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KNOWLEDGE CENTER · FUNDAMENTALS

How Crude Oil Storage Works

From tank selection to custody transfer: the mechanics behind holding crude oil safely and provably.

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Crude oil rarely moves directly from a wellhead to a refinery unit. Between production and processing sits a global layer of storage infrastructure — tank farms at export terminals, import hubs, refinery gates and trading centers — that absorbs the mismatches between how oil is produced, shipped, traded and consumed. This guide explains how that layer actually works.

Why crude needs storage at all

Three mismatches create storage demand. First, **parcel size**: a VLCC carries roughly two million barrels, but no refinery consumes a cargo instantaneously — tankage bridges the gap between marine economics and processing rates. Second, **timing**: production is continuous while liftings, refinery turnarounds and demand are not. Third, **price structure**: when futures trade above spot prices (contango) by more than the cost of storage and financing, holding oil becomes a trade in its own right.

The tank itself

Most crude is stored in large vertical cylindrical tanks built to standards such as API 650, in two principal configurations:

- **External floating-roof tanks** — the roof floats directly on the oil surface, rising and falling with inventory. Minimal vapor space means lower evaporative losses and reduced fire risk, which suits volatile crudes.
- **Fixed-roof tanks** — a permanent roof with a managed vapor space, often used for lower-vapor-pressure or heated service, with pressure-vacuum valves controlling breathing.

Around the steel sits the safety envelope: bunded containment sized to hold the tank's contents if it fails, level instrumentation with independent high-level alarms, overfill protection philosophy shaped by incidents like Buncefield (2005), and firefighting systems matched to the tank class.

Custody: proving whose oil it is, and how much

Commercially, the decisive question in storage is not "is the oil safe?" but "can I prove exactly how much oil I have?" That proof is custody transfer measurement:

- 1 **Opening measurement** — before receipt, the tank is gauged (level, temperature, free water) or the transfer routed through proved meters.
- 2 **Quantity calculation** — observed volumes are corrected to standard conditions using API MPMS / ISO procedures and tank calibration tables.
- 3 **Sampling** — representative samples are drawn, sealed and retained; quality documentation follows the parcel.
- 4 **Closing measurement** — the same discipline at the end of the movement; the difference is the transferred quantity, signed by the operator and typically witnessed by an independent surveyor.

In professional storage, every barrel exists twice: once as liquid in a tank, and once as a signed document trail. The two are reconciled daily.

Living in the tank: what operators do daily

Between receipt and redelivery, operators monitor levels and temperatures, draw off settled water (crude carries water that separates in storage), circulate or heat grades that need it, watch floating-roof position and seals, and reconcile physical stock against the book. Grade segregation is preserved throughout — mixing a light sweet crude into a heavy sour tank destroys assay value that pricing depends on.



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Blending: storage as manufacturing

Tank farms are also where crude blends are built — combining grades to hit a refinery's preferred assay or a market's standard export quality. Blending happens tank-to-tank or in-line during transfer, always against a written blend order, with metered component movements and post-blend testing. Done well, blending converts storage from a cost center into a margin tool.

What to ask a storage provider

- What measurement standard governs custody figures, and can my surveyor witness every step?
- How is my grade segregated — dedicated tanks, dedicated lines, documented service changes?
- What loss tolerance applies, and how are discrepancies investigated?
- What does the daily reconciliation and reporting look like in practice?
- Is the operator independent, or does a trading desk sit behind the tankage?

The quality of the answers — specific, documented, auditable — usually tells you more than the size of the tank farm.

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