Unmanned Driving System for Underground Mine

1. System Overview

Unmanned Driving System for Underground Mine connects and controls the Signal, Integrated and Blocking system and can input production plan, locomotive operating parameters, and height of the material in winzes, etc. into central system. The system can realize optimal dispatching, autonomous cruise, automatic loading and automatic unloading of electric locomotives, and ultimately achieve the goal of unmanned driving of electric locomotives.

The implementation of unmanned driving of electric locomotives can reduce transportation personnel at the same level, including underground locomotive drivers and winze ore drawing personnel. In over ground control room, one dispatcher can monitor the operation of 3-4 vehicles, which can improve production capacity and intrinsic safety level, and truly realize “Machinery replaces labor”.

2. System Function

Unmanned Operating Control System

Vehicle-mounted controller controls vehicle-mounted frequency converter through MODBUS, and vehicle-mounted frequency converter directly controls the locomotive's motor, to realize vehicle's
start, acceleration, uniform speed, deceleration and brake, and to control pneumatic brakes and lifting bows through solenoid valves.

**Locomotive Precise Positioning System**

Locomotive precise positioning system is one important condition for realizing driverless. Through the integration of various technologies, precise positioning of underground locomotives can be achieved. For example, the positioning of locomotives on key track nodes can be achieved through a narrow RF angle RFID orientation technology. Combined with the vehicle's own encoder positioning and orbital GIS distribution, 2cm accuracy of positioning can be achieved.

**Network Communication System**

Establish underground backbone networks, including optical fiber ring networks and wireless ad hoc networks, which is the foundation platform for underground mine information construction and can provide reliable, high-speed information channels.

**Video Monitoring System**

Video Monitoring System includes: vehicle-mounted video monitoring, loading point video monitoring, discharging station video monitoring, substation video monitoring, entrance on middle winzes video monitoring, common road segment video monitoring, and monitoring for other major areas. To secure high-level safety of vehicle driving.

**Variable Speed Cruise System**

Realize locomotives' orbits and dispatching instructions self-adaption and autonomous adjustment of driving speed. Realize autonomous operation of underground locomotives. To achieve the purpose of a single person managing the operation of multiple locomotives.

**Automatic Loading System**

When locomotive is approaching and the loading system has received loading instruction from dispatching center, the automatic loading system will automatically control the winze ore dumping machine, according to the adjustable ore-drawing parameters, to achieve automatic loading. There is no need of personnel to participate in the automatic loading process. The system will automatically detect the material level and control the locomotive to go forward and backward.

3. Application Case