CGA H-10—2018

COMBUSTION SAFETY FOR STEAM REFORMER OPERATION

SECOND EDITION

CGA
Compressed Gas Association
The Standard For Safety Since 1913

PREFACE

As part of a program of harmonization of industry standards, the Compressed Gas Association (CGA) has published CGA H-10, *Combustion Safety for Steam Reformer Operation*, jointly produced by members of the International Harmonization Council.

This publication is intended as an international harmonized standard for the worldwide use and application of all members of the Asia Industrial Gases Association (AIGA), Compressed Gas Association (CGA), European Industrial Gases Association (EIGA), and Japan Industrial and Medical Gases Association (JIMGA). Each association's technical content is identical, except for regional regulatory requirements and minor changes in formatting and spelling.

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Work Item 17-051
HYCO Committee

NOTE—Technical changes from the previous edition are underlined.

SECOND EDITION: 2018
FIRST EDITION: 2012

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1 Introduction

Large scale hydrogen production has been practiced for decades and the demand for such production has grown over that period. Developments in crude oil processing, such as the increased use of hydrogen to remove sulfur and the refinement of heavier crude oil stocks, has driven significant growth in the demand for hydrogen supply.

In response to this demand, industrial gas companies operate and maintain large scale hydrogen production facilities worldwide and have done so with an exemplary safety record for many years. However, it should be noted that large scale hydrogen production involves potential personnel and process safety hazards that must be addressed in design and operation. Such hazard potential is inherent to the processing of toxic and flammable gases via high temperature reforming as practiced in hydrogen production.

The steam reformer represents the core operating unit of most large scale hydrogen production facilities. Therefore, steam reformer furnace combustion safety is fundamental to the overall safe operation of these large scale hydrogen plants. This publication provides best practices for managing the combustion safety aspects of steam reformer operations. The associated potential safety hazards include fire, rapid uncontrolled energy release, gas release, as well as personnel exposure related to such hazards.

There are some internationally accepted standards that apply to the combustion systems of process furnaces. Such standards, including NFPA 86, *Standard for Ovens and Furnaces*, EN 746, *Industrial thermoprocessing equipment*, Parts 1-3, and API RP 556, *Instrumentation, Control, and Protective Systems for Gas Fired Heaters,* some of which are not specific to reforming furnaces, provide guidance on combustion safety systems [1, 2, 3].[1] These standards and other standards referenced in this publication shall be consulted when considering combustion safety for steam reformers.

It should be noted that there are other industries, such as ammonia and methanol production, that operate large steam reformers. Therefore, it may be instructive to consider the learnings and experiences from those industries through organizations such as the American Institute of Chemical Engineering and their Ammonia Safety Symposium and the International Methanol Producers and Consumers Association (IMPCA).

Steam reformer furnace design will continue to develop along with methods to implement combustion safety in these furnaces. A wide variety of steam reformer designs, configurations, and component equipment exists today. Therefore, this publication includes some generalized statements and recommendations on matters on which there might be diversity of opinion or practice. Users of this publication should recognize that it is presented with the understanding that it can supplement, but not take the place of, sound engineering judgment, training and experience. It does not constitute, and should not be construed to be, a code or rules or regulations.

2 Scope and purpose

2.1 Scope

This publication applies to steam reformers that are operated with natural gas, refinery off-gas, naphtha, and other light hydrocarbon streams. It specifically applies to large volume hydrogen production plants, defined for this publication as a production capability of 373 000 scfh (10 000 Nm^3/hr) (9 MMSCFD or 241 000 Nm^3D) or greater.

This publication covers operation, maintenance, and certain design aspects of steam reformers relative to the potential safety hazards of the combustion process inherent to these units. Emphasis is placed on operational guidance and features that provide safeguards against such hazards such as furnace control philosophies, safety interlocks, and inspection routines. The publication is not intended to address the details of design, installation, and construction of steam reformers.

2.2 Purpose

The purpose of this publication is to inform and guide interested parties on the procedures and practices fundamental to combustion safety in the operation of steam reformers. This publication presents a baseline for safe

[1] References are shown by bracketed numbers and are listed in order of appearance in the reference section.