

Tikrit University

College of Petroleum Processes Engineering

**Department of Petroleum and Gas Refining
Engineering**

Gas Technology

Forth Class

Lecture 16

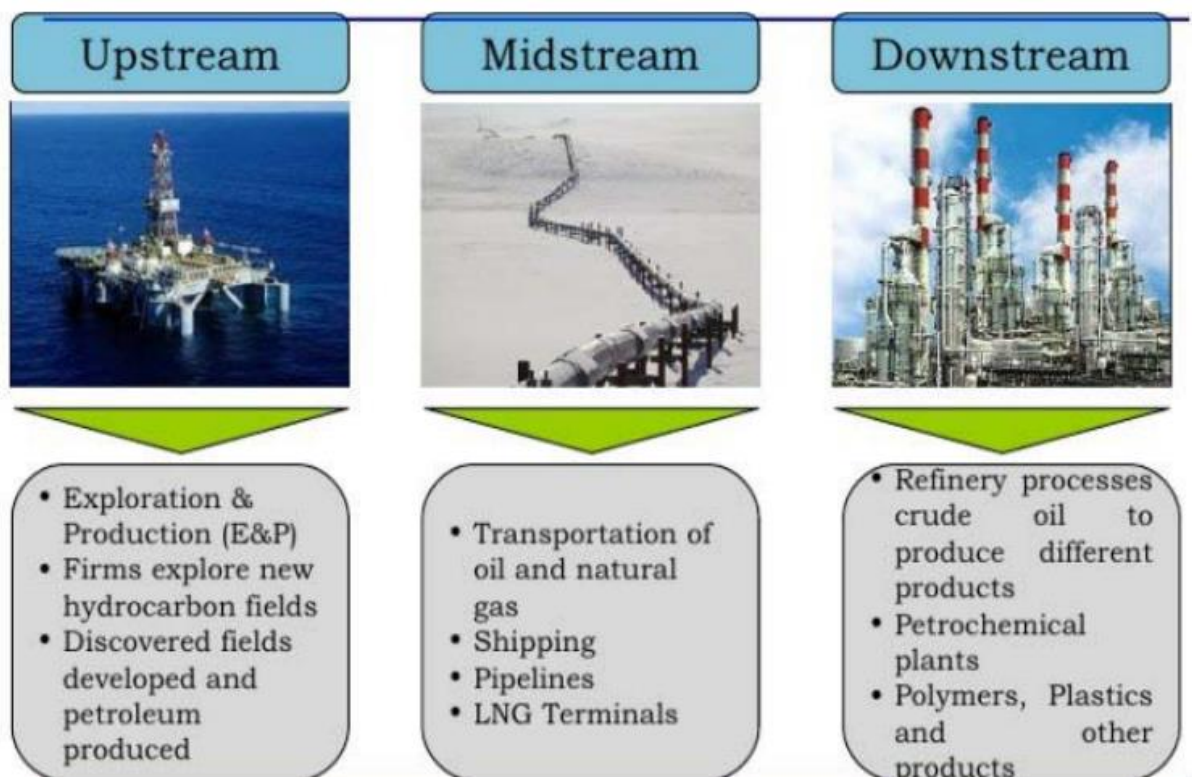
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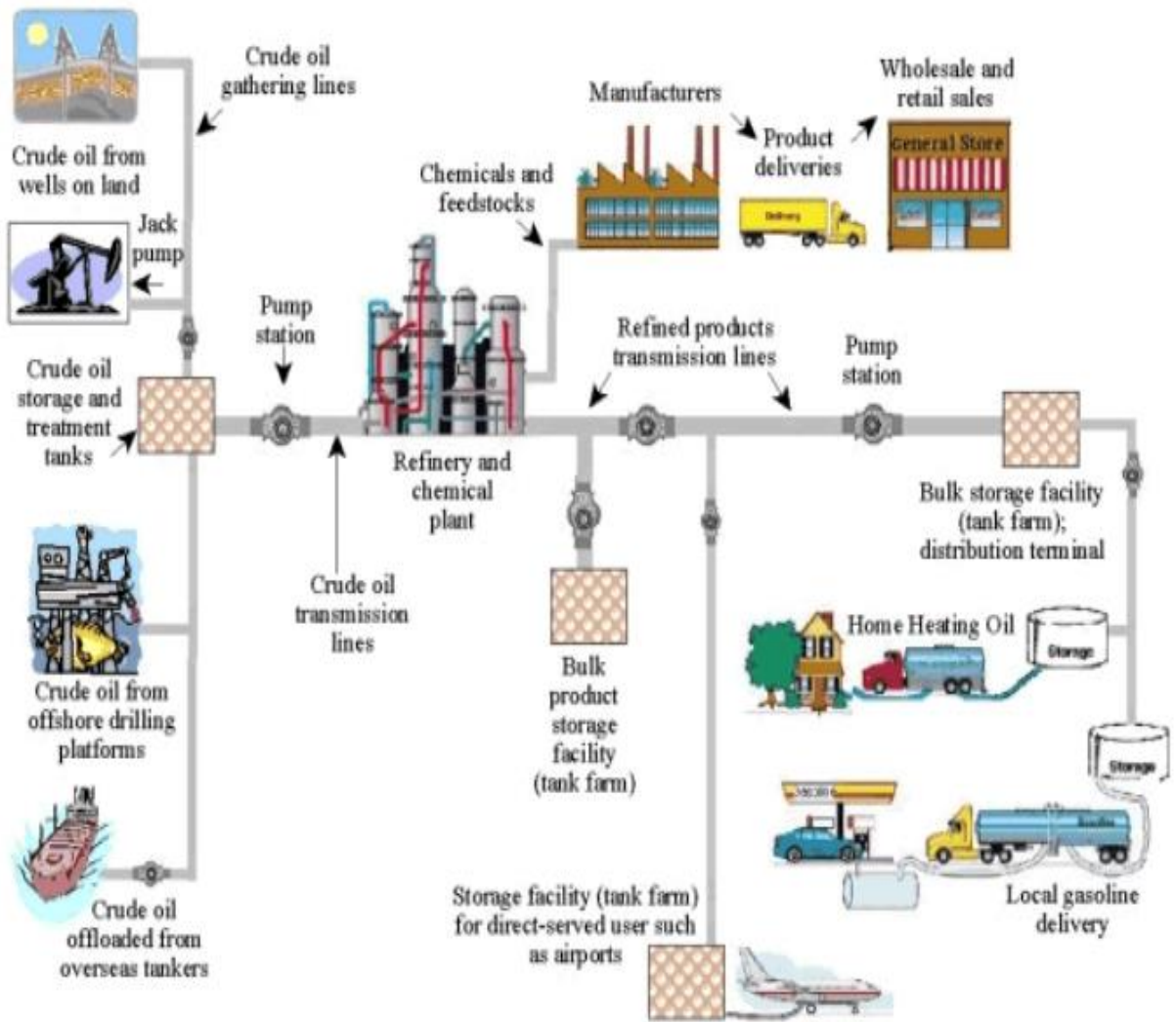
Jasim I. Humadi

Storage & Transport of Crude Oil and Petroleum Products



Types of Petroleum and Gas Industry Sector





Petroleum Storage Tanks

Storage tanks for crude oil are needed in order to receive and collect oil produced by wells, before pumping to the pipelines as well as to allow for measuring oil properties, sampling, and gauging (Figure 15).



Figure 15: Storage tanks.

The design of storage tanks for crude oil and petroleum products requires, in general, careful consideration of the following important factors:

- **The vapor pressure of the materials to be stored.**
- **The storage temperature and pressure.**
- **Toxicity of the petroleum material.**

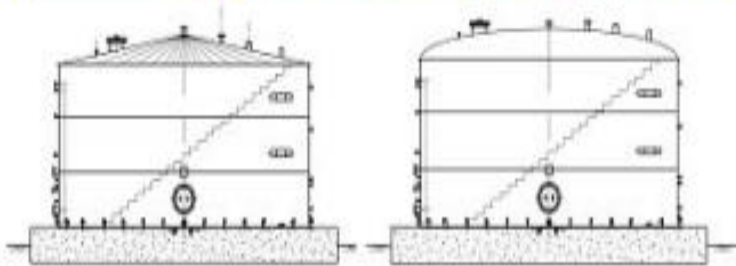
Types of Storage Tank

The main features of some of the common types of storage tank used by the petroleum industry in general are presented in Table 3.

Table 3: Summary of Refinery Storage Tanks.

Characteristics	Standard Storage Tanks	Conservation-Type Storage Tanks		
		I (Floating Roofs)	II (Variable-Vapor-Space)	III (Pressure Storage)
Evaporation losses	High	Significantly reduced	Significantly reduced	Prevented or eliminated
Operating conditions	Recommended for liquids whose vapor pressure is atmospheric or below at storage conditions (vented).	Allow no vapor space above the liquid: level (no venting)	Allow the air-vapor mixture to change volume at constant or variable pressure (no venting)	Allow the pressure in the vapor space to build up. Tanks are capable of withstanding the maximum pressure without venting.
Sub-classification	1. Rectangular 2. Cylindrical: a) Horizontal b) Vertical	-	1. Lifter roof, which is a gas holder mounted on a standard storage tank. 2. Vapor-dome	1. Low-pressure storage normally designed for 2.5-5 psig and up to 15 psig (0.14 – 0.34 bar and up to 1.02 bar) 2. High pressure storage: 30-200 psig (2 – 13.5 bar)
Typical types	Cone-roof-vertical (cylindrical tanks)	Floating-roof. wiggins-Hidek type	Lifter roof tanks. wiggins dry seal type	Spheroids and hemispheroids for low pressure storage, spheres for high pressure storage
Applications	Heavy refinery-products	Sour crude oils, light crude oils, light products.	Light refinery product and distillates	Spheroids are used to store aviation, motor, jet fuels. Spheres are used to store natural gasoline and LPG.

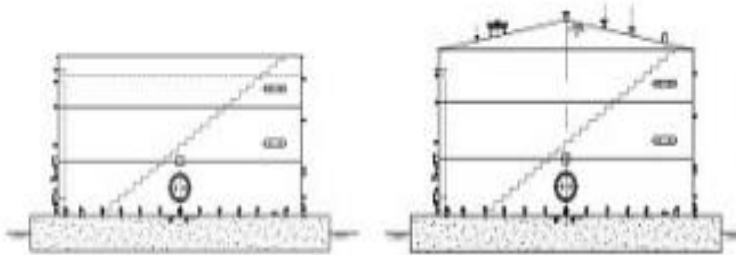
Types of Petroleum Storage Tanks



Umbrella Roof

Dome Roof

The major parts in storage tanks to which calculations apply, include shell, roof and bottom plate respectively.



Floating Roof

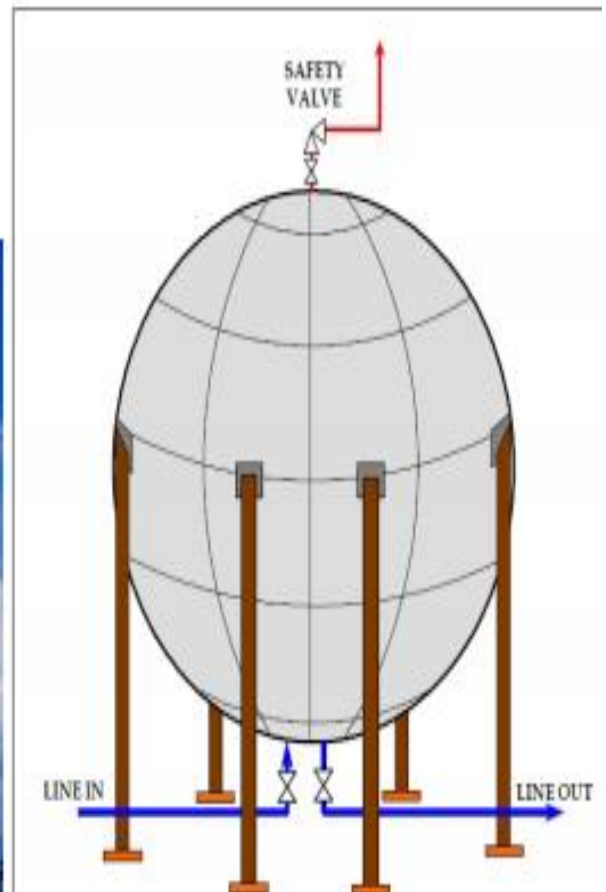
Cone Roof

Based on the shape of the roofs, storage tanks are classified to four major categories as flowing:



Spherical Storage Tanks for N.G and LPG

This type of storage vessel is preferred for storage of high pressure fluids. A sphere is a very strong structure. The even distribution of stresses on the sphere's surfaces, both internally and externally, generally means that there are no weak points.



Pipeline Transportation

- ❑ **Transportation Pipeline:** Long pipe with large diameter, moving products (natural gas, petroleum products) between cities, countries, continents.
- ❑ Pipelines are owned by shippers or operating companies
- ❑ Land is owned by corporate, private (right-of-way) and public (federal, state, local)
- ❑ Material in pipeline is owned by the shipper.



Pipelines System:

- **Crude Oil Transportation**
- **Gas Transportation**

Advantages of Using Pipelines

They are insensitive to surface conditions such as storms, inclement weather, etc.

High fixed versus low variable. Operating costs are low.

They are environmentally friendly.

Unique mode of transportation as the equipment is fixed in place and the product moves through it in high volume.



Stages of Petroleum Pipeline Construction

Site Preparation



Trenching



Pipeline Construction

Stringing the Pipe



Bending



Welding



The various pipe sections are then welded together into one continuous length, using manual, semiautomatic or automatic welding procedures.

Welding



Coating



After the pipe is welded, the welds are examined, usually by X-ray, and a coating is applied to the welded areas at the ends of the pipe sections to prevent corrosion.

Lowering and Backfilling



Once the pipeline is welded and coated, it is lowered into the trench. Lowering is done with multiple pieces of specialized construction equipment called **sidebooms**.

Lowering and Backfilling



Testing

All newly constructed hazardous liquid and natural gas transmission pipelines must be hydrostatically tested before they can be placed into service. The purpose of a hydrostatic pressure test is to eliminate any defect that might threaten the pipeline's ability to sustain its maximum operating pressure, or to determine that no defects exist.



Testing



Site Restoration



Pipeline Cleaning Services

Debris and deposits in pipelines reduce product flow and if left unchecked can result in pipelines becoming blocked.

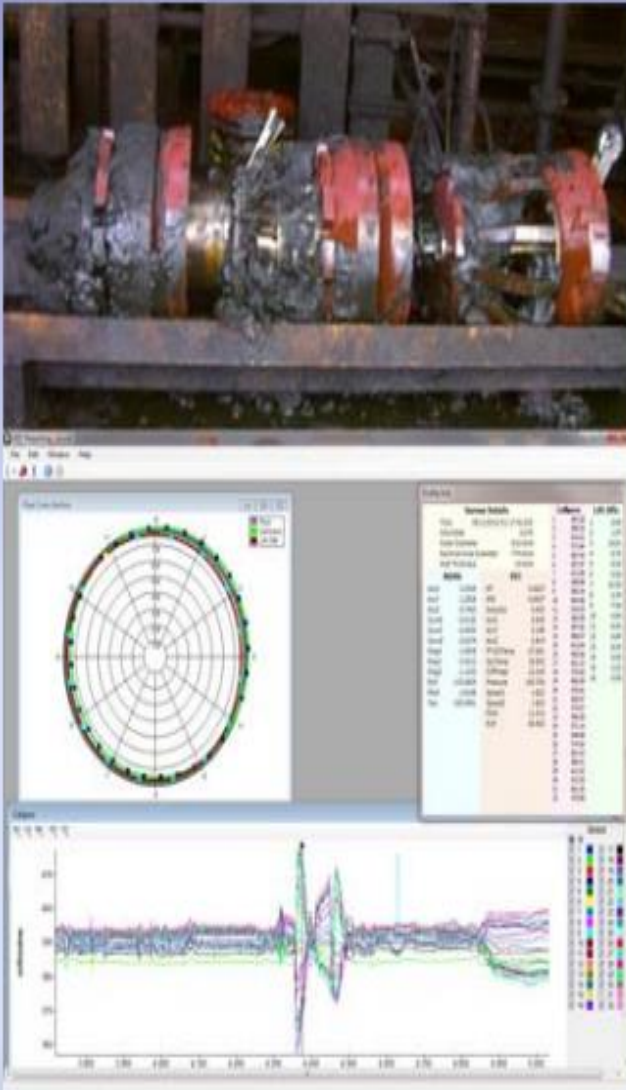


Pipeline cleaning services covering different aspects of pipeline pigging and flow assurance services.

Pipeline Cleaning Services



Pipeline Cleaning Services



maintenance pigging supported with tailored pipeline pigging

- 1- The removal of loose debris such as black powder, dust, sand and soft pipewall deposits
- 2- The removal of pipewall debris by brushing and cleaning into corrosion pits
- 3- The addition of de-scaling pins or scraper blades to remove hard pipewall deposits such as wax and scale