



Institute of Natural Resources
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Crude oil treatment

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• Plan

Fundamentals of crude oil treatment

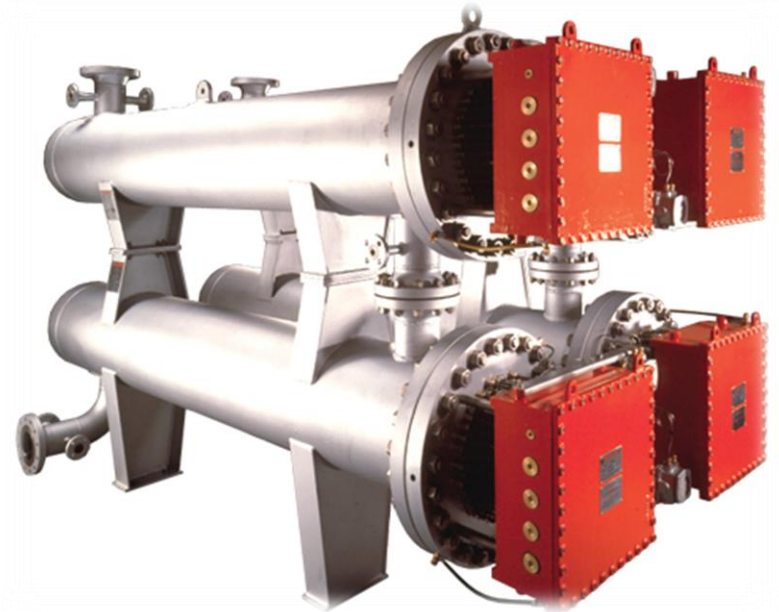
Scheme of crude oil treatment

Separation

Dehydration

Desalting

Degassing



● Fundamentals of crude oil treatment

In an oil field the oil is generally mixed with:

- ✓ associated gas,
- ✓ production water,
- ✓ hydrogen sulfide,
- ✓ salts.

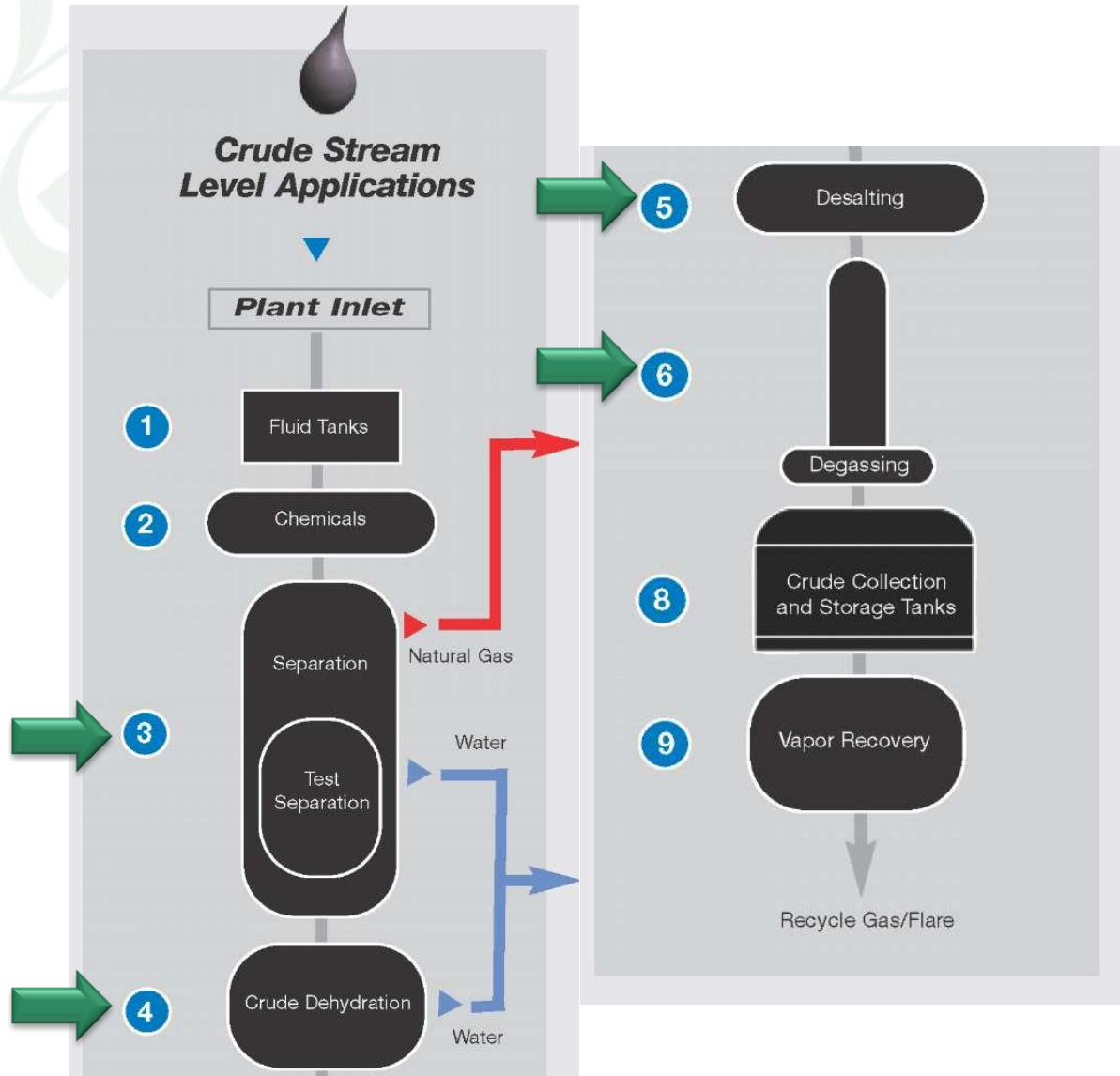
are separated from the oil
in the oil treatment plant

After primary oil/water separation, there is a small amount of unwanted salts in residual water in the crude oil.

Crude oil desalting technology is utilized to remove residual salts.

The stabilized oil is then stored and ready to be shipped via pipeline or oil tanker.

● Scheme of crude oil treatment



● Separation



Water is the largest-volume contaminant in oil or gas production.

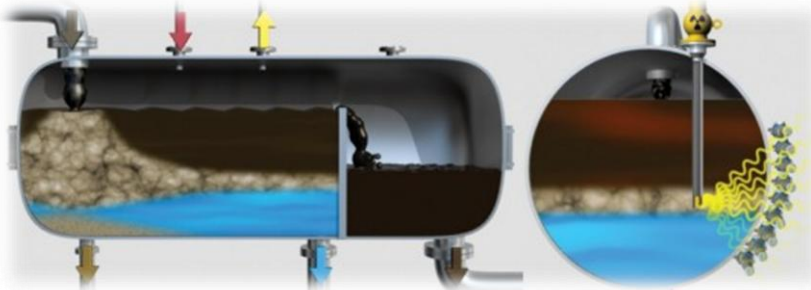
Separators are large drums designed to separate wellstreams into their individual components.

Separators are classified according to:

- ✓ horizontal or vertical,
- ✓ operating pressure,
- ✓ turbulent or laminar flow,
- ✓ test or production separation.

two-phase (gas/liquid)

three-phase
(gas/oil/water)



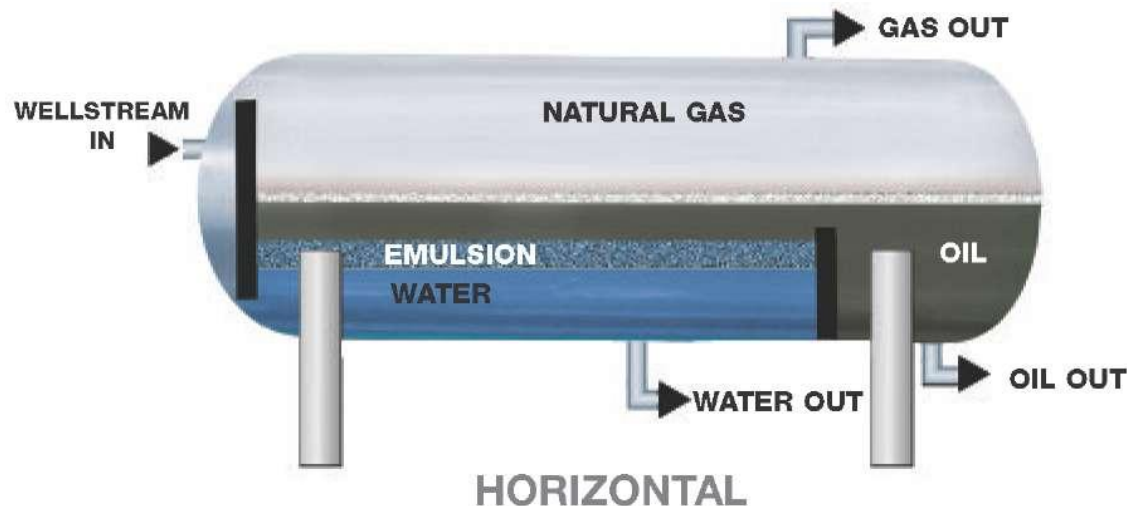
● Separation



● Separation

Horizontal separators:

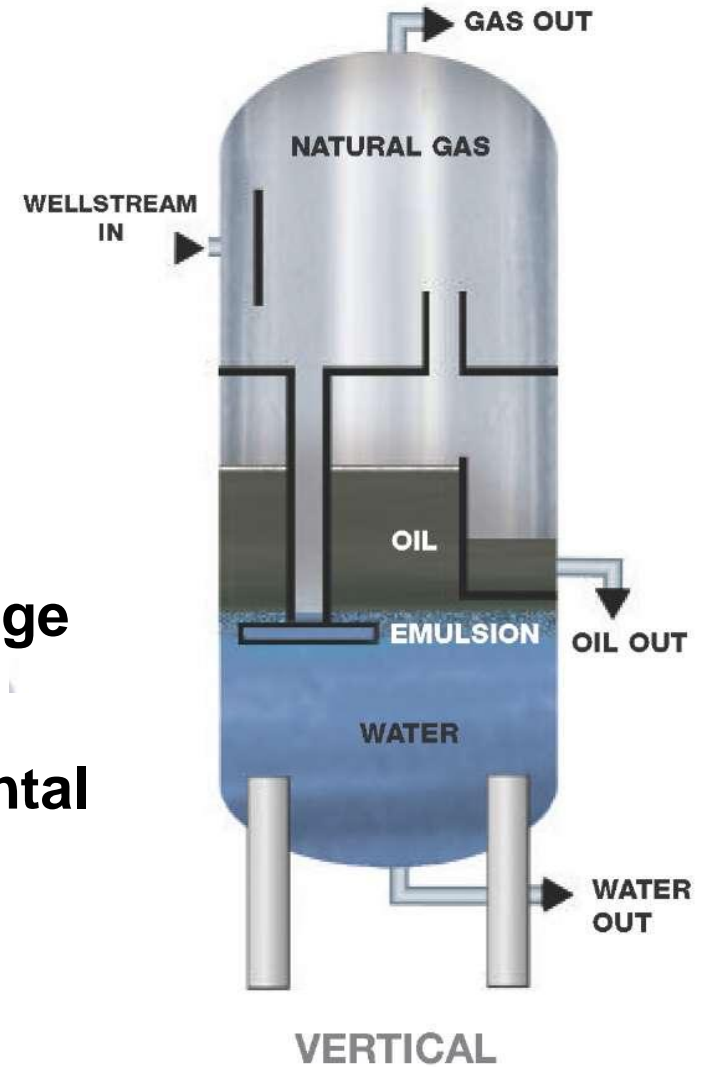
- ✓ well suited for three-phase separation because of their large interfacial area between the two liquid phases;
- ✓ preferred when wellstreams have high gas-to-oil ratios, when wellstream flow is more or less constant, and when liquid volumes are insignificant;
- ✓ have a much greater gas/liquid interface area, which aids in the release of solution gas and in the reduction of foaming.



● Separation

Vertical separators:

- ✓ can accommodate large volumes of liquids;
- ✓ well suited for high sediment loads;
- ✓ preferred when wellstreams have large liquid-to-gas ratios;
- ✓ occupy less floor space than horizontal types and are often found on offshore platforms.



● Separation

Free water knockout (FWKO) is specialized separator which is used to remove large amounts of free water from crude oil prior to crude dehydration.



● Dehydration



Not all water is removed from crude oil during the gravity separation.

Separated crude oil may contain water in an emulsified form.

Oil-water emulsion can be broken by:

- ✓ increasing the settling time;
- ✓ heating the emulsion;
- ✓ applying electricity;
- ✓ adding demulsifying chemicals.



● Dehydration

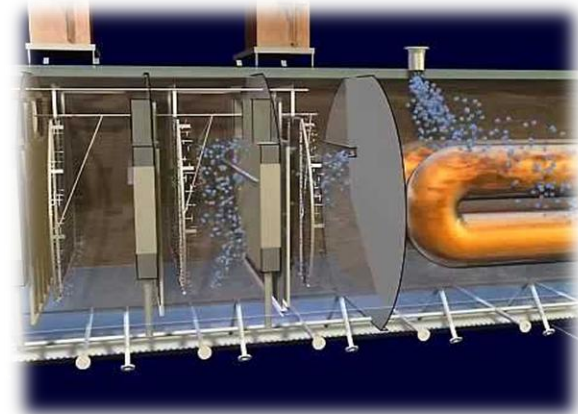
Heating the emulsion:

- ✓ deactivating the emulsifying agent;
- ✓ allowing the dispersed water droplets to collide;
- ✓ achieved by devices called **heaters-treaters**.



Applying electricity:

- ✓ In an electric field, the small droplets are attracted to each other.
- ✓ They coalesce into larger droplets and separate more rapidly from the oil.
- ✓ Electrostatic heaters-treaters contain electrodes.



● Dehydration

Electrostatic heaters:



- ✓ more compact;
- ✓ preferred device where space is at a minimum and a large volume of crude oil must be treated.



Adding demulsifying chemicals:

Demulsifying agents are chemicals which act as surface acting agent to neutralize the effect of emulsifying agents.



● Desalting

More important than water content to a refiner is the salt content of the oil.

Desalting removes both salt and the residual free water.

- ✓ **Clean dilution** or **wash water** is injected into the crude oil to dilute the brine to a level where the target salt content can be achieved by the downstream dehydration unit.
- ✓ In difficult applications wash water can be recycled in a 2 stage dehydration and desalting process.



● Degassing



Crude oil stabilization

removing of dissolved gases

Crude oil sweetening

removing of hydrogen sulfide

diminish safety and corrosion problems



Gases are removed by a stabilizer.

Sweetening employs stabilization or vaporization processes along with a gas or steam-based stripping agent.