signal being filtered and transfered and finally connected to the information network, it can be widely applied at important part at underground mine for environment parameters monitoring.

Ventilating system

Convey fresh air and oxygen to underground mine.

Water supply system

The device is to keep personnel at underground mine can drink safe and clean water when there is accident.

Emergency shelter system

The system belongs to mine infrastructure, it includes self-rescuer, emergency shelter, rescue capsule and all kinds of contingency plan and routes for avoiding accidents designed by the mine owner according to mine condition.

Integrated information management platform

The integrated information management platform gathers all kinds of information on and under the ground. The personnel and equipment location, equipment status, status of underground safety parameters, and monitor screen of underground video are displayed on the monitoring computer. According to the need of safety production, the platform monitors the change of production operation condition in real time, and raises reasonable warn, alarm and solution.



Emergency shelter



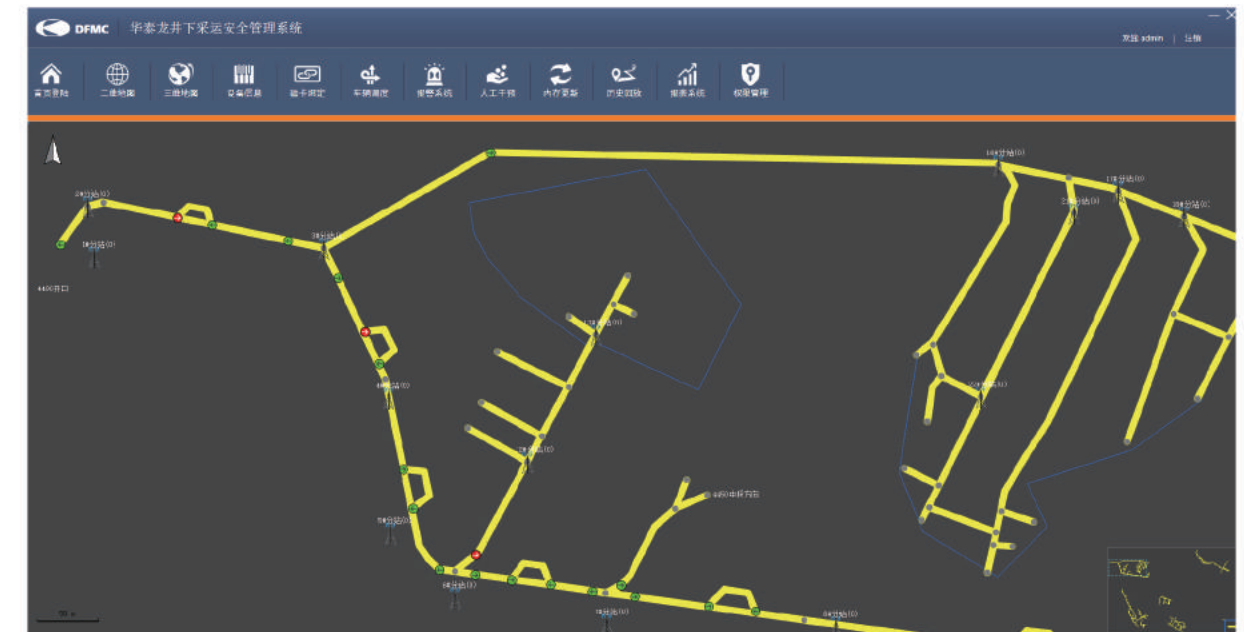
Ramp traffic light control system

SYSTEM OVERVIEW

The system uses technologies such as RFID, GIS, underground wireless communication, traffic light control, etc. Thus to ensure the safety driving of underground vehicles. By using equipments like traffic lights, terminals to control the movement and avoidance of vehicles, thus to reach optimized production transportation condition.

SYSTEM FUNCTIONS

- Get the driving position of underground vehicle and collect its moving speed and direction.
- Make reasonable judgment for vehicles to drive or avoid according to the traffic condition.
- Optimize vehicle driving route and reach optimized effect.
- Auto and semi-auto control the traffic light underground, realize reasonable management and control of underground traffic.
- Real-time tracking vehicles' driving data to provide basis for emergency traffic accidents. It adapts to the harsh environment underground and can be operated stably.



APPLICATION

CHINAGOLD : since 2016

Jinfeng Mining: since 2016



Underground unmanned electric locomotive driving system

SYSTEM OVERVIEW

Underground unmanned electric locomotive driving system connects and controls block signals system, it inputs parameters of production schedule, locomotive operating parameters, jack shaft material level into the central system. The system realizes optimized dispatching, auto-cruising, auto-ore loading and dumping of electric locomotives, eventually realizes unmanned driving.

The implementation of the system reduces personnel for transportation including drivers and operator at jack shaft. The dispatcher at control room on the ground can monitor 3 to 4 vehicles, which improves productivity and safety level, realizes 'mechanization replaces manpower, automation decreases manpower'.

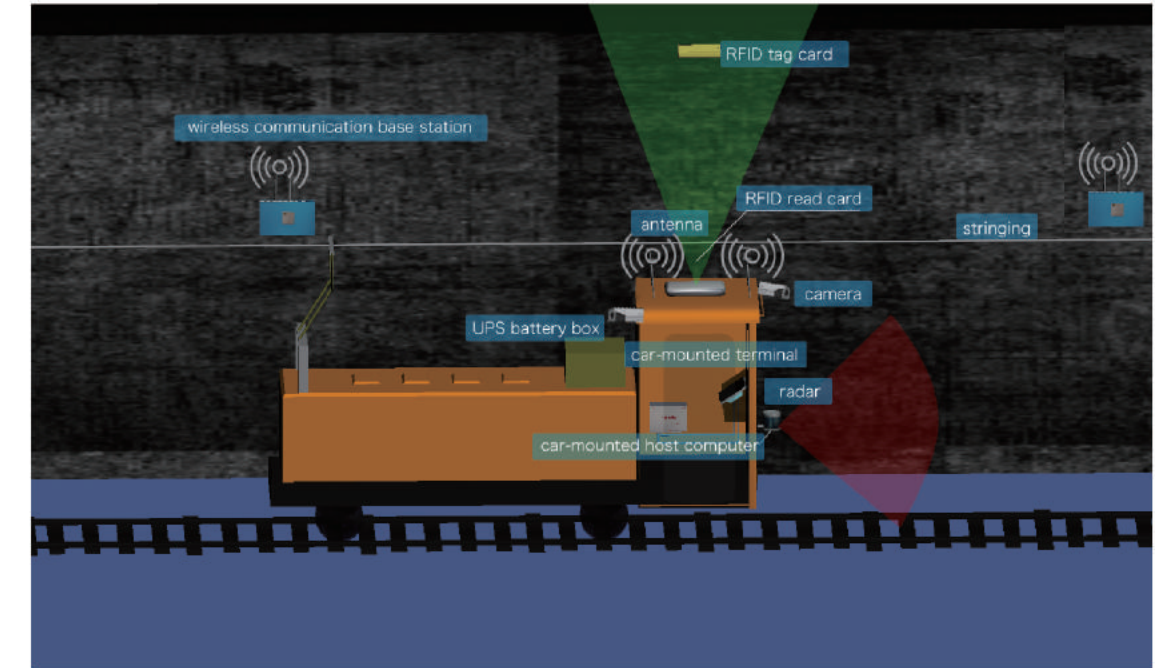
SYSTEM FUNCTIONS

Unmanned driving control system

Car-mounted controller controls car-mounted transducer through MODBUS, transducer controls the power motor of locomotive directly and realizes the start, speed-up, constant speed and brake; The system controls air-operated brake and lift bow through electromagnetic valve.

Electric locomotive precise positioning system

Electric locomotive precise positioning system is one of the key conditions to realize unmanned driving. Through integrated technology method to realize precise positioning of underground vehicles, such as locomotive positioning at key track positions by using narrow angle RFID positioning technology, with the coder of vehicle and track GIS distribution, it can realize maximum 2cm precision.



Network communication system

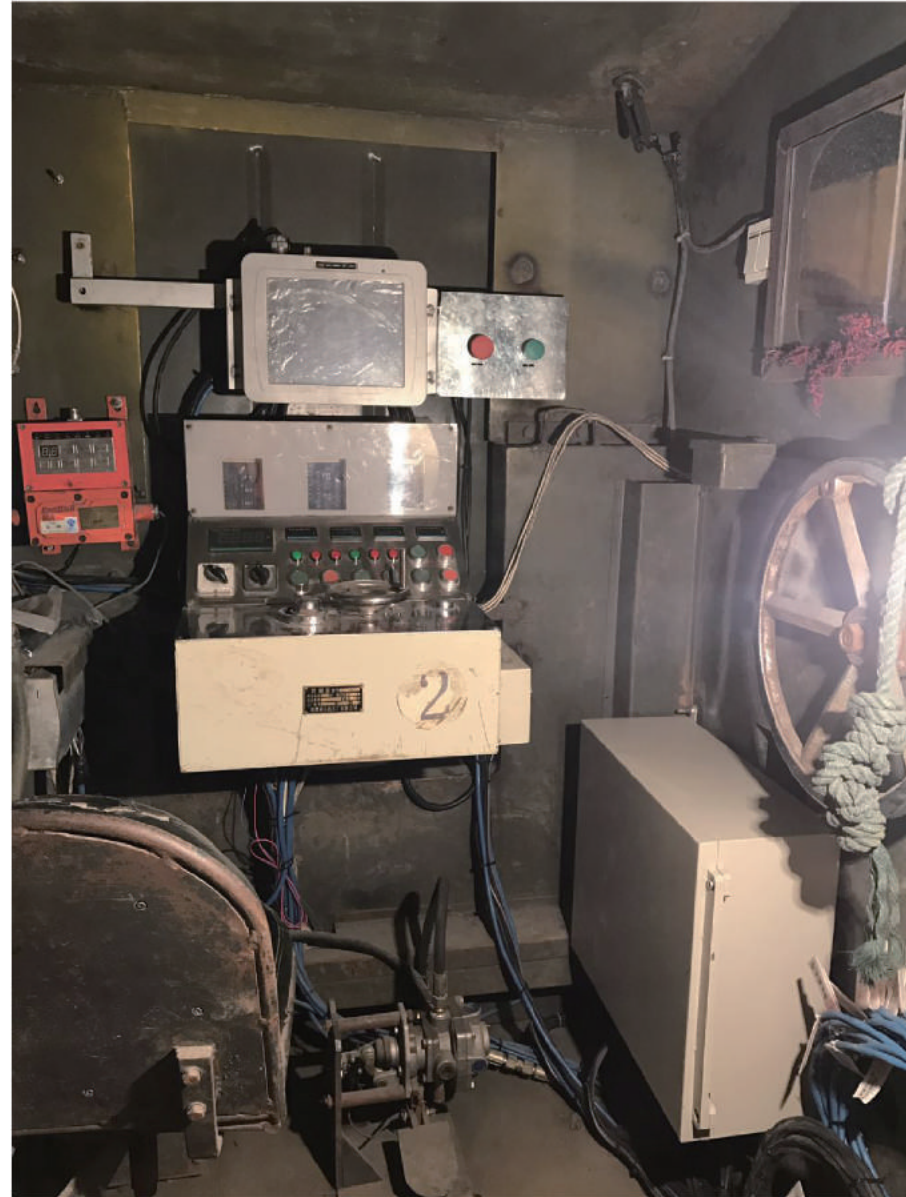
Build underground backbone network including optical fiber ring network and wireless ad hoc network. It is the basic platform of underground mine informatization, provides reliable and high speed information channel.

Video monitoring system

It includes: car-mounted video monitoring, ore loading location monitoring, dumping location monitoring, substation monitoring, medium jack shaft entrance monitoring, normal pathway monitoring and monitoring at other key areas. It ensures high driving safety.

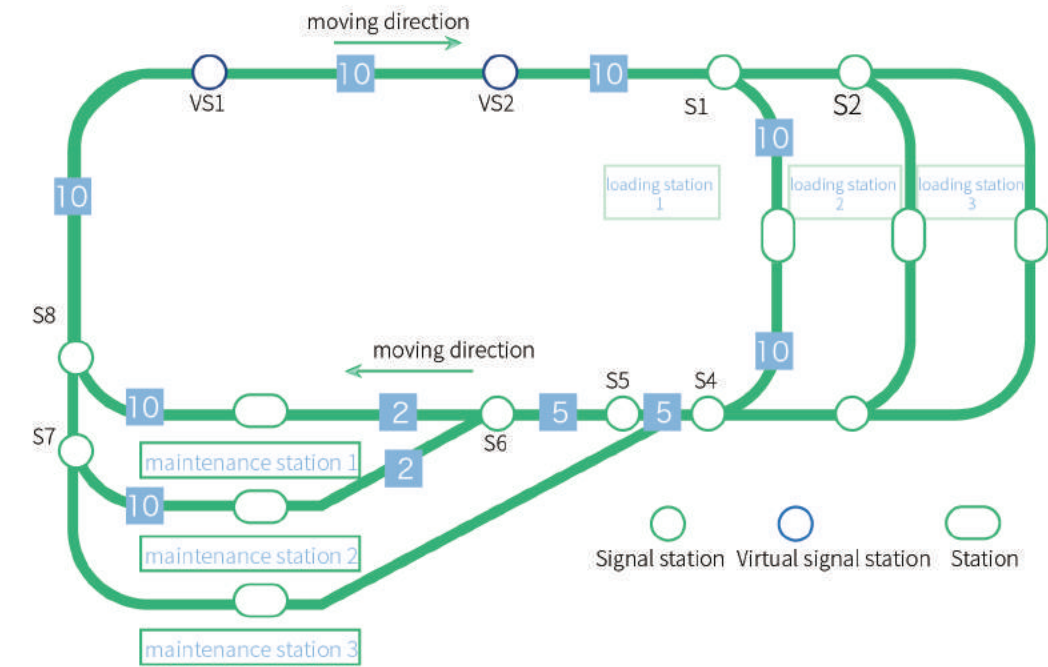
Speed change cruising system

Realizes locomotive driving auto-adaption to track and dispatching orders, auto-alter driving speed. Realizes underground locomotive auto-driving. One man can manage several locomotives.



Auto-ore loading system

When the locomotive moving close and current ore loading system receives the loading order from dispatching center, auto-ore loading system will control the jack shaft according to adjustable parameters and realizes ore loading automatically. No man is required during the loading process, The system measures the material level automatically and control the upward or backward of locomotives.



Underground mine track transportation system

Electric locomotive unmanned driving safety insurance system

Through the speed limiting devices set according to GIS map, the highest speed of driving vehicle can be limited to ensure best driving speed and safe driving. By using radar to realize anti-collision early warning between locomotives and obstacles monitoring.

APPLICATION

Ma Steel, Zhangzhuang Iron mine, underground unmanned locomotive driving system: since 2016