

5.1.23. TRAINING OF EXPERTS IN THE FIELD OF TECHNICAL DIAGNOSTICS

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Modern diagnostics of equipment and structures state, possessing a large arsenal of various physical methods and means, already does not limit itself to flaw detection problems. It is more and more widely used at solution of problems of materials' actual mechanical characteristics determination.

In connection with this circumstance, methods of engineering diagnostics combining fracture mechanics, physical metallurgy and non-destructive testing occupy the foreground. Such methods incorporate, first of all, methods of stress-strained state (SSS) testing.

Nowadays the topic of "Stress testing" is relevant both for quality control of engineering products and in the course of operation during the lifetime assessment of metal components.

The Independent Body for Personnel Certification in the field of non-destructive testing (NDT Certification Body) Energodiagnostika Co. Ltd in the course of experts training in the metal magnetic memory (MMM) method provides compulsory consideration of the stress testing problems and the ways of their solution based on the MMM method.

A specific feature, which distinguishing the MMM method from other NDT methods, is that it detects concentration of stresses on defects, i.e. evaluates the extent of their danger for damaging development and assesses the stress-strained state of metal and welded joints.

Three parts of the new ISO Standard on the metal magnetic memory method – ISO 24497-1:2007(E), 24497-2:2007(E), 24497-3:2007(E) are published.

Such active development of this direction of non-destructive testing and engineering diagnostics was taken into account in the latest edition (2005) of the International Standard ISO 9712 "Non-Destructive Testing. Qualification and Certification of Personnel", which introduced the new type of inspection – "Strain Testing" along with conventional methods.

In 2005 the Russian Society for Non-Destructive Testing and Technical Diagnostics (RSNDTD) approved the "System of voluntary personnel certification in the field of non-destructive testing and diagnostics", where "Stress testing" was included in the list of NDT methods.

With introduction of the new NDT type – "Stress Testing" in the new edition of ISO Standard 9712 it is required to solve the problem of specialists training in this direction.

SSS assessment is the most significant part of the process of experts training in the field of technical diagnostics.

Experts of Energodiagnostika Co. Ltd developed a program for training of experts in the subject "SSS testing".

During training great attention is paid to studying of the following National Standards:

- GOST R 52330–2005. Non-destructive testing. Stress-strained state tests on industrial objects and transport. General requirements.
- GOST R 53006–2008. Engineering diagnostics. Estimation of potential dangerous objects lifetime on the basis of express methods. General requirements.

These standards were for the first time developed by the experts of Energodiagnostika Co. Ltd and there are no analogues in Russia and abroad.

Table 1 presents the list of topics included in the program for experts training in the subject "SSS testing".

1. Basic sections of the program of specialists training in the field of NDT under the topic “SSS Testing”

N	Topic name	Hours
1	Study of the “Provision about the order of technical devices, equipment and constructions safe operation period prolongation at hazardous industrial objects” (GD 03-484-02)	4
2	Problems of ageing equipment residual life assessment	2
3	Analysis of IO state based on technical documentation (operational, repair, design). Analysis of equipment failures by units and reasons. Reliability criteria	4
4	Study of the “Methodical guideline for residual life assessment of potentially dangerous objects under control of Rostekhnadzor” (GD 09-102-95). Study of branch GDs on life assessment	6
5	Study of standards on engineering diagnostics GOST 27.004-85 and safety GOST 27.002-89	4
6	Basics of fracture mechanics. Energy criteria	8
7	GOST R 52330-2005. Non-destructive testing. Stress-strained state tests on industrial objects and transport. General requirements	4
8	GOST R 53006-2008. Engineering diagnostics. Estimation of potential dangerous objects lifetime on the basic of express methods. General requirements	4
9	Methods and instruments for stress-strained state (SSS) testing. Theory and practice	8
10	The procedure of SSS and metal’s mechanical properties inspection methods and flaw detection methods application at life assessment	8
11	Drawing up of expert conclusions at equipment life assessment	4
12	Laboratory classes. Sitting for a practical examination in methods of SSS testing, mechanical properties investigation and flaw detection methods	16
13	Examinations	8
	TOTAL:	80

References:

1. **Vlasov V.T., Dubov A.A.** Analysis of reasons for materials’ stress-strained state (SSS) diagnostic means low effectiveness. Stress-strained state inspection of industrial equipment and metal structures at residual life assessment / International Workshop. Contributions Digest under edition of TC-132 Coordinating Council Chairman Professor A.A. Dubov. Moscow: Energodiagnostika Co. Ltd, 2005. P. 8–22.
2. **Dubov A.A.** Metrological problems of equipment stress-strained state assessment and ways of their solution based on the metal magnetic memory method. Stress-strained state inspection of industrial equipment and metal structures at residual life assessment / International Workshop. Contributions Digest under edition of TC-132 Coordinating Council Chairman Professor A.A. Dubov. Moscow: Energodiagnostika Co. Ltd, 2005. P. 23–31.
3. **IIW-Document V-1219-02.** Dubov A.A., Demin E.A., Milyaev A.I., Steklov O.I. The Experience of Gas Pipelines Stress Strain State Control with Usage of the Metal Magnetic Memory Method as Compared to Conventional Methods and stress Control Means.
4. **Vlasov V.T., Dubov A.A.** Physical theory of the “Strain-failure” process. Part I. Physical criteria of metal’s limiting states. Moscow: ZAO “TISSO”, 2007. 517 p.