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Guidance on Practice for Inert Gas Systems

GP 60-20

BP GROUP
ENGINEERING TECHNICAL PRACTICES

Foreword

This is the first issue of Engineering Technical Practice (ETP) BP GP 60-20. This Guidance on Practice (GP) is based on parts of heritage documents from the merged BP companies as follows:

British Petroleum

RP 60-6

Inert Gas Systems.

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1. Scope

This Guidance on Practice (GP) provides guidance for the design, construction, and operation of Inert Gas Systems. This document takes into account health, safety and environmental legislation, good design practice, and technical and economic considerations. The design information included in this specification is not intended to cover complete details.

2. Normative references

The following normative documents contain requirements that, through reference in this text, constitute requirements of this technical practice. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this technical practice are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

National Fire Protection Association (NFPA)

NFPA 69	Explosion Prevention Systems
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Occupational Safety and Health Administration (OSHA) Standards 29 CFR

Part 1910.1200	Hazardous Communication (HAZCOM)
Part 1910.106	Flammable and Combustible Liquids

US Bureau of Mines

Explosive Gas Properties

UK Fire Protection Association

Explosive Gas Properties

3. Terms and definitions

For the purposes of this GP, the following terms and definitions apply:

blanketing

Blanketing (or Padding) is the technique of using an inert gas to maintain an inert atmosphere in the vapour space of a tank or vessel.

inert gas

In scientific terms an inert gas is a chemical substance which does not readily change by chemical means into simpler substances; is non-flammable.

inert gas system

Within the definition of this Recommended Practice, an inert gas system is an assembly of equipment and/or distribution piping within the factory limits which provides a means for supplying inert gas in a ready-to-use condition at the inlet connection to process equipment, storage tanks or vessels, and pipe-work.



pressurizing

Additions of inert gas to a flammable gas/air mixture, affects a reduction in the flammable range, until UEL and LEL eventually coincide. This is demonstrated for gasoline vapour, mixed with (i) carbon dioxide, (ii) nitrogen and (iii) exhaust gases in Figure 5

purging

Purging is the technique used to clear a system of hydrocarbon gas so that it can be rendered safe; or to clear a system of air so that it can be commissioned safely.

snuffing

The use of inert gas to extinguish or prevent combustion.

vapours

For the purpose of this Recommended Practice vapours are regarded as gases.

4. Symbols and abbreviations

For the purpose of this GP, the following symbols and abbreviations apply:

PSA Pressure-swing adsorption

LEL Lower Explosive Limit

UEL Upper Explosive Limit

5. Uses of inert gas

5.1. General

- a. It is important that any gas used as an inert gas within the scope of this Recommended Practice should remain above its dew point at all times.
- b. The supply point for input to the inert gas system should be a pipe manifold for attaching portable pressurised gas cylinders or vessels containing cryogenic liquid, or a block valve at the downstream side of the supplier's contractual supply limit when prepared inert gas is piped into the user's site facilities, or an on-site inert gas generator or a reliable source of steam at suitable conditions.
- c. Selection of inert gas for any application will depend on duty, site factors and commercial considerations.
- d. Inert gases commonly used for purging and inerting purposes include:
 1. Steam (Purging and snuffing duties only),
 2. Products of combustion,
 3. Carbon dioxide,
 4. Nitrogen.

5.2. HSE

- a. In the design and operation of any inert gas production or distribution system, precautions must be taken to minimise human exposure to the gas being used.

Note: All inert gasses can cause asphyxiation. Carbon dioxide and some constituents of products of combustion are toxic. Regulations are designed to protect persons at work, where such work has to be done in a confined space in which



hazardous vapours can be present or the lack adequate levels of oxygen is present to sustain life.

- b. Appropriate action should be taken to minimise the use of combustion gasses and to avoid unnecessary leakage to atmosphere.

Carbon dioxide and some constituents of products of combustion are considered to be 'greenhouse gasses'.

- c. Precautions must be taken to ensure only essential and properly equipped personnel are allowed in areas where the atmosphere near purge vents is likely to become oxygen-deficient during purging operations.
- d. Permits to enter must be issued and only authorised persons properly equipped shall be permitted to enter until a confined space is certified safe after purging.
- e. Areas adjacent to a cryogenic nitrogen storage area must be kept free from traps, such as pits and trenches, where leaked nitrogen could accumulate.
- f. Barriers and warning notices shall be provided to protect personnel from the risk of asphyxiation in the event of spillage or leakage from cryogenic storage vessels.

5.3. Application methods

The designer should consider the likely use of the various methods when sizing an inert gas system.

Essentially there are four methods of the use of inert gas.

Blanketing; the supply of inert gas in this case is regulated to maintain a slightly positive pressure in the vapour space at all times. Exclusion of air (oxygen) from vapour spaces in storage tanks and vessels protects against the risks of fire and explosion, unwanted chemical reactions with the stored liquid, and corrosion of the storage container.

Purging; the method used to ensure a flammable/explosive mixture does not occur inside a confined space by a judicious use of inert gas. Flammable/explosive limits for various gases mixed with standard atmospheric air are explained in OSHA Standards, 29 CFR Part 1910.106, and lists of various gasses are published by US Bureau of Mines, UK Fire Protection Association, and others.

Pressurizing; the method used to provide a positive pressure inside a chamber and perform as a sealing agent; a deliberate leak of inert gas may be required to prevent another fluid from entering the protected space.

Snuffing; this method is used on vents going to the atmosphere.

6. Quality of inert gas

- a. The dew point temperature should be at least 10°C (18F) below the lowest expected ambient temperature for the particular site,

This will not apply to steam.

- b. There shall be no 'free water' contained in the inert gas,
- c. The inert gas shall not contain any hydrocarbon or other flammable gas,
- d. The oxygen content in the inert gas shall not exceed 5% by volume; also any mixture of flammable gas and inert gas in the system shall not contain more than 5% oxygen by volume. Lower levels of oxygen may be required for process reasons and should be agreed with the process designer,

