Oil Terminal Design

Oil Terminals are designed according to API and relevant standards such as ASME, ANSI, ASTM, NFPA and NACE. These standards are implemented for safe and efficient handling of the oil and oil related products to support the commercial distribution network.

An oil terminal consists of the following equipment: a receiving pipeline, manifolds, storage tanks, a pumping system, a piping system, truck loading racks, an electrical system, a monitoring and control system, an associated water collection and disposal system, a fire suppression system, administration buildings, warehouses and workshops, a fence, gates and a security system.

Oil Terminals are designed in the following order:

•Client requirements are gathered in regards to the types of stored products, storage capacities, receiving and distribution methods, etc. that will be needed.
•Research including a strong understanding of site conditions, a comprehensive topographic survey, geotechnical investigation and seismic/climate factors discovery is conducted.
•The conceptual design will reflect and fulfill the customer requirements, site conditions and codes governing the design.
•Zoning and orientation of the terminal elements will offer security, safety, smooth traffic, and the ability to easily manage the terminal.
•Storage tanks will be designed in accordance to API 650 (Design of Welded Steel Tanks for Oil Storage). The tank's flat bottom will be designed according to the size of the tank and rested on the ring foundation. The tank's cylindrical wall thickness shall be calculated by using API adapted methods. The tank will be anchored to the foundation using anchor clamps. The tank will have manways, manholes and pipe joints. The tank may have a fixed or floating roof depending on the stored liquid. The tank's venting capacity will be calculated in accordance to API standards. Also the tank will include a cathodic protection system, leak detection system, automatic gauging system/overfill protection and be coated on both the inside and outside. Tanks will be grouped in designated dikes. The distance between the tanks as well as other terminal elements shall be determined utilizing NFPA standards.
•Piping systems are designed according to ANSI/ASME B31.3 and/or ANSI/ASME B31.4. Piping material will be in accordance to ASTM A 53/A 53A. Piping systems run in parallel groups, above ground when possible or underground if crossing a road or area where traffic occurs. Pipe diameters are determined according to the flow rate. Velocity of the liquid inside the pipe shall be below the level of velocity which generates static electricity. The pipe wall's thickness is determined so that it withstands 1.5x the working pressure. Computer modeling software's are utilized to determine the piping system is able to bear pressure surge and hydraulic chocks. Underground piping is protected by cathodic protection and an overhead layer that is able to withstand the weight of traffic. The piping is coated in accordance to NACE standards and marked according to API. The operation requirements, cost of pipes/pumps and harmful effects of excessive fluid velocity, fatigue or failure are the main factors considered when developing the piping system design for the terminal.

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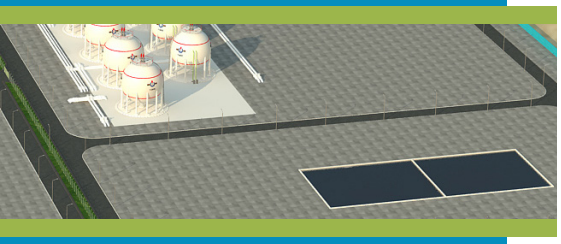
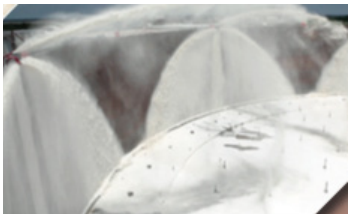


•The terminal's pumping system shall be sufficient to transfer products between tanks and distribution outlets such as truck loading racks and marketing pipelines. The pumps shall be designed according to API 610 (Centrifugal Pumps for Petroleum, Petrochemicals and Natural Gas Industries). Every pump will be capable of achieving 110% of the head required in the correct working temperature range. All pumps are installed on concrete foundations. When taking into consideration the number of pumps necessary spare pumps per each capacity used will always be considered. Pumps are equipped with strainers, valves and bypass lines. Electrical and diesel drives shall be considered in the design.

•The trucks loading and unloading racks shall be capable of transferring up to 130 M3/H from or to the trucks. The trucks loading and unloading racks are installed on a concrete mat and have a weather cover to protect the trucks and workforce. The loading and unloading racks are positioned according to NFPA standards.

•The terminals will be powered by an electrical system consisting of two (2) sources of electrical power, a primary and secondary source. The primary source is most often the national grid while the secondary source consists of diesel power generators used in case of a primary source failure. The power supply's distribution system shall give management strong operation and maintenance capabilities.



•The terminal's control system shall be utilizing the SCADA system in the field and the PLC system in the control room. Field data should be transmitted from the field to the control system where the program is able to handle it without human interference.

•The associated water collection system shall be designed according to API standards in order to reduce the volume of associated water. Associated water will be processed through the O/W separators and gathered in the evaporation ponds where the water can be treated, made environmentally friendly and disposed of responsibly.

•A fire suppression system is necessary as the presence of flammable and combustible fluids/gases among oil and gas terminals present a fire safety hazard, potential to pollute the environment and endanger human lives. In order to prevent and extinguish fires the facility will be protected by a fire suppression system. A fire suppression system starts with a monitoring and alarm system to alert the workforce in case of a fire. The fire suppression system also includes heat/flame detectors, gas/vapor sensors and an alarm control panel. A water based fire suppression system includes a fire water source, water storage system, pumps, piping, foam tanks and proportioners. Water based fire suppression systems also include fixed delivery systems such as manifolds, sprinklers, foam chambers, monitors and mobile delivery systems for foam/cooling water such as mobile pumps and monitors. None-water based fire suppression systems include dry chemical agents, CO2 and other non-aqueous firefighting material such as dykes and drainage systems for purging water and foam used in a fire event.

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•The design of fire suppression systems for oil and gas terminals is conducted according to the NFPA standards starts with the identification of at-risk fire zones. Each fire zone is characterized by the type of hazardous material (liquid or gas) involved, the flash point, quantity, storage vessel size, storage pressure and distance from water source. Next by estimating fire scenarios for each zone we're able to calculate the required foam and cooling water for each zone according to NFPA standards. The fire zone that requires the highest quantities of foam and cooling water is considered as the Worst Case Fire Scenario (WCFS). The quantities required for the WCFS will be considered the point of reference when designing the storage, pumping and delivery systems for the field. Next, the water source, storage tanks, pumping, piping and application equipment of foam/cooling water are designed. Civil, mechanical, electrical, control and environmental engineering aspects are completed to compliment the design package. A construction plan is configured for the contractor in order to keep fire suppression capabilities functioning throughout the construction period so fire is prevented in hazardous areas during construction.

•The earthing and lightening protection system is designed to prevent fires caused by lightning or static electricity. The system assures that any stray electrical charges are passed to the earth avoiding any chance of creating sparks.

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