ISSN 0040-6015, Thermal Engineering, 2013, Vol. 60, No. 4, pp. 299–304. © Pleiades Publishing, Inc., 2013.
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AUTOMATION AND HEAT CONTROL IN POWER ENGINEERING

Solving the Problems Concerned with Modernization of Power Unit Monitoring and Control Systems Using the Distributed Facilities and Technologies Available in the SARGON Computerized Automation System. Part 2: Standard Solutions for Problems Relating to Modernization of Power Unit Monitoring and Control Systems

V. A. Mendelevich

NVT-Avtomatika, proezd Zavoda Serp i Molot 6, Moscow, 111250 Russia

Abstract—Typical problems encountered in modernizing control and monitoring systems of the main thermal power equipment used at power stations are considered, and ways of solving them through the use of distributed tools available in the SARGON computerized automation system for control of essential equipment are discussed.

Keywords: automated process control system, SARGON computerized automation system, distributed system

DOI: 10.1134/S0040601513040071

According to a commonly shared opinion, multichannel rack-mounted controllers installed in a power unit control room (UCR) are best suited for modernizing the information part of the existing power unit monitoring and control system because all cables from sensors have already been laid thereto, and all that has to be done is to install the controller cabinets and connect cables to them.

However, the experience that has been gained for many years at NVT-Avtomatika shows that in reality, the situation is somewhat different. At many plants, an attempt to carry out such modernization inevitably involves the need to replace a significant part of sensors and the majority of cables and cable routes, and to solve problems connected with the use of a large number of additional marshalling cabinets and jumpers at the UCR and with placement of the computerized control system's equipment at the UCR.

In what follows, problems arising in entering the most widely used types of signals are discussed, and the solutions used in automated process control systems (APCSs) constructed on the basis of the SARGON computerized automation system (CAS) are described.

Measurement of flowrate/pressure/level parameters. The majority of monitoring and control systems (MCSs) that are subject to modernization use flowrate, pressure, and level sensors without a unified output; therefore, they must be replaced by modern sensors with the 4–20 mA output signal. However, a mere replacement of sensors themselves is as a rule insufficient: in old MCSs signals from a considerable part of sensors are wired only to local control panels (e.g., from high- and low-pressure heaters), and the majority of signals connected to the UCR are transmitted thereto via an unshielded cable that does not ensure adequate protection from interference and noise. With the usual length of the line from the sensor to the cabinet at the UCR (more than 100 m), stability and accuracy of measurements transmitted via an unshielded cable cannot be guaranteed even for analog input modules with individually isolated channels having high noise immunity. The most unpleasant thing is that interference may not show itself during "cold" adjustment carried out when the process equipment is shut down (under such conditions, the majority of interference sources are inactive), but it can make the system fully inoperable once the equipment start to operate. If such a situation occurs, there is nothing to do but replace the cables, and such replacement increases the cost for upgrading the instrumentation and control system by more than a factor of two.

Temperature measurement. The temperature signals used in power installations are as a rule picked up using thermocouples and resistance temperature detectors (RTDs). These sensors are much (by approximately an order of magnitude) cheaper than flowrate/pressure/level sensors, due to which replace-