PURGING PRINCIPLES AND PRACTICE

THIRD EDITION

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PURGING PRINCIPLES AND PRACTICE
PREFACE TO THIRD EDITION

This manual helps provide principles and practices for pipeline purging and describes equipment encountered in the natural gas industry. The information provided is based on sound engineering principles and good operating practices. The intent is to provide the operator with guide material to help safely and successfully plan and implement a purging operation. The operator should use this information with caution and recognize that the information may not be adequate for all conditions encountered.

The material included provides guidelines for maintaining safe atmospheres inside pipes, holders, and other facilities that are to be purged into service or taken out of service. Good operating practice as well as federal and state laws require that precautions be taken to minimize or control mixtures of combustible gas in the air during purging, welding and cutting operations.

New information presented includes information for purging pipelines developed by the Gas Research Institute (GRI), now known as the Gas Technology Institute (GTI). In addition, there have been significant improvements made in instruments that measure combustible gas mixtures.

This publication is not an operating code, but is instead guide material consisting of background information and descriptions of various methods and procedures found by experienced operators to be effective in minimizing or controlling combustible mixtures. Applicable federal, state and local regulations must be observed. The methods and procedures described within cannot be considered to have universal application because of various job conditions. The operator is cautioned that the material presented may not be adequate under all conditions encountered.

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American Gas Association

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CHAPTER 1

GENERAL INFORMATION

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CHAPTER 1 GENERAL INFORMATION

1.1 INTRODUCTION

When the combustible gas content of a pipe, tank, or other enclosure is directly replaced by air, a mixture of gas and air within the flammable limits forms and remains during part of the operation. A similar mixture within flammable limits occurs when air is directly replaced by gas.

Carefully controlled purging of air from pipelines by direct displacement with natural gas has been safely practiced for many years with the recognition that some flammable mixture is present. Purging of natural gas from pipelines by direct displacement with air also has been similarly practiced.

There are many situations in which formation of flammable mixtures during purging should be prevented. As an example, flammable mixtures in large pipelines, tanks and other large volume containers cannot be safely controlled or tolerated even though there may be no apparent source of ignition present. Whenever flammable mixtures cannot be tolerated, their formation should be prevented by means of an inert purge, which involves using an inert substance to keep separate the two media being interchanged.

The basic requirement for a successful and safe purging operation is knowledge of the principles concerning the formation, analysis and control of gas mixtures. Additional requirements include a thorough preliminary study of the application of these principles for each situation; a well prepared procedure detailing the sequence of events, a predetermined rate of introduction of the purge medium and verification of end-points. Finally, the steps of the procedure must be followed and carried out by capable, well-informed people.

Chapters 1, 2, 3 and 4 cover general principles of purging. Subsequent chapters discuss application of the principles to particular situations and provide some examples of typical procedures. The appendices include information on purging facilities that were common in the natural gas industry but for the most part, are no longer in use. This information is included for historical reference.

1.2 GLOSSARY OF TERMS

Words and expressions commonly used in purging procedures are defined below:

Aeration: Provision of a constant supply of air by mechanical means.

Blanking: Insertion of a solid metal plate across a pipe at fitting flanges.

Channeling: The occurrence of lighter gases or fluids flowing over heavier gases or fluids during a pipeline purging process.

Clear: See *Purge*

Combustible: Capable of being ignited and rapidly oxidized when mixed with proper proportions of air.

Combustible mixture: A gas and air mixture that can be ignited at ordinary temperature and pressure. (See *Flammable limits*)

Concentration: Percent by volume unless otherwise noted.

Dilution: A form of purging in which replacement of one substance by another is accomplished with appreciable mixing.

Disking: See *Blanking*

Displacement: A form of purging in which replacement of one substance by another is accomplished without appreciable mixing.

End-point: Attainment of concentration (percent by volume) of inert substance in the closed system being purged that subsequent admission of air, if purging out of service, or admission of gas or vapor if purging into service, will not result in formation of a flammable mixture.

Exhaust gas: The products of combustion gas (primarily carbon dioxide and nitrogen) from an inert gas generator that is used as an inert gas for purging.

Explosive limits: See *Flammable limits*

Explosive mixtures: Gas and air mixtures that can be ignited at ordinary temperatures and pressure. (Synonymous: Flammable mixtures)