

1.5.5. MODERN COMPLEX THERMAL QUALITY CONTROL AND ENERGY EFFICIENCY OF CONSTRUCTION AND INDUSTRIAL OBJECTS TECHNOLOGIES

Budadin O.N., Troitskiy-Markov T.E., WEMO Technological Institute for Energy Investigations, Diagnostics and Non-Destructive Testing, Moscow, Russia

This report is devoted to the problem of development and applications of complex technical diagnostics technologies basing on thermal fields analysis for use safety and energy use efficiency in industrial and construction objects.

Current main accent in the field of thermal non-destructive testing and diagnostics is on the equipment development, including thermo visors, methods and software for thermal fields visualization, control systems based on direct application of thermal imaging and so on.

Development and investigation of thermal control procedures and metrological certification are virtually non-existent.

Increase in number and complexity of devices, raising number of risks and emergencies, need for safe use procedures, identification of risks, energy use increase drastically raise the importance to develop and implement new all-purpose technologies for technical condition and energy efficiency evaluation.

Diversity of tasks, that accompany complex thermal diagnostics method development, has lead to face the following problems:

- complex multi-parameter thermal control processes modeling;
- thermal defectometry method development – definition of defect attributes and materials structure;
- control equipment parameters optimization;
- location of defects in materials and constructions without a standard;
- multitasking of acquisition and processing of multi-parameter data;
- development of software for data processing in the above-mentioned tasks and other.

Majority of these tasks were solved. This enabled to build a new, **firmware methodical product – basic technology for complex non-destructive thermal analysis and technical diagnostics**, to be applied in the following fields:

- industrial safety inspection;
- construction inspection;
- technical diagnostics and technical auditing;
- in-line testing with thermal control method of safe use and energy efficiency increase, in construction and industrial objects;
- in-line development of thermal control technology and new objects diagnostics;
- training and certification for thermal non-destructive control and diagnostics.

Practically it is a mobile complex of hardware (including thermal control equipment), procedures and software with multitasked data processing.

Complex thermal diagnostics includes 30 unique technologies of various industrial and construction objects technical condition determination.

More than 9,000 objects were tested using these technologies.

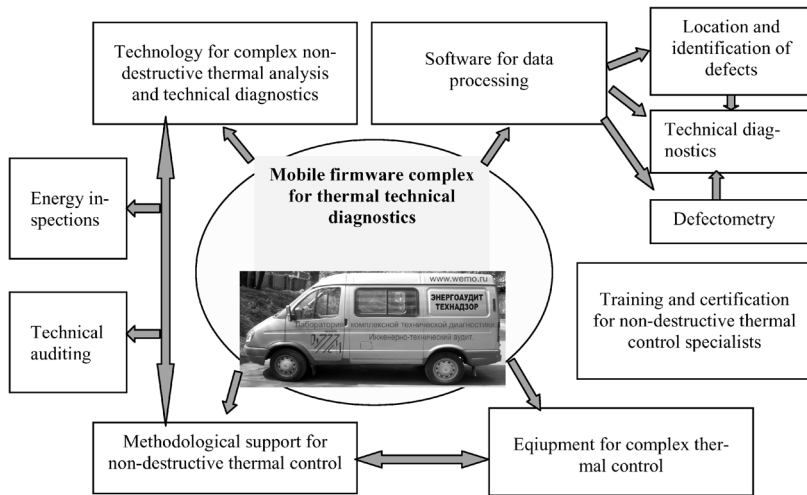


Fig. 1

Advantages of the **basic technology for complex non-destructive thermal analysis and technical diagnostics**:

- systematic, complex, all-round approach to determination of technical condition and use safety evaluation: from technology and automatic firmware development to training and certification of the relevant experts,
- in-line characterization of construction and installation material defects in various objects, e.g. electric gear, subway tunnels, thermal stations, structural units etc.,
- ability to diagnose objects in-line, in real exploitation conditions, for example detection of stress raisers in overhead traveling cranes ironworks during periodic load.