1.13.3. INTERCONNECTING METHODS OF NONDESTRUCTIVE TESTING WELDED TUBES IN THE STREAM OF MANUFACTURE

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In the report questions interconnecting non-destructive testing (NDT) quality monitoring which are indissolubly twisted in technological operations of manufacture longitudinal welded tubes of the big diameter are considered and provide the complex testing of elements of a tube in which formation of defects is the most probable by manufacture of a tube and the zones of a tube participating in formation of a ring welded seam at construction of pipelines. Methodical questions of the automated ultrasonic control of a welded seam are investigated. Normative documents and standards on which the control of welded tubes over their purposition and a scope is carried out are systematized.

In technological operations of manufacture of tubes distinguish two stages of control operations: technological and delivery. At a technological stage interconnecting the following methods NDT: automated ultrasonic testing (AUST) of welded seams, radioscopic testing (RT) of the marked defective sites of a welded seam, manual ultrasonic testing (MUST) of the sites marked AUST, but not confirmed RT, RT the repaired sites of a welded seam, MUST the repaired sites of a welded seam. At a delivery stage the complex of the following methods is used: AUST welded seams, AUST the ends of tubes, RT the ends of welded seams, visual survey and repair of defective sites of tubes, rechecking MUST a welded seam and MUST the ends of tubes. If as a result of indication of defects, a scrap of the end of a tube it is impossible, the tube is rejected, if scrap is possible – the end of a tube is cutting-off, and it comes back to a position of the beginning of the control of the end of a tube. If all elements of a pipe are recognized suitable, the tube is translated in a position of magneto-luminescent testing (MLT) of a facet of tubes. In case of successful passage of the given operation, final acceptance is made and on each tube the passport is formed. In case of revealing defects of a facet, it is made a piece of the end of a tube, and it comes back to the repeated delivery control of the ends, or is rejected.

In conditions of manufacture longitudinal welded tubes of the big diameter of JSC "VSW", for realization of the listed methods of NDT the following systems and the equipment are used.

Technological AUST welded seams it is carried out by installations HK360, HK361, intended for revealing defects in a seam of longitudinal and cross-section orientation, in a technological stream before hydrotests. AUST it is equipped with the automatic sound, light signal system and paintmarker for a mark of defective sites and sites of deterioration of acoustic contact. On installation the laser system of tracking a welded seam with accuracy ±1 mm is established. For detection of longitudinal defects, depending on thickness of a wall of tubes, two pairs inclined piezoelectric probes (probe) with slot-hole contact and up to three pairs dual immersion converters working on a method "tandem" are used. One or two pairs are applied to detection of cross-section defects in a seam immersion the converters, settling down above a welded seam and providing input of ultrasound directly in it under a corner of 45 degrees. Methodical questions of the control and decoding of results of the control are in more detail considered in the report. Fixing of results of the control of tubes is made in memory of the computer complex of installation, with the subsequent record on CD carriers and transfers to archive.

RT defective sites of a welded seam of tubes it is carried out by the equipment of firm "YXLON", "SEIFERT", "ASK-RENGEN". RT sites of welded seams of the tubes

having marks of the automated ultrasonic control over presence of defects and sites of seams after repair by welding are exposed. Fixing of results of the control of tubes is made in memory of computer complex RT, with the subsequent record on CD carriers and transfers to archive.

MUST welded seams it is carried out by installations on the basis of ultrasonic flaw detectors UD2-12, UDC-201P and SKARUCH. Installation of the manual ultrasonic testing is intended for rechecking and estimations of deficiency of sites of the welded seams defective by installations AUST, but nonvalidated by installations RT, and also for the control of sites of the seams repaired by removal of defects with the subsequent tea leaves and polishing.

Delivery AUST welded seams and the ends of tubes it is carried out after hydrotests of tubes by installations SNUP-LO/OFF-L-REP with the automatic sound, light signal system and paintmarker for a mark of defective sites and sites of deterioration of acoustic contact, to registration of the report of the control. The structure of acoustic system of installation and decoding of results of the control are considered in the report.

AUST the ends of tubes it is carried out by installations HK362 intended for revealing of defects such as longitudinal cracks and stratifications in the basic metal on all perimeter of trailer sites of tubes, in a technological stream of shop after hydrotests. HK362 with the automatic sound, light signal system and paintmarker for a mark of defective sites and sites of deterioration of acoustic contact, to registration of the report of the control. For the control of tubes it is used four acoustic blocks, on two each end, carrying out scanning of both ends of a tube simultaneously with volume of the control over 150 mm. Each acoustic block will consist of two piezoelectric probes, one of which separately - combined, one is used for detection of defects such as stratifications, and inclined probe for detection of longitudinal defects.

RT the ends of welded seams trailer sites of welded seams at length not less than 300 mm are exposed. Sensitivity RT is determined on wire or groove etalons. For definition of scale of the image and a visual estimation the operator of the sizes of defects uses a sample representing a plate from steel by thickness of 3 – 5 mm with apertures in diameters 4 ± 0.1 mm; 3 ± 0.1 mm; 2 ± 0.1 mm; 1 ± 0.1 mm and distances between their centers 10 ± 0.2 mm. Fixing of results of the control of tubes is made in memory of computer complex RT, with the subsequent record on CD carriers and transfers to archive.

MUST welded seams and the ends of pipes on perimeter it is intended for the control of trailer sites of a welded seam over length not less than 250 mm (on both ends of a tube), not checking AUST, and sites of a welded seam with marks AUST, as the control of trailer sites of tubes over perimeter with marks AUST of the ends of tubes.

MLT facets of pipes than 300 mm from both ends of a pipe and a facet from both ends of a tube are carried out by equipment UMLK-10 and MAGNISCOP KT/B on trailer sites of external and internal zones of a welded seam at length not less. Revealed defects – defects such as stratifications, bowls, cracks of any orientation leaving on a surface of an end face of a tube and a welded seam on distance not less than 300 mm from an end face with use of a display material – magneto-luminescent suspension. The site of a seam can be polished or cut off before removal of defect and MLT is made repeatedly.

Interconnecting methods NDT quality monitoring providing release of welded tubes, it is based on more than 30 standards and the normative documents resulted in the report and regulating application of set of those or other methods NDT at various stages of manufacture of tubes depending on area of their application.