

1.11.18. THE RADIOLOGICAL INSPECTION OF TUBE TO TUBE SHEET WELDING JOINTS. PROBLEMS AND DECISIONS

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Welds “tube-tube plate” are widely used in modern heat exchangers working with aggressive and dangerous environments, therefore in the design documentation for a number of plants, it is identified a requirement of 100% control by non-destructive methods. In practice, the main method of the NDT is the radiation testing, specifically-radiographic.

At a rather long stage, the task of 100% NDT was successfully enough solved by use of two basic radiographic schemes : with an arrangement of the X-Ray device outside, and a film (detector) inside a tube; by arrangement Ir 192 isotope source inside a tube, and the film – outside, on all perimeter of welding joint. Technological advantages of the second scheme are obvious, since the control of the whole joint is implemented over one exposition with identical conditions of the image formation on each site, however, the radiographic sensitivity is worse in the case of the isotope sources; there are also the constructive restrictions caused by the diameter of the source holder of the gamma-defectoscope.

An Indirect confirmation of the complexity of monitoring procedure under the above-mentioned schemes is the following restriction existing till now, “tube to tube sheet welding joints at nominal internal diameter ... tubes up to 15 mm are not being subjected to the radiographic control, if there are no special indications in the design documentation”.

Last years the following tendencies were determined in the development of heat exchangers, which precisely have designated a circle of corresponding problems:

- reduction of diameter welding tubes;
- replacement of steel by other materials;
- increase of requirements to radiographic sensitivity and reliability of the X-Ray inspection.

There is an actual necessity to increase the productivity of the radiological inspection of tube to tube base welding joints.

It is necessary to note, that now, in conditions of market economy, the opportunity to use the isotope sources for the decision of the arisen problems is rather limited (a small half-life, difficulties in circulation, etc.).

The following directions of works have been determined:

- use the microfocal X-Ray device with the rod anode tube and development on it's base of the mechanized installation for the radiographic inspection the “tube – tube plate” weld joints with the program control;
- development means reduction the contribution of scattered radiation in formation of the radiation image at microfocal and at common radiography, into scheme with an arrangement of the rod anode tube X-Ray device inside of a welded tube.

In the report, the results of the works carried out are stated and the description of the developed installation is given.