Industrial Fired Boilers for General Refinery and Petrochemical Service

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Suggested revisions are invited and should be submitted to the Standards Department, API, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001, standards@api.org.

Reliable boiler operations are necessary to ensure steam production in refineries and petrochemical plants. Boilers are a critical component of U.S. commercial and industrial facilities and operations. Industrial boilers are also a major energy consumer. U.S. refineries and petrochemical plants employ approximately one-third of the total boiler heat input of all U.S. commercial and industrial facilities.

This document is based on the accumulated knowledge and experience of manufacturers and users of industrial fired boilers. This recommended practice (RP) addresses design, operating, maintenance, and troubleshooting considerations for industrial boilers that are used in refineries and chemical plants. This document directly reflects business needs by having API’s Subcommittee on Heat Transfer Equipment (SCHTE) membership, vendors, manufacturers, and contractors tailor these precise requirements. Manufacturers’ input from within and outside the SCHTE was sought and thus the final document reflects prevailing technical expertise. This RP could not have been developed in this manner by any other industry group. Manufacturers’ and contractors’ standards and requirements have individual differences that may not permit a purchaser to understand technical distinctions.

ASME codes focus on a boiler’s mechanical construction and performance testing. National Fire Protection Association codes focus on a boiler’s burner management safety system. API standards applicable to boilers focus on fans/drivers and post-combustion oxides of nitrogen (NOx) control. This SCHTE RP complements rather than duplicates these requirements, focusing on refinery and petrochemical boilers.

API 538 includes information on boiler types, burner management, system reliability/availability, feedwater preparation, BFW and boiler water treatment, waterside control, steam purity, combustion control, boiler burners, emissions, tube cleaning, and more. The information contained in API 538 is not covered by any other standards-writing body. By combining multiple technical subjects related to industrial fired boilers, the boiler user has the benefit of the collective industry experience that this RP provides, rather than having to rely on multiple technical documents.

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Introduction

Users of this recommended practice (RP) should be aware that further or differing requirements may be needed for individual applications. This RP is not intended to inhibit a vendor from offering, or the purchaser from accepting, alternative equipment or engineering solutions for the individual application. This may be particularly applicable where there is innovative or developing technology. Where an alternative is offered, the vendor should identify any variations from this RP and provide details.

In API RPs, the metric (SI) system of units is used. Where practical in this RP, U.S. customary (USC) units are included in brackets for information. In Annex A, separate data sheets are provided in SI units and USC units.

A bullet (●) at the beginning of a section or subsection indicates that either a decision is required or further information is to be provided by the purchaser. This information should be indicated on data sheets (see examples in Annex B) or stated in the enquiry or purchase order.

Industrial Fired Boilers for General Refinery and Petrochemical Service

1 Scope

1.1 This recommended practice (RP) specifies requirements and gives recommendations for design, operation, maintenance, and troubleshooting considerations for industrial fired boilers used in refineries and chemical plants. It covers waterside control, combustion control, burner management systems (BMSs), feedwater preparation, steam purity, emissions, etc.

1.2 This RP does not apply to fire tube boilers, gas turbine exhaust boilers, or fluidized bed boilers.

1.3 This RP does not cover boiler mechanical construction. Purchaser or owner shall specify codes such as ASME, ISO, etc.

1.4 This RP does not cover forced circulation boilers.

2 Normative References

The editions of the following standards, codes and specifications that are in effect at the time of publication of this recommended practice shall, to the extent specified herein, form a part of this recommended practice. Changes in referenced standards, codes and specifications shall be mutually agreed upon by the purchaser and the supplier.

API *Manual of Petroleum Measurement Standards (MPMS)* Chapter 14.3.3, *Orifice Metering of Natural Gas and Other Related Hydrocarbon Fluids—Concentric, Square-edged Orifice Meters—Part 3: Natural Gas Applications*

API Specification 6FA, *Specification for Fire Test for Valves*

API Recommended Practice 534, *Heat Recovery Steam Generators*

API Recommended Practice 535, *Burners for Fired Heaters in General Refinery Services*

API Recommended Practice 536, *Post-combustion NOx Control for Fired Equipment in General Refinery Services*

API Standard 541, *Form-wound Squirrel Cage Induction Motors—375 kW (500 Horsepower) and Larger*

API Standard 547, *General-purpose Form-wound Squirrel Cage Induction Motors—250 Horsepower and Larger*

API Recommended Practice 551, *Process Measurement Instrumentation*

API Recommended Practice 553, *Refinery Valves and Accessories for Control And Safety Instrumented Systems*

API Recommended Practice 555, *Process Analyzers*

API Standard 560, *Fired Heaters for General Refinery Service,* 5th Ed., 2015

API 570, *Piping Inspection Code: In-service Inspection, Rating, Repair, and Alteration of Piping Systems*

API Recommended Practice 574, *Inspection Practices for Piping System Components*

API Standard 607, *Fire Test for Quarter-Turn Valves and Valves Equipped with Nonmetallic Seats*

API Standard 611, *General Purpose Steam Turbines for Petroleum, Chemical, and Gas Industry Services*