

TOTALS OF THE METAL MAGNETIC MEMORY METHOD INTRODUCTION IN RUSSIA, POLAND AND OTHER COUNTRIES

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At present the following guidance documents are developed and practically applied based on the method of metal magnetic memory in power engineering, petrochemistry, gas industry and in other industries:

- GOST R 52005-2003. Non-destructive testing. Metal magnetic memory method. General requirements.
- GOST R 52081-2003. Non-destructive testing. Metal magnetic memory method. Terms and definitions.
- GOST R 52330-2005. Non-destructive testing. Stressed-strained state test on industrial objects and transport. General requirements.
- ST RWS 004-03. Non-destructive testing. Welded joints of equipment and constructions. Method of metal magnetic memory.
- GD 10-577-03. Standard instruction for metal control and lifetime prolongation of boilers, turbines and pipelines main units at thermal power stations.
- GD 34.17.446-97. Technical guideline for engineering diagnostics of heating surface pipes of steam and hot-water boilers.
- GD 34.17.437-95. Technical guideline for engineering diagnostics of welded joints on pipelines and vessels (temporary document).
- GD 51-1-98. The technique for on-line computer diagnostics of local gas pipeline segments using the metal magnetic memory.
- GD 03-380-00. The instruction for inspection of ball vessels and gasholders for pressurized liquefied gases storage.
- GD 12-411-01. The instruction for diagnostics of gas pipelines underground networks.
- GD 102-008-2002. The instruction for diagnostics of pipelines technical condition by non-contact method.
- GD 08.00-29.13.00-KTN-012-1-05. The regulations for procedure of engineering examination and lifetime prolongation of oil pipelines fitting.

- GD 16.01-60.00-KTN-085-1-05. The technique for diagnostics and certification of the ODS technological oil pipelines.
- MR-10-72-04. Methodical recommendations for technical condition assessment and residual life estimation in order to determine the possibility to prolong elevators safe operation life.

The techniques and methodical guidelines developed by Energodiagnostika Co. Ltd and agreed with State Engineering Supervision of Russia (Rostechnadzor):

- Technical guideline for engineering diagnostics of pipelines.
- Technical guideline for engineering diagnostics of vessels and apparatuses.
- The technique for assessment of steam boiler drums condition.
- The technique for assessment of boiler and steampipe bends condition.
- Technical guideline for magnetic inspection of elevators metallic structures.
- Technical guideline for magnetic inspection (MMM method) of metallic structures of lifting machines.
- Technical guideline for engineering diagnostics of electrical rotary pump systems (ERPS) end parts.

The techniques and methodical guidelines developed by Energodiagnostika Co. Ltd:

- The technique for assessment of steam turbine rotors condition.
- The technique for assessment of steam turbine blades condition.
- The technique for control of turbine rotors flushing holes.
- The technique for assessment of individual parts condition in turbine equipment (studs, bearing inserts, etc.).
- The technique for assessment of turbine bodies, cylinders, lock and control valves condition.
- The technique for assessment of generator sleeve tubes condition.
- The technique for assessment of compressor system blades and rotors condition.
- The technique for control of babbitt abutment density on sliding bearing inserts.
- The technique for detecting mechanical stress concentration zones in gear wheels.
- The technique for control of crane pivots, buckets, hooks and hook hangers.

- Technical guideline for engineering diagnostics of compressor-boring pipes and couplings.
- Technical guideline for in-pipe diagnostics of heat exchangers.
- The technique for control of production trees at oil and gas fields.
- Technical guideline for non-invasive magnetometric inspection of gas and oil pipelines using TSC.
- Technical guideline for inspection of large-diameter pipelines (\varnothing 530-1420mm) using specialized scanning devices and the MMM method.
- Technical guideline for inspection of rolling-mill working and back-up rolls.
- Technical guideline for \varnothing 2,0 and \varnothing 2,6 steel wire inspection.
- Technical guideline for inspection of locomotive power components (frog, shaft, spline joints).
- The technique for control of stress distribution in tightened bolted joints.
- The methodical guidelines for engineering diagnostics of high-voltage line derrick guys fastening units.
- The technique for detection of mechanical stress concentration zones in products and equipment.

Energodiagnostika Co. Ltd has developed and produces on a full-scale basis the following specialized inspection instruments and the appropriate program software:

- Tester of Stress Concentration Magnetometric TSCM-2FM and advanced TSCM-2FM.
- Electromagnetic Indicator of Cracks EMIC-1M, EMIC-2M.
- Testers of Stress Concentration with scanners on the basis of microprocessor TSC-1M-4, TSC-2M-8, TSC-3M-12, TSC-4M-16 and TSC-5M-32.
- Tester of Stress Concentration on the basis of Notebook with 32-channels scanner.
- The “MMM-System” software for computer processing of MMM-inspection results using Windows’95-2000/XP/Vista.
- The “MMM-Lifetime” software.

The instruments are certificated in Gosstandard of Russia and are included in the State List of Measuring Instruments. Certificates RUC.34.003.A No.22257 and No.22258.

Since 1996 the Russian and International Centre for experts training and certification by the method of metal magnetic memory with issuing of Level I and II Certificates operates in Moscow. The branches of the centre operate in Warsaw and Beijing. As of January 2009, more than 1500 experts in Russia, more than 300 experts in China, 70 experts in Poland and more than 60 experts in other countries passed training.

The first, second, third, fourth and fifth International Conference «Equipment and structures diagnostics using the metal magnetic memory» was held in Moscow in 1999, 2001, 2003, 2007 and 2009. The conference proceedings were considered at meetings of the International Institute of Welding (IIW).

During the period from 1994 till 2008 45 IIW documents with positive resolutions on the metal magnetic memory method were issued.

The International Standard ISO 24497-1:2007(E), 24497-2:2007(E), 24497-3:2007(E) on the metal magnetic memory method is approved in 2007 as a result of positive voting among 18 IIW member countries and more than 10 ISO Committee countries.

The metal magnetic memory method and appropriate testing instruments are used at more than 1000 Russian enterprises. Besides Russia, the method was implemented at a number of enterprises of 26 countries: Argentina, Angola, Australia, Bulgaria, Byelorussia, Canada, China, Czech Republic, Finland, Germany, India, Iraq, Iran, Israel, Kazakhstan, Latvia, Lithuania, Macedonia, Moldova, Mongolia, Montenegro, Poland, Serbia, South Korea, Ukraine, USA.