CGA

Compressed Gas Association

The Standard For Safety Since 1913

CGA H-12—2015

MECHANICAL INTEGRITY OF SYNGAS OUTLET SYSTEMS

FIRST EDITION

PREFACE

As part of a program of harmonization of industry standards, the Compressed Gas Association (CGA) has published CGA H-12, *Mechanical Integrity of Syngas Outlet Systems*, 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.

PLEASE NOTE:

The information contained in this document was obtained from sources believed to be reliable and is based on technical information and experience currently available from members of the Compressed Gas Association, Inc. and others. However, the Association or its members, jointly or severally, make no guarantee of the results and assume no liability or responsibility in connection with the information or suggestions herein contained. Moreover, it should not be assumed that every acceptable commodity grade, test or safety procedure or method, precaution, equipment or device is contained within, or that abnormal or unusual circumstances may not warrant or suggest further requirements or additional procedure.

This document is subject to periodic review, and users are cautioned to obtain the latest edition. The Association invites comments and suggestions for consideration. In connection with such review, any such comments or suggestions will be fully reviewed by the Association after giving the party, upon request, a reasonable opportunity to be heard. Proposed changes may be submitted via the Internet at our web site, www.cganet.com.

This document should not be confused with federal, state, provincial, or municipal specifications or regulations; insurance requirements; or national safety codes. While the Association recommends reference to or use of this document by government agencies and others, this document is purely voluntary and not binding unless adopted by reference in regulations.

A listing of all publications, audiovisual programs, safety and technical bulletins, and safety posters is available via the Internet at our website at www.cganet.com. For more information contact CGA at Phone: 703-788-2700, ext. 799. E-mail: customerservice@cganet.com.

Work Item 12-119
HYCO Committee

FIRST EDITION: 2015

Contents **Page**

Figures

Tables

This page is intentionally blank.

1 Introduction

Large scale hydrogen production has been commercially practiced for decades and the demand for such production has grown over that period. In the last several years, 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. The products from the steam reformer are collected and transferred to downstream unit operations by a collection and transfer header system. The interior of the outlet system is subjected to high temperature, pressure, and hydrogen attack, while the outside is subjected to ambient conditions. The increasing severity of the service has resulted in a number of failures and therefore requires appropriate operation and maintenance.

It should be noted that there are other industries, such as ammonia and methanol production, that operate large steam reformers. Therefore, it can be instructive to consider the learning and experiences from those industries through organizations such as the American Institute of Chemical Engineering: Ammonia Plant 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 generalized statements and recommendations on matters which there can 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 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 nominal production capacity of 10 000 Nm^3/hr (approximately 9 MMSCFD) or greater. This publication may also be applied to smaller reformers depending on the technology used.

This publication may also be used for similar applications such as internally insulated piping in a partial oxidation unit. Applicability for cases other than what is described in the publication is left to the reader.

2.2 Purpose

The purpose of this publication is to inform and guide interested parties on the procedures and practices related to the mechanical integrity of syngas outlet systems. This publication presents a baseline for safe reformer header system operation. This publication provides a technical basis that can be used to present a common viewpoint to government and regulatory authorities, ensuring proper application of rules and regulations.