



ABB New explosion-proof drive product for underground coal mine application

ABB, a leader in power and automation technologies, has launched a new explosion-proof drive product for underground coal mines (Figure 1). The drive covers the 660 – 3300 V levels, a power range of 200 kW – 2 MW and complies with (Exd[ib] I) explosion-proof and intrinsically safe standards. The product mainly applies to drive equipment requiring multipoint transmission, constant torque output and potential energy variation, such as ventilation fans, pumps, belt conveyors, armoured face conveyors, winches used in blind shafts and inclined shafts, and endless rope winches, etc.

Explosion-proof drive technology

Explosion-proof drive products should be highly adaptable and stable in order to deal with the harsh operating environment of underground coal mines, which suffer humidity, limited space and electromagnetic interference. For most applications (pumps and distributed fans excepted), the drives have to handle constant torque loads, requiring high starting torque, frequent overload and a wide range of loads. This requires drives that are capable of full torque output at 0 speed and fast torque response.

The air-cooling converter modules are designed to be compact and easy-maintenance, without the need for complex cooling tube connections. With the air-water heat exchanging system, the risk of a short circuit due to leakage of the cooling water is solved by incorporating a separate structure for electrical components and cooling water (Figure 2). This design also avoids the disadvantage of the low vibration tolerance of capillary tubes in the water cooling system.

ABB combined conventional explosion-proof product design knowledge with finite element analysis, 3-D modelling, fluid analysis and thermal analysis theories to design the enclosure and inner structure. This design method can decrease the steel consumption, reduce the volume and weight, while still ensuring mechanical strength, stiffness and cooling capability. The integrated design decreases weight and increases the ease of installation. The

separated cabinets should bring increased cooling efficiency, while the smart design of the auxiliary parts can improve the efficiency of assembly and maintenance.

Design features

Direct torque control

The new drive applies direct torque control (DTC) technology. With this control method, the status of the controlled motor can be calculated rapidly, allowing the system to quickly respond to sudden variations in load, provide highly accurate static and dynamic speed and torque control, achieve full torque output at 0 speed, improve the power factor to near 1 and reduce the voltage and current harmonics. DTC technology also increases energy efficiency and significantly enhances technical process control of production. DTC technology is applied in:

- Multipoint transmission applications to help achieve multi-motor power balance in order to increase motor service life.
- Belt conveyors in blind or inclined shafts, as well as other applications involving potential energy variation, to reduce energy consumption and improve operation safety and riding comfort.

Compatibility and reliability

ABB explosion-proof drive products are equipped with an air-water heat exchanging system. The heat-exchange units are applied with the original converter modules in order to improve reliability and EMC capacity, avoiding risks after disassembly and any change of the converter modules.

The specially designed converter modules are horizontally-arranged so as to avoid the disadvantages of roundabout circuit layout and reduce electromagnetic interferences. Due to the laminated busbar technology, the stray inductance, which is proportional to du/dt , will be reduced and EMC capacity could be enhanced.

Compact and light weight

Taking advantages of the heat transfer principle to cooling and selecting a low-power segment air-cooled inverter makes the ABB explosion-proof converter lighter and



Figure 1. ABB's new explosion proof drive for underground coal mines.



Figure 2. Air-water heat exchanging system.

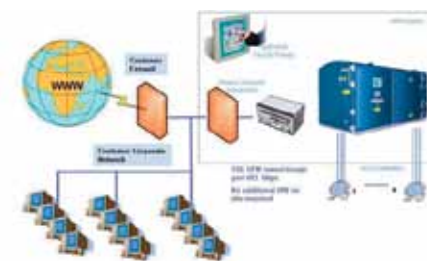


Figure 3. Remote diagnostics and service platform.

smaller than other product on the market, while still fully meeting the harsh conditions found in a coal mine.

Stringent quality system

The development and manufacturing process is in full accordance with ABB's stringent quality control system. In addition, ABB's remote diagnostics and service platform (Figure 3) monitors product performance to effectively reduce downtime and significantly improve equipment utilisation. The explosion-proof drive product will also enjoy the full range of after-sales service system maintenance services.