

1.9.6. DEVELOPMENT OF COMPUTER TOMOGRAPHY METHODS FOR TECHNOLOGY MATURATION IN NUCLEAR POWER ENGINEERING AND INDUSTRY

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Rapid development of nuclear industry and techniques has resulted in creation of new technologies and unique equipment in nuclear instrument engineering and nuclear industry, which find application in other industry branches (space and aviation industry) as well.

Further development of computer tomography methods is one of the prospective directions of non-destructive testing. Its advantages are:

- Complex inner structure of article is reproduced without overlapping as it is on the section drawing.

- Materials of different density and composition are distinguished clearly.

- Dimensions of any inaccessible cavity and wall can be measured with accuracy being better than 0.05 mm. Defects in the form of pores and inclusions are detected distinctly. Cracks with opening of 50 μm are detected confidently irrespective of their orientation.

- By sensitivity to local defects, small irregularities of geometry and density inside of articles with complex inner structure, computer tomographs exceed by a factor of 100 possibilities of traditional non-destructive testing means.

- One of the main distinctions of computer tomography methods developed in OJSC “NIITFA” consists in that tomogram of examined object is formed in the form of a matrix array in physical units (g/cm^3).

In NIITFA, radiation computer tomographs are developed intended for application:

- in nuclear power industry (testing of fuel elements and fuel packings, containers with radioactive wastes);

- in aviation and space industry (testing of parts and subassemblies of engines, pneumatic and electric systems);

- in geology (examination of core samples with heavy metals and samples in steel shells).

Presently, works are carried out in following directions:

- improvement of quality of images distorted in the process of their formation, transmission and recording, including by means of intrascopes;

- development of tomography on the base of not collimated scattered radiation making possible to implement not only visual reconstruction of the inner structure of surface layers of an object with unilateral access to it, but to obtain numerical distribution of Compton scattering with high resolution.