# INFORMATION AND TECHNOLOGIC PROVISION OF THE AUTOMATED SUPERVISORY CONTROL SYSTEM FOR DISTRIBUTED HOUSING AND PUBLIC UTILITIES

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The article deals with the question of creating an automated system of supervisory control of distributed energy resources, as well as organizing the information exchange between the equipment of separate functional levels by the example of the implemented ASCS (Automated supervisory control system) of distributed energy resources of OJSC “Kmaproyektzhilstroy” in Stary Oskol. The special attention is paid to the solution of problems connected with unification of protocols and integration into the system of the diverse equipment of the ASCS bottom functional level.

Keywords: ASCS, energy efficiency, information exchange, protocol, distributed energy resources.

At the enterprise of any level complying with all current trends of development of technologies, the main objective of modernization is the increase of energy efficiency and power safety level. One of the best technological actions that can help achieving the required performance for energy efficiency is the use of information systems, which allow:

1. control the distributed energy resources centrally;
2. collect, transmit and display the operational information about the parameters of the technological mode of the enterprise's operation, followed by analysis of the state of control objects in real time;
3. carry out the choice of optimum operating modes of the enterprise objects;
4. collect, transfer and display the non-operative technological information on the account and the quality control of functioning given from microprocessor devices of relay protection and anti-emergency automatic equipment and auxiliary systems (fire extinguishing, the security alarm system, etc.);
5. optimize expenses on the objects service;
6. create and fill (update) a database of significant parameters for an assessment of quality of functioning of objects of the enterprise;
7. provide the multiuser enterprise control system for the exception of the possible contingency situations connected with random errors of operators and etc.

As an example of the information system combining all the above described properties, can serve the power effective automated supervisory control system (ASCS) of the distributed housing and communal services objects, implemented in Stary Oskol, Belgorod region of OJSC "KMAproektzhilstroy" [1]

An automated supervisory control system is territorially distributed multilevel information and measuring central-station real time control system and is intended for control

and management of technological processes and equipment at the objects of the industrial enterprises and city networks of housing and communal services.

In the information structure of ASCS we can single out the three functional levels:

- data collection and acquisition systems (DCA) – the bottom and average level according to ASCS;
- operational information operating complex of the control center – the top level of ASCS

The ASCS bottom functional level represents autonomous boiler rooms with several coppers, carrying out a heat supply and hot water supply of inhabited residential districts; the individual thermal points (ITP), the sewer pump stations (SPS), sensors and actuators which are used in local control systems of these objects.

At the development and deployment of ASCS of an enterprise there occurs a problem connected with use of the diverse equipment of the bottom functional level and various extent of automation of separate objects (fig. 1.) [2-4]:

1. The manually operated elevator components and ITP, as a rule, do not have communication interfaces to combine objects into a single enterprise network. In this case, the problem is solved by installing additional sensors that determine the state of an object (primary sensors of temperature, pressure, level, etc.).
2. Autonomous boiler houses with boilers having a control system, as a rule, have in their structure a communication interface. When creating ASCS it is necessary to choose the appropriate communication controller providing the correct contact.
3. The sewage pumping station had in its construction the equipment, which gave discrete signals about it condition. Hence, for this object it was necessary to install the equipment processing discrete signals and transforming them to the corresponding signal, transmitted to ASCS.

The average level of ASCS serves for the unification of heterogeneous signals and their subsequent transfer to the top level in a correct unified form to ensure the right processing of the information. The following equipment was applied for this purpose:

1. For processing the output signal from the control panel of the autonomous boiler room coppers, transferred under the RS-485 protocol, there is used a communication controller of the i-7188EAX series, carrying out the transformation and transfer of an input signal by the Ethernet protocol.
2. When processing the output signals of the primary sensors of ITP there was used an analog input module OWEN MBA-8, receiving the analog signals of the form: 800 .. 2000 ohms, TCM 4 .. 20 mA, and the output is a signal transmitted via Ethernet.
3. For processing the output signal from pumping stations there is used an input-output module of series i-7060DIO.

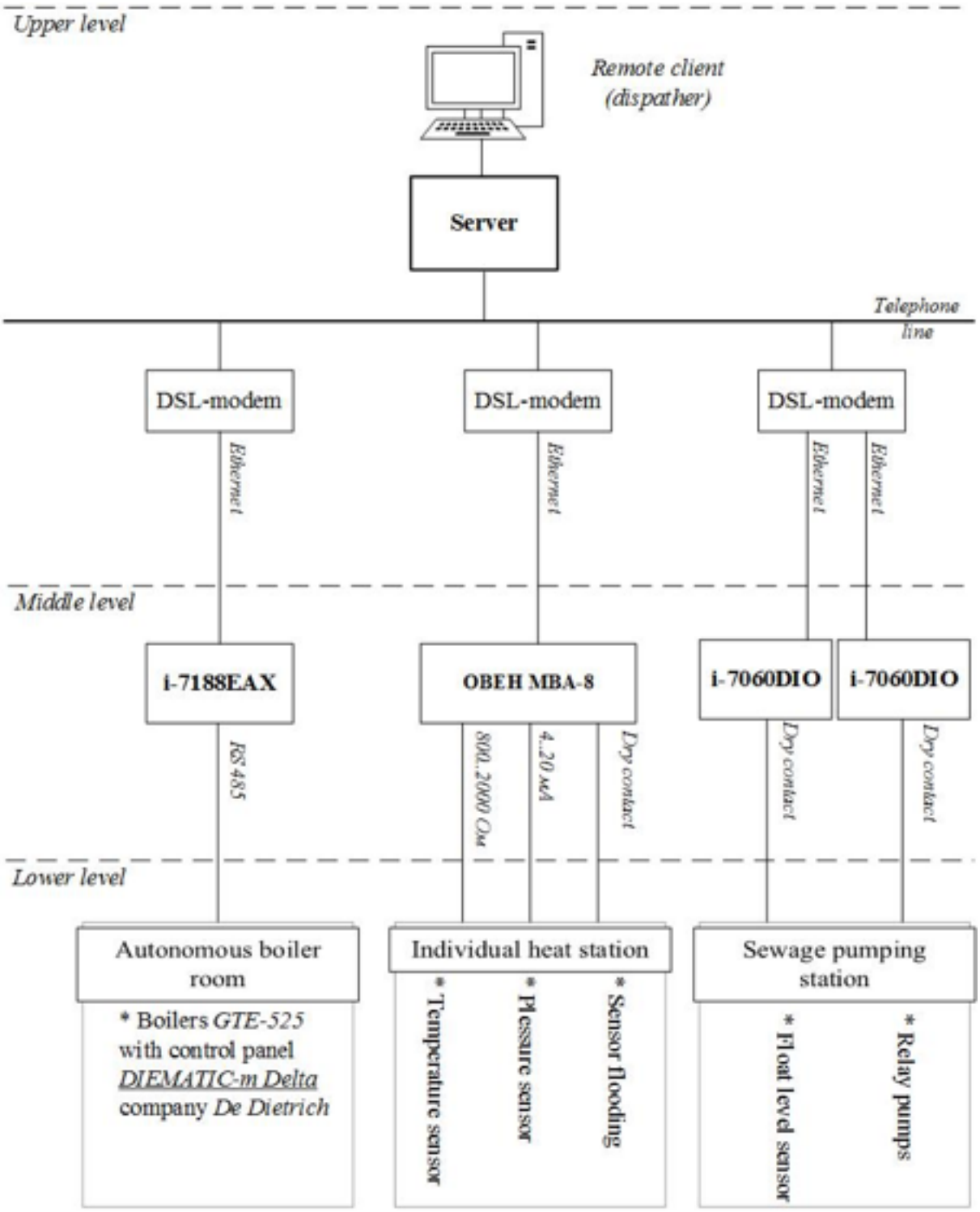


Fig. 1. Model of ASCS of the distributed objects of housing and public utilities

After ensuring the transformation of the objects' output signals to the unified form there occurs a problem of territorial remoteness of objects from each other, caused by the geographical arrangement of the enterprise branches [3]. For the solution of this problem it is necessary to create the communication lines providing reliable information transfer, complying with speed performance qualities, necessary for correct processing.

Within the city precincts this problem can be solved, using the city telephone network. Then the DSL modems, providing the correct transformation of a signal, are necessary for transforming the output unified signals. If the objects are located rather far from each other, this problem can be solved, using the technology of GSM data transmission and capabilities of the Internet, as well as the fiber-optical communication lines between objects.

The hierarchical structure of ASCS implies the central-station control of the enterprise objects, as is provided at the top level. The concept of control center means the creation of an integral block, protected against contingency and emergency situations, and providing control and management of remote distributed enterprise objects. The integral server which carries out the poll and processing of the signals coming from the control objects is required for providing the functioning of control center. Due to visualization by means of SCADA (fig. 2, 3), the operator of control center gets access to the server and is able to trace and operate the remote enterprise objects, having full and actual information on functioning of all objects included into the system of dispatching control.

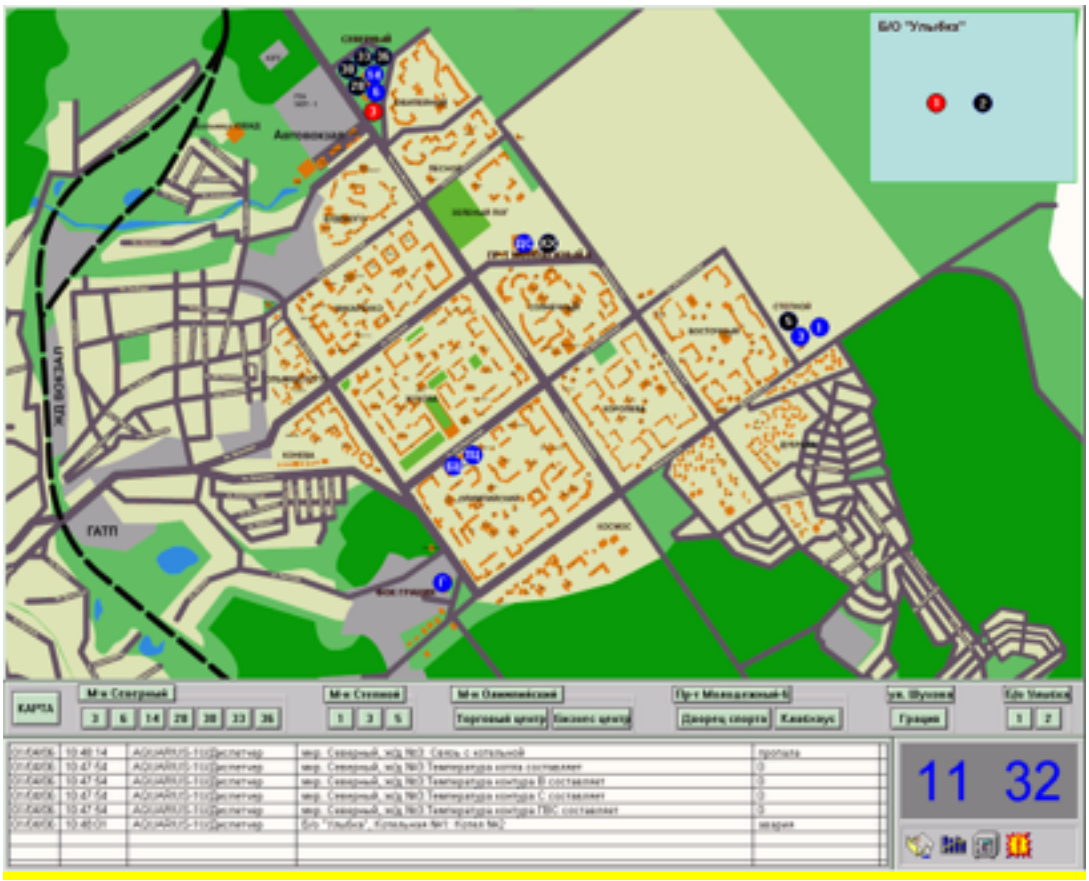


Fig. 2. The screen form of the dispatcher's automated working station

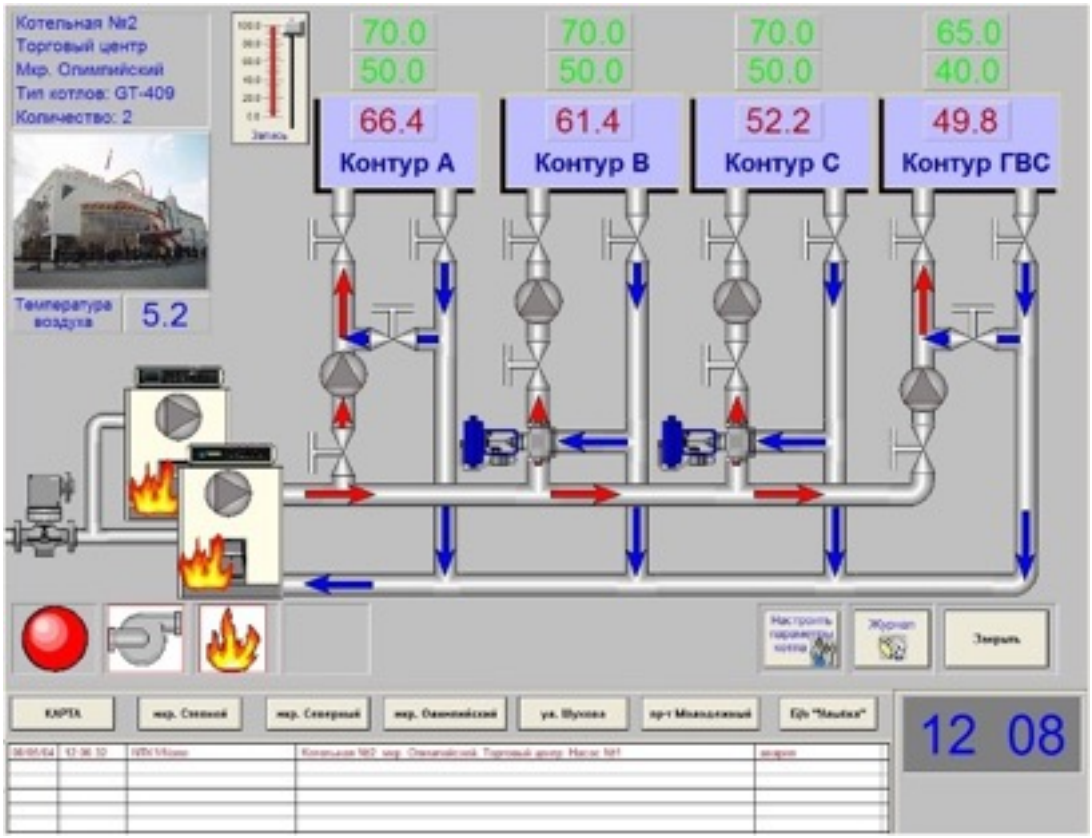


Fig. 3. The mimic diagram of the boiler house as part of ASCS of distributed energy resources.

Thus, the above described information and technologic provision allows solving the problems of synthesis, implementation and operability of the automated system of supervisory control of the remote distributed enterprise objects of various orientations. In the operating mode there is performed the batch exchange of information between all levels of the system, which allows providing the full functionality of all objects of the information system, specifying the optimum settings and operating modes of the central-station controlled equipment, and raising the level of energy efficiency and power safety of both separate technological objects, and the enterprise as a whole.

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