

## Construction of storage tanks by [Lian RAG Co.](#)

Two kinds of storage tanks are made in [Lian RAG Co.](#). The portable storage tanks and the immobile oil storage tanks. There are different applications for the liquid storage in the industry, which are:

- Storage of input materials and feed units.
- Storage of intermediate materials, which is produced in the process.
- Storage of products.
- Storage of materials for loading and distribution.
- Equalization of products quality.
- A criterion for measuring the volume of feed and product.

Some of portable storage tanks manufacturing in [Lian RAG Co.](#) are shown as figures below:





Oil storage tanks are the other important product of [Lian RAG Co.](#). Production of large oil fields is accompanied by new operating conditions that in order to create a suitable platform for stabilization and prevention of waste of time and delivery of crude oil and petroleum products, storage tanks in large exploitation units and in the area of pumping crude oil transmission houses to Export terminals are installed.



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Establishment of storage tanks in the oil extraction and refining industries, after purification and preparation for consumption is one of the most important issues because the materials that are the feed of many refineries and petrochemicals are not used immediately after production. The storage of crude oil, gas, and petroleum products depend on the capacity of the refining units, the variety of products produced, the distance and proximity of the unit to the sources of crude oil supply and how the products are transported and distributed.

## Classification of storage tanks

There is no unit classification for storage tanks. This classification can be based on geometry, type of fluid and vapor pressure of the stored liquid in the tank. A brief description of the types of tanks is written as follows:

### 1- Open top storage tanks

Open top storage tanks are the simplest type of tanks, and are in the form of roofless walls. Due to the lack of roof and fluid contact with the outside environment, this type of tanks is used to store materials such as the ones which:

- Their volatility rate is very low, because high volatility rate causes the material to evaporate and lose.
- Do not have flammable properties, as there is a possibility of fire.
- Materials should not be expensive, as the material may become contaminated unless the purity of the fluid is of little importance or it is treated before use.

These storage tanks are generally in large size. Open top tanks are usually made in the range of diameters up to 70 meters and depths up to 7 meters and sometimes larger. The material of these tanks may be steel, concrete, etc.

Among the substances that are stored in these tanks: water, salt water, chemical fertilizers that are in the form of slurry, etc. can be mentioned.



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### 2- Closed top tanks

Gases, flammable liquids, hazardous chemicals such as acids or bases, and fluids emitting toxic gases must be stored in closed containers. Closed top tanks include floating roof tanks, fixed roof tanks, spherical tanks, cylindrical tanks and refrigerated tanks.

#### 2-1- Floating-roof tanks

Materials such as crude oil, whose vapor pressure is slightly higher and is about 0.5 psi, are stored in special tanks equipped with floating roofs. This type of floating roof has no fixed

roof and is called External Floating Roof. These tanks are suitable for non-toxic or low-flammable materials.



If the vapor pressure of a substance is in the same range, but the substance is toxic or flammable, a special type of tank with a floating roof, which also has a fixed roof, is used. These types of tanks are called Internal Floating Roof.



## 2-2- Fixed-Roof Tanks

This type of cylindrical, vertical, and with a fixed roof is standardized based on the most appropriate diameter and height to provide the required capacity and is used to store various petroleum products.

If the vapor pressure of the material is not high but the material is toxic or flammable, such as heavy petroleum compounds, tanks with fixed roofs are used which are much safer than open tanks. The pictures below show the process of construction of fixed roof tanks by **Lian RAG CO.**





Fixed roof tanks come in a variety of shapes, including domed, conical or canopy roofs. Cone and dome roofs are more common. Operationally, conical roofs are more common, but domed roofs are more robust. In the next section, each of these tanks is described.

- **Supported cone roof:** A roof is a cone that is placed on the beams and columns by means of braces or on trusses with columns by means of braces.
- **Self-supported cone roof:** This conical roof rests only on its perimeter.



- **Self-supported dome roof:** This type of roof is spherical and relies only on its environment. Figure 5 shows an example of a tank with a domed roof.



- **Self-supported umbrella roof:** It is a kind of the dome roof tank that has been modified, each horizontal part of which is a regular polygon.



### 2-3- Spherical and cylindrical tanks

In cases where the vapor pressure of the material is around 0.5-50 psi, pressurized tanks, such as spherical tanks or horizontal cylinders, are used. Of course, in this pressure range, horizontal cylindrical tanks are preferred, but depending on the operating conditions, sometimes spherical tanks are used and in vapor pressures above 50 psi, spherical tanks must be used.

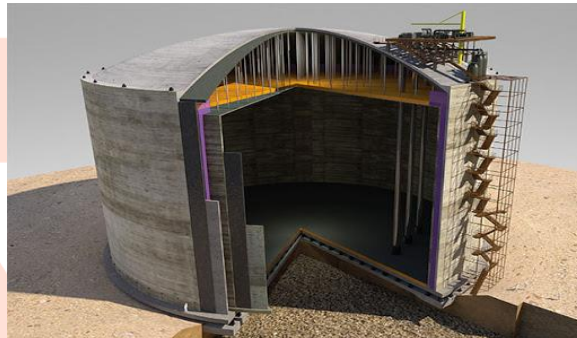


### 2-4- Refrigerated tanks

Refrigerated tanks are used to store liquefied gases and materials with low boiling points and often below 0°C. The low boiling point of these materials causes most of them to be gaseous

at normal ambient temperature. Therefore, to prevent evaporation of these materials, they need to be stored at low temperatures.

The most economical and safest temperature for storing these gases is slightly lower than their boiling point and in liquid form. For example, butane gas at  $0^{\circ}\text{C}$ , butadiene at  $-4^{\circ}\text{C}$ , ammonia at  $-33^{\circ}\text{C}$ , propane at  $-42^{\circ}\text{C}$ , ethylene at  $-103^{\circ}\text{C}$ , argon at  $-186^{\circ}\text{C}$ , nitrogen at  $196^{\circ}\text{C}$  -, hydrogen is stored at  $-253^{\circ}\text{C}$  and .... To keep these gases liquid, they can also be stored at high pressures and ambient temperatures, but there are several reasons why storage at low temperatures and atmospheric pressure has advantages over storage at high pressures and ambient temperatures.

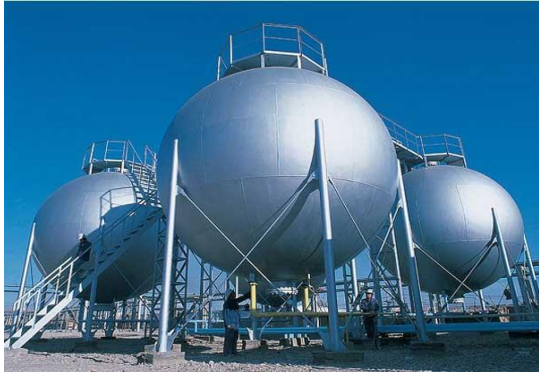


## Pressure vessels

Pressure vessels according to ASME SEC VIII standard are tanks with a design pressure of more than 15 psi and less than 3111 psi. These metal tanks are usually cylindrical or spherical for storing or performing chemical processes of liquids or gases that have the ability to withstand various loads (internal pressure, or external pressure and vacuum inside).

Pressure vessels are designed to operate safely at a specific pressure and temperature, called design pressure and design temperature. Designing and manufacturing such pressure equipment without principles and standards will be very dangerous and accidental.





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