Glossary of Oil Sands Terms

API
An American Petroleum Institute measure of liquid gravity. Water is 10 degrees API, and a typical light crude is from 35 to 40. Heavy oil is, by convention, typically from 9.0 to 11 degrees API, while bitumen is 7.5 to 8.5.

Aromatics
Hydrocarbon species that occurs in unusually high concentrations in bitumen and some derived products.

Asphaltenes
The heaviest and most concentrated aromatic hydrocarbon fractions of bitumen.

Banked Cubic Metres (BCM)
A measurement of volume used to state the volume of in situ material moved during mining operations.

Barrel
The traditional measurement for crude oil volumes. One barrel equals 42 US gallons (159 litres). There are 6.29 barrels in one cubic metre of oil.

Bitumen
Naturally occurring, viscous mixture of hydrocarbons that contains high levels of sulphur and nitrogen compounds. In its natural state, it is not recoverable at a commercial rate through a well because it is too thick to flow. Bitumen typically makes up about 10 per cent by weight of oilsand, but saturation varies.

Bucket-wheel excavator
Mining machine that uses toothed buckets mounted on the rim of a revolving wheel to scoop up oilsand and deposit it on a conveyor system.

Catalyst
Used in upgrading processes to assist cracking and other upgrading reactions.

Coke
Solid, black hydrocarbon which is left as a residue after the more valuable hydrocarbons have been removed from bitumen by heating the bitumen to high temperatures.

Coking
An upgrading/refining process used to convert the heaviest fraction of bitumen into lighter hydrocarbons by rejecting carbon as coke. Coking can be either delayed coking (semi-batch) or fluid coking (continuous).

Cold Heavy Oil Production with Sand (CHOPS)
CHOPS is a non-thermal primary heavy oil production method. Continuous production of sand improves the recovery of heavy oil from the reservoir. The simultaneous extraction of oil and sand

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during the cold production of heavy oil generates high-porosity channels termed “wormholes.” Wormholes grow in a three-dimensional radial pattern within a certain layer of net pay zones, resulting in the development of a high permeability network in the reservoir, boosting oil recovery. In most cases, an artificial lift system is used to lift the oil with sand.

Cogeneration
The simultaneous production of electricity and steam.

Condensate
Mixture of extremely light hydrocarbons recoverable from gas reservoirs. Condensate is also referred to as a natural gas liquid, and is used as a diluent to reduce bitumen viscosity for pipeline transportation.

Conventional crude oil
Mixture mainly of pentane and heavier hydrocarbons recoverable at a well from an underground reservoir and liquid at atmospheric pressure and temperature. Unlike bitumen, it flows through a well without stimulation and through a pipeline without processing or dilution. In Canada, conventional crude oil includes light, medium, and heavy crude oils, like those produced from the Western Canadian Sedimentary Basin. Crude oils containing more than 0.5 per cent of sulphur are considered “sour,” while crudes with less than 0.5 per cent are “sweet.”

Cracking
An upgrading/refining process for converting large, heavy molecules into smaller ones. Cracking processes include fluid cracking and hydrocracking.

Cyclic steam stimulation
For several weeks, high-pressure steam is injected into the formation to soften the oilsand before being pumped to the surface for separation. The pressure created in the underground environment causes formation cracks that help move the bitumen to producing wells. After a portion of the reservoir has been saturated, the steam is turned off and the reservoir is allowed to soak for several weeks. Then the production phase brings the bitumen to the surface. It either flows on its own, or is pumped up the well to the surface. When the rates of production start to decline, the reservoir is pumped with steam once again.

Cyclofeeder
Receives oilsand feed and prepares it in slurry form for transport to extraction.

Deasphalting (or solvent deasphalting)
A physical separation process using light solvents to separate heavy material from deasphalted oil.

Density
The heaviness of crude oil, indicating the proportion of large, carbon-rich molecules, generally measured in kilograms per cubic metre (kg/m3) or degrees on the American Petroleum Institute (API) gravity scale; in western Canada, oil up to 900 kg/m3 is considered light to medium crude—oil above this density is deemed as heavy oil or bitumen.

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Desulphurization
The process of removing sulphur and sulphur compounds from gases or liquid hydrocarbon mixes.

Dilbit
Bitumen that has been reduced in viscosity through addition of a diluent such as condensate or naphtha.

DilSynBit
A blend of bitumen, condensate, and synthetic crude oil similar to medium sour crude.

Diluent
see Condensate

Dragline
Mining machine that drops a heavy, toothed bucket on a cable from the end of a boom into the oilsand, then drags the bucket through the deposit, scooping up the sand.

Ebullated bed process
An upgrading/refining process that uses an expanded, ebullated bed of catalyst for hydrocracking.

Engineered tails
A term used to describe a mixture of mature fine tails and coarse tails. Also referred to as "consolidated tails."

Enhanced Oil Recovery (EOR)
The third stage of hydrocarbon production during which sophisticated techniques that alter the original properties of the oil are used. Enhanced oil recovery can begin after a secondary recovery process or at any time during the productive life of an oil reservoir. Its purpose is not only to restore formation pressure, but also to improve oil displacement or fluid flow in the reservoir.
The three major types of enhanced oil recovery operations are chemical flooding (alkaline flooding or micellar-polymer flooding), miscible displacement (carbon dioxide [CO2] injection or hydrocarbon injection), and thermal recovery (steam flood). The optimal application of each type depends on reservoir temperature, pressure, depth, net pay, permeability, residual oil and water saturations, porosity and fluid properties such as oil API gravity, and viscosity.

Established recoverable reserves
Reserves recoverable under current technology and present and anticipated economic conditions, plus that portion of recoverable reserves that is interpreted to exist, based on geological, geophysical, or similar information, with reasonable certainty.

Established reserves
Reserves recoverable with current technology and present and anticipated economic conditions specifically proved by drilling, testing, or production, plus the portion of contiguous recoverable reserves that are interpreted to exist from geological, geophysical or similar information with reasonable certainty.

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Extraction
A process, unique to the oilsands industry, which separates the bitumen from the oilsand using hot water, steam, and caustic soda.

Fine tailings
Essentially muddy water—about 85 per cent water and 15 per cent fine clay particles by volume produced as a result of extraction.

Fines
Minute particles of solids such as clay or sand.

Fiscal terms
Royalty and tax terms under which the industry operates.

Fluid coking
A residual upgrading process which continuously cracks the heaviest fraction of bitumen into lighter hydrocarbons as fluid coke.

Fraction
A portion of crude oil defined by boiling range. Naptha, diesel, gas oil, and residual are fractions of crude oil.

Froth treatment
The means to recover bitumen from the mixture of water, bitumen, and solids “froth” produced in hot water extraction (in mining-based recovery).

Gas oil
The fraction of crude oil that can be processed into gasoline through fluid catalytic cracking or hydrocracking in a refinery.

Gasification
A process to partially oxidize any hydrocarbon, typically heavy residues, to a mixture of hydrogen and carbon monoxide. Can be used to produce hydrogen and various energy byproducts.

Greenhouse gases
Gases commonly believed to be connected to climate change and global warming. CO2 is the most common, but greenhouse gases also include other light hydrocarbons (such as methane) and nitrous oxide.

Gypsum
A byproduct of flue gas desulphurization units, and is also partly consumed in mining operations to help consolidate fine tailings.

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Heavy crude oil
Oil with a gravity below 22 degrees API. Heavy crudes must be blended, or mixed, with condensate to be shipped by pipeline.

Hydrocracking
Refining process for reducing heavy hydrocarbons into lighter fractions, using hydrogen and a catalyst; can also be used in upgrading of bitumen.

Hydroprocessing
A unit measuring the extent to which the outdoor mean daily dry-bulb temperature (average of maximum and minimum) falls below 18^{o} Celcius for each calendar day on which such deficiency occurs. (On the Fahrenheit scale, the assumed reference temperature is 65°.)

Hydrotransport
A slurry process that transports water and oilsand through a pipeline to primary separation vessels located in an extraction plant.

Hydrotreater
An upgrading/refining process unit that reduces sulphur and nitrogen levels in crude oil fractions by catalytic addition of hydrogen.

Initial established reserves
Established reserves prior to the deduction of any production.

Initial volume in place
The volume calculated or interpreted to exist in a reservoir before any volume has been produced.

In situ
In its original place; in position; in situ recovery refers to various methods used to recover deeply buried bitumen deposits, including steam injection, solvent injection and fire floods.

In situ combustion
A displacement enhanced oil recovery method. It works by generating combustion gases (primarily CO and CO2) downhole, which then “pushes” the oil towards the recovery well.

LC-Fining
A licensed hydroprocessing upgrading technology that uses an ebullated catalyst bed to continuously crack the heaviest fraction of bitumen into lighter products.

Lease
A legal document from the province of Alberta giving an operator the right to extract bitumen from the oilsand existing within the specified lease area. The land must be reclaimed and returned to the Crown at the end of operations.

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Light crude oil
Liquid petroleum with a gravity of 28 degrees API or higher. A high-quality light crude oil might have a gravity of about 40 degrees API. Upgraded crude oils from the oilsands run around 30 to 33 degrees API (compared to 32 to 34 for Light Arab and 37 to 40 for West Texas Intermediate).

Mature fine tailings
A gel-like material resulting from the processing of clay fines contained within the oilsands.

Medium crude oil
Liquid petroleum with a gravity between 23 and 28 degrees API.

Middlings
Mixture of water, clay, sand, and bitumen that remains between the bitumen froth at the surface and the sand at the bottom of a primary separation vessel at the end of the extraction stage. Further processing is required to maximize bitumen recovery.

Muskeg
A water-soaked layer of decaying plant material, one to three metres thick, found on top of the overburden.

Naphtha
Any of various volatile, often flammable, liquid hydrocarbon mixtures used chiefly as solvents and diluents. Naptha has a boiling range of 40 to 400 degrees Celsius.

Oilsands
Bitumen-soaked sand, located in four geographic regions of Alberta: Athabasca, Wabasca, Cold Lake, and Peace River. The Athabasca deposit is the largest, encompassing more than 42,340 square kilometres. Total deposits of bitumen in Alberta are estimated at 1.7 to 2.5 trillion barrels.

Overburden
A layer of sand, gravel, and shale between the surface and the underlying oilsand. Must be removed before oilsands can be mined. Overburden underlies muskeg in many places.

Pilot plant
Small model plant for testing processes under actual production conditions.

Primary production
The first stage of hydrocarbon production, in which natural reservoir energy (such as gas drive, water drive, and gravity drainage) displaces hydrocarbons from the reservoir into the wellbore and up to surface. Primary production uses an artificial lift system in order to reduce the bottomhole pressure or increase the differential pressure to sustain hydrocarbon recovery since reservoir pressure decreases with production.

Process gas
Gas produced from the upgrading process that is not distilled as a liquid. Usually burned as a fuel.

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Proven recoverable reserves
Reserves that have been proven through production or testing to be recoverable with existing technology and under present economic conditions.

Reclamation
Returning disturbed land to a stable, biologically productive state. Reclaimed property is returned to the province of Alberta at the end of operations.

Remaining established reserves
Initial reserves less cumulative production.

Residuum
The heaviest boiling fraction (552 degrees Celsius plus) remaining after processing or distillation of hydrocarbons.

Royalty
The Crown's share of production or revenue. About three quarters of Canadian crude oil is produced from lands, including the oilsands, on which the Crown holds mineral rights. The lease or permit between the developer and the Crown sets out the arrangements for sharing the risks and rewards.

Sour oil
Crude oil containing free sulphur, hydrogen sulphide, or other sulphur compounds.

Steam Assisted Gravity Drainage (SAGD)
An in situ production process using two closely spaced horizontal wells: one for steam injection and the other for production of the bitumen/water emulsion.

Steam methane reforming
A process commonly used to convert natural gas to hydrogen for upgrading.

Surface mining
Operations to recover oilsands by open-pit mining, where overburden depth permits.

SynBit
A blend of bitumen with sweet synthetic crude oil to meet pipeline transportation specifications.

Synthetic crude oil
A manufactured crude oil comprised of naptha, distillate, and gas oil-boiling range material. Can range from high-quality, light sweet bottomless crude to heavy, sour blends.

Tailings
A combination of water, sand, silt, and fine clay particles that is a byproduct of removing the bitumen from the oilsand.

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Tailings settling basin
The primary purpose of the tailings settling basin is to serve as a process vessel allowing time for tailings water to clarify and silt and clay particles to settle, so the water can be reused in extraction. The settling basin also acts as a thickener, preparing mature fine tails for final reclamation.

Thermal recovery
Any process by which heat energy is used to reduce the viscosity of bitumen in situ to facilitate recovery.

Toe-to-Heel Air Injection (THAI)
An in situ combustion method for producing heavy oil and oilsand. In this technique, combustion starts from a vertical well, while the oil is produced from a horizontal well having its toe in close proximity to the vertical air-injection well. This production method is a modification of conventional fire flooding techniques in which the flame front from a vertical well pushes the oil to be produced from another vertical well.

Truck-and-shovel mining
Large electric or hydraulic shovels are used to remove the oilsand and load very large trucks. The trucks haul the oilsand to dump pockets where it is conveyed or pipelined to the extraction plant. Trucks and shovels are more economic to operate than the bucket-wheel reclaimers and draglines they have replaced at oilsands mines.

Upgrading
The process of converting heavy oil or bitumen into synthetic crude either through the removal of carbon (coking) or the addition of hydrogen (hydroconversion).

Vapour extraction (VAPEX)
VAPEX is a non-thermal recovery method that involves injecting a gaseous hydrocarbon solvent into the reservoir where it dissolves into the sludge-like oil, which becomes less viscous (or more fluid) before draining into a lower horizontal well and being extracted.

Visbreaking
A process designed to reduce residue viscosity by thermal means, but without appreciable coke formation.

Viscosity
The ability of a liquid to flow. The lower the viscosity, the more easily the liquid will flow.

Western Canadian Sedimentary Basin (WCSB)
The major land-based sedimentary basin in Canada. The basin extends from British Columbia in the west, eastward through Alberta, Saskatchewan, and Manitoba, and includes portions of the Northwest and Yukon territories. The WCSB covers approximately 1,502,193 square kilometres.

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