Recommended Practice for Materials and Fabrication of 1 1/4CR-1/2Mo Steel Pressure Vessels for Service Above 825 °F (440 °C)

API RECOMMENDED PRACTICE 934-E
FIRST EDITION, AUGUST 2010

AMERICAN PETROLEUM INSTITUTE

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Downstream Segment

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Introduction

This recommended practice (RP) applies to new pressure vessels in petroleum refining, petrochemical and chemical facilities in which fluids are processed at temperatures in the 825 °F to 1100 °F (440 °C to 595 °C) range. It is based on decades of industry operating experience and the results of recent experimentation and testing conducted by independent manufacturers, fabricators and users of pressure vessels for this service.

Licensors and owners of process units in which these pressure vessels are to be used may modify and/or supplement this RP with additional proprietary requirements.

Recommended Practice for Materials and Fabrication of 1 1/4CR-1/2Mo Steel Pressure Vessels for Service Above 825 °F (440 °C)

1 Scope

This recommended practice (RP) includes materials and fabrication requirements for new 1 1/4Cr-1/2Mo steel and 1Cr-1/2Mo pressure vessels and heat exchangers for high temperature service. It applies to vessels that are designed, fabricated, certified, and documented in accordance with ASME Code Section VIII, Division 1.

This document may also be used as a resource when planning to modify existing pressure vessels.

The interior surfaces of these pressure vessels may have an austenitic stainless steel, ferritic stainless steel, or nickel alloy weld overlay or cladding to provide additional corrosion resistance.

This RP is applicable to wall (shell) thicknesses from 1 in. (25 mm) to 4 in. (100 mm). Integrally reinforced nozzles, flanges, tubesheets, bolted channel covers, etc. can be greater than 4 in. (100 mm). At shell or head thicknesses greater than 4 in. (100 mm), 1 1/4Cr-1/2Mo and 1Cr-1/2Mo have been shown to have difficulty meeting the toughness requirements given in this document, but this does not preclude the use of this alloy if these properties can be met or if the equipment is designed with stresses below the threshold for brittle fracture. Although outside of the scope, this document can be used as a resource for vessels down to 0.5 in. (12.7 mm) shell thickness with changes defined by the purchaser.

This RP is not intended for use for equipment operating below 825 °F (440 °C). Refer to API 934-C for information on design for equipment operating at lower temperature ranges. Since hydrotreaters typically are designed to temperatures lower than 825 °F (440 °C), the guidelines in this RP do not apply to most hydrotreaters. Also, since coke drums typically fail due to fatigue and not due to reheat cracking; these RPs may not be appropriate for all aspects of coke drums.

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.

API Recommended Practice 582, *Welding Guidelines for the Chemical, Oil, and Gas Industries*

API Recommended Practice 934-A, *Materials and Fabrication of 2 1/4Cr-1Mo, 2 1/4Cr-1Mo-1/4V, 3Cr-1Mo, and 3Cr-1Mo-1/4V Steel Heavy Wall Pressure Vessels for High Temperature, High Pressure Hydrogen Service*

API Recommended Practice 934-C, *Materials and Fabrication of 1 1/4Cr-1/2Mo Steel Heavy Wall Pressure Vessels for High Pressure Hydrogen Service Operating at or Below 825 °F (440 °C)*

API Recommended Practice 934-D, *Technical Report on the Materials and Fabrication Issues of 1 1/4Cr-1/2Mo and 1Cr-1/2Mo Steel Pressure Vessels*

API Publication 938-A, *An Experimental Study of Causes and Repair of Cracking of 1 1/4Cr-1/2Mo Steel Equipment*

ASME *Boiler and Pressure Vessel Code* [1], Section II—*Materials*; Part A—*Ferrous Material Specifications*; Part C, *Specification for Welding Rods, Electrodes and Filler Metals;* Part D—*Properties*

[1] ASME International, 3 Park Avenue, New York, New York 10016-5990, www.asme.org.