

MONITORING CONDITION OF THERMAL OBJECT

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Thermal power plants are producing more than a third of consumed electricity and become main enterprise which generate electricity, both in Ukraine and other countries. To achieve optimal control of the combustion process it is necessary to provide individual adjustment of the following parameters: distribution of the combustion zone according to the project plan; control of air distribution and air/fuel ratio in combustion zone.

One of the main factors affecting the production process is the temperature in the furnace of the boiler. The quality and efficiency of the boiler also depends on an optimal dosage and mixture of fuel and air in combustion zone. The main problem in temperature measurement of the furnace is the high combustion temperature (about 4000-5000 °C), therefore it isn't possible to use contact measurement methods [1]. That's why control system of powerful boiler units currently often do not contain technical devices for determining temperature field inside the working furnace. And burner control is based on the signal from the flow sensor mounted on the steam line.

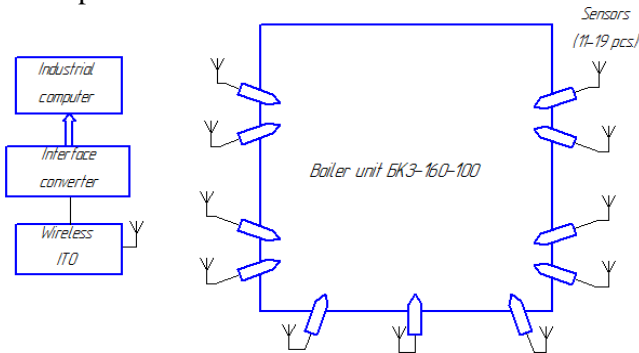
It is possible to obtain the necessary data in real time by using the video data processing system. This system provides: video image in real time; thermo graphic analysis of temperature distribution inside the combustion chamber; determining the temperature at any point in the furnace; continuous analysis of all temperatures.

On the basis of the above developing an expert system for the determining flame temperature and the furnace temperature field is necessary.

The flambeau of gas fuel is a complex heterogeneous system consisting of gaseous products of complete combustion CO_2 and H_2O and suspended black carbon particles. Triatomic flue gases CO_2 and H_2O have a number of the vibration-rotation bands located in the infrared region of the spectrum. The flue gas aerodynamic flow conditions, fuel, combustion conditions and regime have influence on the formation of the temperature field of the furnace [2].

We list some of the well-known methods of observing the flame and measuring its temperature [3]: pyrometry (brightness, color, radiate ones), thermocouple, flame pulsation registration, the use of video cameras, the spectral. Pyrometric radiation method, based on the conditions at CHP, cost, operating conditions, ease of maintenance and functionality, was

chosen for measuring flame temperature. Schematic diagram of the developed measuring complex is shown in Figure 1. The complex consists of: pyrometric sensors, the interface to the object, interface converter, industrial computer.



Pyrometric sensors are installed in standard observation windows, that allows not to make critical structural changes in the boiler furnace. The sensor consists of a photo detector and a circuit with a radio transmitter. Information from the sensors, using an interface to the object, is coming to the industrial PC, which acts as workstation.

Pyrometric complex allows to measure, visualize and save in archives temperature in the boiler furnace at the location of the sensors. This information is use to match the actual boiler behavior modes to the design modes. Complex provide an opportunity to carry out monitoring of the uniformity of distribution of the temperature field in the furnace during boiler exploitation.

1. Kostukov A.V. – Improving efficiency of enterprises.
2. Svet D.J. – Optical methods of measuring.
3. Vavilov V.P. – Thermal control methods.

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