

Design of pressure vessels

Oil storage tanks have long been one of the important needs of the oil industry in Iran and in all countries of the world. The standard of construction of storage tanks is standard API650 while pressure vessels are built up according to ASME section VIII. Tanks have different types, each of which is used according to their characteristics and application. The selection of a tank and its arrangement and location also depends on the conditions and place of use and the type of use of the tank.

Fluid storage needs special requirements due to their physical properties; for example: storing a highly flammable substance such as gasoline is quite different from storing water. There are different applications for storage in the industry, which are:

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



Traditional design methods that used to be based on manual calculations have now been improved with the use of tank design software. The design of the tanks is done using ETANK and TANK 2012 commercial software. These two software are the latest additions of APIs 650 and 653 of the latest versions and can consider the design of tank roofs, seismic and wind design, anchor design and so on.

Assembly of tanks parts

According to ASMEVIII (Division 1) standard, pressure vessel construction methods are classified into two categories, some of which are briefly described: 1-welding, 2- Forging.

Welding method

In the construction of pressure vessels by welding method, several methods can be used according to the base metal material, type of use, sensitivity in the construction of the tank and workshop equipment, including manual electrode welding, MiG welding, sub-welding Powder and welding of the TIG pointed. In this method, after rolling the body of the tank and making its cap, they are welded together.



Forging method

The construction of pressure vessels by forging method will be applicable for tanks in which there are no longitudinal welds. Also, this method is applicable to low carbon steels, low alloy steels.



Design of storage tanks

There are different methods and steps to construct the non-portable storage tanks. The first method, or the traditional method, is to assemble a tank from the bottom to the top using cranes and scaffolds.

Advantages of this method:

- Suitable for all diameters and heights
- Dimensional control of the shape of the shell and the floor close to the designed samples

Disadvantages of this method:

- Long construction time
- Working at heights (safety concerns)
- More materials are needed



In the second method, the tank is made from the highest shell to the lowest shell using the hydraulic jack system (Jacking Method). The construction steps of these tanks are as follows:

- After preparing the tank foundation, the floor sheets and the first row of the shell are placed and welded. The first 2 rows of shells are traditionally made to hold the jack in place
- The tools needed to determine the angle and compression of the sheets are installed on site.
- The roof of the tank is placed on two rows of installed shells.
- Roofing shells, wind deflectors and other support equipment are installed.
- The jacks are placed inside the tank to lift it.
- The number of jacks is low based on the total weight of the roof and shells except for two rows.



The third method is a new method in which the Argentine company that manufactures tanks for storage of petroleum products called Cantoni Gruas has presented a creative design for the installation and assembly of tank components. The use of hydraulic tools and automatic welding in this method facilitates the process of making the tank in order to increase the level of safety and quality.

In this method, there is no need to weld various components such as backs, scaffolding brackets and temporary attachments that keep the body round and stable. In other methods, we are constantly faced with the hassle of grinding installation accessories, which takes a long time. The Canton method consists of a new automatic hydraulic lifting system that uses modern technology to cover the disadvantages of the jack system (the second

method of tank construction). These disadvantages include welding the jacks to the tank body and the need for scaffolding.

