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9/13/18
Rev 0

Storage Type Selection Process for Gas Products

The following is a review of potential issues that affect the storage selection type for gas products. This example is associated with LNG and CNG. Other gas products can be performed in a much simpler fashion, due to the reduced regulations.

The presentation takes the selection process and divides it into (3) categories. These categories include location, storage interface and storage dynamics.

1. LOCATION:

Just like real estate, location, location, location will drive your decision-making process. The first location category authority having jurisdiction, will deal with the authority having jurisdiction over the location. The second location category will be Site-Specific Relationships covering items, such as the adjoining properties, co-owners, and potentially affected facilities. The third location category will deal with the Specific Site for the storage facility.

1.1 Authority Having Jurisdiction

The first category for location will be the authority having jurisdiction. These will cover the U.S. Regulations from 49 CFR 193, State Regulations, County and City Regulations, FAA and the appropriate Fire Marshal. Other stakeholders or authorities having jurisdiction may have some input and should be considered. Important topics associated with each of these jurisdictions include the following:

a. Federal Regulations – Although Federal Regulations allow for LNG tanks to have penetrations in the shell and bottom, it is widely regarded as an unacceptable design by permitting standards today.

b. State Regulations – Some states have a real concern associated with public safety and the storage of LNG or methane gas. This can delay or cause significant issues associated with the permitting process.

c. City and County Regulations – Although most city and counties have no specific regulations, some such as Los Angeles have gone out of the way to develop a seismic code that is far more stringent than any applied elsewhere. The application in L.A. can act as a significant driver in the formula for storage type selection. More common to city and county areas are height or color restrictions. Height restrictions can be costly associated with flat bottom pressurized storage.

d. FAA Regulations – There are parameters that have to be addressed associated with the relationship of LNG storage tanks and airports. FAA issues may have

a significant impact if for some reason the tank has to be designed to take impact from aircraft or aircraft components.

e. Fire Marshal – Traditionally, the Fire Marshal will have little impact on the overall economics of the project, but can stifle issues associated with permitting, due to public safety, and/or fire/rescue support systems.

1.2 Site-Specific Relationships

Site-Specific relationships relate to the idea of your adjacent neighbors and facilities in the immediate vicinity of the storage. This category will include insurance, co-owners of the facility, adjacent properties, public property, schools, hospitals, and public transportation systems. Each of these could have an impact on the decision-making process and the balance of design.

a. Insurance – Insurance carriers can dictate some of the balance of design issues associated with the storage because of its liability and/or proximity to other components in the facility.

b. Co-Owners – Co-owners can act like insurance companies dictating requirements associated with their own appetite for risk.

c. Adjacent Property – Although there are a number of regulations on distance to a property line, siting calculating that deal with thermal exclusion and vapor dispersion become a driving force with selecting the proper storage type. Fire from an adjacent source is a common component in the Basis of Design.

d. Public Facilities, Schools, Hospitals, and Public Transportation – Often, authorities and/or public concern can drive a design selection when it is in proximity to any of these.

e. Projectile and Impact Issues from Waterborne and Rail – Although minimal in probability of occurrence, it can become a significant cost factor, if required. Special consideration is given to rail for passenger trains verses industrial.

1.3. Specific Site

Specific site relates to the land that is destined for the storage component. Issues, such as whether the land can flood, components that could generate adjacent fire, or if the tank had a fire it could interrupt some level of service to the public all need to be considered. Additionally, the land owner should consider what his future uses are. A single containment structure might wipe out the future use of the entire property, while a full containment structure may only cannibalize a small portion of the actual site. Issues of concern include the following:

a. Site flooding –

b. Site security –

c. Site associated with current sources of ignition –

d. Site associated with future expansions –

e. Site associated with interruption to public services –

2. STORAGE INTERFACE:

Storage Interface deals with the issues and dynamics associated with the inbound and outbound products over the life of the facility. Examples include the following:

a. Inbound Rates – Some applications with vessels can restrict inbound rates from ships or other components that may have rapid fill capabilities.

b. Inbound Styles – The style relates to whether it is inbound from a process unit, ship, rail, truck, or pipeline.

c. Inbound State – The state deals with whether the inbound product is coming in as a gas, liquid, sub-cooled, or requires some level of process before it can be stored.

d. Outbound Rates – Some applications with vessels can restrict outbound rates to pipelines or other components that may require rapid supply.

e. Outbound Styles – The style relates to whether it is outbound to a ship, rail, truck, vaporizer, or pipeline.

f. Outbound State - The state deals with whether the outbound product is a gas or liquid.

3. STORAGE DYNAMICS:

Storage Dynamics deal with factors, such as the minimum of maximum of volume that may be stored, hold times, throughputs, operational style that fits the customer and potential service changes. Risk to service interruption and other factors can also be added in this category to round out the components that will drive the Basis of Design. These issues may have factors, such as the following:

a. Storage volume – Obviously for small storage, vessels may be the answer, but the decision-making process can have a break as early as 350,000 Gal. to convert to a flat bottom storage tank. This may be supported with calculations for thermal exclusion and/or vapor dispersion because of the storage style and the lower pressure. At the same time, vessels can be utilized up to as great as

a million gallons, due to the fact that cost may be less and property is available, as well as impacts to adjacent facilities.

b. Hold Time/Throughput – Hold time and throughput can easily change the approach to the insulation systems for the overall structure. This can also drive at storage styles because of the service area verses volume stored.

c. Operational Style – Customers come in all shapes and sizes and each has a different appetite for the operational aspect. Although, vessels could represent a simpler style of storage based on receiving and outbound, multiple vessels do require some additional efforts in operation. A flat bottom storage tank may be the simpler mode of storage, but may also be found to be more complex based on overall plant design.

d. Interruption of Service/Changes – The service change could relate to potential backup systems for interrupted inbound or outbound logistics, as well as changing parameters associated with future markets. This, combined with an analysis for risk to service interruption should be considered in the overall style selection process.

Hopefully, the above components will help support a balance of design style document and some weighted components that show benefits for each style of storage. Combining these factors with estimates for each style of storage should help managers make an informative decision verses a Balance of Plant approach, where the contractor/vendor does not fully support all storage options.