

## Information and Control System for Mining Transportation Management

Mikhailovsky GOK (Mining and Processing Works) has been established in the early 60's and deals with mining operation and iron ore preparation at the Kursk Magnetic Anomaly, processing of iron ore concentrate, pellets and sintering ore. Currently, the Mining-Transport Complex of Mikhailovsky GOK includes 40 freight-hauling locomotives, approximately 230 support service vehicles, 30 large dump trucks as well as 9 stations, 8 of which are equipped with modular relay routing control, based on the ladder algorithm.

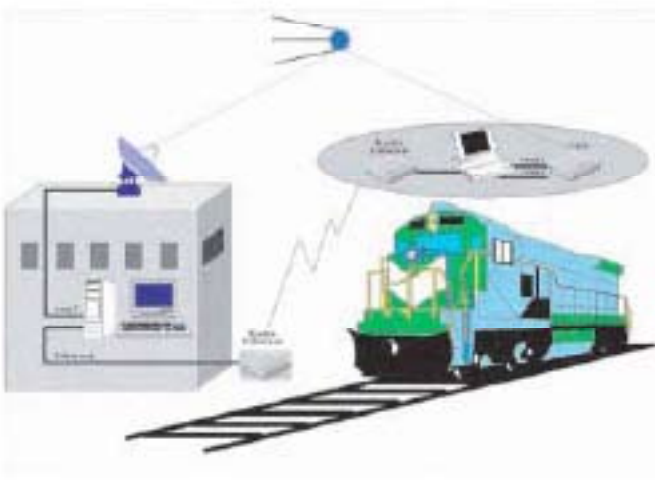
Over the period of three years there has been a research work in progress in Mikhailovsky GOK to develop a microprocessor control system of electric alarm equipment for railroad stations and adjacent railway hauls.

Tasks assigned to developers of the microprocessor control system (MCS), first of all, included higher safety measures for train traffic, terminal capacity and cost saving in signals and interlocking maintenance. At the same time this system has to correspond to all requirements according to the Railway Code of Metallurgy Industry, Traffic and Shunting Movement Instructions and Signalling Handbook.



MMK





InTouch is used for the visualization. Signalling system of the Trench station has the following functions:

- Implementation of all tasks, assigned from a traditional signalling and interlocking maintenance system to the mnemonic diagram of the station. That includes a visual display of track occupancy, point states, a route visualization, etc.
- Implementation of tasks, assigned from a traditional signalling and interlocking maintenance system to the station switchboard.
- Station routing, implemented by industrial protocol SuiteLink in the past.

**Other options provided by MCS:**

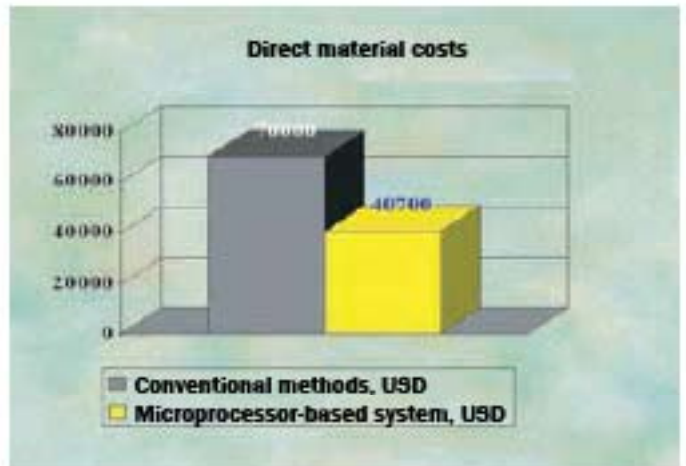
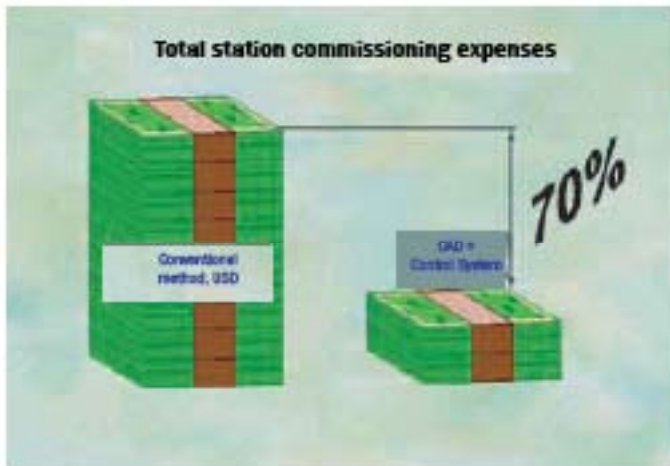
- An on duty operator by a mere use of the computer mouse can either protect or clear the lines, assigning recognition or danger signals (during the working hours of the maintenance crew).
- An on duty operator can install or remove warnings of traffic limitations. Besides, MCS will remind to

inform the train crew about any warnings while planning a route in these sections.

- MCS not only blocks any counter and frontal route release, but also informs about the reasons of these activities.
- MCS forever remembers all the events that have taken place at the station from the very starting point and provides all traffic data of any time period required in the past.
- MCS can print all information of the traffic movement upon request.

**Implementation of Non-Contact Type Track Circuit**

The main highlight of the new signalling system is an absence of a traditional track circuits. There are no insulated rail joints installed at the Trench station. The traditional scheme has been replaced by the so called non-contact type track circuit (NCTC). The main idea is to apply navigation receivers in order to position mobile units and accordingly, evaluate track occupancy.



NCTC also includes communication tools based on RadioEthernet. The operating station called Opencast had carried out a successful pilot scheme on interoperation of a mobile item with an electrical signalbox after a preliminary track mapping had been done.

It is planned to install an on-board microprocessor set to electric locomotive. Its main functions would be a maintenance of GPS receiver, data receiving - transmission via a communication channel between an electric locomotive and the station, informing a motorman about any warnings, emergency situations, a status of stoplights and sections of line on the route.

### Conclusion

The Trench station has been the first phase in the development of Information and Control System of Mining and Transport Complex and has already proven its savings to Mikhailovsky GOK, caused by lower equipment costs in comparison to the traditional signalling system, and a substantial economic impact has been expected from the Information and Control System in general in the long term period. A construction of another railway station equipped with signalling and interlocking maintenance system by the Trench station type has been planned in the near future.

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