KLM Technology Group
#03-12 Block Aronia,
Jalan Sri Perkasa 2
Taman Tampoi Utama
81200 Johor Bahru
Malaysia

RECOMMENDED PRACTICES ON OIL STORAGE AND HANDLING

(PROJECT STANDARDS AND SPECIFICATIONS)

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SCOPE

The present document is applicable to safety in the design philosophies and operating procedures pertaining to the storage and handling of crude oil and petroleum products at crude oil exploration & production, refineries and pipelines installations which are normally stored in above ground atmospheric pressure or low pressure storage tanks and underground tanks. This does not cover the storage and handling of propane, LPG, butane etc. which requires pressurized / cryogenic storage.

INTRODUCTION

Crude oil, the feed to all petroleum refineries, is received and stored in tanks to build up enough inventory prior to processing. This takes care of contingencies like delays in crude receipt and avoids interruptions in crude oil processing. Tanks are also provided to store intermediate products/finished products prior to transfer to terminals for further distribution. Ultimately, distribution of petroleum products is done by trucks/pipeline/tankers/ barges etc.

DEFINITIONS

For the purpose of this document, relevant terms are defined as below:

1. TERMINALS

Terminals consist of tanks which receive crude/products from oil tankers, rail cars, truck tankers, pipelines as well as loading or unloading facilities for dispatch or receipt of products. A terminal could be part of a refinery/production unit or a separate marketing facility or a cross country pipeline installation.

2. SLOP

Off-specification products obtained during plant start- up, shutdown or upset conditions and draining etc. from various equipments/tanks/pumps containing oil – water mixture from process plants / marketing / pipeline installations are called slops. Slops containing large quantity of free water are known as wet slop. When free water content is low enough to process the slop in plant, in a controlled manner, it is known as dry slop.

3. Loading Bays

In order to handle large number of rail cars / trucks for loading or unloading, facilities called loading bays are provided. These consist of loading/unloading headers with loading/unloading points with hoses/arms, walkways, railings, set stop ramping / up-ramping down (opening in steps and closing in steps) automatic cut-off valves, approach platforms, metering station, rail tracks etc.

4. TANKS

Storage tanks are defined as "ATMOSPHERIC STORAGE TANK" and "LOW PRESSURE STORAGE TANK".

ATMOSPHERIC STORAGE TANK

Tanks designed as per API Code 650 or equivalent is called ATMOSPHERIC STORAGE TANKS. These tanks can also be sub-divided into two categories:

- Atmospheric storage tanks with open vent to atmosphere i.e. goose neck type vent
- Atmospheric storage tanks with blanketing facilities

LOW PRESSURE STORAGE TANK

Tanks designed as per API Code 620 or equivalent is called LOW PRESSURE STORAGE TANK. Products having slightly higher vapor pressure are stored in these types of tanks.

TANK CAPACITY

a. Nominal Capacity of a Tank

Nominal capacity shall mean the geometric volume of the tank from bottom up to curb angle in case of fixed roof tanks and the underside of roof deck up to the maximum floating position of floating roof in case of floating roof tanks.

b. Gross Capacity of a Tank

Gross capacity (stored volume) is the capacity of the tank up to the maximum safe filling height of the tank.

c. Net Capacity

Net capacity is the net pump able capacity of the tank during operation after subtracting the volume of tank bottom contents up to the top of normal pump out nozzle from safe filling capacity of the tank

5. CLASSIFICATION OF PETROLEUM

Petroleum products are divided into three classes based on their flash points as follows:

Class A - Flammable liquids having flash point below 23^{o}c.
Class B - Flammable liquids having flash point of 23oC and above but below 65^{o}C.
Class C - Flammable liquids having flash point of 65oC and above but below 93^{o}C.
Excluded - Liquids having flash point of 93 degree C Petroleum and above

DESIGN CONSIDERATIONS FOR STORAGE TANKS

1. ROOFS

Tanks are classified based on their roof design. Normally, atmospheric tanks are of fixed roof or cone roof or floating roof or fixed cum floating roof (with or without Nitrogen blanketing) type tanks and low pressure Nitrogen blanketed tanks.

Floating Roof

Floating roof may be single deck pontoon roof, double deck or pan roof. Pan roof shall not be used as these are unsafe. For designing these tanks, API 650 guidelines may be followed.

Fixed Roof

Fixed roof may be of cone type or dome shaped. The tank may be pressurized (to a few inches of water) type with breather valves. Alternatively, tanks may be provided with fuel gas or inert gas blanketing to prevent oxygen/moisture ingress. Fixed roof tanks for light products (e.g. Motor Spirit) breathing into a neoprene balloon is not acceptable. For designing atmospheric/low pressure tanks, API 650 or API 620 may be followed based on the type of the tank

Fixed Floating Roof

These tanks have a fixed roof over a floating roof. They are used for products having very stringent water content specifications like Aviation Turbine Fuel and products sensitive to oxygen like light intermediate feed tanks. Where oxygen ingress is to be avoided, it is preferable to provide Nitrogen blanketing.

a. Selection of Roof

Selection of type of roof generally depends on ambient conditions and the product handled.

b. Ambient Temperature

Ambient temperature statistics shall be taken for the past at least 15 years. Maximum average daily temperature for four (4) summer months for each year shall be considered.

c. Product Handled

Following guidelines should be used for specific cases:

(i) Tanks used to store finished Aviation Gasoline/ Turbine Fuel shall be floating fixed roof to avoid entry of water into product.

(ii) Where product degradation due to air/moisture ingress is a problem and fixed roof tanks are used, such tanks should be provided with inert gas blanketing.

(iii) Nitrogen blanketing for internal floating roof tanks/fixed roof tanks should be considered for storing hazardous petroleum products like benzene etc.

2. TANK BOTTOM

Tank bottoms may have conical shape or inverted cone shape, also known as "Apex down". Tanks used to store finished Aviation Turbine Fuel shall have bottoms coned downwards towards the centre with a sump of adequate size at the centre of the tank bottom and a siphon drain. The outside of pipe shall be epoxy coated.