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AUTOMATED SYSTEM HEAT SUPPLY DISPATCHING CONTROL

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Today problems which are related to energy conservation and efficiency of energy are very important. Federal authority develops energy conservation programs. Decree №899 «Measures and programs of energy and ecology efficiency rise in Russian economy» was signed by President of the Russian Federation on 4 of July 2008. Federal law № 261 «Energy conservation and energy efficiency rise» was accepted on 23 of November 2009. There was published the main nation goal of energy conservation in this document.

It is difficult to find investing funds in energy efficiency technology in conditions of financing deficit. This is the reason to reveal projects which bring in perceptible effect after implementation. Complex projects which operate in several directions are most actual. Measures on energy efficiency introduction of automated system in housing and communal services are attributed to these projects.

Automated control systems are characterized by implementation quickness and small payback period (1-2 years). They let not only get water and electricity profits, to assure resource-saving technologies of using equipment, to raise service quality, but successfully to deal with problem of housing and communal worn assets without input of resources into modernization. Integrated approach to introduction housing and communal industrial control let us get cities progress resources without generating supply which costs are more expensive.

There are general economy efficiency results of automated control systems implementation in water supply, water disposal and heating:

- electricity economy about 30%;
- resource increasing of pipeline operating – 1,5-2 times;
- great reduction of accident number at stations;
- reduce water loss about 30% at the expense of maintenance pressure diagram with pin station accuracy in heating and water supply;
- stabilization and dependability of heating, water supply, water disposal systems;
- possibility to response to contingency in real time;
- information of life support system operation acquisition in real time;
- information of life support system operation archiving and occurred accident automatic archiving;
- possibility to control of automatic performance and minimization of human factor ;
- reduction of service staff;
- increasing quality and accessibility of housing and communal service;
- power supply reservation;
- decreasing environmental impact

LLC «KrasKom» is one of the first-rate enterprises in Krasnoyarsk. Its principal activity is rendering water supply, water disposal, energy supply and heating services to population and commercial customers. LLC «KrasKom» is progressive high-technology enterprise which is interested in current and modern technology, so automated processes

control is the leading part of its activity. High automation level implemented at the processes of central heating station.

Workflow automation operations are in progress at enterprises. Industrial control developed with taking into account automatic control systems integration, information provision on upper level, information safety requirements.

Goals of automation generally reached by standard application means: SCADA, PLC's, control program and information reflections. For automation of central heating stations was used PLC's «Kontars» which are produced in Moscow.

Example of central heating station human interface is shown bellow on Fig.1

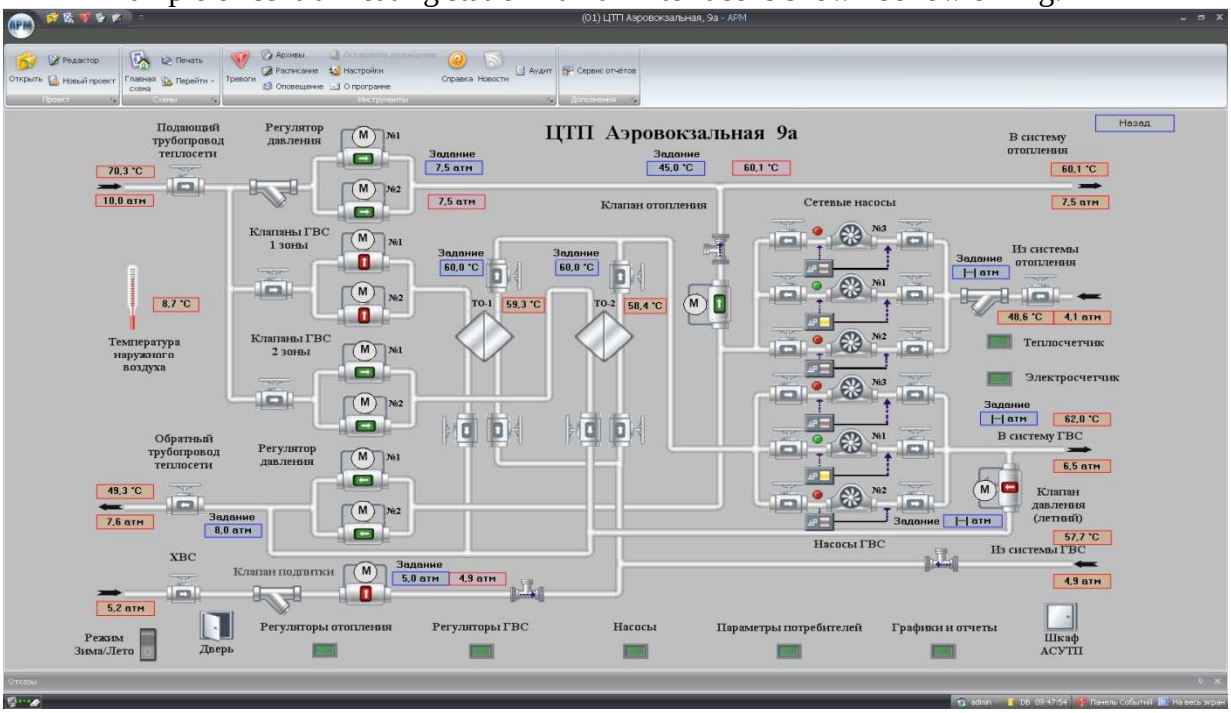

Fig.1 – Central heating station human interface of Aerovokzalnaya street

Systems network architecture consists of fourth behavioral hierarchy:

- field bus (connection with automated management systems);
- net of controller (connection of controllers);
- net of process control system (net of technological server and SCADA systems);
- enterprise network (connection of network workstations and enterprise technological servers)

Equipment of automated system of dispatching control consists of:

1. Composition of control cabinet on central heating stations:
   - frequency converter;
   - programmable Logic Controllers;
   - programmable relays;
   - power service protectors;
   - magnetic starters;
   - controls;
   - indications
2. Sensors:
   - primary loop pressure sensors of flow pipe and return line;
   - circulation loop pressure sensor of hot-water supply flow pipe and return line;
   - heating meters of central heating station primary loop;

- heating meters of central heating station secondary loop;
- temperature sensors of primary loop heat carrier;
- temperature sensors of hot-water supply flow pipe;
- temperature sensors of flow pipe and return line;
- outdoor temperature sensors;
- indoor temperature and indoor atmospheric moisture capacity sensors;
- voltage monitors;
- control phases sensors;
- loading of pump unit sensors;
- vibration sensors;
- room water filling up sensor;
- security fire sensors;

3. Central dispatching station equipment:

- personal computer;
- monitors;
- keyboard;
- mouse;
- uninterruptible power supply;
- router

Functions of the system

1. Systems pump control:

- heating system;
- hot-water supply system;
- replenishment heating system;
- cold water system;
- firefighting system
- smooth start and stop pumps, smooth productivity correction;

2. Given value control of hot-water supply heat carrier irrespectively of hot water flow rate;

3. Automatic temperature control level of flow pipe and return line accordingly to temperature diagram;

4. Intelligent control of loading hot-water supply loops and heating depend on the hours of darkness or daylight;

5. Automated system recovery after electricity resumption;

6. Fail-safety control system when frequency converter fails;

7. Electric current, load, pumps supply voltage measuring;

8. Primary sensor work control, continuous troubleshooting of equipment;

9. Secondary loop flow rate control of heat carrier;

10. Compliance with sound level decreasing and vibration of pumps safety regulations;

11. Archiving database. Operating log formation of central heating technological station equipment work;

12. Accident archive;

13. Security fire sensors

Control modes of system:

1. Control mode of valves:

- «Automatic mode» (on-line control of valves by the controllers from sensor’s feedback or program flexibility);

- «Manual mode» (exercise control of valves by local staff or remote control from central dispatching point)

2. Control mode of pumps:

- «Automatic mode» (on-line control of pumps by the controllers from sensor's feedback or program flexibility);
- «Manual mode» (pump across-the-line start by local staff or remote control from central dispatching point)

Control modes interface is presented on Fig.2

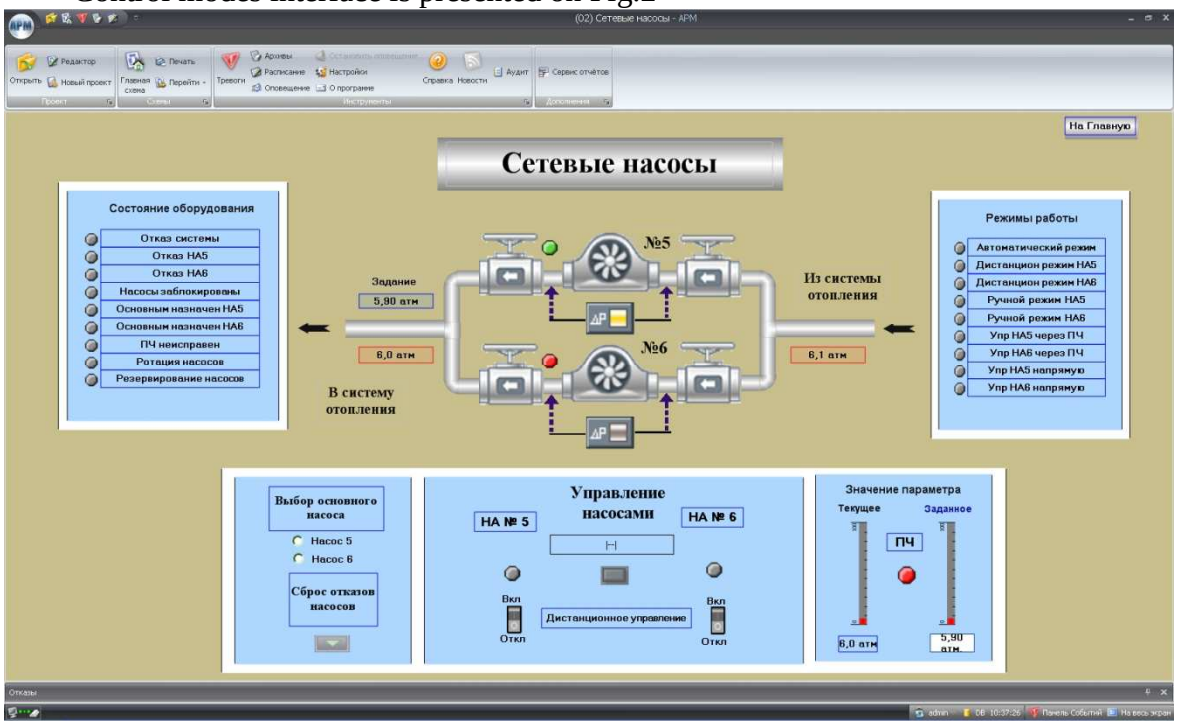

Fig.2 – Control modes interface

System protects from:

- single-phase, between-phase, three-phase short-circuits;
- overload and overheating of frequency converter;
- phase misbalance and control phase;
- excess voltage and undervoltage;
- electric motor overloading;
- loss of phase of electric motor stator;
- motor winding overheating;
- pipeline failure;
- feedback sensor failure;
- unauthorized access;
- burglary;
- hydrodynamic disturbance of pipelines, isolation valves, pumps;
- pumps dry tact;
- automatic shutdown when pump frequancy decreases or when frequancy decreas is below the limiting continuous value;
- pump automatic switch on mains supply when frequency converter fails;
- pressure shock of heating pipelines coursed by steam generation and boiling heating carrier;
- room water filling up of central heating station;
- automatic switch on reserve power supply when voltage supply fails

In conclusion it is important to station out that implementation of automated dispatching system on the stations of LLC «KrasKom», proved that it is the most efficient approach, which allows to maximize the period of payback and to minimize expenditures on construction the system.