

Gas supply systems — Underground gas storage —

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

The European Standard EN 1918-2:1998 has the status of a
British Standard

ICS 75.200

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

BSI
Documents



Document Sharing Hub

National foreword

This British Standard is the English language version of EN 1918-2:1998.

The UK participation in its preparation was entrusted by Technical Committee GSE/33, Gas supply, to Subcommittee GSE/33/4, Gas supply: storage, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Find” facility of the BSI Standards Electronic Catalogue.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 11 and a back cover.

Amendments issued since publication

Amd. No.	Date	Text affected

This British Standard, having been prepared under the direction of the Engineering Sector Board, was published under the authority of the Standards Board and comes into effect on 15 June 1998

© BSI 1998

ICS 75.200

Descriptors: Storage, natural gas, definitions, specifications, environmental protection, design, safety, layout, tests, operating requirements, wells, maintenance, inspection

English version

Gas supply systems — Underground gas storage — Part 2: Functional recommendations for storage in oil and gas fields

Système d'alimentation en gaz — Stockage
souterrain de gaz — Partie 2: Recommandations
fonctionnelles pour le stockage en gisements de
pétrole et de gaz

Gasversorgungssysteme — Untertagespeicherung
von Gas — Teil 2: Funktionale Empfehlungen für
die Speicherung in Öl- und Gasfeldern

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.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

© 1998 CEN All rights of exploitation in any form and by any means reserved worldwide for CEN national Members.

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 2 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*

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.

Contents

	Page
Foreword	2
Introduction	3
1 Scope	3
2 Definitions	3
3 General	5
3.1 Long-term containment of stored products	5
3.2 Environmental conservation	5
3.3 Safety	5
3.4 Monitoring	5
4 Design	5
4.1 Design principles	5
4.2 Field description	5
4.3 Determination of the maximum operating pressure	6
4.4 Wells	6
4.5 Monitoring systems	7
4.6 Neighbouring subsurface activities	7
5 Construction	7
6 Testing and commissioning	7
7 Operation, monitoring and maintenance	8
7.1 Operating principles	8
7.2 Monitoring	8
7.3 Injection and withdrawal operations	8
7.4 Maintenance	8

Introduction

Natural gas produced from oil and gas fields is increasingly being used to supply energy requirements. The inflexible gas production from these fields does not match the variable market demand. Underground storage of compressed natural gas in oil and gas fields is an efficient common technology and has been used since 1915 for adjusting supply to meet demand.

For underground storage, natural gas is injected into subsurface oil and gas reservoirs when market demand falls below the delivery from the supply sources. It is withdrawn from storage to supplement the steady supply when demand exceeds that supply.

The primary function of underground gas storage is to ensure that supply is adjusted for peak and seasonal demand. Apart from this, the storage facilities can provide standby reserves in case of interruption to the normal supply and can help to conserve energy by storing associated gas which, otherwise would have to be flared.

Oil and gas fields are preferred as underground storage for large gas volumes, as the containment up to the initial pressure of these reservoirs is proven by the existence of the hydrocarbon accumulation. Furthermore, the knowledge about the reservoir behaviour and properties is available from the exploration phase and from the production period of the oil and gas field.

Nevertheless, the suitability of each oil and gas reservoir for gas storage has to be investigated individually, to operate the storage facilities in an efficient, safe and environmentally compatible manner. In order to construct a storage facility, wells are used to establish a controlled connection between the reservoir and the surface. The wells used for cycling the storage gas are called operating wells. In addition to the operating wells, specially assigned observation wells may be used.

Figure 1 illustrates a storage facility in an oil and gas field. Two typical completions of storage wells are shown in Figures 2 and 3.

Natural gas is injected via the operating wells into the pores of a subsurface reservoir, which was originally hydrocarbon bearing, thus building up a containment of compressed natural gas. Gas is withdrawn using the operating wells. Compression may be needed for injection and withdrawal.

The storage can be cycled between the maximum and minimum operating pressures equivalent to the working gas capacity. Below the minimum operating pressure it is inevitable that a large quantity of gas, known as cushion gas, remains in the reservoir. This cushion gas volume usually represents roughly half the maximum volume of gas in place.

Recommendations for the design, construction and operation of underground storage facilities in oil and gas fields are described in clauses 4 to 7.

For specific elements of an underground gas storage facility, e.g. wells and surface installations, existing standards should be applied.

1 Scope

This standard specifies procedures and practices which are safe and environmentally acceptable.

It covers the functional recommendations for design, construction, testing, commissioning, operation and maintenance of underground gas storage facilities in oil and gas fields up to and including the wing valve of the wellhead.

The necessary surface facilities for underground gas storage are described in EN 1918-5. 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 and which remains in a gaseous state under storage conditions.

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.

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

2 Definitions

For the purposes of this standard, the following definitions apply:

2.1

abandoned well

well whose use has been discontinued and which has been permanently plugged

2.2

annulus

space between two strings of pipes or between the casing and the borehole

2.3

aquifer

reservoir, group of reservoirs, or a part thereof that is fully water-bearing

2.4

boundary fault

fault which forms the physical border of a field

2.5

capillary pressure

pressure difference between the non-wetting phase and the wetting phase in porous rock

2.6

caprock

oiltight and gastight layer covering a porous and permeable formation