Upgrading Recorders and Control Systems at CS-39 of the Urengoy–Pomary–Uzhhorod Pipeline

V. V. Pavlyk, I. M. Vovk, V. Y. Vyhodovaniuk, Bohorodchany Line Production Department of Main Gas Pipelines

Compressor station No. 39 of the Urengoy–Pomary–Uzhhorod pipeline (Fig. 1) was commissioned in 1983. Its automation equipment, in terms of components and design, corresponds to the level of the early 1980s. Since the replacement of automatic control systems with modern ones has not yet begun at similar compressor stations of Ukrtransgaz with GTK-25I units, this article describes the technical solutions developed by the Instrumentation and Control (I&C) Service of the Bohorodchany Line Production Department to upgrade the most worn-out and obsolete automation systems.



Fig. 1. General view of CS-39, Urengoy–Pomary–Uzhhorod pipeline

Data acquisition and recording system

The unit and station-wide control panels of CS-39 used SER and LINAX electromechanical chart recorders to monitor and record the main process parameters. After 25 years of operation they had become worn out and obsolete. Worn recorder parts need replacing, and the recorders also require daily maintenance: cleaning the pens, replacing ink, changing charts and so on.

The I&C staff replaced the recorders with a microprocessor-based system for collecting and recording unit and station-wide process parameters, built on four MTR-8 microprocessor controllers made by Microl (Fig. 2). Since the MTR-8 can operate as an 8-channel meter, this scheme records all the process parameters previously wired to the chart recorders with twice the accuracy, and also monitors additional important data:

- for the GCUs — hydraulic oil pressure (an additional PTX 7517 transmitter was installed in the auxiliary compartment of the turbine unit, Fig. 3) and axial compressor discharge pressure;
- for the station-wide control system — 110 V and 24 V supply voltages and air humidity.

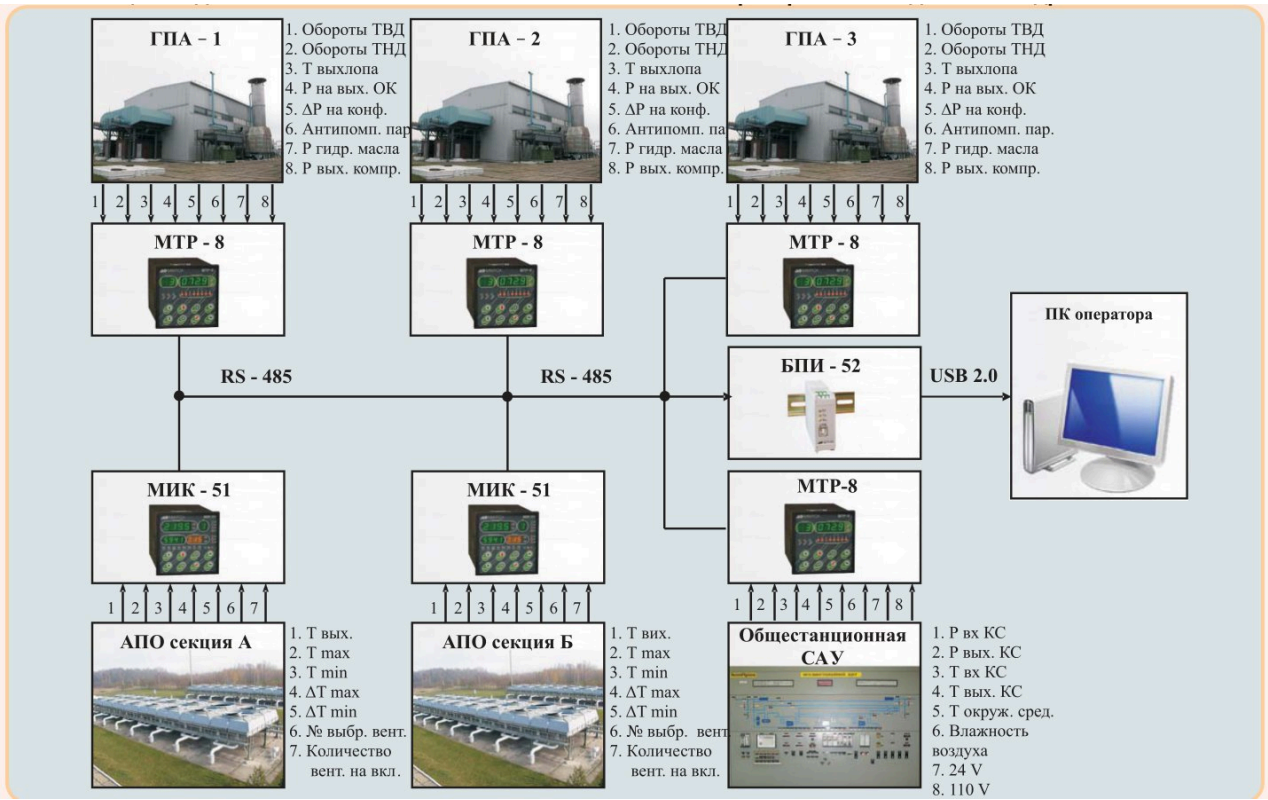


Fig. 2. Structure of the data acquisition system



Fig. 3. Hydraulic oil pressure transmitter

Data collected by the MTR-8 instruments is transmitted via RS-485 to the shift engineer's PC at the compressor station, where the Visual Intellect software package displays it on the corresponding mimic diagrams (Figs. 4, 5) and trend charts (Figs. 6, 7).

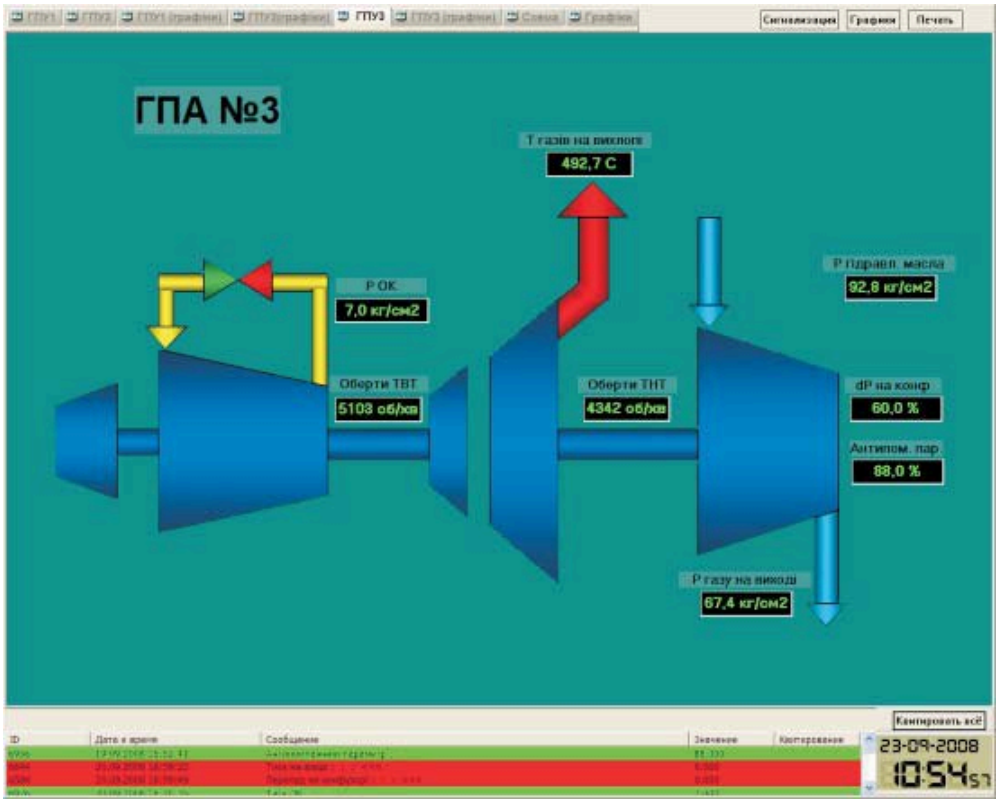


Fig. 4. Mimic diagram of GTK-25I GCU No. 3

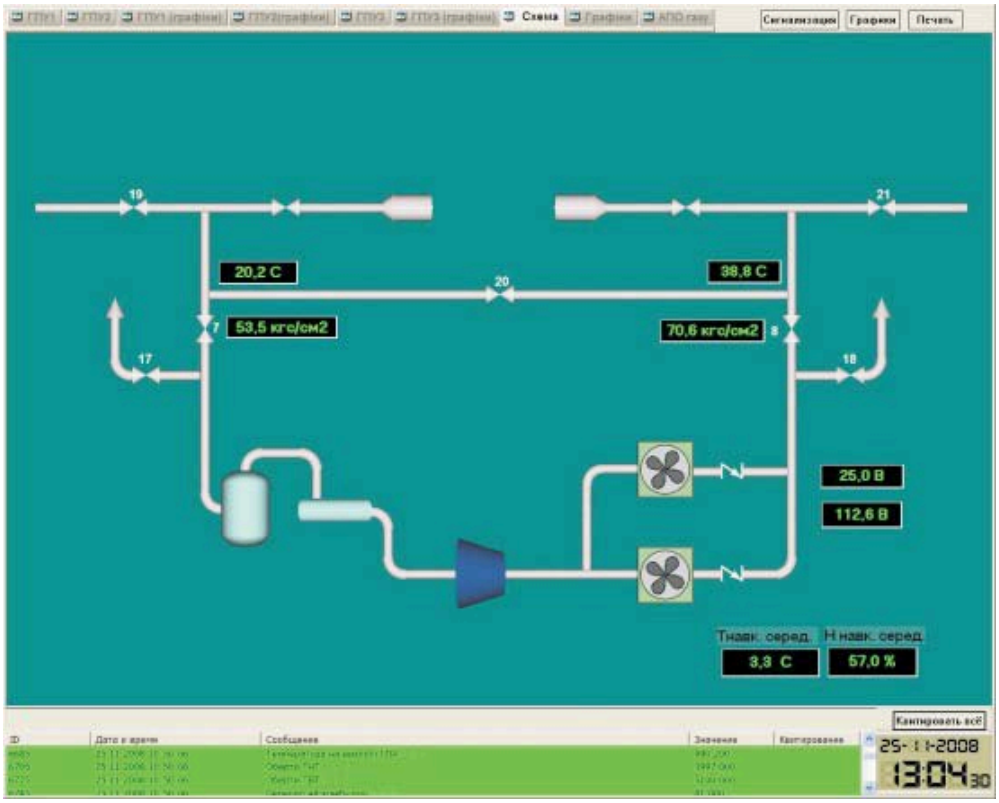


Fig. 5. Station-wide mimic diagram

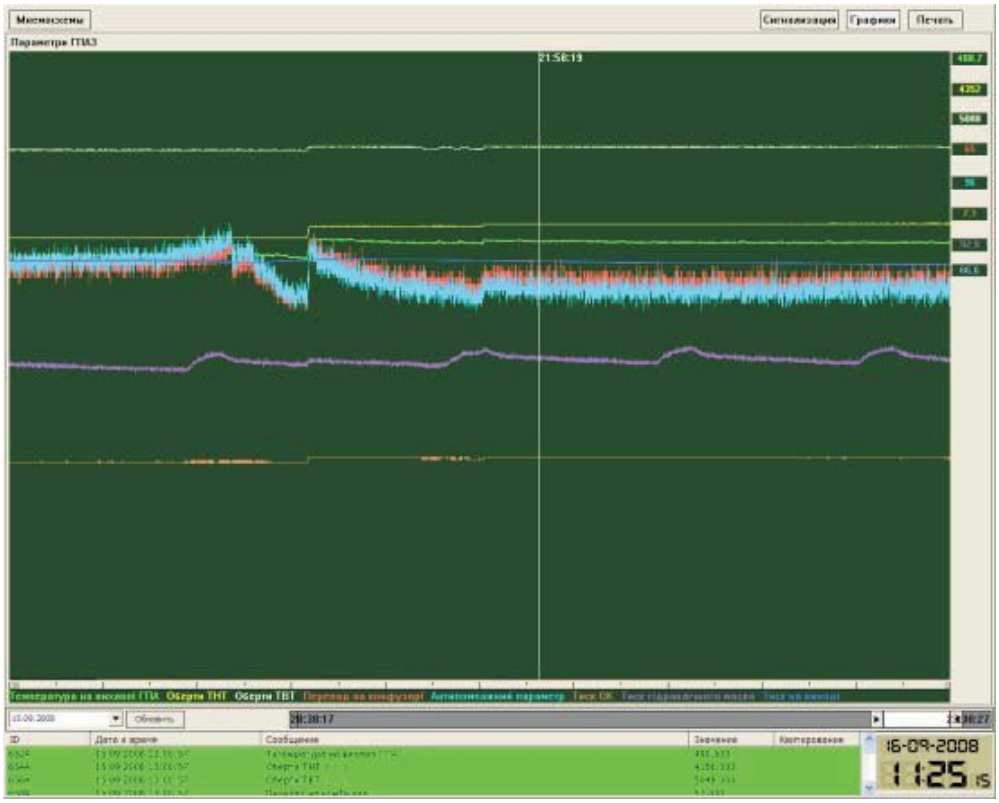


Fig. 6. Trend charts of GTK-25I GCU No. 3 parameters

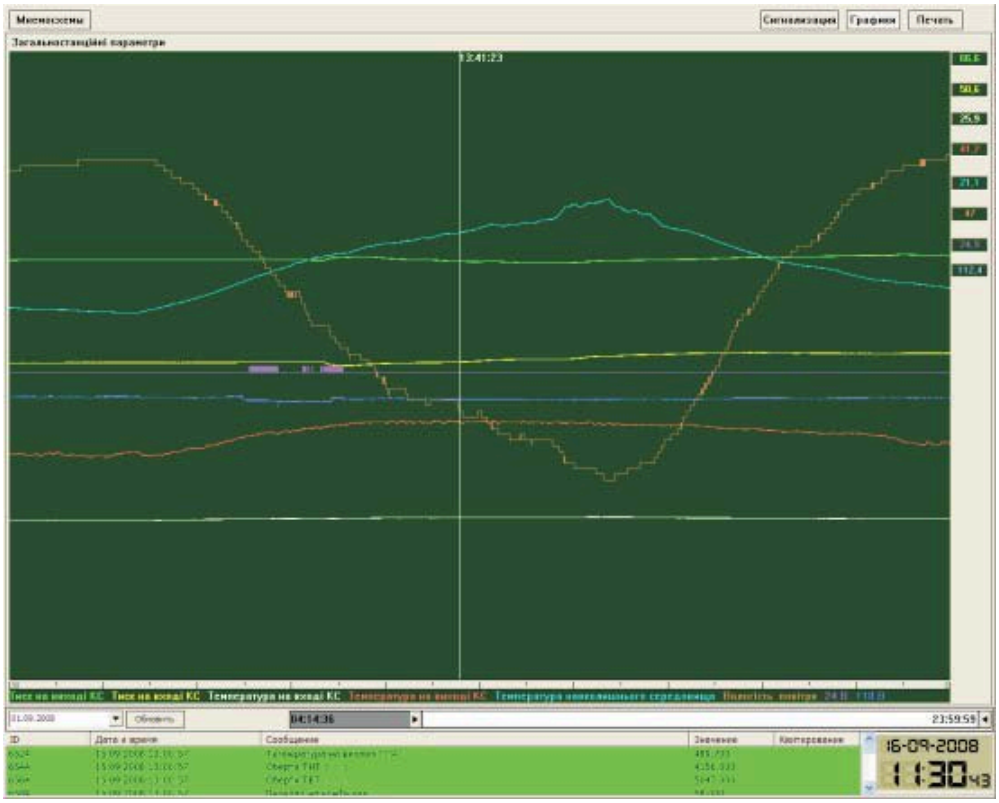


Fig. 7. Trend charts of station-wide parameters

This improvement saves money on new chart recorders (imported equivalents cost an order of magnitude more than MTR-8 instruments), eliminates charts and ink, and makes it possible to display, record and archive data and analyze abnormal situations at the compressor station far better and more accurately, in line with modern requirements.

Gas air cooler control

The fans of the gas air cooling units at CS-39 were controlled by German-made Logistat controllers, built on components equivalent to the Soviet-era KS573RF2 memory chip. In operation, the Logistat controllers proved unreliable: the control program often became corrupted, especially during supply voltage fluctuations, so specialists from the Tekhdiagaz research and engineering center had to rewrite the controllers' ROMs every year. The I&C staff of the Bohorodchany Line Production Department proposed replacing the obsolete Logistat controllers with modern Microl MIK-51 microprocessor controllers (Fig. 8) and integrating them into the existing MTR-8 data acquisition system (Fig. 2).

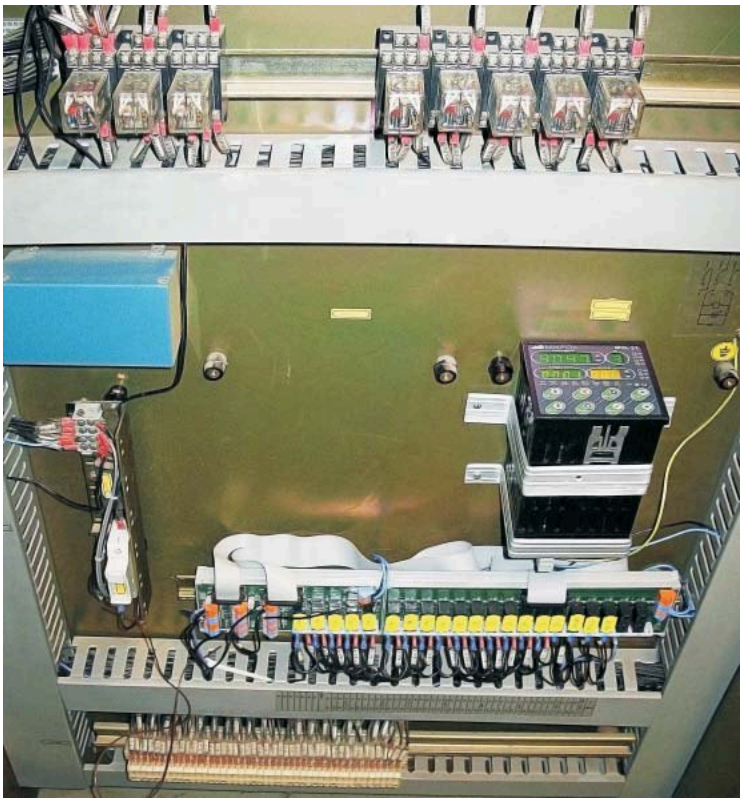


Fig. 8. MIK-51 controller installed in the gas air cooler control panel

The air cooler control program was loaded into the MIK-51 controllers using the ALFA FBD program editor and fully reproduces the Logistat control algorithm. The shift engineer additionally receives on the PC the gas temperature at the outlet of each air cooler section and important MIK-51 operating parameters: the minimum and maximum control setpoints, the number of the fan from which the start-up sequence begins, the number of fans commanded to start, and so on (Fig. 9). To keep the standard panel indicator showing the number of running fans, an electronic encoder board was developed that converts the number of running fans in each air cooler section into binary-coded decimal.

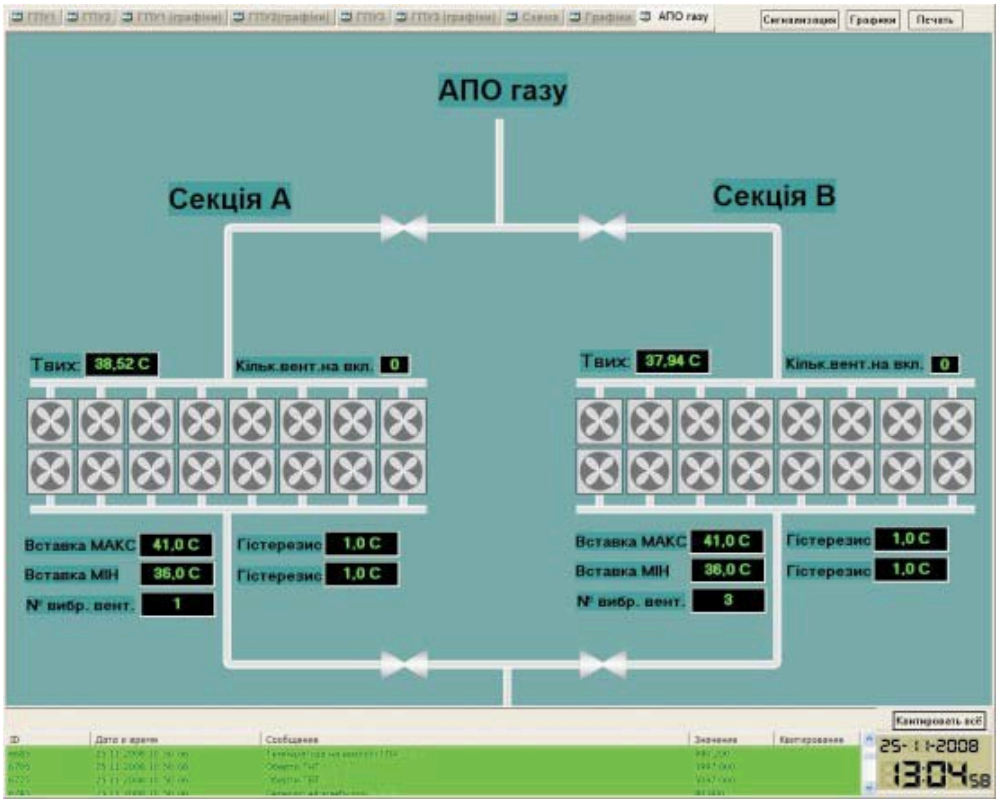


Fig. 9. Gas air cooler mimic diagram

Thus, Ukrainian-made microprocessor instruments and software make it possible to bring process parameter recording and local automatic control systems at compressor stations with GTK-25I units on the Urengoy–Pomary–Uzhhorod pipeline up to modern standards.

Contacts

For more information about the products mentioned in this article, please contact **Microl LLC**:
+38 (0342) 502-701
+38 (067) 359-70-90
+38 (095) 092-07-28
sale@microl.ua, microl_zbut@microl.ua, zbutmicrol@gmail.com
www.microl.ua

Technical support:
+38 (0342) 502-702
+38 (067) 704-00-29
+38 (095) 302-37-57
support@microl.ua, supmicrol@gmail.com

Originally published in Truboprovodny Transport (Pipeline Transport) magazine, No. 4(54), November–December 2008.