

Dump Trucks

BelAZ (Belorussian Autoworks) specializes in the production of quarry trucks and - with more than 120.000 mining vehicles (trucks, power shovels, etc.) produced - is one of the leading corporations worldwide in this field.

The payload capacity of these trucks ranges from 40 to 220 metric tons. The vehicles are used in surface mining (coal, iron, etc.), in salt mines and in infrastructure projects, such as pipeline, sewer, tunnel and road construction. Special purpose vehicles are also employed worldwide in the iron and steel industry as well as underground transport.

Every year more than 1,000 mining vehicles are produced at the plant in Zhodino, Belarus. The trucks are sold around the world and are serviced at dedicated maintenance plants.

Requirements

The highly complex level of engineering and the extremely rough conditions found in mining and construction environments place high demands on the reliability of control and visualization systems. The technicians at BelAZ tested many microprocessor and control systems under these harsh conditions. At the end of the evaluation phase, B&R's System 2003 and Power Panel products were chosen as the most reliable. In cooperation with the specialists at the ENTAS Corporation in Minsk, one of B&R's international partners, the BelAZ technicians developed and certified the following functions:



- A system for monitoring and visualizing the weight of the payload and the gross vehicle weight rating
- An electronic management system that controls the electro-mechanical transmission (hybrid gearbox and electrical drive train)
- A diagnostics and monitoring system that keeps the driver informed via an intelligent display unit

Electronic Management System (ESUTEP)

The electronic system ESUTEP was developed to replace the analog system used in ten thousands of trucks during the last decades. The move to the PLC system brought a whole host of advantages. The electronic system is characterized by its flexibility, automatic adjustment through self-optimizing control cycles, simple error diagnosis, constant improvement of system diagnosis, reduced number of electronic modules, etc.

The ESUTEP system was developed for propulsion control and monitoring the hybrid drive train and braking process.

Hybrid drive trains convert mechanical energy produced by a diesel engine into electrical energy.

Braking inertia is also fed into the drive train as electrical energy.

The power plant of BelAZ trucks basically consists of a diesel generator and two electric motors installed in the wheels that are responsible for moving the truck.

The drive train power circuit is made up of an electrically driven shaft, operated with precise power by a commutator-free AC generator.

The drive train motors consist of an electrical generator (TEG), electric motor (TEM), brake resistors, power commutators, switching devices and a number of sensors for monitoring TEG and TEM temperatures and currents as well as the commutators diodes.


Software Functions

The software monitors and controls the electric hybrid drive train. It monitors driver inputs and sensor data from the feedback sensors. The system warns the driver when the drive train approaches limit values (temperature, TEM rotation speed, etc.) and drives the power switching devices.

In basic (tractive) operating mode, the system maintains the optimum levels of output at the diesel generator. Furthermore, the system performs operative checks of the truck's subsystems, self-diagnosis of the electronics and protects against operator errors or erratic activities of the driver.

All values, messages and alarms are displayed on the operator panel mounted in the driver cabin.

Increase in Productivity

During the last 5 years, numerous improvements have been achieved in the mining trucks, among them an increase in traction/speed parameters and fuel efficiency. Fuel consumption was reduced by 7-10%, the medial speed of the trucks has increased by 6-8% and overall productivity has increased by 12-15%. 

www.belaz.minsk.by



Sergey Kudin
Deputy Chief Designer
BelAZ

“The cooperation with ENTAS, NVK VSIT and B&R has turned into a veritable success story for BelAZ.

During the past 5 years, we have equipped more than 1.000 trucks with the ESUTEP system. The mining trucks are operated in various regions of Russia and the CIS countries, including areas with extreme climatic conditions.

We are very impressed by the quality of the B&R products and are extremely satisfied with the cooperation. The commitment to service and the flexibility of this cooperation are of prime importance to the success of our company.”

