

Non-Contact Magnetometric Diagnostics of Pipelines Using the Metal Magnetic Memory Method

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The non-contact magnetometric diagnostics (NCMD) of buried pipelines (oil and gas pipelines, heat lines, water supply lines, etc.) has been developed by Energodiagnostika Co. Ltd. since 2000 based on the 25-year experience of the metal magnetic memory (MMM) method application (ISO 24497-1:2007(E)). NCMD is based on measurement along the pipeline route of the Earth's magnetic field intensity (He) distortions caused by variation of the pipe metal magnetization in stress concentration zones (SCZs) and in zones of developing corrosion-fatigue damages. The paper describes the experience of complex diagnostics of buried pipelines based on NCMD, the MMM method and conventional methods of non-destructive testing. Based on NCMD results, the most strained pipeline sections are determined for their opening and additional control by the MMM method, ultrasonic testing and other NDT methods. On opened pipeline sections the MMM method is used to determine the presence of defects and the mechanical properties of the metal by hardness parameters. Inadmissible defects are removed, and the actual mechanical properties (yield strength and ultimate strength) are taken into account in check strength calculations. The inspection should provide the answer to the following question: "Where and when should a damage or an accident be expected?". If this task is solved, then the possibility of timely replacement or repair of a potentially hazardous section is provided. Application of NCMD in combination with additional inspection of pipelines (UT, eddy current, etc.) in prospect holes determined by NCMD is aimed exactly at solution of this problem. The paper presents the experience of NCMD of buried polyurethane foam insulated pipelines in order to detect girth welded joints with developing damage.