

Metal magnetic memory testing of welded joints of ferritic and austenitic steels

Abstract. The method of the metal magnetic memory testing is a passive method of non-destructive testing based on the residual magnetic field (RMF) of a component. It allows the localization of stress concentration zones in the objects under examination. The defects in welded joints are places of stress concentration. Also, due to the geometric notch effect and thermal deformations after welding, the welded joint is a stress concentrator. Therefore, not all indications obtained in the method of the MMM testing are defects in the common, standard meaning. Additionally, in the weld seams of austenitic steels, the non-uniformity of delta ferrite in the joint results in changes in the RMF distribution and gives rise to indications. The paper presents the ways of examination and assessment of welded joints by means of the method of the MMM testing. The presented research methodology is the outcome of a synthesis of own experience and the provisions of standards ISO 24497-1, 2, 3: 2007. The results obtained in the MMM testing were compared to the results of the radiographic testing (RT). It was found that the MMM testing allowed the detection of imperfections, including defects, in welded joints at the production stage. Knowing the potential of the method of the MMM testing it seems well justified that it should be used in the examination of welded joints at the operation stage. These joints, after non-destructive testing at the production stage, are not free from defects. The defects, together with imperfections at the micro-level, concentrate stresses from working loads. Wear processes and the development of micro- and macro-cracks proceed in them the fastest. By finding the stress concentration zones, the areas of potential cracks can be found. The development of reliable procedures of examination and assessment of welded joints with the use of the method of the metal magnetic memory testing still needs a lot of research.