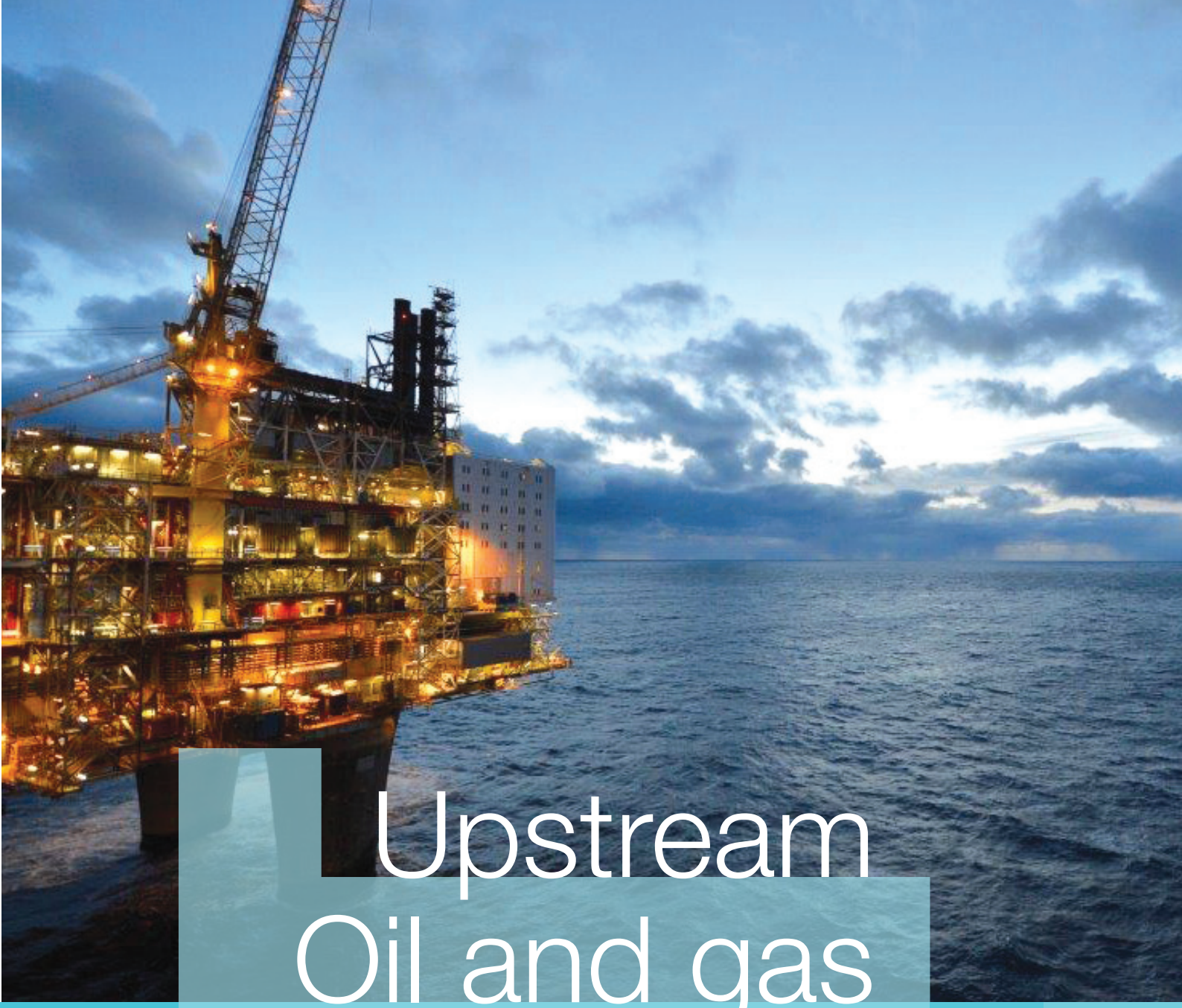

Upstream Oil and gas glossary

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Upstream oil and gas training specialists

IHS SPECTRUM
Excellence Awards
Celebrating Achievement of Business Goals Through Information, Analytics and Expertise

Delivering integrated upstream oil and gas industry training

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Contents

Introduction

Esanda is an independent upstream oil and gas consultancy specialising in industry specific training and field development planning services. Our operations are supported by our UK and Australia offices.

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Glossary

Abandonment End of production, plug and abandon wells, dismantle and remove all material and equipment

Acidising Treatment of reservoir with hydrochloric or hydrofluoric acid to improve performance

AFC Approved For Construction

AFD Approved For Design

AFE Approved For Expenditure

AHV Anchor Handling Vessel

Alkane Any of various saturated open-chain hydrocarbons having the general formula CnH2n+2, the most abundant of which is methane (CH4)

Alkene Any unsaturated aliphatic hydrocarbon with the general formula C2H2n such as ethylene, also known as olefins

Alluvial fan Pattern of sedimentary deposit frequently laid down by streams or rivers which spread out into plains

Annulus Space between two concentric objects such as between the wellbore and casing

Anoxic Lack or absence of oxygen

Anticline An arched shape fold in which rock layers are upwardly convex

API American Petroleum Institute

API gravity Density measurement for oil. API gravity = 141.5/(specific gravity) – 131.5

Aquifer Water-bearing rock strata

Aromatics Relating to an organic compound containing at least one benzene ring (C6 ring) or similar ring-shaped component. Naphthalene and TNT are aromatic compounds. Notable for their distinctive, usually fragrant smell

Artificial lift Sucker rod-pumps (nodding donkeys), gas lift, hydraulic pumps, and submersible electric pumps, used to aid the production of oil as reservoir pressure declines

Asphalt Solid petroleum residue, similar to bitumen, tar and pitch

Associated gas Natural gas which is dissolved in crude oil in the reservoir

Bar Unit of pressure

Bara bar, absolute pressure

Barg bar, gauge pressure

Barrel 42 US Gallons

Bbl Blue barrel, 42 US Gallons

bbl/d barrel of oil per day (see also Mbbl/d and MMbbl/d)

Blue Barrel

bbl/MMscf barrels per million standard cubic feet

bcf billion cubic feet (109)

BH Bottom Hole

BHA Bottom Hole Assembly

BHP Bottom Hole Pressure

Bit The cutting/boring element used in drilling wells, consisting of a cutting and a circulating element

Drill Bit

Bitumen Form of heavy, solid petroleum. See Asphalt

Block Subdivided areas for the purpose of licensing to a company for exploration or production rights

Blow down Process of releasing pressure. Producing a gas cap after oil production has concluded

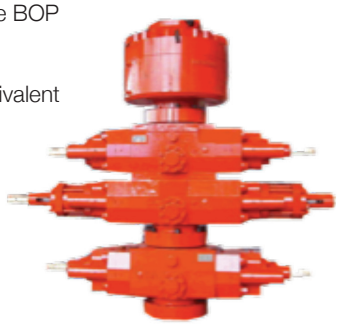
Blowout Uncontrolled release of fluids from the well bore

Blowout preventer See BOP

BOD Basis Of Design

BOE Barrels of Oil Equivalent (6,000 scf of gas equivalent to 1 bbl of oil)

BOP Blowout preventer, arrangement of valves and rams installed at wellhead to prevent sudden escape of fluids from reservoir



BOP

Bopd Barrels of oil per day

Borehole Refers to the face of the rock outside or below the casing

Bottom-hole Deepest part of a well

Bottom-Hole Assembly (BHA) Includes drill bit, drill collars, stabilizers and other drilling components

Bottom-Hole Pressure (BHP) Formation pressure at reservoir depth

Bottom-hole pump Pump installed in the wellbore, to increase productivity, (Also downhole pump)

Bpd Barrels per day

Bridge plug Down hole packer assembly used in a well to seal off or isolate a particular formation for testing, acidizing, cementing

BS&W Basic Sediment and Water

Btu British thermal unit

Bubble point The pressure and temperature at which the first bubbles of gas come out of solution

Bwpd Barrels of water per day

Calliper Tool for checking casing in a well for deformation

CALM Catenary Anchor Leg Mooring

Calorific value Quantity of heat produced by complete combustion of a unit weight of a material

Cantilevered jackup Jackup drilling unit where the drill rig is mounted on two cantilevers – see also Jackup

CAPEX Capital expenditure

Cap rock Impermeable layer of rock providing a seal to contain the reservoir fluids

Casing Steel pipe placed in the well and cemented in place

Catenary The natural curve assumed by a chain or cable suspended between two points (e.g. an anchor chain).

cc Cubic centimetre (cm3)

CCR Central Control Room

CCS Carbon Capture and Storage

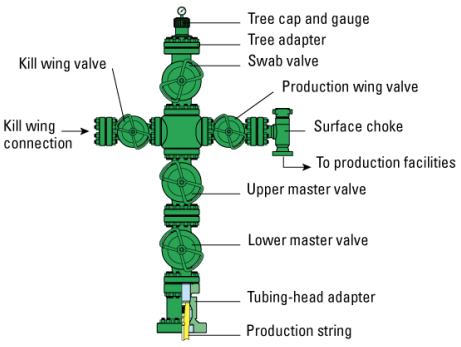
Cellar deck Deck beneath the working floor of a drilling rig or below the main deck of an offshore platform

Centipoise (cP) A unit of measurement for viscosity

Check valve A non-return valve, allowing flow in only one direction

Choke Device incorporating an orifice that is used to control fluid flowrate or downstream system pressure

Christmas tree (Xmas Tree) The set of valves, spools, pressure gauges and chokes fitted to the wellhead of a completed well to control production



Christmas Tree

Clastic Rock Rock which has been formed from sediment of other rocks e.g. sandstone, shale, conglomerates, etc.

Cloud Point The temperature at which paraffin waxes solidify and give a cloudy appearance to the oil which they form part

CNG Compressed Natural Gas

CO_2 Carbon dioxide

Concession Licence, lease, or other permit for exploration and/or production in an area or block

Condensate Low density, high API gravity liquid hydrocarbon phase that generally occurs in association with natural gas

Conductor casing Generally the first string of casing in a well

Conductor pipe A short string of large diameter casing used to keep the wellbore open and prevent it from caving in. It is usually put into the well first

Coning At excessive rates the reduction in reservoir pressure may tend to draw up underlying water or overlying gas towards the well in a cone like shape

Continental Shelf The area at the edge of a continent from the shoreline to a depth of 200m, where the continental slope begins

Conventional A reservoir in which buoyant forces keep hydrocarbons in place below a sealing caprock. Reservoir and fluid characteristics of conventional reservoirs typically permit oil or natural gas to flow freely into wellbores

Core A cylindrical sample taken from a formation for geological analysis

Coring The process of cutting a vertical, cylindrical sample of the formations

Cp Centipoise, a unit of measurement of dynamic viscosity (See Centipoise)

CPF Central Processing Facility

CPU Central Processing Unit

CRA Corrosion Resistant Alloy

Cretaceous Rock formed in the last period of the Mesozoic era, between the Jurassic and the Tertiary periods, during which chalk deposits were formed.

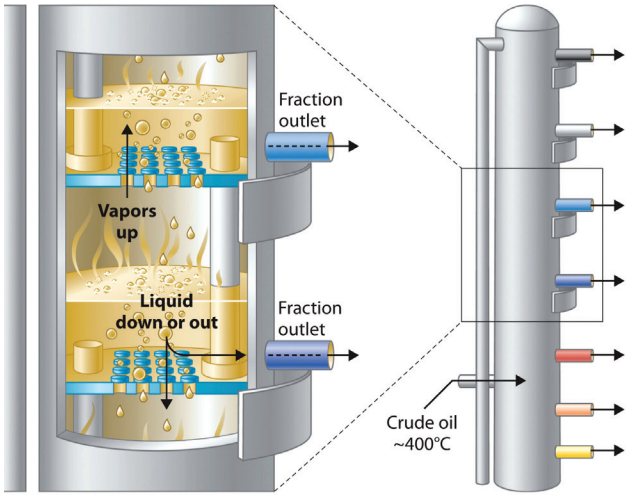
Crude Oil An unrefined mixture of naturally occurring hydrocarbons

Cuttings Small chips of rock retrieved from a well by the circulation of the mud, studied/logged by well-site geologist

Daisy chaining Subsea wells connected in series by flowlines

Darcy Unit of measurement of rock permeability, the extent to which fluid will flow through it

DCF Discount Cash Flow



Distillation Tower

	Number of carbons	Boiling point range	Uses
Gases	1–4	0–30°C	Bottled and natural gas
Naphthas	5–10	30–180°C	Gasoline
Kerosenes	10–16	180–260°C	Kerosene for home heaters, jet fuel
Gas oils	16–60	260–350°C	Diesel fuel, feedstock for cracking
Lubricants	>60	350–575°C	Motor oil, feedstock for cracking
Fuel oil	>70	>490°C	Candles, fuel oil for ships and power stations
Asphalt	>80	>580°C	Roofing tar, road tar

Petroleum Fractions

DCQ Daily Contract Quantity

DCS Distributed Control System

DDCV Deep Draught Caisson Vessel

Dead Oil Oil containing no natural gas

DEG Diethylene glycol

Degasser A separator which removes entrained gases from liquids (oil or water)

Dehydrator Equipment for the removal of water from oil or gas

Dehydration Removal of water from oil or gas to meet an end user specification

Delineation well An appraisal well, drilled to determine the boundary of a discovered reservoir

Density Mass divided by volume, kg/m3, lb/ft3 etc.

Density log Measurement of density, a guide to porosity

Depletion Progressive reduction in reserves as a result of production

Depth map Relief map of sub-surface structure, contours relating to depths from surface datum level, (i.e. sea level)

Derrick A large load-bearing structure, used for drilling

Development well A well drilled to allow production

Deviated well Well diverted from the vertical

Dew point Temperature and pressure condition at which liquids first condense from a gas

Dewpointing Removal of heavier hydrocarbons from a gas stream to meet end user specifications

Diaper Up-thrust intrusion of lower-density rocks through overlying formations, e.g. a salt dome

Directional drilling Intentional deviation of a wellbore from the vertical

Discovery well A successful wildcat or exploration well

Distillates The products of distillation

Distillation The process of heating and "flashing" or boiling off successive fractions, component hydrocarbon, from a crude oil feedstock, or a product of earlier distillation

Down Hole Down a well

Downstream Generally refers to crude oil refining, petrochemicals, marketing and distribution

Downtime A period when equipment is unserviceable or out of operation for maintenance etc.

DP Dynamic Positioning

Draft The vertical distance between the bottom of a vessel floating in water and the waterline.

Drawdown The difference between the static and the flowing bottom hole pressures

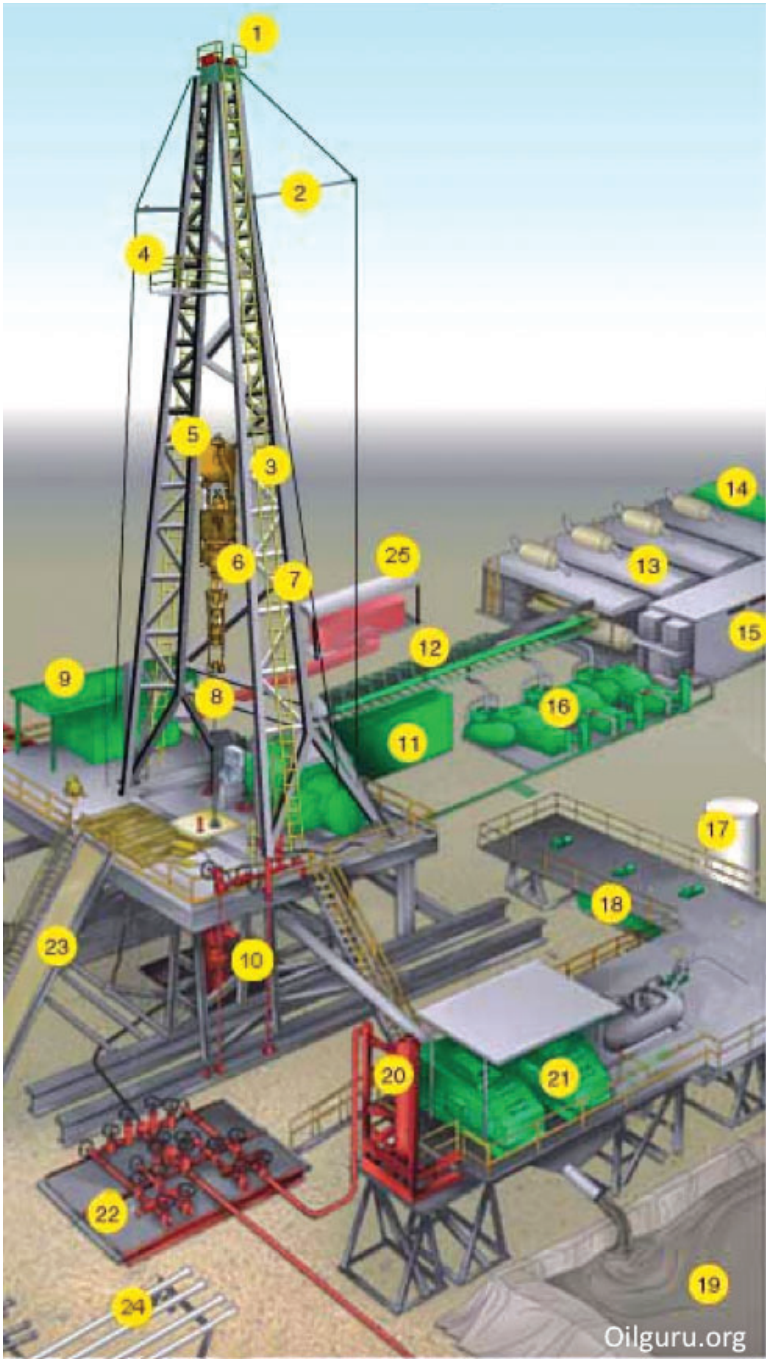
Drawworks The hoisting mechanism in a drilling rig

Drilling fluid Circulating fluid, removes cuttings from wellbore to surface, cools the bit and counteracts downhole formation pressure. See mud

Drilling mud Specially compounded liquid circulated through the wellbore during rotary drilling operations. See mud

Drilling rig Comprises derrick, draw-works, lifting tackles and blocks, Kelly and rotary table, mud pump and mud circulation system, blowout preventer, and a system for handling drillpipe and casing

Drill pipe Heavy, seamless tubing used to rotate the drill bit and circulate the drilling fluid



Drill Rig

1. Crown Block
2. Catline Boom and Hoist Line
3. Drilling Line
4. Monkey board
5. Travelling Block
6. Top Drive
7. Derrick or Mast
8. Drill Pipe
9. Doghouse or drillers shack
10. Blowout Preventer
11. Water Tank
12. Electric Cable Tray
13. Engine Generator Sets
14. Fuel Tanks
15. Electrical Control Room
16. Mud Pump
17. Bulk Mud Components Storage
18. Mud Pits
19. Reserve Pits
20. Mud Gas Separator
21. Shale Shakers
22. Choke Manifold
23. Pipe Ramp
24. Pipe Racks
25. Accumulator

Drill Ship

Drill ship Self-propelled ship with an offshore drilling unit

Dry Gas Natural gas, methane and ethane, with small amounts of heavier hydrocarbon fractions

Dry Hole Unsuccessful well, also called a “Duster”, containing no or uncommercial quantities of hydrocarbon

DST Drill Stem Test

DSV Diving Support Vessel

Duster A dry well drilled during exploration. See dry hole

Dynamic positioning A satellite monitoring system used to control the action of thrusters/propellers to maintain a vessel on location without deploying anchors

EDU Electrical Distribution Unit

EFL Electrical Flying Lead

EH Electro-Hydraulic

EHDM Electro-Hydraulic Distribution Manifold

E/H MUX Electro-Hydraulic Multiplexed

9k,k,mpl Environmental Impact Assessment

EIS Environmental Impact Statement

Emulsion Suspension of one liquid in another, e.g. oil in water

Enhanced oil recovery Assisted extraction of oil either by installing equipment into the production tubing or by injecting water, gas or steam into the reservoir

EMP Environmental Management Plan

EMS Environmental Management Study

EPC Engineering, Procurement and Construction

EPIC Engineering, Procurement, Installation and Construction

EPU Electric Power Unit

ERD Extended Reach Drilling

ESP Electric Submersible Pump

ESS Expandable Sand Screen

EWT Extended Well Test

Fault A break in subsurface strata

FBHP Flowing Bottom Hole Pressure

FEED Front End Engineering Design, early phase of field development engineering

FFD Full Field Development

Fiscal metering Measurement of oil, gas or condensate for taxation purposes

FID Final Investment Decision

Fixed installation A fixed offshore structure involved in the production of oil and gas

Flare Vent for burning off unwanted gas or hydrocarbons which due to process upsets cannot be safely retained in process vessels

Flare stack Elevated tower containing piping for the discharge and burning of waste gas

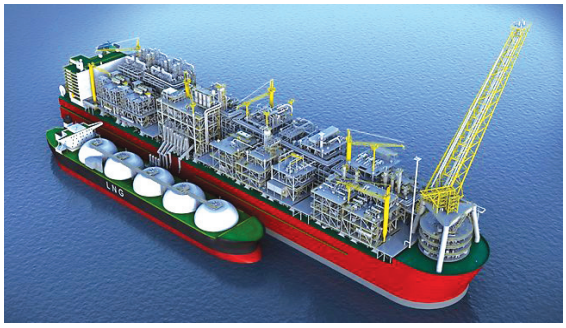
Flash drum Pressure vessel used to reduce pressure of oils and other liquids to encourage vaporisation of dissolved gases

Flash To vaporize or “boil off” a hydrocarbon gas by reducing pressure or heating

Flash Point Lowest temperature at which a vapour will burn when ignited.

FLNG Floating Liquefied Natural Gas Facility

Floater Floating substructure for drilling or production



FLNG

Flowing Bottom Hole Pressure Bottom hole pressure (reservoir) measured at a given flow rate.

hxFlowline Pipe from the Xmas tree through which produced fluid travels to a manifold, processing equipment or storage

Flowline Bundle A combined assembly of production flowlines, hydraulic and/or electrical control lines

Flowmeter Used to measure the rate of flow of a fluid

Formation Reservoir rock

Formation Damage Reservoir damage due to plugging with mud, crumbling under pressure or high flow rate, etc.

FPF Floating Production Facility

FPP Floating Production Platform

FPS Floating Production System

FPSO Floating Production, Storage and Off-loading (vessel)

FPDSO Floating Production, Drilling, Storage and Off-loading (vessel)

FPSO

Fracturing Fracturing formation adjacent to well bore to improve well productivity (flow) by applying hydraulic pressure downhole

Free-water knockout Removing any water that is not emulsified with the oil, usually in a vessel

FSO Floating Storage and Off-loading (vessel)

FSU Floating Storage Unit

FTP Flowing Tubing Pressure

FWHP Flowing Well Head Pressure

FWHT Flowing Well Head Temperature

FWKO Free Water Knock Out. See free water knockout

Gamma ray log Log of the total natural radioactivity. Shales and clays are responsible for most natural radioactivity, so the gamma ray log often is a good indicator of such rocks

Gas Cap Free gas at the top of a reservoir

Gas Cap Drive Primary production utilising the pressure and expansion of the gas cap to drive the oil to the surface

Gas Chromatography Laboratory method of separating and analysing the components of hydrocarbon mixtures

Gas Column See Oil Column/Gas Column

Gas Condensate Light hydrocarbons in gas which condense into liquid when brought to the surface

Gas Injection Gas is injected if there is no market for it, as a means of recovering condensate in certain reservoirs or until oil production is complete and then gas blowdown (production) can take place

Gas lift Process of lifting liquids from a well by injecting gas into the wellbore to reduce the density of the liquid, i.e. making it lighter

Gas/Oil Ratio (GOR) Ratio of gas to oil in reservoir, scf/bbl

GBS Gravity base structure

GCR Ratio of Gas to condensate in a reservoir, bbl/MMscf

Geochemical Survey Analysis of the hydrocarbon-bearing potential of an area by studying shallow cores and subsurface water for evidence of seepage or kerogens

Geology The study of the history of the earth and its rocks

Geologist Geologists in the oil and gas industry specialise in Sedimentology, Palaeontology

Geophones Sound wave receivers for onshore seismic surveys. See also Hydrophone

Geophysics Application of physics to the measurement of the earth and the study of its composition.

Geophysicist A Geophysicist in the oil and gas industry usually specialises in the interpretation of seismic survey data

Geothermal Gradient Increase of temperature with depth in the earth's crust, (Approximately 1 F°. per 70 feet).

GI Gas Injection

GIS Geographic Information System

GJ Gigajoules

GLR Gas Liquid Ratio

GOC Gas Oil Contact

GoM Gulf of Mexico

GOR Gas Oil ratio. See Gas oil ratio

GPD Gallons per day

GPH Gallons per hour

GPM Gallons per minute

Grass-Roots Development project which is built from scratch on a green field site

Gravel Pack Unconsolidated formations may require the wellbore in the producing zone to be filled with fine gravel which supports the formation and prevents sand production into the well

Gravimeter Device used to measure the variations in the gravitational field between 2 or more points

Gravity Platform/Structure Offshore platforms which rely on weight alone to keep them stable and in place

Gravity survey Exploration method measuring the intensity of the earth's gravity in order to detect geological structures

GRP Glass Reinforced Plastic

GTL Gas To Liquid

GWC Gas Water Contact

H2S, H2S Hydrogen sulphide, toxic sour gas.

Hawser Heavy rope for mooring or towing

HAZAN Hazard analysis

HAZID Hazards in design analysis

HAZOP Hazard and operability analysis

Header Pipe in which several pipes feed fluid into or from

HC Hydrocarbon

HDPE High density polyethylene

Heat Exchanger Process vessel equipment which passes fluid through pipes or plates to heat or cool another fluid (without mixing)

Helipad Helicopter landing deck or landing area

HFO Heavy Fuel Oil

HIPPS High Integrity Pipeline Protection System

Horizon Formation at a given depth is identified by geological age, e.g. "Middle Jurassic Horizon"

Horizontal Drilling Wells drilled up to 90° from the vertical, "horizontal", to the reservoir strata in order to increase well productivity

HPHT High Pressure High Temperature

HPU Hydraulic Power Unit

HSE Health, Safety, Environment

HUC Hook-Up and Commissioning

Hydrates Ice like crystals formed of water and methane in well bores or pipelines under certain pressure and temperature conditions. Problematic in that they can cause blockages that prevent continual production

Hydrocarbons Organic compounds formed of hydrogen and carbon atoms

Hydrocyclone Separation device utilising centrifugal force to remove oil from water

Hydrofrac See Fracturing

Hydrophones Instruments used for detecting and returning sound waves in offshore seismic operations.

Hydrostatic Pressure/Head pressure exerted by a column of liquid at a given depth

Hydrostatic Testing Pressure-testing vessels and piping systems with the use of water to a specified pressure

ID Internal Diameter

IEA International Energy Agency

Igneous rock Rock mass formed by solidification of molten material into/onto the earth's crust e.g. Granite

Impermeable Rock Rock that will not allow hydrocarbons to flow through it

Inert Gas Chemically unreactive gas

Infill Drilling Production wells drilled between existing wells to increase recovery of hydrocarbons.

Injection Well Well through which water/gas is injected to maintain pressure and improve 'sweep' recovery of reserves. Or for the return of gas to the reservoir if it has no market

Injector See injection well

In Place Total hydrocarbon content of a reservoir, as distinct from 'Reserves' which can be 'recovered' or produced

Instrument/Intelligent Pig Pipeline pig fitted with monitoring/gauging devices to check pipe integrity, wall thickness and or damage

IOC International Oil Company

IP Institute of Petroleum

IPE International Petroleum Exchange

IR Injection Rate

IRR Internal Rate of Return

ISO International Standards Organisation

ITT Invitation To Tender

Jacket Steel framework supporting platform topsides

Jack-Up Rig Drilling rigs/barges which once floated to location raise their legs clear of the water by 'jacking' themselves up

JIP Joint Industry Project

JOA Joint Operating Agreement

Joint Venture A common form of risk-sharing in Oil and Gas operations, especially during exploration and production

JT Joule Thompson -Change in temperature when gas expands from a high pressure to low pressure, such as across a valve, aids in the cooling and condensation of hydrocarbon liquids from gas

J-tube Open-ended J section of pipe attached to a jacket structure or to a pipelay vessel providing a means of installation and protection for flexible flow lines and umbilicals

J-T valve Joule-Thompson valve. Throttle valve using pressure reduction of a gas stream for NGL removal. See JT

Jurassic Rock formed in the second period of the Mesozoic era, between the Triassic and the Cretaceous periods. (from the French, after the Jura mountains)

Jack-Up Drilling Rig

JV Joint Venture. See Joint venture

K 103, kilo, thousand (Europe)

Kelly A long square or hexagonal steel bar with a hole drilled through the middle for a fluid path

Kerogen Organic material (originating from phytoplankton and zooplankton) from which oil or gas matures with time through burial, temperature and pressure

Kerosense Liquid mixture consisting mainly of alkane hydrocarbons with boiling points in the range 150° to 300°C, used as aircraft fuel, in domestic heaters, and as a solvent

Kitchen Term for rock rich in organic sediments and in which under the right conditions become a source of hydrocarbons

Knock-Out Drum Tank or vessel used to separate water from oil or liquids from gas

KO Kick Off (deviated well)

kPa kilopascals, measure of pressure

kW Kilowatt, measure of electrical power

LAT Lowest Astronomical Tide

Lay barge Barge used in the construction and placement of underwater pipelines

Licence A right to explore for and/or produce hydrocarbons issued by a Government agency

Lifting Collection of a shipment of crude oil etc. at the point of sale

Lithification The process by which unconsolidated materials are converted into coherent solid rock, by compaction or cementation

Lithology The study of rocks

Live Oil Crude oil containing volatile gases

LNG Liquefied Natural Gas (CH4)

Log Systematic recording of well data

LMRP Lower Marine Riser Package

LPG Liquefied Petroleum Gas, essentially propane and butane

LTS Low Temperature Separator

LWD Logging While Drilling

M Thousand (oilfield), Roman M=1,000, M in metric and some other fields relates to million. Care must be taken to ensure that the value is understood

Magnetic survey Exploration method measuring the changing magnetic intensity in the earth to indicate the existence of hydrocarbon reservoirs

Magnetometer Instrument used to measure magnetic fields

Mat/Mattress A structure placed on poorly consolidated, soft or unstable seabed as a footing for jackup rigs, flowlines and subsea equipment

Maturity Function of burial pressures/temperatures, and time determining whether source of hydrocarbons will provide oil or gas

Maximum exposure Maximum negative cash flow of a project

MBbls Thousand barrels. See M

Mcf Thousand cubic feet. See M

MCM Manifold Control Module

Mcm/d Million cubic metres per day. See M

Md Millidarcies (unit of permeability)

MD Measured Depth (well)

Measurement While Drilling (MWD) The evaluation of physical properties, pressure, temperature and wellbore trajectory in 3D while drilling

MEG Monoethylene glycol

MEOH Methanol

Metamorphic rock Rock formed by mineralogical, chemical and structural alterations caused by processes within the earth's crust. Marble is a metamorphic rock

MFM Multiphase Flow Meter

Midstream Transportation to market or refinery

Migration Movement of hydrocarbons from source rock either into a reservoir or seeping to the earth's surface

Millidarcy See Darcy

Miocene Rocks formed in the fourth epoch of the Tertiary period, between the Oligocene and the Pliocene, see Tertiary

MM Million (oilfield), Roman M=1,000, MM = 1,000*1,000 = 1,000,000, M in metric and some other fields relates to million. Care must be taken to ensure that the value is understood

MMbbl/d Million barrels of oil per day

MMboe Million barrels of oil equivalent. See BOE

MMBTU Million British Thermal Units

MMcf Million cubic feet

MMcf/d Million cubic feet per day

MMSCF Million standard cubic feet

MMSCFD Million standard cubic feet per day

MOD See Money Of the Day

MODU Mobile Offshore Drilling Unit.

Module A self-contained, liftable package forming part of a facility, e.g. accommodation module, compression module, drilling module, etc.

Money of the Day Nominal or current value. This is the money, which as coins, bank notes and cheques, changes hands all over the world in exchange for goods and services. Its purchasing power will change with time

Monopod Small offshore platform, usually resting on a single conductor, usually in shallow water

Moonpool A hole in the hull of a ship through which operation can take place

MSL Mean Sea Level

MSV Multi-Service Vessel

MTD Measured Total Depth

Mud Drilling fluid, mixture of water, or oil distillate, and 'heavy' minerals such as bentonite or barites

Mudline The seabed, or bed of any body of water

Multilateral Multiple boreholes drilled from an existing single bore well

Multiphase Fluid consisting of oil, gas and or water

Multiple Completion Well perforated and completed to produce from more than one formation/zone

MWD Measurement While Drilling

N Newton (unit of force)

NACE National Association of Corrosion Engineers (USA)

Napthenics Any of a group of hydrocarbon ring compounds of the general formula, CnH2n, derivatives of cyclopentane and cyclohexane, found in certain petroleums.

Natural Depletion Reservoir production by use of its natural pressure

Natural Gas Natural Gas is primarily methane which can contain some ethane and small quantities of propane, butane, etc. which can be condensed from the natural gas (methane) and are known as Natural Gas Liquids (NGLs)

Beam Pump/Nodding Donkey

Neutron log Normally synonymous with a neutron porosity log, however, the term is sometimes broadened to include an activation log. Guide to rock porosity

NGL Natural Gas Liquid, mixture of hydrocarbon liquids which include ethane, propane, butane and pentane condensed from natural gas

NGO Non-Government Organisation

Nodding Donkey The colloquial name for conventional onshore wellhead production beam pumps

NOC National Oil Company

Nominal Money of the day or current value. This is the money, which as coins, bank notes and cheques, changes hands all over the world in exchange for goods and services. Its purchasing power will change with time

NPI Net Profit Interest

NPS Nominal Pipe Size

NPSH Net Pump Suction Head

NPV Net Present Value

Obligation Well Well required to be drilled as part of a concession agreement

OD Outside Diameter

O&G Oil and Gas

Oil and gas separator Production equipment used to separate liquid and gas components as well as water from oil

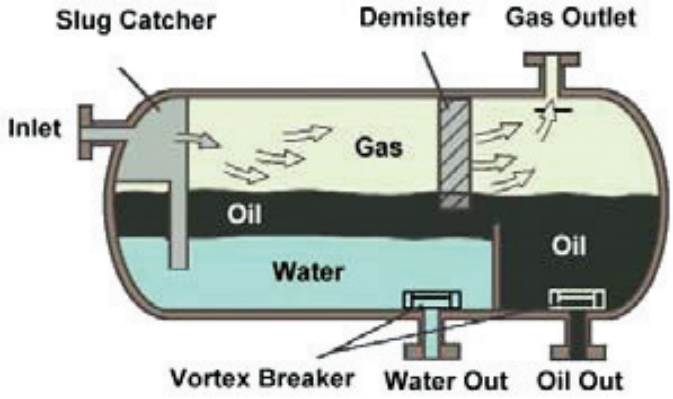
Oil Column/Gas Column The vertical distance between highest and lowest known oil or gas in a reservoir.

Oil/Water Contact The lower end of the column in a reservoir with underlying water

Oligocene Rock formed in the third epoch of the Tertiary period. See Tertiary

Open Hole An uncased section of well borehole.

Operator The company or organisation responsible for conducting operations on a concession



Oil and Gas Separater

OPEX Operating expenditure

Organic Substances derived from living organisms, such as oil in the natural state.

Outcrop The appearance of a rock formation at the surface.

OWC Oil-water contact

P&A Plug and abandon

Paraffin Any member of the Alkane series. See Alkanes

Passive Margin Offshore continental Plates, a tectonic boundary where two plates are moving away from each other

Pay Zone/Horizon A formation containing producible hydrocarbons

Payback The point at which all costs of leasing, exploring, drilling and operating have been recovered from production of a well or wells as defined by contractual agreement

Perforation Holes shot through the casing in the pay zone (producing zone)

Perforating Gun tool loaded with explosive charges which are shot into the pay zone

Permeability The ability of fluid to flow through a rock

Petroleum Literally 'rock oil'. A complex mixture of naturally occurring hydrocarbons found in rock

Petrochemicals Petrochemicals are chemical feedstocks and intermediates derived from petroleum

Petroleum Engineer Specialist in properties and behaviour of hydrocarbons in reservoirs and under production conditions. A geologist will provides estimates of hydrocarbons-in-place, whereas a petroleum engineer will make an estimate of how much can be produced (recoverable reserves) and under what conditions, and rate

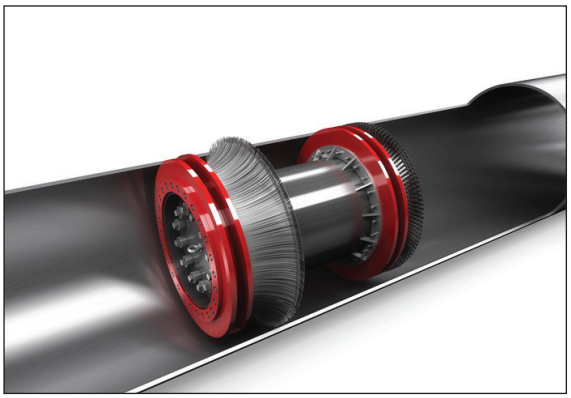
Petrology/Petrophysics The study of rocks, their origin, chemical and physical properties and distribution

PDQ Production Drilling and Quarters platform, see also Production Platform/Facility

Perforate Pierce casing wall and cement by using a perforating gun charged with explosives

Phase One of two or more fluids as in a production fluid (i.e. oil, gas or water)

PI Productivity Index



Pig

Pig Bullet-shaped, cylindrical or spherical capsules which are inserted into pipeline flow, with the primary purpose of scraping clean wax and other build-ups to prevent blockages

PIP Pipe In Pipe

Pipeline A system of connected lengths of pipe, buried or surface laid for the transportation of fluids

Plate tectonics Study of the formation and movement of the "plates" of which the earth's crust is formed

Platform Immobile offshore structure from which development wells are drilled and produced

PLEM Pipeline End Manifold

PLET Pipeline End Termination (usually a skid or sled)

Plug/Plug and Abandon To seal a well with cement, e.g. before producing from a higher formation, sidetracking, or leaving the well permanently sealed and abandoned

POOH Pulled Out Of Hole

Polymer Combination of two or more molecules of the same kind which form a compound of differing physical properties – e.g. Polyethylene

Porosity Free space volume between rock grains capable of holding fluid, (gas or liquid), expressed as a percentage of total gross rock volume

ppm Parts per million

Present Value Also known as present discounted value, is a future amount of money that has been discounted to reflect its current value, as if it existed today

Pressure Maintenance Process of maintaining reservoir pressure during production by water/gas injection

Pressure Vessel Vessel built to hold fluids under pressure

Produced water Formation water removed from the oil and gas

Production Extraction of hydrocarbon reserves

Production Casing String Innermost steel lining of a well cemented in place and perforated for production in the pay zone, note the production tubing is inserted inside this casing. (See production tubing string)

Production Plateau Period during which field is producing at its maximum production rate

Production Platform/Facility Production platforms are of varying types depending on environment (water depth etc. and reservoir needs). The production facility allows the oil and gas to be processed and exported or reinjected as required

Production Separator Main process vessel used for the separation of oil, gas and water, see also oil and gas separator

Production Sharing Contract (PSC) Contract in which part of the return to the host government is delivered as produced hydrocarbons, which is calculated after deduction of production and other agreed costs

Production Testing Production test looks at the capability to produce (productivity) of a well and its effects on the reservoir produced, this may be undertaken prior to final commitment of development expenditures etc.

Production Tubing String Pipe installed inside the production casing of a well

Productive Horizon A pay zone. See also Horizon

Productivity Index (PI) A mathematical means of expressing the ability of a reservoir to deliver fluids to the wellbore

Production Platform

Proppants Sand, gravel or other particles or “beads” used in hydraulic fracturing of a formation, the proppant allows fluid to flow by wedging into the fractures/cracks created by fraccing

PSA Production Sharing Agreement

PSC Production Sharing Contract

psi pounds per square inch - pressure

psia pounds per square inch, absolute - pressure

psig pounds per square inch gauge - pressure

PUQ Production Utilities Quarters, see also production platform/Facility

Qualitative risk assessment Assessment based on operational experience, engineering standards and judgement

QRA Quantitative Risk Assessment – includes calculations to assist with the identification of risks and to determine the frequency, magnitude and consequence of hazardous events

Raw Gas Natural gas prior to processing

Real (Real Terms, RT) Constant value of money (imaginary money), this was introduced to overcome the varying purchasing power of money of the day, which keeps the purchasing power the same at different moments in time

Recovery Factor The ratio between the volumes of oil and/or gas produced and producible from a reservoir and the oil and/or gas originally in place

Reef Reservoir, usually limestone which was deposited in marine conditions, usually elongated

Reservoir Subsurface porous & permeable rock body in which oil and or gas is stored

Reservoir Pressure The pressure at reservoir depth in a shut-in well

Resistivity log A log of the resistivity of the formation made by an electrode device such as a laterolog, in this sense the term is used to distinguish the log from an induction measurement, which responds more directly to conductivity

Rig Term describing the equipment needed for drilling a well, see also drilling rig

ROI Return On Investment

ROP Rate Of Penetration (drilling)

Rotary table Principal component of rotating, or rotary machine, which turns the drill stem and supports the drilling assembly, see also drilling rig

ROV Remotely Operated Vehicle

RVP Reid Vapour Pressure

SALM Single Anchor Leg Mooring; a compliant monopod version of the SBM tanker-loading buoy, used in deeper water

Salt dome A dome that is caused by an intrusion of rock salt into overlying sediments

Satellite well Usually a single well drilled offshore to produce from the fringes of a reservoir or adjacent small reservoir

SBM Single Buoy Mooring, a single point buoy mooring for loading and unloading tankers

SBV Standby Vessel

Scf Standard cubic feet

Scf/bbl Standard cubic feet per barrel

Scf/d Standard cubic feet per day

Scf/Stb Standard cubic feet per stock tank barrel. See GOR

SCM Subsea Control Module

Scrubber Separator for removing liquids/solids from gas stream

SCS Subsea Control System

SCU Surface Control Unit

Scuff Standard cubic feet

SDU Subsea Distribution Unit

Seal Impermeable fault/stratum of rock beneath or behind which hydrocarbons can accumulate. See also reservoir

Secondary recovery Production of fluids from a reservoir by water/gas injection used for pressure maintenance

Sedimentary rock Rock composed of weathered materials transported by wind or water that have undergone lithification, e.g. sandstone, shale and limestone

Seep Fault or pathway where hydrocarbon migrates to the surface/atmosphere

Seismic survey Exploration method in which strong, low-frequency sound waves are generated on the surface or in the water to find subsurface rock structures that may contain hydrocarbons

Semi-submersible Floating offshore production and or drilling unit, which can include living quarters, storage space, etc. They can be either self-propelled or towed to a site and either anchored or dynamically positioned. Semi submersibles are more stable than drill ships and used extensively to drill wildcat wells in rough waters such as the North Sea

Separator Cylindrical vessel used to separate the components in streams of mixed fluids. See also oil and gas separator

Semi Submersible Drilling Rig

Service contract Duration often fixed, company does not receive any of the oil produced, but gets a fixed fee per barrel, above the reimbursement of the costs it incurs

Service well See injection well

Shale Fine-grained, muddy sedimentary rock with low porosity

Shale shaker Vibrating screen used to remove cuttings from the circulating fluid (mud) in rotary drilling operations

SHEQ Safety, Health, Environment and Quality

Shut-in pressure The pressure in a shut-in, non-flowing well or the static pressure

Shuttle tanker Oil tanker used to transport oil from larger vessels to port

SI System Internationale (International System of Units)

Side-tracked well Well that has been re-drilled from an intermediate depth

Sidewall coring Coring samples taken from the side walls of a well bore using a special tool

Single point mooring system Offshore system to which stabilised oil can be routed and an export tanker can moor for the oil to be offloaded for export

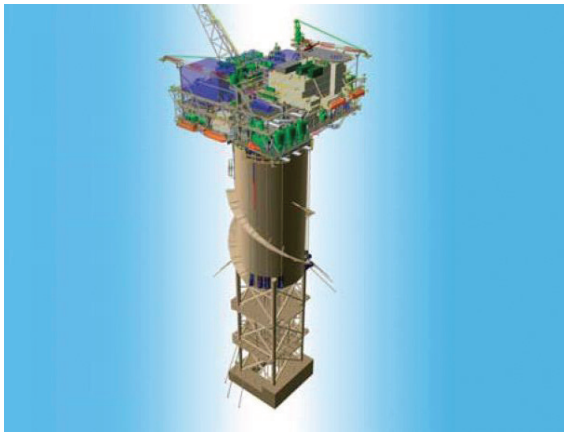
Skid Steel framework used to contain equipment or mount equipment on for transport

Skimmer Equipment for removing the surface layer of oil from an oil spill, or from an effluent water separator tank.

Slop tank Tank for the temporary storage of water that is contaminated with oil

Sonic log A type of acoustic log that displays travel time of P-waves versus depth. Sonic logs are typically recorded by pulling a tool on a wireline up the wellbore. The tool emits a sound wave that travels from the source to the formation and back to a receiver

Sour oil/gas Oil or gas with a relatively high content of sulphur compounds such as hydrogen sulphide



SPAR Facility

Source rock Sedimentary rock with organic deposits that form into hydrocarbons

SPAR A cylindrical/partially submerged offshore drilling/ production platform, well adapted to deepwater

Splash zone The part of an offshore structure that is regularly exposed alternately to atmosphere and water or spray and therefore highly prone to corrosion

Spontaneous potential A log of the natural difference in electrical potential, in millivolts, between an electrode in the borehole and a fixed reference electrode on the surface. The most useful component of this difference is the electrochemical potential since it can cause a significant deflection opposite permeable beds

Spread Any complete set of equipment and ancillary vessels or vehicles for a designated task e.g. diving spread

Spud To begin drilling

SSIV Subsea (safety) isolation valve

SSV Surface safety valve

SSSV Surface controlled subsurface safety valve OR Subsea safety valve

Stab To make a connection by inserting (stabbing) one device into another

Stabilised crude oil Crude oil which has had the volatile gas (at normal surface conditions) removed from it to meet commercial sale specifications. Also known as stock tank oil

Start up Production from a commissioned and tested installation

Steam injection/flooding Used to lower the viscosity of residual/heavy oil in the reservoir and aid it in flowing to the well

STOIIP Stock Tank Oil Initially In Place

STP Standard Temperature and Pressure

Subsea blowout preventer Blowout preventer placed on the seabed for use by a floating offshore drilling rig, see also BOP

Subsea template Template placed on seabed to facilitate drilling of wells, the wells are drilled through the template and completed by mounting the subsea Xmas trees

SUDU Subsea Umbilical Distribution Unit

SUTA Subsea Umbilical Termination Assembly

SUTU Subsea Umbilical Termination Unit

SV Support Vessel

Swab Valve Subsea tree mounted valve used during workover

Sweet Pertaining to crude oil or natural gas lacking appreciable amounts of sulphur or sulphur compounds

Syncline A downward, trough-shaped configuration of folded, stratified rocks. Compare with anticline

Tanker Any mobile storage unit for the bulk transport of crude oil, gas or products

Tar See Asphalt

Tariff Volume-based or tonnage-based rental charge, e.g. pipeline tariff, processing tariff

Tar sands Sands impregnated with oil in the form of asphalt or bitumen which are mined

Tcf Trillion cubic feet

TD Total Depth i.e. the drilled depth in a well at any one time

Tectonics The process of formation and evolution of the earth's solid surface crust. (See also Plate tectonics.)

TEG TriEthylene Glycol

Template Structural framework where subsea wellheads are grouped

Tension-leg platform A compliant offshore drilling or production platform which resembles a semisubmersible and is attached to the seabed with tensioned steel hawsers or tubes. The buoyancy of the platform applies tension to the hawsers or tubes

Tertiary Period or rock system divided into Palaeocene, Eocene, Oligocene, Miocene and Pliocene epochs or series

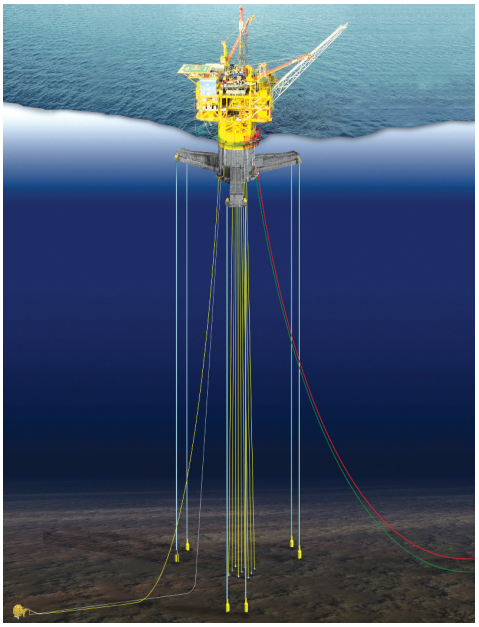
THFP Tubing Head Flowing Pressure

THP Tubing Head Pressure

Tie-in Connecting one pipeline to another or to equipment, also known as tie-back

TLP Tension Leg Platform

Topsides Installation on substructure consisting of the decks, accommodation and process equipment required for production, see also production Platform/Facility



TLP Facility

Trap Rock strata that are arranged so that petroleum accumulates in them

Trunk lines Long distance pipelines, as distinct from field, gathering or branch lines

Tubing Small-diameter pipe that is run into a well to serve as a conduit for the flow of oil and gas to the surface

Tubing head The tubing head is installed at the wellhead on the production tubing, sealing off the annulus between the casing and the tubing, and carries the connections for production flowlines

Tubing hanger Incorporated in a tubing head (similar to a casing hanger)

Turnkey contract Fixed price contract for construction, drilling a well, etc., contractor takes on risk for non-completion

Turret moored A production turret (a cylindrical buoy) is built into a cavity similar to a moon-pool in a floating ship-shaped production facility, this is connected to the wells by flexible pipelines and then moored in place, the ship/facility is free to rotate or "weathervane" around the turret maintaining an optimum profile to wind and sea. The turret can also be externally attached

TUT Topside Umbilical Termination

TUTU Topside Umbilical Termination Unit

TVD True Vertical Depth; the vertical distance below surface datum reached by a deviated well

TVDSS True Vertical Depth Subsea

Ullage Unused/available storage in a tanker, pipeline or plant

Unconventional Currently refers to oil and gas resources whose porosity, permeability, fluid trapping mechanism, or other characteristics differ from conventional sandstone and carbonate reservoirs. Coalbed methane, gas hydrates, shale gas, fractured reservoirs, and tight gas sands are considered unconventional resources

Upstream Exploration, development and production

USG United States Gallons

UTA Umbilical Termination Assembly

UTM Universal Transverse Mercator. A worldwide grid system of rectangular coordinates that uses metric (SI) units

Vapour pressure The pressure exerted by the vapour of a substance, and also the pressure required to prevent a liquid from vaporising

Vent Pipe/fitting on a vessel that can be opened to atmosphere

Vent stack Open pipe and framework for discharging vapours into the atmosphere at a safe location without combustion

VFD Variable Frequency Drive

Viscosity Property of fluids/slurries indicating their resistance to flow, defined as the ratio of shear stress to shear rate

VIV Vortex Induced Vibration

VLCC Very Large Crude Carrier

VOC Volatile Organic Compounds

Volatility Readiness with which a liquid converts to its gas state

VP Vapour Pressure

VSD Variable Speed Drive

WAAC Weighted Average Cost of Capital

WAP Wax Appearance Point

WAT Wax Appearance Temperature

Water drive Hydrocarbon reservoir in contact with underlying water table, the formation pressure will drive the water into the rock pores vacated by produced oil, thus maintaining reservoir pressure and aiding production

Watering out When the proportion of water in production from a well is so high that it must be shut in (up to 95%)

Water injection The injection of water in order to maintain reservoir pressure and boost production

Water re-injection Disposal of produced water into a disposal well as opposed to dumping to the environment (not for boosting the reservoir pressure)

Water saturation Proportion of water in the pore spaces of a reservoir. See Porosity

Water separation Removal of water from oil or gas, techniques available are e.g. settling (gravity), heating and electrostatic precipitation (especially for breaking water-oil emulsions)

Water table The level in the earth below which rock pores are saturated with water

Wax Paraffin waxes are found in crude oil, sometimes making up a significant proportion of it and require special treatment to allow the oil to flow freely at surface conditions.

WD Water Depth

Weather window Period of relativity good weather when operations can take place

Well Steel-lined boreholes drilled to search for, exploit and produce hydrocarbon reservoirs

Well completion Preparing a well for the production of oil and gas

Wellhead The "Wellhead" is descriptive of a location or function (including the Xmas tree and hang offs) rather than a specific item of equipment. Permanent equipment used to secure and seal the casings and production tubing and to provide a mounting for the Xmas tree

Wellhead platform Offshore platform designed to support only wellheads (including Xmas trees) and associated piping, production fluids are then transferred to a nearby production platform or onshore for processing

Wellhead separator The first process vessel in a production operation, operating at or near wellhead pressures

Well logging Recording of information of subsurface formations. Logging includes records kept by the driller and records of mud and cutting analyses, core analyses, drill stem tests, and electric, acoustic and radioactivity logging

Well permit Regulatory permission to drill a well

Well program The engineering design and technical/ operational plan for drilling, completing and testing a well

Well testing Testing of an exploration or appraisal well to aid the estimation of reserves in communication with the well and well productivity. Testing in a production well also monitors the effects of cumulative production on the formation

Wet gas Natural hydrocarbon gas containing significant amounts of natural gas liquids

Wet tree Xmas tree installed on seabed and exposed to water, see also Christmas tree

WI Water injection

Wildcat Well drilled in an area where no oil or gas production exists. With modern exploration methods and equipment, about one wildcat out of every seven proves productive, but not necessarily economic

Wireline Small-diameter metal line used in wireline operations; also called slick line. A system in which a flexible cable and reel is used to lower a log or maintenance equipment into a well, rather than a rigid drill string, offering considerable savings of equipment, manpower and time

WO Workover

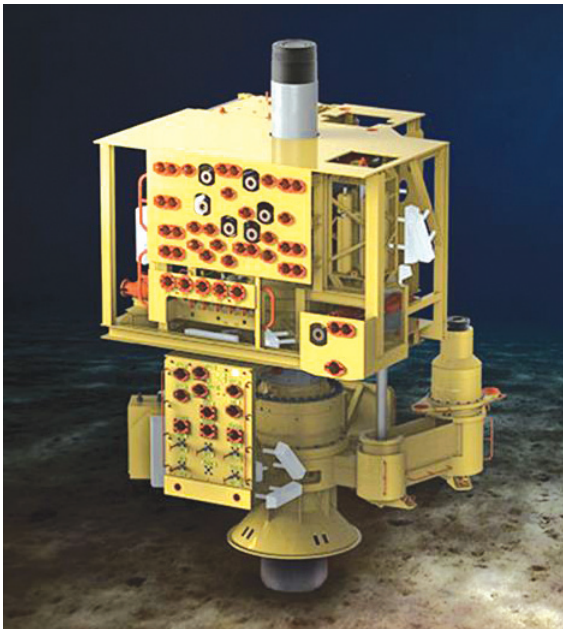
Workover Maintenance job on a well to replace equipment and or stimulate production

Workover rig Usually a smaller portable version which can be used on installations which do not have a permanent rig

WOW Waiting on weather

Xmas tree See Christmas tree

Zone Interval between two depths in a well containing reservoir or other distinctive characteristics



Subsea (Wet) Christmas Tree

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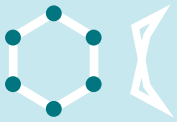
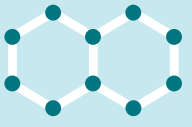
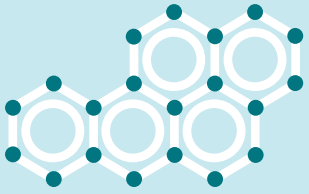
Petroleum Chemistry

Normal Paraffins (Alkanes)			Branched-Chain Paraffins (Alkenes)		
● = Carbon Atom		Boiling point			Boiling point
CH_4	Methane	–161°C	C_4H_{10}	Isobutane	–12°C
C_2H_6	Ethane	–89°C	C_6H_{14}	2,2-Dimethylbutane	50°C
C_3H_8	Propane	– 42°C	C_6H_{14}	2,3-Dimethylbutane	58°C
C_4H_{10}	Butane	– 0.5°C	C_6H_{14}	2-Methylpentane	60°C
C_5H_{12}	Pentane	36°C	C_7H_{16}	2-Methylhexane (Isoalkane)	90°C
C_6H_{14}	Hexane	69°C	C_7H_{16}	3-Methylhexane (Anteisoalkane)	92°C
C_7H_{14}	Heptane	98°C	C_8H_{18}	2,2,4-Trimethylpentane (Iso-octane)	99°C

Petroleum Chemistry

Napthenes (Cycloparaffins)			Aromatics		
		Boiling point			Boiling point
C_6H_{12}	 Methylcyclopentane	72°C	C_6H_6	 Benzene	80°C
C_6H_{12}	 Cyclohexane (Side View)	81°C	C_7H_8	 Toluene	111°C
C_8H_{16}	 Ethylcyclohexane	132°C	C_8H_{10}	 Paraxylene	138°C
C_9H_{18}	 1,1,3-Trimethylcyclohexane	137°C	C_9H_{12}	 Isopropylbenzene	152°C
$C_{10}H_{18}$	 Trans form Decalin	187°C	$C_{20}H_{12}$	 3,4-Benzpyrene	>500°C

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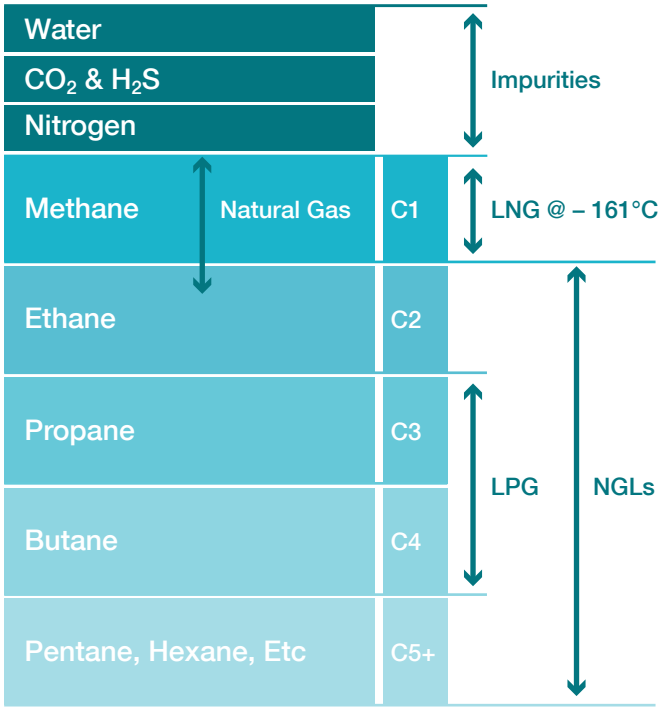
Gas and Gas Condensate Categories



A Brief History of Oil and Gas

40,000 BC Natural bitumen found on stone tools from Neanderthal sites in Syria

5,000 BC Ancient Egyptians use bitumen to create their mummies – mumiyyah Arabic for bitumen

2,000 BC Herodotus claims that asphalt was used in the tower of Babylon with bitumen recovered from the banks of local rivers

600 BC Ancient Greeks observe the "eternal fires" in Absheron peninsula (in modern Azerbaijan)

350 AD Chinese use bamboo drill strings to drill oil wells up to 300 m

1,000 Arabic geographer, Al-Mas'udi observes oil seeps in southern Europe and the Middle East. He dubs the Absheron peninsula bilad al-naffata (the land of the naphtha fountain)

1,000 15,000 inhabitants of Baku mostly involved in the extraction and export of oil. A primitive industry with hand dug wells at natural seeps collected in simple containers. Persian chemists facilitated the extraction by the technological breakthrough of distillation of the crude to separate Kerosene. Such technology was not available to Western Europe until1,200 AD

1,200 Oil production in Azerbaijan reaches almost 100 bbl/day creating an export market for oil

1,632 Natural oil springs found in New York

1750s Industrial revolution takes hold and powered by coal

1753 Seneca Indian trading oil seep products

1790 Nathanial Carey skims oil from seeps near Titusville, Pennsylvania

1846 Abraham Gessner develops process to refine liquid fuel from coal, bitumen and shale – kerosene. A cleaner and cheaper alternative to whale oil

1848 Well drilled to 21m at Bibi-Heybat in Azerbaijan

1853 Ignacy Lukasiewicz invents the modern kerosene lamp, a boon for the modern oil industry

1855 Ignacy Lukasiewicz opens first industrial refinery in the world in Ulaszowice

1859 Colonel Drake drills the first oil well for George Bissell's Rock Oil Company and strikes oil on August 27 at a depth of 21m at Oil Creek where there were natural oil seeps. This was one of the first rotary drilled wells. The phrase Creekology referring to the exploration methods of the day, basically looking for and following oil seeps in creeks

1861-1865 American Civil War.1 Modern barrel of oil is equivalent to around 23,000 human energy slave hours

1865 Civil war is over and oil costs 59 cents per gallon

1870 John D Rockefeller sets up Standard Oil. Kerosene costs 26 cents per gallon

1873 Nobel brothers enter Baku and are in the Russian oil business

1877 Whaling industry is in disarray

1878 Thomas Edison invents the incandescent light bulb, now the oil industry is in disarray

1890 Royal Dutch was formed by Henri Deterding and Jean Baptist August Kessler to focus on the Dutch East Indies

1892 Samuel Samuels, of Shell fame, commissions the Murex, the world's first oil tanker

1895 Oil is 7 cents a gallon

1896 Firs known offshore (saltwater) oil well is drilled at the end of a 300 ft wharf in Summerland, California

1896 Model T Ford is put into production and due to its popularity creates a new dawn in the oil industry

1900 In the United States there were 8,000 registered automobiles, by 1920 there were 8,500,000

1901 Jan10 Spindletop drilled to a depth of 347m produces a gusher of 100,000 bpd

1901 William Knox D'Arcy acquires a Persian concession

1907 Shell Transport and Trading Company and The Royal Dutch Petroleum Company merge to create Royal Dutch Shell

1908 Oil discovered in Persia leading to the creation of Anglo-Persian, later to become BP

1911 Standard Oil ordered to be broken up into 34 smaller companies under the Sherman Antitrust Act

1914 Oil asserts itself for the allies and in the mechanisation of the battlefield. The shortfall in German supplies hindered their war efforts

1922 Venezuela - Los Barroso discovered

1929 Onset of the Great Depression

1932 Oil discovered in Bahrain

1932-1933 Anglo-Iranian concession cancelled

1933 Standard of California (SOCAL, now known as Chevron) wins concession in Saudi Arabia

1938 Oil discovered in Saudi Arabia and Kuwait

1939 World War II

1940 United States limits oil supplies to Japan

1941 United States embargos oil to Japan. Japan attacks Pearl Harbour

1945 WWII ends Germany and Japan basically run out of fuel

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1951 Iranians nationalise Anglo Iranian – First post-war oil crisis

1956 Suez crisis – Second post-war oil crisis

1956 Nigeria and Algeria discover oil

1958 Iraqi revolution

1959 Groningen natural gas field discovered and developed in the Netherlands.

1960 OPEC is founded

1967 Six Day war, closes Suez Canal – Third post-war oil crisis

1968 Alaskan North Slope, oil is discovered

1968 Ba'athists seize Iraqi power

1969 Gaddafi seizes power in Libya

1969 North Sea oil discovered

1969 Santa Barbara oil spill

1973 Yom Kippur Ware – Fourth post-war oil crisis. Oil rises from $2.90 to $11.65 in 3 months.

1974 International Energy Agency (IEA) founded

1975 First oil production from North Sea fields

1975 Saudi, Kuwaiti and Venezuelan concessions come to an end

1977 Alaskan North Slope oil comes to market

1979 Three Mile Island nuclear plant accident

1979 – 1981 Iranian hostage crisis. Oil rises from $13 to $34 – Fifth post-war oil crisis

1980 Iraq goes to war with Iran

1982 OPEC quotas

1983 OPEC cuts price to $29/bbl

1983 Crude oil futures floated on NYMEX

1986 Oil price collapse

1986 Chernobyl (USSR) nuclear accident

1988 Iraq Iran war ends

1989 Exxon Valdez tanker oil spill

1990 Iraq invades Kuwait – Sixth post-war oil crisis

1998 Oil price $10/bbl

1998 Piper Alpha oil rig disaster, 167 oil rig workers died

2003 Iraq war

2007 Oil price $147/bbl

2010 Deepwater Horizon oil spill, 11 fatalities, 16,000 miles of coastline affected and over 8,000 animals reported dead

2016 Oil price drops below $30/bbl

A Brief History of Oil and Gas References

1. Penn Museum website - www.penn.museum
2. The View from the Mountain, grandemotte.wordpress.com
3. Anglopolish.com
4. Wikipedia
5. The Prize – Daniel Yergin

Useful Conversions

Volume

Barrel of Oil (bbl) = ~42 US Gallons
= ~ 159 litres
= ~ 0.159 m3
= ~ 0.136 Tonnes of oil equivalent (toe)
= ~ 5,660 SCF natural gas

Energy

Tonne of oil equivalent = ~ 10,000,000 Btu

SCF natural gas = ~ 1,025 Btu

Natural Gas

Essentially >90% Methane

Calorific Value ~ 1,000 Btu/SCF

Conversion of Gas to Liquid Products

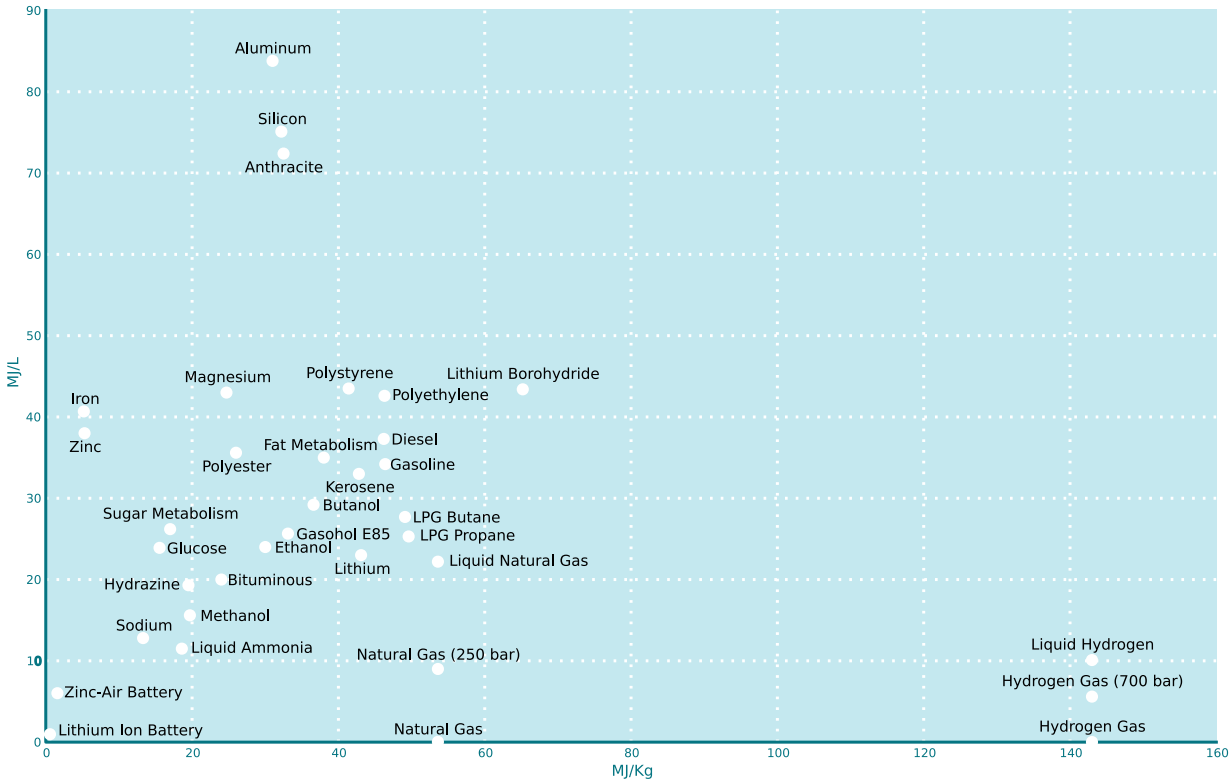
100 MMSCFD = ~ 730,000 tonnes/y of LNG
= ~ 2,100 t/d of LNG

1 million tonnes LNG = ~ 2.2 million m3 LNG
= ~ 140 MMSCFD gas

Conversion of Gas to Energy

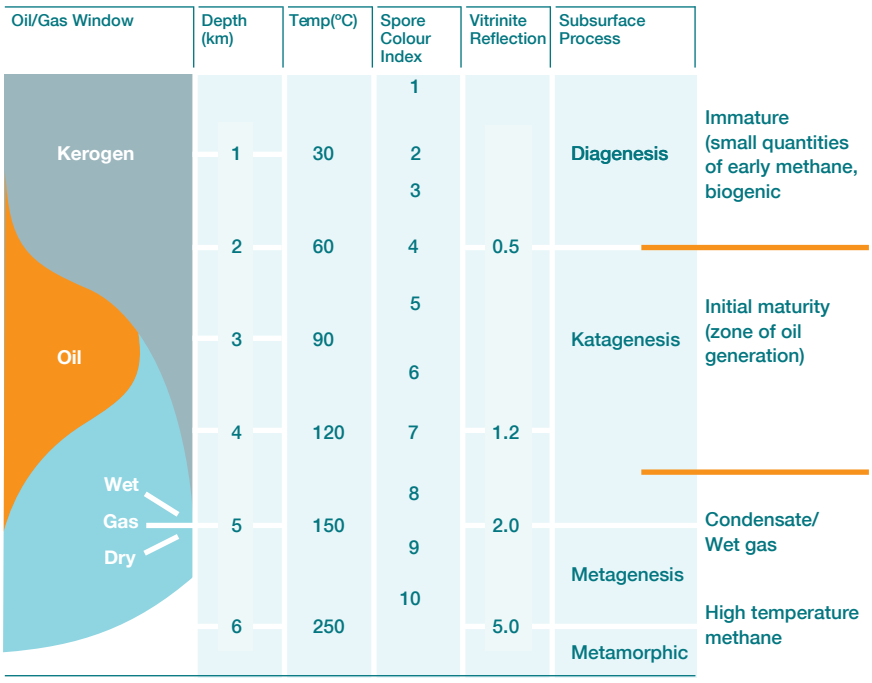
100 MMSCFD = ~ 4,200 MMBtu/h

Selected Energy Densities



"Energy density" by Scott Dial - Own work Data Source: Energy density, Lithium-ion battery. Licensed under Public Domain via Commons https://commons.wikimedia.org/wiki/File:Energy_density.svg#/media/File:Energy_density.svg

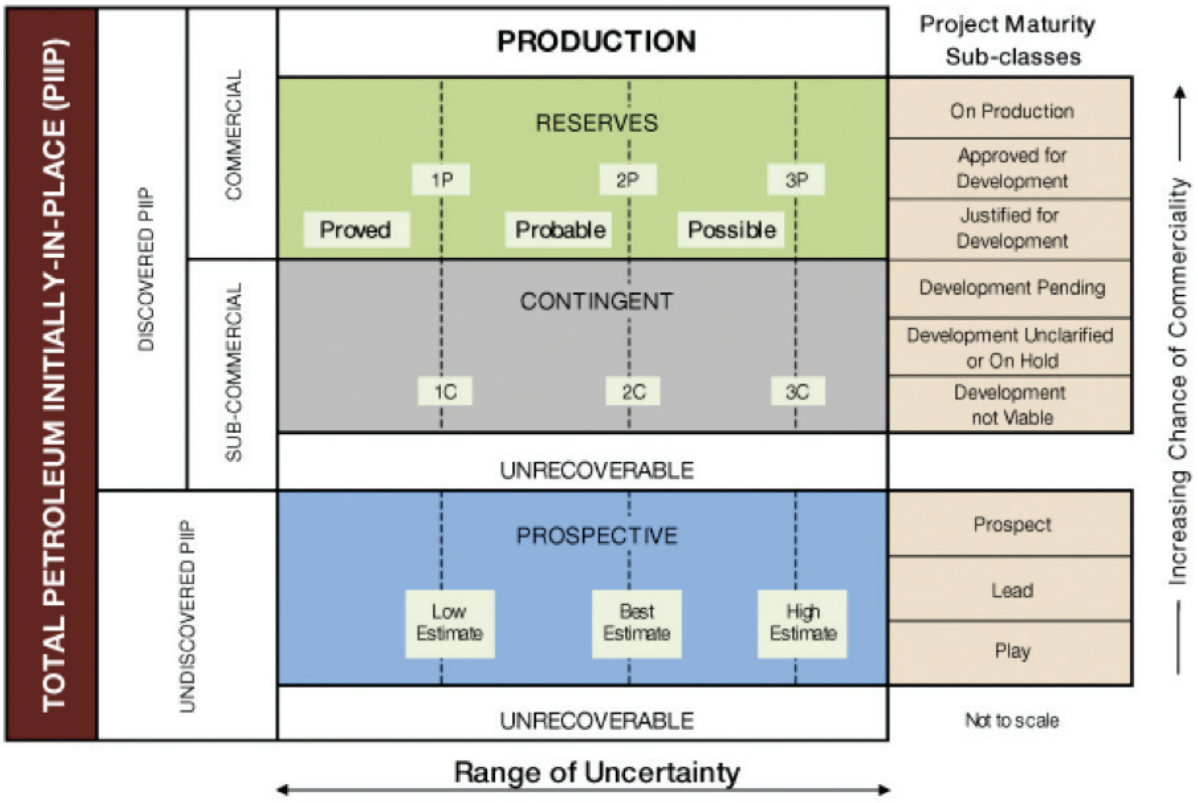
The Oil and Gas Window



SPE Reserves Categorisation

"The estimation of petroleum resource quantities involved the interpretation of volumes and values that have an inherent degree of uncertainty. These quantities are associated with development projects at various stages of design and implementation. Use of a consistent classification system enhances comparisons between projects, groups of projects, and total company portfolios according to forecast production profiles and recoveries. Such a system must consider both technical and commercial factors that impact the project's' economic feasibility, it's productive life and its related cash flows."

Source: SPE - Petroleum Resource Management System



Reserves are Like Fish Analogy

Proved Developed: The fish is in the boat. You have weighed him. You can smell him and you will eat him.

Proved Undeveloped: The fish is on your hook in the water by the boat and you are ready to net him. You can tell how big he looks (they always look bigger in the water).

Probable: There are fish in the lake. You may have caught some yesterday. You may even be able to see them, but you have not caught any today.

Possible: There is water in the lake. Someone may have told you there are fish in the lake. You have your boat on the trailer but you may go play golf instead.

However, these humorous definitions do not recognize the impact of the price of fish.

Esanda Training Course List

For open course dates and locations visit
www.esandaengineering.com
or contact us at
info@esandaengineering.com
to discuss your specific in-house training and development requirements

Introductory and Cross Discipline

Introduction to Oil and Gas Exploration and Production

Fundamentals of Oil and Gas Exploration and Production

Unconventional Oil and Gas Developments Overview

Fundamentals of LNG and the Value Chain

Oil and Gas Overview

Upstream Familiarisation for Administration Staff

Introduction to Hydrocarbons - An overview of Oil and Gas

Introduction to Petroleum Engineering

Economics, Financial, Commercial & Accounting

A View of Where the Oil and Gas Industry is Heading

Designing a Corporate Strategy and Assessing it's Effectiveness

Introduction to International Petroleum Economics

Petroleum Economics

Petroleum Economics and Risk Analysis

Decision Making in the Upstream Oil and Gas Sector

Establishing International Joint Venture and Strategic Alliances in the Oil & Gas Industry

Upstream Oil and Gas Production Forecasting and Economics

New Ventures Management

International Oil & Gas Joint Operating and Profit Sharing Agreements

Accounting in the Oil and Gas Industry – Introduction

Accounting in the Oil and Gas Industry – Intermediate

Accounting in the Oil and Gas Industry – Advanced

Accounting in the International Oil and Gas Industry

Accounting Workshop

Financial Management in the Oil and Gas Industry

Financial Statements & Methods of Payment

Letter of Credit Opening Methods

Design and Implementation of Computerised Financial Systems

Accounting for Upstream Energy & Joint Ventures

Authorisation for Expenditures

Well Costing AFE Development

Budgeting Process for E & P Companies

Capital Expenditure and AFE Controls - Intermediate

Managing in the Current Oil Price Environment

Oil and Gas Contracts and Negotiations

Petroleum Project Analysis and Economics - Advanced

Risk Analysis, Prospect Evaluation and Exploration Economics

Upstream E&P Accounting Intermediate

Well Costing and Cost Control - Advanced

Costing

Upstream Oil and Gas Development Lifecycle Costing

Cost Engineering

IHS QUE$TOR Oil and Gas Cost Analysis – IHS Specialist Course

Strategic Opex Management

Geology

Fundamentals of Stratigraphy and Sedimentology

Fundamentals of Global Tectonics

Fundamentals of Petroleum Geology (with and without Field Trips)

Basin Evaluation

Practical Techniques of Geological Modelling: A Geostatistical Approach

Advanced Structural Geology in the Field

Basic Geoscience

Basic Geodynamics

Mapping Techniques

Basic Field Geology

Clastic Sedimentology and Facies Analysis

Carbonate Sedimentology and Facies Analysis

Foredeep Migration

Basin Analysis Workshop: An Integrated Approach

Production Geology

Sequence Stratigraphy

Petroleum System Modelling

Operations Geology

Introduction to Dataset Evaluation and Regional Interpretation

Play Fairway Analysis

Prospect Generation and Risk Analysis

GIS and GPS Data Visualisation and Input

Multidisciplinary Approach in the Field - Walking along a crustal profile across the Sicily Fold and Thrust Belt

Basic Geology - Northern Apennines - Stratigraphy & Tectonics

A complex intertwining of palaeographic domains and multiple thrust belts across the Southern Apennines

Deformed Foreland Basins: Migration of Apenninic Foredeep Through Space and Time

Well Site Geology
Applied Biostratigraphy for Petroleum Systems
Applied Stratigraphic Concepts
Carbonate Reservoirs
Clastic Sedimentology
Geodynamics and Structural Styles in Exploration
Reservoir Characterisation
Petroleum Exploration
Petroleum Geology
Petroleum Geology, Exploration, Risking and Economics
Play Assessment and Prospect Evaluation
Structural Geology

Geophysics

Introduction to Petroleum Geophysics
Fundamentals of Petroleum Geophysics
Seismic Interpretation and Petroleum Geology
AVO and Seismic Inversion
Seismic Introduction
Seismic Interpretation
Seismic Acquisition and Processing
Seismic Interpretation - Practical
Potential Field and SCEM applied to Hydrocarbon Exploration
Seismic Interpretation on Workstation
Integrated Seismic Interpretation in the Field
Mapping and Depth Conversion
Fundamentals of Seismic Interpretation
Cased Hole Logging and Formation Evaluation
Reflection Seismic Survey

Petrophysics

Introduction to Petrophysics
Sedimentary Petrology
Rock Lab - Thin Sections
Capillarity in Rocks
Open Hole Log Interpretation
Special Core Analysis (SCAL)
Formation Evaluation by Means of Log Analysis
Well Log and Mud Log Analysis
Mud Logging
Basic Well Log Interpretation
Well Log Interpretation
Cased Hole Logging & Production Log Evaluation
Fundamentals of Applied Petrophysics
Advanced Petrophysics
Introduction to Formation Evaluation
Cased Hole Formation Evaluation - Advanced
Facies Analysis and Rock Typing
Pore Pressure and Well Control
Log Analysis Fundamentals
Shaly-Sand Petrophysics
Formation Evaluation and Log Analysis
Nuclear Magnetic Resonance Petrophysics (NMRP
Pore Pressure Prediction
Integration of Petrophysics and Core Analysis

Reservoir Engineering

Basic Reservoir Engineering for Production operations Staff
Fundamentals of Reservoir Engineering
Reservoir Management
Reservoir Simulation
Reservoir Model Design
Enhanced Oil Recovery
Artificial Lift – Well Optimization and Diagnostics
IOR with emulsified polymers
EOR with gas lift
Applied Reservoir Engineering
Integrated Production Modelling
PVT
Reservoir Appraisal & Development
Artificial Lift Methods
Well Performance (NODAL) Analysis
Introduction to Integrated Production Modelling,
Unconventional Integrated Asset modelling
Advanced Integrated Asset Modelling
Practical Reservoir Simulation, history matching best practices
PVT and EOS modelling workshop
Advanced Wellbore modelling
Effective Use of Relative Permeability Data
Digital Field Setup & Management
Reserves Estimation
Field Development Planning

Field Development Planning

Field Development Planning
Facilities Field Development Planning
Marginal Fields' Development Strategies

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Drilling & Well Engineering

Wellhead Operations

Well Testing Operations

Well Production Control and Management

Well Servicing

Directional Drilling, Horizontal and Side-tracking

Introduction to Drilling & Completions Operations

Drilling Fluids

Advanced Drilling Technology

Primary Cementing

Fishing Operations

Drilling Methods and Equipment

Well Equipment (Casing, Tubing, Wellhead)

Pumps (Rig/mud pumps, cementing units)

Drilling Calculations

Stuck Pipe Prevention

Casing Cementing - Current Leading Practice and New Techniques

Directional Drilling

Drilling Fluids and Solids control

Fundamentals of Well Control

Advanced Hydraulic Fracturing

Advanced Stimulation

Stimulation & Sand Management

Well Test Design & Analysis

Hydraulic Fracturing for Shale Oil & Gas

Hydraulic Fracture Design and Analysis with 3D Simulators

Completions Design for FDP

Formation Damage Prevention, Remediation, and Control

Matrix and Fracture Acidizing

Horizontal Well Completions and Fracturing

Advanced Well Cementing

Practical Well Test Interpretation

Advanced Well Test Interpretation

Production Logging Tools

Asphaltene, Paraffin, and Scale Control
Coil Tubing (CTU) Operations

Nitrogen Engineering for O&G Operations

Advanced Sand Control

Advanced Hydraulic Fracturing with 3D Models

Advanced Well Completions

Damage Control - The Neglected Part of Drilling and Operating Safely

HPHT Drilling Operations

Offshore and Deepwater Drilling Operations

Pore Pressure and Fracture Gradient Prediction

Well Control and Associated Surface Equipment

Well Stimulation: Matrix and Fracture Acidising

Oil and Gas Processing and Facilities Engineering

Oil and Gas Facilities Fundamentals: Onshore, Offshore, FPSO and Subsea

Offshore Facilities Fundamentals, Offshore, FPSO and Subsea

FPSO Fundamentals

Subsea Facilities Fundamentals

Gas Production, Transmission and Storage Overview

Oil Processing

Gas Processing

Production Facilities - Design Engineering

Production Facilities - Process Engineering

Process and Project Drawings - PDFs, P&IDs and Mechanical Drawings

Understanding P&IDs

Process Plant Fundamentals

Surface Production Operations

Plant Shutdown, Commissioning and Start-up

Relief Systems

Flare, Blowdown and Pressure Relief Systems

Heat Exchangers

Oil and Gas Process Troubleshooting

Xmas Tree Inspection, Maintenance and Pressure Testing

Water Treatment and Disposal

Chemical Injection - Oil and Gas Process

Applied Water Technology in Oil and Gas Production

Corrosion Management in Production/Processing Operation

FSRU Project Development and Operation

Gas Processing and Conditioning

Means of Personnel Transfer

Oil Production and Processing Facilities

Onshore Pipelines Design and Construction

Tanker Familiarisation

Health, Safety and Environment

Xmas Tree and Wellhead Safety

Oil and Gas Field - Internal Audit

Introduction to Process Safety

Introduction to HSSE Case

Process Safety Management Techniques

HSE in the Workplace

HSE in Drilling and Workover

Safety Audit and Hazards Identification

Accident and Incident Investigation, Reporting and Management

Behavioural Based Safety

HSE in Construction

Environmental Awareness and EMS Overview

Permit to Work (Control of Work/Safe Systems of Work

Hazardous Substances in the Workplace

Introduction to Emergency Management

Health & Safety Representative – Offshore Oil and Gas

Safe Supervisory Skills

HSSE Basics

Introduction to Safety Case

Project Management and Operations

Plant Readiness Program

Faultless Start-up

Commissioning and Start-up

Troubleshooting and Process Operations

The Turnover and completions program

Project Management for Suppliers

Achieving Operational Readiness

Scoping Systems and Subsystems for Start-up

Project Management in the Upstream Oil and Gas Industry

Maintenance Management

Shutdown Planning and Optimisation

CMMS (Computerised Management Maintenance Systems) Set Up

Major Emergency Management

Oilfield Operations Overview

Asset Integrity Management

Risk Management

Hazard Awareness and Risk Assessment

Bow-Ties, Barriers and Major Accident Events Accredited by the Intl. Association of Drilling Contractors (2 day short format, 3 day long format)

Advanced Energy Project Management

Enterprise Risk Management for the Energy Industry

Tripod Beta Accident Investigation Course

PMP Exam preparation

Information Security Strategy & How to Build It

Introduction to Data Management

Soft Skills

Supervisory Skills

Crisis Management

Leadership Skills for Supervisors

Workplace Communications

Internal Communications

Communication, Presentation and Persuasion Skills for Engineers and Technical Professionals

Presentation Skills

Leadership and Management

Team Building

Web and Intranet Writing

Crisis Communication

Writing and Presentation Skills for Engineers and Technical Staff

Downstream

Introduction to the Downstream Petroleum Industry

Introduction to the Petrochemicals Industry

Introduction to Petroleum Refinery Processing

Introduction to Condensate Fractionation Plant

Basic Principles of Catalytic Reforming Process, Chemical Reactions and Thermodynamics

Catalyst Reforming Parameters

Catalytic Reforming Plant Design

Fundamentals of Petroleum Refinery Equipment Process Design

Gasoline and Diesel Blending for Refiners and Traders

Storage Tanks

Pumps - Design, Application and Operation

Refinery Piping

Economic Fundamentals of the Petroleum Industry and Refinery

Water Treatment for Refining and Petrochemical Operations

Environmental, Health, and Safety Guidelines for

Petroleum Refineries

Crude Oil Shipping and Tankers

Photo: Harald Pettersen – Statoil

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Course categories available

See inside for complete couse list

Introductory and Cross Discipline

Economics, Financial, Commercial & Accounting

Costing

Geology

Petrophysics

Reservoir Engineering

Field Development Planning

Drilling & Well Engineering

Oil and Gas Processing and Facilities Engineering

Health, Safety and Environment

Project Management and Operations

Soft Skills

Downstream

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