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Coalbed methane exploration and development — Terms and definitions

Exploration et développement du méthane de houille — Termes et définitions

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Foreword

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The committee responsible for this document is ISO/TC 263, *Coalbed methane (CBM)*.

Coalbed methane exploration and development — Terms and definitions

1 Scope

This International Standard provides terminology on geology and exploration, engineering construction, field development and production in coalbed methane industry. This International Standard does not contain surface gathering.

2 Terms relating to geology and exploration

2.1
coalbed methane
CBM
methane-rich gas naturally occurring in coal seams (and surrounding rock) typically comprising of 80 % to 95 % methane with lower proportions of ethane, propane, nitrogen and carbon dioxide

Note 1 to entry: In common international use, this term refers to methane recovered from un-mined coal seams using surface boreholes.

2.2
adsorption
enrichment of the absorptive gas at the external and accessible internal surfaces of a solid material (coal matrix)

[SOURCE: ISO 15901-2:2006, 3.2]

2.3
desorption
opposite of *adsorption* (2.2), in which adsorbed gases leave the surface of a solid material (coal matrix)

Note 1 to entry: The liberation can be spontaneous but can be accelerated by physical actions.

[SOURCE: ISO 3529-1:1981, 1.13.2]

2.4
gas content
volume of gas per unit mass of coal, usually expressed in cubic meter of gas per ton of coal under standard temperature and pressure (STP) conditions

Note 1 to entry: Unit is m^3/t or cm^3/g. STP conditions are 100 000 Pa and 0 °C (273,15 K).

2.5
CBM content
volume of hydrocarbon gas per unit mass of coal, usually expressed in cubic meter of gas per ton of coal under standard temperature and pressure (STP) conditions

Note 1 to entry: Unit is m^3/t or cm^3/g. STP conditions are 100 000 Pa and 0 °C (273,15 K).

2.6
CBM reservoir
coal seams and surrounding rock with hydrocarbon resources that can potentially be extracted for commercial purposes

2.7
initial reservoir pressure
P_i
initial gas pressure measured in a reservoir, prior to the start of production

[SOURCE: WWW.GLOSSARY.OILFIELD.SLB.COM]

2.8
pressure gradient
pressure change with distance ratio of fluid pressure in the middle of the coal seam and reservoir depth rate of pressure change with respect to depth of coalbed methane reservoir in unit depth, MPa/m, increasing pressure value of coalbed methane reservoir in unit depth, MPa/m

2.9
abandonment pressure
lowest pressure at which commercial production can be maintained under present economic and technical conditions expressed by flowing bottom hole pressure (FBHP)

2.10
adsorption isotherm
relationship between the amount of gas adsorbed and the equilibrium pressure of the gas at constant temperature

Note 1 to entry: Normally described by the Langmuir equation $V_{ads}=V_L \cdot (p/(P_L+p))$.

[SOURCE: ISO 15901-2:2006, 3.5]

2.11
Langmuir volume
V_L
maximum adsorbed gas content per unit mass of coal at infinite pressure under particular temperature conditions

2.12
Langmuir pressure
P_L
pressure at which half of the Langmuir volume exists within the coal under particular temperature conditions

2.13
adsorption time
time in hour or day taken for 63,2% of the total absorbed gas to desorb from the matrix

2.14
adsorption saturation
ratio of measured gas content to the maximum adsorbed gas content in theory per unit mass of coal under particular CBM reservoir pressure and temperature conditions

2.15
critical desorption pressure
pressure in which the gas begins to desorb from the coal matrix as the CBM reservoir pressure declines

2.16
shrinkage
contraction coefficient
decrease in volume of coal matrix after gas desorption expressed as a percentage of the initial volume

[SOURCE: ISO 14616:1997, 2.2 — modified]

2.17
diffusion coefficient
rate of gas diffusion through a material

Note 1 to entry: Expressed in m^2/s.

Note 2 to entry: Express flow ability of coalbed methane depending on concentration.

[SOURCE: ISO 9346:2007,3.34]

2.18
dual porosity system
rock characterized by primary porosity from original deposition and secondary porosity from some other mechanism [*cleat* (2.20) or *fracture* (2.19)] and in which all flow to the well effectively occurs in one porosity system, and most of the fluid is stored in the other

[SOURCE: WWW.GLOSSARY.OILFIELD.SLB.COM — modified]

2.19
fracture
natural fractures in a formation resulting from external stress, usually being associated with a displacement

2.20
cleat
natural *fractures* (2.19) in a coal seam usually being associated with *coalification* (2.21)

Note 1 to entry: Normally in a form as two groups of parallel fractures orthogonal with each other the group with better fracture continuity is called surface cleat (face cleat), the other group limited by surface cleat is called end cleat (butt cleat).

2.21
coalification
process by which deposited and compacted plant remains are transformed into coal

Note 1 to entry: Includes diagenesis and metamorphism.

[SOURCE: ISO 1213-2:1992, 3.29]

2.22
coal rank
position of a coal in the coalification series from lignite coal (low rank) to anthracite (high rank), indicating maturity in terms of chemical and physical properties

[SOURCE: ISO 7404-1:1994, 2.1.3]

2.23
CBM exploration
initial phase in coalbed methane operations that includes generation of a prospect or play or both, and drilling of an exploration well

[SOURCE: WWW.GLOSSARY.OILFIELD.SLB.COM]

2.24
CBM resources
naturally occurring concentrations or reservoirs of coalbed methane in coal seams and surrounding rock in such forms and amounts that economic extraction is currently or potentially feasible

[SOURCE: WWW.EIA.GOV/TOOLS/GLOSSARY]

2.25
original CBM in place
volume of coalbed methane in a reservoir prior to production

2.26
recovery factor
ratio of recoverable amount of hydrocarbon initially in place

[SOURCE: WWW.GLOSSARY.OILFIELD.SLB.COM]

2.27
reserve
portion of the demonstrated reserve base that is estimated to be recoverable at the time of determination

Note 1 to entry: Derived by applying a recovery factor to that component of the identified resource designated as the demonstrated reserve base.

2.28
CBM resource abundance
amount of hydrocarbons in unit area

2.29
zone evaluation
screening of various zones to decide on one or more favorable zone through comprehensive geological research

2.30
prospecting well
wildcat well
well drilled for the purpose of discovering a new field or reservoir in the new frontier

[SOURCE: http://www.mpgpetroleum.com/glossary.html]

2.31
appraisal well
wells drilled after gas has been discovered, in order to establish the limits of the accumulation in terms of both the area extent and thickness of the reservoir and the volume of hydrocarbons it contains, and in order to obtain fluid samples to investigate the distribution of fluid properties in the reservoir

2.32
dirt band
parting
layer of mineral matter lying parallel to the bedding plane in a seam of coal

[SOURCE: ISO 1213-2:1992]

2.33
ash
residue obtained by incineration of a solid mineral fuel under specified conditions

[SOURCE: ISO 1213-2:1992]

2.34
volatile matter
loss in mass, corrected for moisture, when a solid mineral fuel is heated out of contact with air under specified conditions

[SOURCE: ISO 1213-2:1992]

2.35
proximate analysis
analysis of a solid mineral fuel reported in terms of moisture, *volatile matter* (2.34), *ash* (2.33) and fixed carbon

[SOURCE: ISO 1213-2:1992, 3.134]

2.36
air dried basis
means of expressing an analytical result based on the condition in which a solid mineral fuel is in equilibrium with atmospheric humidity

[SOURCE: ISO 1213-2:1992, 3.5]

2.37
dry ash-free basis
means of expressing an analytical result based on a hypothetical condition in which the solid mineral fuel is considered to be free from both moisture and ash

[SOURCE: ISO 1213-2:1992, 3.48]

2.38
seismic
exploration technique that can find structures and potential reservoir traps by reflecting sound waves from the rock strata

[SOURCE: http://www.gekengineering.com/]

3 Terms relating to engineering and construction

3.1
casing programme
number of casing layers in one well, depth of setting and diameters of each casing pipe, wellbore diameter of relevant well depth and returning cement depth

3.2
directional well
well drilled at an angle from a surface location to reach a target which is not located directly underneath the wellhead

3.3
cluster wells
group of two or more wells drilled from one drilling pad

3.4
horizontal well
directional well (3.2) whose hole deviation angle is near, equal or larger than 90° with bore hole entering target seam and extending to a length

3.5
multi-lateral horizontal well
horizontal well (3.4) with more horizontal well segments or with more branch horizontal well segments drilled in one horizontal well segment

3.6
U-type well
combination of a *horizontal well* (3.4) and a vertical well with far end of the former connecting to the latter

3.7
V-type well
combination of *horizontal well* (3.4) wells with far ends connecting to the same vertical well

3.8
coalbed following drilling
drilling type following coal seams with dip more than 45°

3.9
inclination
deviation angle
angle of tangent line at one point of borehole axis and plumb line of the point

3.10
dog-leg severity
dog-leg angle with unit length in well unit °/30m

3.11
azimuth
angle of projection line of tangent line from one point of borehole axis following drilling direction and true north traverse line (clockwise rotation start with true north traverse line)

3.12
measured depth
MD
measured length of borehole axis from rig rotary table surface to measure point in the well

3.13
true vertical depth
TVD
vertical distance from measured point to kelly bushing surface

3.14
horizontal displacement
horizontal distance from measured point on well track to wellbore

3.15
wireline coring
operation to obtain rock sample (*core* (3.16)) drilled from stratum by wire line core barrel

3.16
core
cylinder coal rock sample obtained in the well by coring operation

3.17
core cutting
operation to cut core cylinder from drill to bottom when drilling to designed depth in coring

3.18
well cementing
operation to inject cement into annular space between casing string and borehole wall

3.19
injection
fall off test
method of determination of reservoir permeability based on measurement and analysis of pressure data gathered while injection of a fluid

3.20
skin effect
change in permeability near wellbore causing additional flow effect when permeability after drilling, well completion or well stimulation

3.21
CBM well completion
technology to achieve connection between drilled coalbed methane well and target stratum of development

3.22
open hole completion
well completion method when casing pipe reaches target coal seam of development and cementing, exposing production layer

3.23
cased hole completion
well completion method when casing pipe reaches target coal seam of development, cementing and connect wellbore and coal layer through perforation technology to create eyelet on casing pipe

3.24
cavern completion
well completion method to create a cave in target stratum after fall of coal seam into wellbore through pressure inducing,hydraulic chambering, etc. methods

3.25
screen pipe completion
well completion method of using screen liner in target zone

3.26
stimulation
technology to improve initial fracture system of coal seam and to improve connection between coal seam fracture and wellbore, or other technology to improve production ability

3.27
hydraulic fracturing
well stimulation method where a fracturing fluid is pumped into the coal seam at high pressure and flow rate resulting in fractures in the coal seam

3.28
artificial fracture
fracture created in coal seam through fracturing technology

3.29
proppant
solid particles filling and support fracture in fracturing technology

3.30
fracture conductivity
ability to allow fluid to flow through fracture

Note 1 to entry: Equals to product of fracture permeability and fracture width.

3.31
proppant volume percentage
ratio of volume of *proppant* (3.29) added accumulated volume of proppant to volume of used liquid when pumping proppant-carrying fluid

3.32
fracture half-length
radius of fracture
distance of extending of fracture through radial direction from wellbore to coal reservoir after fracturing coal reservoirs

Note 1 to entry: It is normally equal to length of *horizontal fracture* (3.41).

3.33
fracture pressure
construction pressure to start reservoir crash in fracturing

3.34
fracture pressure gradient
pressure gradient at which a specific formation interval breaks to form fractures

3.35
fracture extension pressure
pressure in fracture making fracture open and extending in fracturing

3.36
closure pressure
construction pressure to make fracture closed after pump stops in fracturing

3.37
vertically staged fracturing
pointed fracture layer by layer (segment) after separating target layers (segment) through a method

3.38
horizontally staged fracturing
technology to operate multi-stage fracturing to horizontal wells through separate layer (segment) fracturing technology

3.39
re-fracturing
fracture more than once on the same layer of the same well

3.40
vertical fracture
fracture surface is perpendicular to the coal seam, normally caused when horizontal stress is smaller than vertical stress

3.41
horizontal fracture
fracture surface is parallel to the coal seam, normally caused when horizontal crustal stress is larger than vertical crustal stress

3.42
log
systematic recording of data, such as a driller's log, mud log, electrical well log, or radioactivity log

Note 1 to entry: Many different logs are run in wells to discern various characteristics of downhole formation.

4 Terms relating to development and production

4.1
CBM development
exploitation of coalbed methane from coal seams through surface borehole

4.2
CBM well pattern
geometric arrangement mode of coalbed methane development well

4.3
inter-well interference
point which accelerates pressure falling and gas desorption when production wells' pressure falling transmit to the point in the same coal seam

4.4
CBM drainage
technology process to eject water out from CBM production well by artificial lift method, to realize CBM production