Calculation of Heater-tube Thickness in Petroleum Refineries

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Contents

Contents

Contents

Contents

Contents

Contents

Contents

Tables

Contents

Contents

Notice

Instructions for Submitting a Proposed Revision to this Standard Under Continuous Maintenance

The American Petroleum Institute maintains this standard under continuous maintenance procedures. These procedures establish a document program for regular publication of addenda or revisions, including timely and documented consensus action on requests for revisions to any part of the standard. Proposed revisions shall be submitted to the Director, Standards Department, American Petroleum Institute, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001, standards@api.org.

This addendum to API 530, 7th Edition, contains the following changes:

— Updated rupture stress data for 9Cr-1Mo material: The rupture allowable stresses the addendum have been lowered to match the values given by the constants in WRC 541, 2nd Edition.

— The limiting design metal temperature for TP304L, TP316L, and TP317L have been decreased to 593 °C/ 1100 °F to match WRC 541 maximum temperatures for designs governed by creep properties. The allowable stress curves for TP304L, TP316L, and TP317L have been extended to 816 °C/1500 °F to match WRC 541 data for short-term exposure.

— The limiting design metal temperatures for 800HT and HK40 have been increased to 1010 °C/1850 °F to match WRC 541. The allowable stress curves also extend to this value.

— New material 347LN has been added based on data from WRC 541.

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1 Scope

This standard specifies the requirements and gives recommendations for the procedures and design criteria used for calculating the required wall thickness of new tubes and associated component fittings for fired heaters for the petroleum, petrochemical, and natural gas industries. These procedures are appropriate for designing tubes for service in both corrosive and noncorrosive applications. These procedures have been developed specifically for the design of refinery and related fired heater tubes (direct-fired, heat-absorbing tubes within enclosures). These procedures are not intended to be used for the design of external piping.

This standard does not give recommendations for tube retirement thickness; Annex A describes a technique for estimating the life remaining for a heater tube.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ANSI/API Standard 560, *Fired Heaters for General Refinery Service*

ASME *Boiler and Pressure Vessel Code* (*BPVC*) [1], *Section VIII, Division 1: Pressure Vessels—Rules for Construction of Pressure Vessels*

ASME *Boiler and Pressure Vessel Code* (*BPVC*), *Section VIII, Division 2: Pressure Vessels—Rules for Construction of Pressure Vessels—Alternative Rules*

ASME B31.3, *Process Piping*

ASTM A106/A106M [2], *Specification for Seamless Carbon Steel Pipe for High-Temperature Service*

ASTM A192/A192M, *Specification for Seamless Carbon Steel Boiler Tubes for High-Pressure Service*

ASTM A209/A209M, *Specification for Seamless Carbon-Molybdenum Alloy-Steel Boiler and Superheater Tubes*

ASTM A210/A210M, *Specification for Seamless Medium-Carbon Steel Boiler and Superheater Tubes*

ASTM A213/A213M, *Specification for Seamless Ferritic and Austenitic Alloy-Steel Boiler, Superheater and Heat-Exchanger Tubes*

ASTM A312/A312M, *Specification for Seamless and Welded Austenitic Stainless Steel Pipes*

ASTM A335/A335M, *Specification for Seamless Ferritic Alloy-Steel Pipe for High-Temperature Service*

ASTM A376/A376M, *Specification for Seamless Austenitic Steel Pipe for High-Temperature Central-Station Service*

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1 ASME International, 3 Park Avenue, New York, NY 10016, www.asme.org.

2 ASTM International, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428, www.astm.org.