



AUTOMATED DISPATCH CONTROL SYSTEM OF TECHNOLOGICAL PARAMETERS OF PUMP STATIONS OF HEAT NETWORKS

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Abstract:

As we know modern automation includes personal computers, controllers, industrial networks, and of course software. SCADA software has a special importance there. It would not be exaggeration to say that, in the last decade, the closest attention in the field of automation has been paid in this software product. The article is about modern technologies and their use.

Key Words: Modern automation, computers, controllers, industrial networks, SCADA software, operational information & Implementation of Automated dispatch control system.

Automated Dispatch Control System of Technological Parameters of Pump Stations of Heat Networks:

Modern automation includes personal computers, controllers, industrial networks, and of course software. SCADA software has a special importance there. It would not be exaggeration to say that, in the last decade, the closest attention in the field of automation has been paid in this software product.

System is designed for operational dispatch control of the main technological parameters of pumping stations and remote control of fire and burglar alarm condition.

Automation equipment of each pumping station is connected by through GPRS network to the central control unit (CCU), which receives operational information.

Implementation of Automated dispatch control system (ADCS) will reduce the cost of operation and maintenance by reducing the staff of the operating duty personnel, timely detection of emergency situations and ensuring proper security of pumping stations premises.

Typical Architecture of Automated System:

ADCS is built on hierarchical principle and it is two-staged facility.

On the lower level of the system, there are automation case (AC) of pumping stations. Controllers installed in the AC provide for the collection and primary processing of input information signals for transmission to the upper level, as well as the issuance of control actions. The AC controllers exchange data with an automated workstation (AWP) of the Central Control Unit (CCU), which is at the top level. Automated workplace of CCU with the archiving functions provides the operating personnel with convenient human-machine interface for monitoring technological parameters and management, analyzing of gathered archival data, and also provides for the formation of reporting documentation.

Hardware:

Automation case are functionally and structurally complete products, equipped with terminal blocks for connecting external circuits, properly labeled, as well as cable entries. To eliminate the possibility of unauthorized access, each AC is locked by key. AC provide stage of protection against external influences not lower than IP54 for TP according to GOST 14254-9.

Means of communication: Wireless GPRS channel is used for data transfer. In order to minimize the traffic (also, accordingly, monthly fee for using the GPRS network), the data exchange algorithm is optimized as much as possible. If the analog parameter's amount (pressure, temperature, etc.) did not changed during 30 minutes, exceeding the aperture value (adjustable parameter), data is transmitted periodically once in 30 minutes. Otherwise, data transmission over parameter that has changed by amount greater than the aperture occurs proactively, at the same point in time. Information about the activated security or fire alarm system is transmitted to the CCU immediately.

Software:

Lower Level:

- ✓ Real-time controller system (RTCS) with the support of the telemechanical channel (TM-channel)
- ✓ Krugol Dev Studio™ - integrated development environment, designed to configure the controller and create technology programs.

Upper Level:

- ✓ OPC-server of RTCS is intended for transfer of operational and archive values from the controller under operation of RTCS to any applications supporting OPC (SCADA / HMI systems)

- ✓ SCADA / HMI system for visualization of technological process (SCADA / HMI DataRate™).
- ✓ Facility of ADCS technological parameters of pumping stations of thermal networks.

Principles of Operation:

Main monitored values:

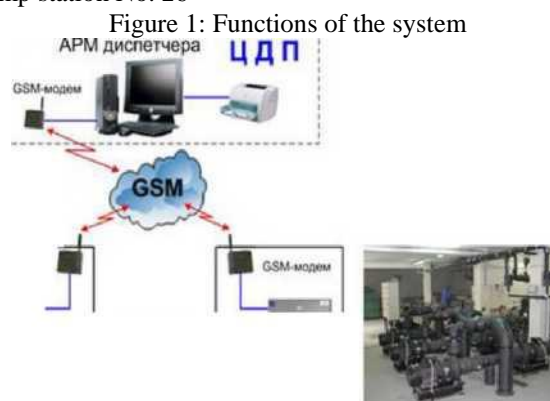
- ✓ Temperature and pressure of the heat carrier (feed / return flow from the CHP and consumers)
- ✓ Parameters of fire alarm loops
- ✓ Parameters of security alarm circuits (door opening sensors, motion sensors).

Each pumping station can be autonomously supplied or removed from the alarm. Arm / disarm can be done either remotely by the dispatcher or “in place” using the Touch Memory key. In case the pumping station is set on an alarm and fire or security sensors are triggered, buzzer is activated at the site, and emergency signal is transmitted to the dispatcher.

Explanation:

CCU - Central Control Unit, AW - Automated Workplace, AC- Automation Case

Pump station No. 1 Pump station No. 26



Information Functions:

- ✓ provide formation of screen images and output forms of information and computational tasks at the request of the dispatcher or non-operational personnel (system administrator) and include:
- ✓ collection and processing of information about condition of technological parameters;
- ✓ detection, alarm and recording of emergency situations, unauthorized entry into the premises of pumping stations;
- ✓ event logging;
- ✓ archiving history of changes in parameters on hard magnetic disk;
- ✓ shaping and issue of operational and archival data to staff;
- ✓ shaping of reporting documentation.

Signaling is formed by the Following Conditions:

- ✓ activation of security sensors;
- ✓ fire alarm triggering;
- ✓ exceeding the controlled parameters of the emergency limits set by the operator;
- ✓ failure of the communication channel with the AC pumping station.

Control Functions:

- ✓ removal / statement of pump room to the alarm “in place” using the Touch Memory key (with dispatcher notification);
- ✓ remote removal / statement of pumping station on alarm by the dispatcher.

Service Functions:

- ✓ carrying out, within regulated limits, disconnections / connections, checking and replacing elements of the system;
- ✓ manual entry (change of settings and constants of control and information processing).
- ✓ Access to system functionality
- ✓ Access to the functionality of the system is provided according to the established demarcation of access levels.

In conclusion of the research we can see the advantages of the system. We counted following advantages of the system:

- ✓ Reduced operating costs;
- ✓ Improving the reliability of pumping stations;
- ✓ Reduced maintenance costs;
- ✓ Improving the efficiency of using human and technical potential for servicing pumping stations;

- ✓ Possibility of expansion (an increase in the number of pumping stations, the connection of additional sensors and actuators to AC controller, etc.).

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