

1.11.17. NEW DEVELOPMENTS IN THE FIELD OF MAGNETIC TESTING OF STEEL PIPES APPLIED IN OIL-AND-GAS INDUSTRY

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In the Institute of the Physics of Metals, UrO RAS, installations are developed for magnetic non-destructive testing (NDT) along the whole perimeter (and across the whole wall thickness) of straight-seam electrically welded pipes manufactured under GOST R 52079, GOST 10705, GOST 3262 and others within technological flow of their production (installation UMD-101M), as well as tubing strings and casing pipes in the process of their manufacturing and recovery of used tubing strings (installation UMD-104M). These installations meet completely requirements of ISO 9402 and ISO 9598, as well as ASTM (E570-91), and have found already wide industrial application.

They are based on single-crystal, thin-film array transducers (AT) manufactured applying advanced technologies. As magnetic sensitive elements (ME), they use probes based on the effect of magnetic resistance anisotropy in ferromagnetic film, where new, proposed by us principle of measurement of magnetic field strength is implemented. It is possible to produce ME-based array transducers in big quantities. As a result, possibility appeared to arrange 100% NDT of electrically welded and hot-rolled pipes.

Magnetic flaw detector UMD-101M (fig. 1) is used, as a rule, with continuous pipe within technological flow.

With slight modifications (in mechanics), it can be applied for incoming (outgoing) testing of precut pipes.

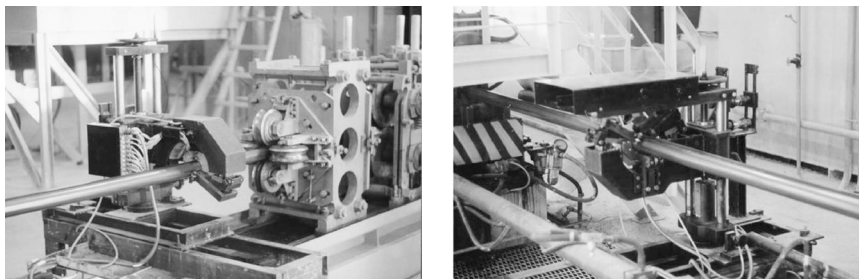


Fig. 1

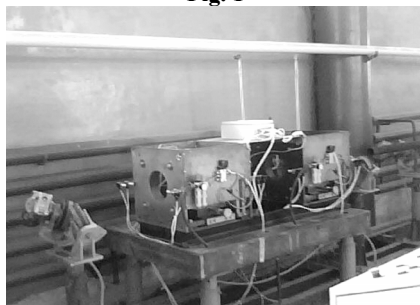


Fig. 2

Distinctive features of flaw detector UMD-101M are:

- possibility of testing pipes without their rotation;
- possibility of testing oil-and-gas line pipes along the whole perimeter (and across the whole wall thickness);
- due to high sensitivity of ME's of new generation, testing is performed with working gap within (3–4) mm;
- possibility of detection of both longitudinal and transverse or obliquely positioned defects, as well as of micro-cracks with opening within 5 – 10 μm ;
- possibility of detection of defects conditioned by the breach of welding modes like burns and adhesions of edges in the area of weld seam.

Installation UMD-104M (fig. 2) is intended for magnetic flaw detection of tubing strings and drilling pipes with diameter of 48 – 114 mm and wall thickness of up to 10 mm in the process of their manufacturing and outgoing testing, as well as during recovery of used pipes. It is distinguished by possibility to test pipes with screwed on couplings and by small overall dimensions of measuring position.