SLOVENSKI STANDARD
SIST EN 1918-5:1999

01-januar-1999

Sistemi oskrbe s plinom - Podzemna plinska skladišča - 5. del: Funkcionalna priporočila za nadzemno opremo

Gas supply systems - Underground gas storage - Part 5: Functional recommendations for surface facilities

Gasversorgungssysteme - Untertagespeicherung von Gas - Teil 5: Funktionale Empfehlungen für Übertageanlagen

Systeme d'alimentation en gaz - Stockage souterrain de gaz - Partie 5: Recommandations fonctionnelles pour les installations de surface

Ta slovenski standard je istoveten z: **EN 1918-5:1998**

ICS:

75.200	Oprema za skladiščenje nafte, naftnih proizvodov in zemeljskega plina	Petroleum products and natural gas handling equipment

SIST EN 1918-5:1999 **en**

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 1918-5

February 1998

ICS 75.200

Descriptors: storage, natural gas, gas installation, design, equipment specifications, performance evaluation, safety, environmental protection, fire protection, explosion proofing, tests, operating requirements, maintenance

English version

Gas supply systems - Underground gas storage - Part 5: Functional recommendations for surface facilities

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This European Standard was approved by CEN on 22 January 1998.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 234 "Gas supply", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 1998, and conflicting national standards shall be withdrawn at the latest by August 1998.

It is Part 5 of a standard on underground gas storage which includes the five following Parts:

Part 1 - Functional recommendations for storage in aquifers

Part 2 - Functional recommendations for storage in oil and gas fields

Part 3 - Functional recommendations for storage in solution mined salt cavities

Part 4 - Functional recommendations for storage in rock caverns.

Part 5 - Functional recommendations for surface facilities.

Other relevant standards are listed in annex A.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

Natural gas or Liquid Petroleum Gas (LPG) from oil and gas fields is being increasingly used to meet energy requirements. The inflexible gas production from these fields may not match the variable market demand. To overcome this, underground gas storage may be used to adjust the supply as required.

Surface facilities are provided to transfer gas between the transmission system and the underground storage structure and to ensure the gas is of the desired specification for both the withdrawal and filling operations.

1 Scope

This standard lists the general functional recommendations for the surface facilities relating to underground gas storage.

It specifies procedures and practices which are safe and environmentally acceptable.

It describes the functional recommendations for the design, construction, testing, commissioning, operation and maintenance of the surface facilities for underground gas storage, between the wellhead and the connection to the gas transmission system.

In this context "gas" is any gaseous fuel which is in a gaseous state at a temperature of 15 °C and under a pressure of 1 bar.

This standard is not intended to be applied retrospectively to existing facilities.

This European Standard specifies common basic principles for gas supply systems. Users of this European Standard should be aware that more detailed national standards and/or codes of practice may exist in the CEN member countries.

This European Standard is intended to be applied in association with these national standards and/or codes of practice and does not replace them.

2 General description

The main equipment that may be required to meet the desired specification for both the withdrawal and the filling operations is described below.

Where no specific mention of LPG or natural gas is made the following statements refer to both.

2.1 Filling facilities

2.1.1 Liquid and solid separation

Liquids and solid particles that the gas stream may contain should be removed by filters and/or separators to prevent damage to or incorrect operation of the equipment.

2.1.2 Gas compression

Compression will normally be required to inject natural gas into the storage structure, unless the storage system pressure is lower than the supply pressure.

For LPG storage recompression of recovered LPG vapours may be required.

2.1.3 Gas cooling

The compressed natural gas is generally cooled by air coolers to ensure the maximum temperature allowable, especially for the protection of pipe coatings, is not exceeded.

In order to maintain the pressure of the stored LPG at a suitable level, cooling of the incoming LPG or condensation of the vapour phase may be required.

2.1.4 Liquid transfer

Liquid transfer pumps may be required for the filling of LPG storage facilities.

2.1.5 LPG heating

LPG may be delivered to the storage facility under cryogenic conditions. To allow the fluid to be warmed to a level suitable for the storage system, the surface facilities should include the installation of gas heaters.

2.2 Withdrawal facilities

2.2.1 Prevention of hydrate formation

Hydrate formation in a gas stream of known composition can be predicted by means of experimental data or calculated using vapour/liquid/solid equilibrium constants.

The formation of hydrates can be prevented by inhibiting, heating and/or dehydrating the gas.

2.2.2 Solid and liquid separation

Natural gas produced from underground storage may contain solids and/or liquids that shall be separated upstream of the treatment facilities.

For the treatment of LPG, specific equipment, for example separators or coalescers, may be used for the removal of solid particles or water droplets.

2.2.3 Pressure control

Pressure reduction from wellhead pressure to the transmission system pressure may be obtained by specific equipment, for example control valves, choke valves or expanders.

2.2.4 Gas heating

To avoid excessively low temperatures due to pressure reduction heating may be required.

2.2.5 Gas conditioning

Gas from underground storage may be saturated with water and shall be dehydrated to meet the required water dew point specifications.

If the specification requires LPG with a water content below that in saturated conditions , then dehydration of the LPG may be required.

To prevent liquid hydrocarbons forming in natural gas transportation/distribution systems, hydrocarbon dew point control may be necessary.

Natural gas from underground storage may contain contaminants (e.g. hydrogen sulfide, carbon dioxide, carbonyl sulfide) that shall be reduced to the required gas specification.

2.2.6 Compression

The operating pressure of process plant is generally higher than gas transportation line pressure. Storage facilities and/or plant may be operated at a pressure lower than gas transportation line pressure. In this case, compressors for natural gas or pumps for LPG are required.

2.2.7 Odorization and/or colourization

If odorization of the gas leaving the surface facilities is required the odour shall be injected downstream of the processing area.

Prior to delivery of LPG the contract specification may require colourization.

2.2.8 Recovered water treatment

If required, equipment should be provided to treat recovered water from the underground storage system before it is disposed of or reinjected.

2.3 Utilities

2.3.1 Gas analysis and metering

Mass and/or volumetric flowrates are normally measured and recorded when injection into and withdrawal from the storage system. Gas analysis may be required to check gas quality before injection into or withdrawal from the storage system.

2.3.2 Fuel gas

A fuel gas system is required for the operation of gas fired equipment.

2.3.3 Instrument air

An instrument air system is required for the control and operation of the surface pneumatic systems if used.

2.3.4 Power supplies

Suitable power supplies are necessary for the operation of all electrical equipment on site.

Leaching and dewatering facilities for salt cavities

Leaching facilities for salt cavities may consist of:

- a system for leaching water delivery with:
  - water offtake station(s) at the leaching water source with filters, pumps;
  - line pipe from the leaching water offtake station(s) to the leaching plant;
  - water reservoirs or tanks;
  - water injection pumps, filters;
  - line pipe from the leaching plant to the well head(s);

- a system for brine discharge with:
  - line pipe for brine discharges;
  - brine discharge pumps, filters, dispersers;

- a system for cavity roof protection with:
  - blanket fluid storage, filters and pumps at the leaching plant;
  - line pipe for the blanket fluid from the leaching plant to the wellhead(s);
  - separation equipment for the removal of blanket fluid from brine;

- a system for ensuring the safety of the facility including a shutdown system;

- equipment for process control.

A system for ensuring the safety of the facility during the first gas filling shall be provided.

3 Design

3.1 Safety and environmental issues

The design of the plant shall enable the operator to conduct its operations in such a way as to minimize the risk of harm to its employees, contractors and all others who may be affected directly or indirectly by its activities, and to comply with standards on safety, occupational health and environmental protection.

For this, the following should be taken into consideration at the design stage:

- selection of the least harmful process materials and intermediaries;
- minimization of the inventory of hazardous materials;
- minimization of emissions of harmful solid, liquid and gaseous substances;
- design of combustion plant and equipment such as gas turbines, diesel and petrol engines, flares and boilers to produce exhaust gas which conforms to the authorized emission contents for oxides of nitrogen and sulphur and other pollutants;
- location of plant to minimize the risk to neighbours and their property;
- setting out and if necessary protection of sections of plant so that an incident in one location does not escalate to another part of the site;
- protection of the ground in areas where harmful liquids could be spilt by an appropriate impervious sealing material, with an appropriate and impervious retaining kerb. Spills shall be directed to tight catchment pits which are not directly connected to the main drainage system, watercourses or the sea;
- provision for the treatment of liquid discharges to drainage systems, water courses or the sea to render them harmless or for their storage in tight tanks before removal.