ELECTRONIC CORRECTOR AS A BASIC PART OF THE SYSTEM FOR SUPERVISION AND CONTROL OF THE OBJECTS ALONG GAS PIPELINE

LE CORRECTEUR ÉLECTRONIQUE – LA BASE DU SYSTEME DE SURVEILLANCE ET DE CONTRÔLE DES OBJETS DE LA CONDUITE DE GAZ

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1. INTRODUCTION

The main purpose of the system for remote supervising and control of the gas pipeline is watching and carrying on of the transport and distribution regime of the natural gas and potential intervention in case of irregular states. Thanks to the system for remote supervising and control of the NIS-Energogas gas pipeline, the Energogas operative staff can have a look to a temporary state on the supervised objects along the gas pipeline at any moment. Control and supervision of the system for transport and distribution of natural gas is realized by means of SCADA (System for Communication and Data Acquisition) information and processing system.

One possibility for implementation of the system for remote supervision of gas pipeline is to use an independent device for data processing and acquisition – such as electronic corrector, as well as devices within microprocessor substations installed along gas pipeline.

One example of using electronic corrector for supervision of natural gas consumption is a system for remote supervision and control of natural gas consumption on the objects of Belgrade Heating Power Plants. The system is based on electronic correctors and realized and developed as a logical continuation of the implementation of the system for remote supervision and control of the NIS – Energogas gas pipeline.

2. TECHNICAL DESCRIPTION

Having in mind world experience and modern achievements in communication and computing techniques as well as previous experience in Energogas, the initial concept supposition of the new system for remote supervision and control was that it must be based on standard hardware platform in dispatching centre and on the remote objects along gas pipeline.

The system for remote supervision and control of the natural gas consumption on objects of Belgrade Heating Power Plants enables uninterrupted supervision of the plant work and gas consumption and automatic billing and invoice of the consumpted quantities of natural gas.

Having in mind reduced and irregular supply of natural gas as well as sanctions imposed to the FRY by the international community at the time the project was being defined, it was supposed that: 1) the system must be reliable and 2) its implementation must be cost saving. The starting point for technical solution was the existing system for remote supervision and control of gas pipeline, developed by the Nis-Energogas team of experts. During exploiting period it showed up to be effective and reliable in functioning of the NIS – Energogas dispatching centre.

The complete system for data acquisition along the gas pipeline is based on electronic corrector, which in real time displays data regarding gas quantities (cumulative – adjusted, unadjusted, current flow), temperature and pressure of the gas. Set of other archived and serviced data, which might be of interest for supervision and transport of natural gas is also displayed.

The input information on measurements of the elapsed unadjusted quantities of gas is taken over by electronic corrector as a short circuit signal from REED relay or from sensor. The information

on gas temperature is taken over via Pt (temperature) probe, and the information on pressure (according to corrector type and its producer) is taken over via low voltage pressure sensor, or tube, which directly applies pressure to corrector.

Simpler and less costly implementations of systems for remote supervision and control of gas pipeline are enabled by developing new technologies and communication systems.

3. SYSTEM FOR DATA TRANSMISSION

Since user requests cannot be all fulfilled by the existing post-office services, the NIS - Energogas team of experts opted for building of its own corporation communication network. It is based on existing leased telecommunication and telephone lines and fibre optic cables laid along the gas pipeline. This gas pipeline comprises the gas network for needs of Belgrade Power Plants.

The experience and practice in the world show that information networks are being built as private and public. This concept requests interconnection among all kinds of telecommunication networks and all kinds of transmission lines. Characteristics of networks built in such a way is that they are open for all present and future network applications.

The network for data transmission from the objects of Belgrade Heating Power Plants to the NIS - Energogas dispatching centre is based on X.25 protocol. Having followed this concept of building hybrid corporation network based on X.25 protocol, the indispensable equipment for packet switching (based on mini devices such as multiprotocol PAD and “switch” package) is being installed in Telecommunication Centre and local post offices. The complete equipment is compatible with Frame Relay and the existing JUPAK network. The modems are installed in Telecommunication Centre and on metering and regulating stations. They cover frequency ranges of the speech and have the possibility of adjusting their transmission speed and output signal level. NIS - Energogas dispatching centre disposes with fast modems and multichannel mini Frame Relay X.25 PAD, designed for reception and servicing of the signal. Block scheme of links in the system for data transmission and processing is shown in figure 1.

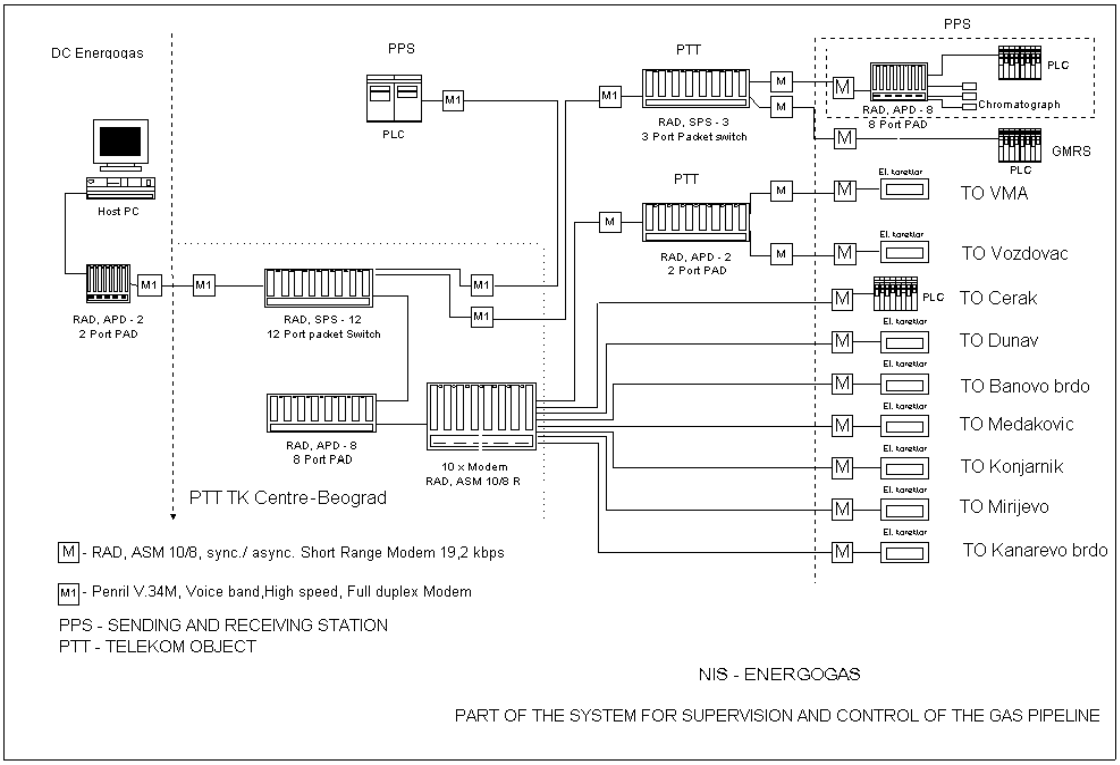

Figure 1. Block scheme of links in the system

Computers and terminals are offered connection on various levels and interfaces by telecommunication subnetworks with packet switching. The inner structure of the network is interface independent. The CCITT standardization for one packet level protocol, with the aim of accomplishing interface towards public networks, is followed by the world around adopted packet switching technology.

The existing cable infrastructure on the objects of Belgrade Power Plants was used during building of the additional cable network.

Connecting of all the objects was done according to the existing and relevant regulations and international ITU standard. Such an approach to network building enables simple expansion without costly investments.

The special advantage of such a concept is remote control and supervision of the network effected from the dispatching centre.

4. HARDWARE SOFTWARE SOLUTION

The system is based on classical PC platform under Windows NT operating system and is realized as the upgrade of the existing system for remote supervision and control of the gas pipeline. The software is implemented on existing computer and it enables the access to network users.

Process data is displayed with the help of especially developed user package. The essential data in the process is displayed on the screen, as a common report for all telemetry stations together. Numeric display of analogue measurements is showed only, with variable colour display depending on alarm limits and state of connection with particular station. The display feature and corresponding colours are adopted according to the existing telemetric system. Displays of flows and input pressures along pipeline are also available on graphic display of gas pipeline. The real coordinate display of the gas pipeline trace as viewed on the screen by dispatcher is shown in figure 2.

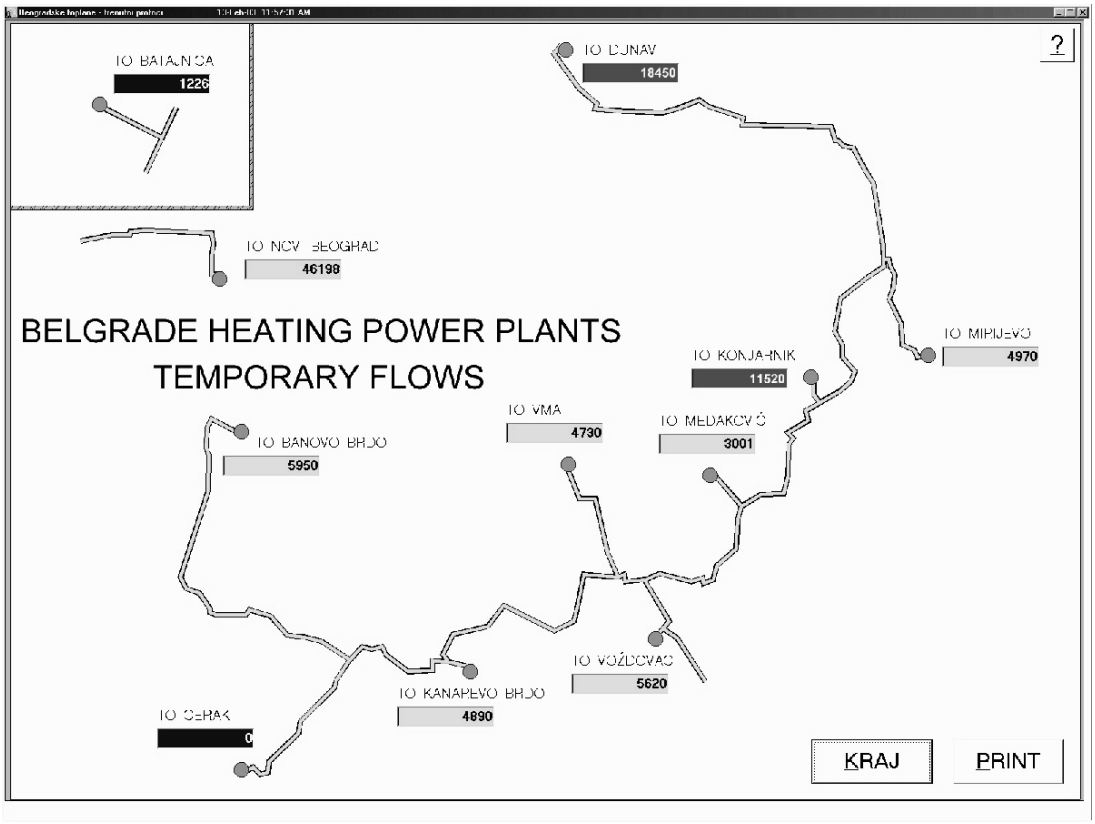

Figure 2. Gas pipeline trace

Electronic correctors are used as final devices on gas metering and regulating stations and have the function of reading meter's state, measure temperature and pressure of the gas, compute adjusted temporary and cumulative gas consumption. Interface and software for communication with corrector were developed in NIS – Energogas. Its use for various types of electronic correctors is possible after applying minimal adjustments. This approach does not suit always to equipment suppliers, but as the whole system is controlled by the operative stuff of the user, in this case the NIS-Energogas team, it proved to be a correct technical solution.

X.25 protocol enables every port (i.e. channel) to have its own particular address. Direct communication between computer and correctors is possible after assigning each corrector its proper address. Not only parameter reading from the electronic corrector is enabled this way, but its adjusting is also possible. By applying electronic corrector and by building in of certain hardware additions the execution of commands intended to limit gas consumption is also enabled.

Figure 3 shows the screen display for one metering and regulating station.

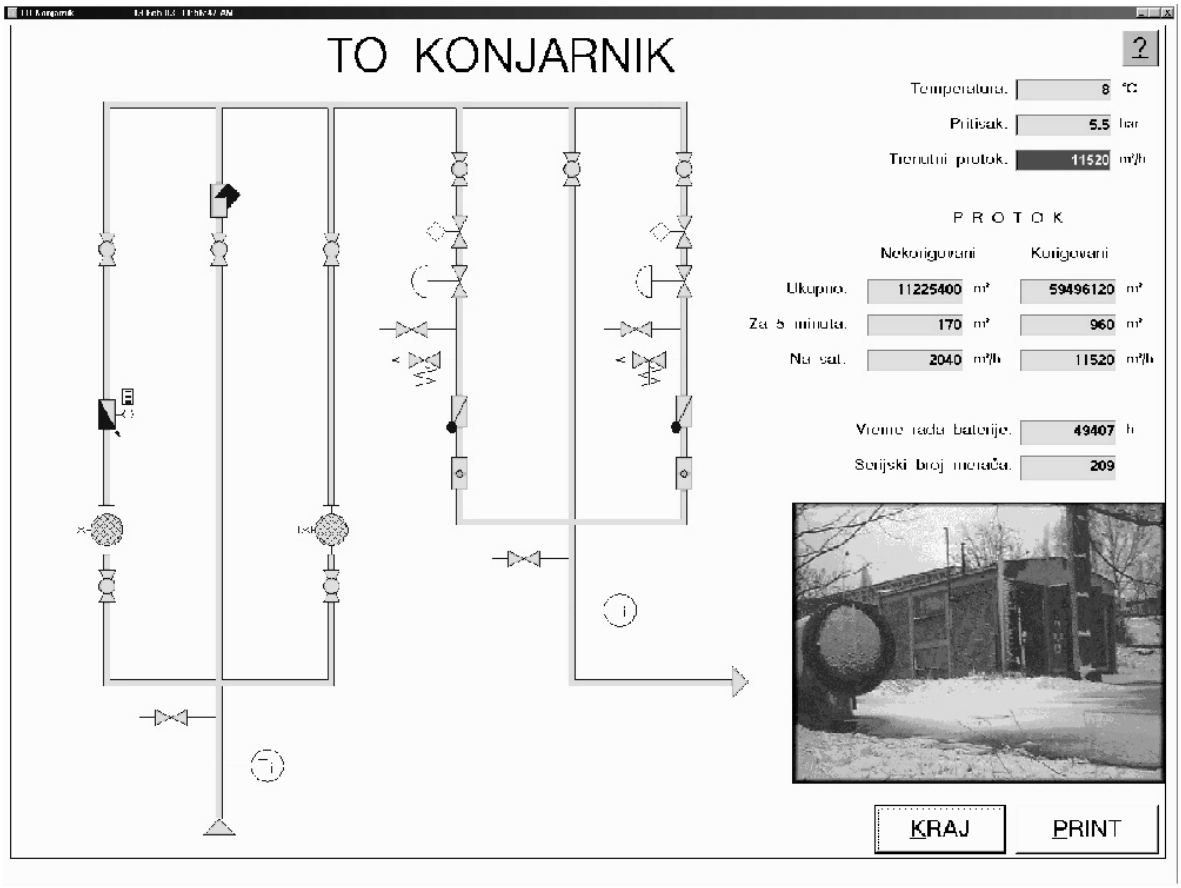

Figure 3. Display of one metering and regulating station

Figure 4 shows one of the screens for statistical report.

System for remote supervision and control of natural gas consumption on the objects of Belgrade Heating Power Plants and gas metering and regulating stations is designed in such a way that the number of metering spots, indications and commands can be easily expanded if necessary.

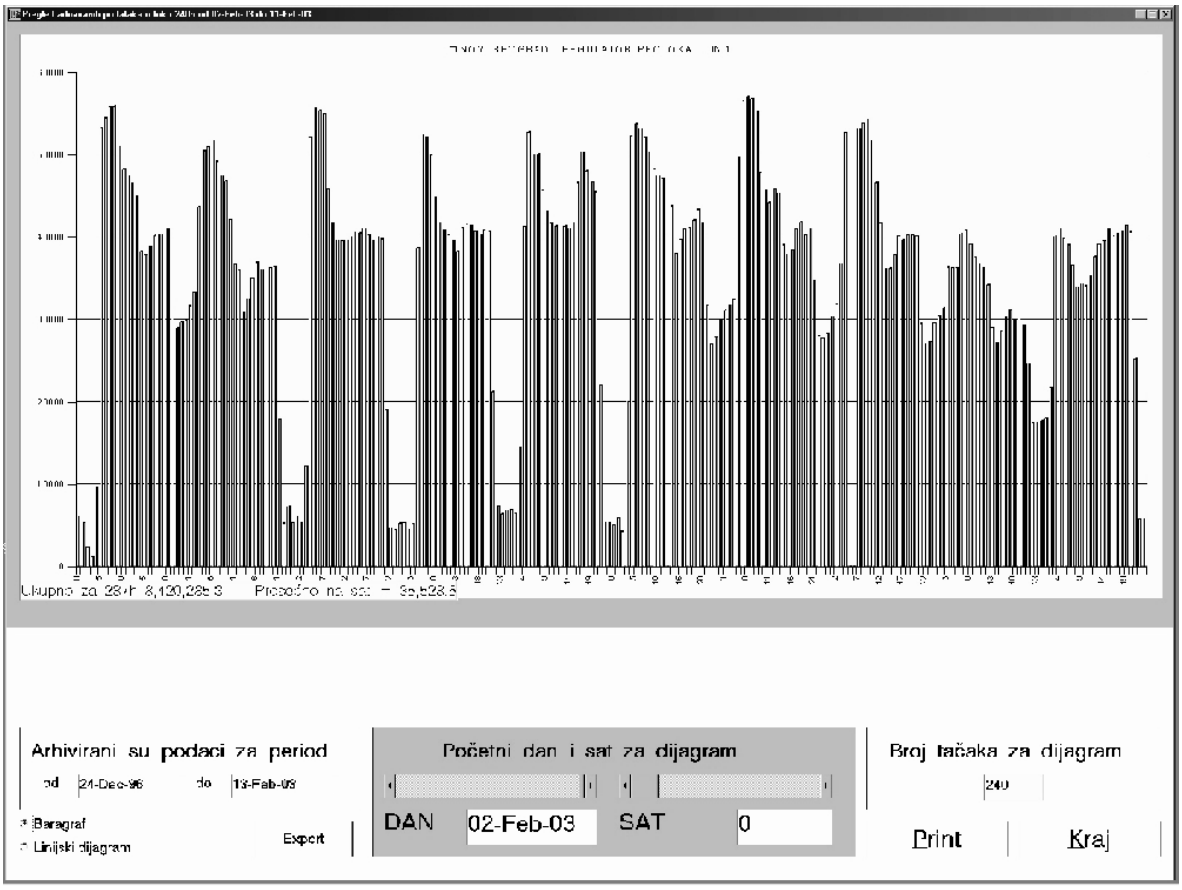

Figure 4. Archive of statistical reports

5. CONCLUSION

When the system was put in work, it enabled continual supervision and restriction of the consumption of natural gas on the objects of Belgrade Heating Power Plants. The system for remote supervision of the gas pipeline objects is based on electronic corrector and proved to be effective, reliable and cheap technical solution.

Investing in development and strenghtening of domestic information and communication market generates considerable expert base, saves capital and reduces dependency on world multinational companies.

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