

1.5.27. THERMOGRAPHY IN UKRAINE: RANGES OF APPLICATION AND RESULTS

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Last efforts of Research & technical centre “Thermocontrol” under Kharkov National University of Radioelectronics in the field of thermography are presented in this report.

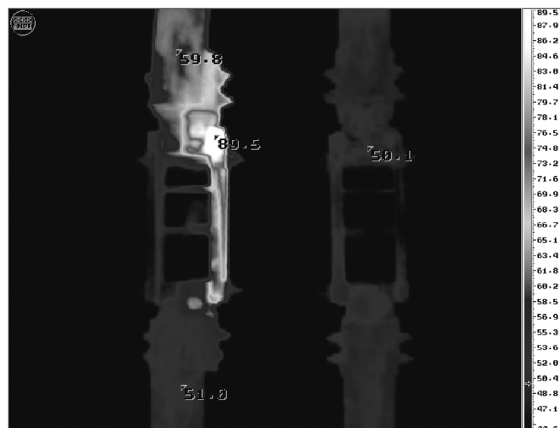
The Centre is certified by National Cosmic Agency of Ukraine (NCAU) № 000084 for the right to carry out the works in the area of space technology. Two specialists of the 3rd IT level are certified by ISO version.

The mainstream of Centre’s work for the last years is the popularization of thermography in Ukraine, where this trend of TNDT is not enough developed yet. Thereto such spheres of application of this method were considered: energetics, hydrotechnics, gas-pumping equipment, building.

Research task was not only the thermography facilities illustration by examples of real objects but also it’s techniques (procedures) developing.

In particular, the thermographic survey of energetic equipment has been done in some metallurgic enterprises of Ukraine. For example, fig. 1 shows the thermogram of bus isolating switch with revealed developed defect that can cause an accident or manufacturing process interruption. By thermographic inspections the equipment which required emergency release and rehabilitation was revealed.

Possibilities of thermography application to hydraulic facilities technical state diagnostics are researched. As it is known, non-equilibrium temperature field of dam body is one of informative signs for evaluation of waterworks structural behavior. The confirmation of it was retrieved while thermographic inspection of the upper gallery of Dnieper water power station where the plots with increased speed of water penetration into dam body were revealed. Obtained temperature distribution by gallery length is shown in fig. 2. The plots with higher temperature coincide with the plots with more speed water penetration.



**Fig. 1. The bus isolating switch (PBP 2000/10) thermogram with accident
phase overheating up on 39°C**

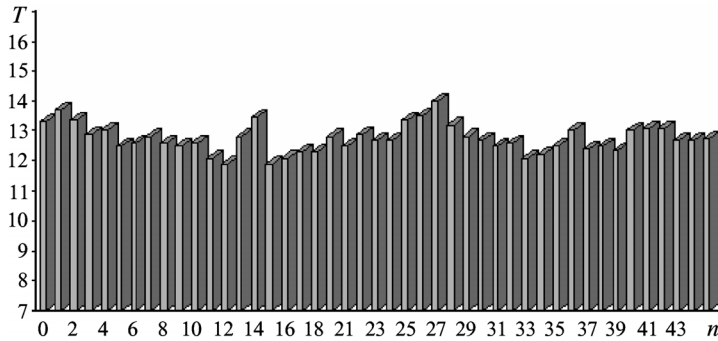


Fig. 2. Temperature distribution along upper gallery of the dam:
 n – number of overflow bay

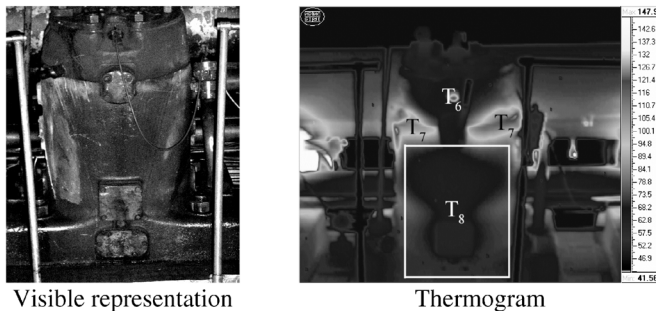


Fig. 3. Visible representation and thermogram of gas-compressor aggregate actuating cylinder

Concerning gas-transport systems thermography capabilities were estimated on such objects as gas-compressor aggregates (fig. 3). The special technique based on the probabilistic- statistical approach for the obtained infrared images analysis was developed. The entity if this technique is that for the first time suggested integral similarity test for the tested object and virtual template is calculated. When calculating this test generated by obtained infrared images histograms are used and this histograms differences by the shape, by the height as well as the position on the temperature axis are taken into account. For the sorting by the proposed integral test the versatile decision rule is proposed. The given technique approval on the real objects allowed to reveal the number of faulty units that was confirmed by the aggregate breakup. Developed technique can be applied also to any other objects which answer the concepts of thermography and hold the enough number of single-type units.

The research in the field of building envelopes state estimation was also carried out. The rapid method permitting to estimate heat loss intensity if buildings in the heating season with the shortest possible delay is developed. The proposed method is based on the

suggested relative heat loss factor calculation and the most intensive leakage places on a building surface visualization. The application of this method to the real objects showed that against the building type the relative heat loss factor can possess the values from 60% (for old buildings) to 40% (for new buildings).

Conclusions. Obtained results confirm the effectiveness of thermography use for testing and diagnostics of different industrial objects. However, to implement these methods in everyday practice of industrial enterprises in Ukraine it is necessary to create respective domestic standard base (national and branch standards, methods, regulations etc.).

The illustration of this problem solving approach can be the developed gas-pumping aggregates testing technique that allows to raise thermography to the technical diagnosis level.