

1.12.1. NUCLEAR-PHYSICAL METHODS AND MEANS OF ANALYSIS AND NON-DESTRUCTIVE TESTING FOR NUCLEAR POWER INDUSTRY

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OJSC “NIITFA” deals for about 50 years with the development of nuclear-physical non-destructive testing and analysis means and methods.

These methods allow implementation of the following:

- non-destructive testing and diagnostics of assemblies and devices;
- testing of elementary composition of materials and objects;
- automation of production processes.

Thus, in 1970's, world first industrial transmission tomography was developed in order to validate the technology of production of nuclear fuel for NPP's (Nuclear Power Plant). The series of tomographs was created to control the production of nuclear fuel, exhausted heat-producing elements and packings, technical diagnostics of the NPP and oil-and-gas complex equipment units.

Methods for testing non-uniformity of the substance density distribution, determination of elementary composition of substance in the test object are developed. These developments have resulted in the whole series of substance composition analyzers operating on the basis of the whole variety of interaction effects of X-ray and gamma-radiation, fast and slow neutrons, beta-particles. Instruments are created, which are used at all stages of nuclear fuel production (geologic exploration, mining, production of powders, pellets, heat-producing elements; their operation at NPP).

Basing on these developments, we have developed methods and equipment for non-destructive analysis and testing of objects in other industry branches. World first industrial gamma-activation complex sets were created to determine the gold content in an ore mineral, which are applied for planning mining activity during gold extraction.

The prospective development directions for analysis and non-destructive testing means for nuclear power industry are:

- Improvement of accuracy and sensitivity of NDT and TD measuring means (primary transducers) and their metrological support.
- Combining of methods and technical means in order to increase informativeness and to take into account factors influencing measurement results.
- Increase of automation level and measurement remoteness. Systemacity and completeness of data massive.
- Increase of the level of personnel readiness to operation and abnormal situations.

Exclusion of (critical) operator's mistakes for the account of strict functionality of systems and sensors.