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PEOPLE'S REPUBLIC OF CHINA**

NB/T 10938-2022

Coil-wound heat exchanger

绕管式热交换器

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Foreword

This document was issued on 13 May 2022 by the National Energy Administration of the PRC and takes effect on 13 November 2022.

It is a NB/T standard: recommended rather than compulsory, but it is the text a Chinese reviewer applies when assessing a submission.

It is classified under ICS 27.060.30, Chinese classification J75.

This document was drafted in accordance with the rules given in GB/T 1.1-2020 Directives for standardization - Part 1: Rules for the structure and drafting of standardizing documents.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The issuing body of this document shall not be held responsible for identifying any or all such patent rights.

This document was proposed by and is under the jurisdiction of the National Technical Committee on Boilers and Pressure Vessels of Standardization Administration of China (SAC/TC 262).

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This document is issued for the first time.

1 Scope

NB/T 10938-2022 is the Chinese standard for coil-wound heat exchangers in austenitic stainless steel, with design pressure up to 10 MPa. A coil-wound exchanger carries many layers of small tubes wound helically around a central core inside a pressure shell: the arrangement packs an enormous surface into a compact vessel and handles several streams at once with close temperature approach, which is why it is the workhorse of LNG liquefaction, air separation and low temperature methanol washing. This is the first edition of the standard. It sets the scope, the normative references and the defined terms, then the general requirements, including the designation system by which a unit is identified. It covers the materials for the shell, the tube bundle, the tubesheets and the core, with their acceptance and the low-temperature toughness required. Design follows: the pressure design of the shell and the tubesheets, the winding geometry of the bundle with its pitch, angle and spacers, the thermal and hydraulic design, the supports and the allowance for thermal movement between bundle and shell. Fabrication covers tube winding and its tolerances, tube-to-tubesheet welding, the assembly of the bundle into the shell, and cleanliness. Inspection and testing, including pressure and leak testing of each stream, then marking, packing, installation, operation and maintenance close the document.

1.1 This document specifies the requirements for materials, design, manufacture, inspection, acceptance, installation, use and maintenance of coil-wound heat exchangers

made of austenitic stainless steel (hereinafter referred to as heat exchangers).

1.2 This document is applicable to heat exchangers with a design pressure not higher than 10 MPa.

1.3 The design temperature to which this document applies shall not exceed the permissible service temperature range of the austenitic stainless steels listed in GB/T 150.2-2011.

1.4 This document is not applicable to the following cases: a) media that are prone to fouling, coking or deposition, with a risk of blockage; b) cases where there is a risk of intergranular corrosion.

1.5 Boundary of the heat exchanger, item a): the connection between the heat exchanger body and the external piping, namely 1) the groove end face of the first circumferential joint for welded connections; 2) the first flange sealing face for flanged connections; 3) the end face of the first threaded joint for threaded connections; 4) the first sealing face for connections made with special connectors or pipe fittings.

1.5 b) Pressure-retaining heads, flat covers and their fasteners of nozzles, manholes, handholes and the like.

1.5 c) The connecting welds between non-pressure parts and pressure parts.

1.5 d) Non-pressure parts directly attached to the heat exchanger, such as supports and pads.

1.5 e) Overpressure relief devices mounted directly on the heat exchanger.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition (including any amendments) applies.

GB/T 150-2011 (all parts) Pressure vessels (including Amendment No. 1)

GB/T 151-2014 Heat exchangers

GB/T 27698.1 Performance test methods for heat exchangers and heat transfer elements - Part 1: General requirements

GB/T 27698.8 Performance test methods for heat exchangers and heat transfer elements - Part 8: Industrial calibration of heat exchangers

NB/T 10558 Coating and transport packing for pressure vessels

NB/T 47010 Stainless and heat-resisting steel forgings for pressure equipment

NB/T 47019 (all parts) Technical conditions for ordering tubes for boilers and heat exchangers

NB/T 47041 Vertical vessels supported by skirt

NB/T 47065 (all parts) Supports for vessels

JB 4732 Steel pressure vessels - Design by analysis (confirmed in 2005)

3 Terms and definitions

For the purposes of this document, the terms and definitions given in GB/T 150.1-2011 and GB/T 151-2014 and the following apply.

3.1 coil-wound heat exchanger: general term for a shell-and-tube heat exchanger in which the heat exchange tubes are spirally wound on a mandrel, one or more tube-side media flow inside the spirally wound tubes, and heat is exchanged through the tube wall with the shell-side medium.

3.2 mandrel: the component made up of the core shaft on which the heat exchange tubes are wound and its supports.

3.3 core: the component made up of the mandrel, heat exchange tubes, spacers, bundles shell and other parts.

3.4 spacer: general term for flat spacer strips, profiled spacer strips, tube hoops and other parts used to fix the position of the heat exchange tubes.

3.5 spiral angle: the angle between the tangent to the helix of a heat exchange tube and the cross section of the equipment.

3.6 bundles shell: the thin-walled cylinder wrapped around the outermost layer of the tube bundle.

3.7 bundle: the structure made up of the tubesheets and the core.

3.8 single-flow: a tube-side arrangement carrying only one medium.

3.9 multi-flow: a tube-side arrangement carrying two or more media.

3.10 integrated tubesheet heat exchanger: a heat exchanger with a single tube-side flow, in which the heat exchange tube holes are distributed over the whole tubesheet.

3.11 integrated tubesheet heat exchanger with different tube layout areas: a heat exchanger with multiple tube-side flows, in which the tube holes for each medium are grouped in different areas of one tubesheet.

3.12 separated tubesheet heat exchanger: a heat exchanger in which the tube holes for each tube-side medium are grouped on different tubesheets.