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Looking for Dry Bulk or Liquid Storage? Always Specify Wisely!

(By Bill Neighbors, President Tank Connection)

In today's market, information technology on storage applications has collided with advanced steel tank designs, advanced coating systems and field construction processes. The outcome includes some of the most cost efficient, high quality storage containment products ever developed for industrial and municipal applications. Under review, high quality storage products offer significant benefits to the client in the form of extended service life, low maintenance and cost savings generated over its service life.

The problem in comparing alternative types of storage construction is separating high quality "Tier A" (ref. Figure 1a.) storage products from marginal and poor performance "Tier D" storage products. ***It may surprise you to know, but in today's market, premier quality dry bulk and liquid storage products can be purchased and installed for about the same price as low quality storage products.*** Of course the real "kicker" is when you add the life cycle costs to the equation. In many cases, the life cycle costs of "Tier D" products will calculate at more than twice the cost of "Tier A" products. Needless to say, it becomes an expensive lesson for the client when marginal and poor quality tank construction is specified and procured for a project.

Quality & Field Performance Classifications of Storage Tank Construction (Figure 1a.)

Tier A Quality	Tier B Quality	Tier C Quality	Tier D Quality
• Cost efficient	• Same pricing level	• Same pricing level	• Same pricing level
• High quality	• Above average	• Average quality	• Low quality
• Extended life	• Long life	• Average life	• Decreased service life
• Low maintenance	• Low maintenance	• Average maintenance	• High maintenance
• Lowest life cycle cost	• Low life cycle cost	• Average life cycle cost	• Highest life cycle cost

The construction of a storage tank/system should always be reviewed as a major infrastructure project. Never assume that a vendor will provide you with the right type of storage tank construction for your application. Always cover the specifications on tank construction, coating systems and field construction processes in detail. Then you can specify and procure a premier quality storage system with confidence.

ABOUT TODAY'S STORAGE INDUSTRY

Tank Connection is a leading designer, manufacturer and installer of storage containment products and field construction services. Tank Connection is the only tank manufacturer worldwide that offers all types of steel tank construction, offering over 100 different types of premier storage containment products tailored specifically for the application.

It is interesting to note that on a global basis, storage products are being introduced in the marketplace today that will not "stand the test of time". As typical with new product offerings by manufacturers, it is all about profit margins. Many suppliers of storage systems fall into the same "ant line" procession as other suppliers of capital equipment. They equate "cheapening" their storage products to "making them less expensive". This has always been a bad model to follow. Relative to the storage tank industry, it is a total misread on today's storage tank requirements.

As previously noted, the best storage containment tanks/products are designed, manufactured and installed as major infrastructure projects. As a reference point, the minimum service life of a storage tank use to be considered 40 years. In today's storage industry, there are tank/containment products that are being introduced into the market that will provide less than a 10 to 20 year service life and other products that will provide service in excess of 60 to 80 years. All of these products have a comparable initial installed cost by construction type, but when the life cycle costs are added, "Tier D" products will cost over twice as much as "Tier A" products.

Today, in industrial and municipal applications, there are steel storage tanks throughout North America that are over 100 years old. Based on proper maintenance of a storage tank and its coatings, a steel storage tank can be maintained for an indefinite service life.

LIQUID STORAGE UNDER REVIEW

As you will note in Figure 2a., a variety of storage tank designs are offered depending on the design code specified. As noted, the service life of these products range from 20 years up to 80 years plus. Glass/vitreous enamel coatings, which use to be considered the best in liquid applications, no longer reign as the leader. The inherent problem with glass storage tanks are the panel edges, bolt holes and high factory reject rates. A bigger problem with glass is a finite service life of 30 to 40 years in liquid storage and then the storage tank requires replacement. With today's advanced coating technologies, bolted steel tanks that can be recoated can provide an indefinite service life. Glass tanks can never be recoated, which is now being recognized in the municipal and industrial applications as its major product weakness. Again, advanced coatings technology is outdating products previously considered as premier storage systems.

Liquid Storage Tank Products Available Today & Related Service Life (Figure 2a.)

Design Code	Construction Type	LIQ Fusion 7000 FBE Tanks			Other Coated Tanks			Glass / Vitreous Enamel Tanks	
		PDT*	Service Life**		PDT*	Service Life**		PDT*	Service Life**
AWWA D103	Bolted	40+	60-80+		30+	40+		30+	30-40
AWWA D100	Welded	N/A			40+	60-80+		N/A	
FM 4020	Bolted, Welded	40+	60-80+		30+	40+		30+	30-40
FM Principles	(not a valid listing)				10+	10-15+		N/A	
NFPA-22	Bolted, Welded	40+	60-80+		30+	40+		30+	30-40
AISC	Bolted, Welded, Hybrid	40+	60-80+		20+	20-30+		25+	25-30+
EN 15282	Bolted - Glass Coated	N/A			N/A			25+	25-30+
API 650	Welded	N/A			40+	60-80+		N/A	

* PDT - Plate design thickness in years. A function of steel tank design.

** Service life in years. A function of periodic maintenance and coatings.

DRY BULK STORAGE UNDER REVIEW

Bolted Tank Construction - In bolted construction, the bolted RTP (rolled, tapered panel) design is the top performance product offered in the industry today worldwide. It is the premier product and it is outdating other types of bolted tank construction. API 12B (flanged panel tank) is an older bolted tank design that has incurred too many field leak issues in dry bulk and liquid storage applications and is being replaced by the RTP design. A newly introduced storage product is the vertical FP (flat panel) design, which is being promoted as another replacement for API 12B construction. The vertical FP design is a poorly conceived design. (In essence, if you chop-off the external flanges of an API 12B panel, you have a vertical FP design.) There is no merit in a vertical panel design, except that it allows the use of older, existing API 12B field construction equipment (i.e., air tugger and gin pole), which is also considered outdated by today's field construction technology. In precision bolted fabrication, the RTP panel design must be rolled horizontally, the same as API 650 and API 620 fabrication.

RTP (rolled, tapered panel) Construction (left)
API 12B Flanged Panel Construction (right)

Field-Weld (FW) Tank Construction - In field weld construction, API 650 and API 620 fabrication has changed little, with the exception that state-of-the-art shop fabrication equipment is now utilized. In the field, new field weld construction technology has allowed for some phenomenal advances in welding processes. API 650 & 620 construction remains the premier storage products in welded tank construction. All panels (~8-10' height x ~25-35' length) are rolled horizontally and leading fabricators will minimize the large piece count in the shop. A variety of other field-weld construction types have also surfaced in the industry by smaller fab shops, without governing code requirements. Field-weld construction that does not minimize the large piece count in the shop and/or is not subject to radiograph examination (both in the shop and the field) per API 650 should be considered no better than"Tier D" quality.

API 620 Field-Weld Construction
Dry Bulk Storage Application

Hybrid Tank Construction – Any tank component combination of bolted, field-weld or concrete construction will produce a storage product classified as a hybrid. As noted, tiers range from A – D in quality and performance.

API 650 Field-Weld Construction
Liquid Storage Terminal

Concrete Tank Construction – Slip-form concrete construction is the premier concrete storage tank design for dry bulk storage applications. Jump-form concrete is routinely utilized in biomass storage, grain applications and elevated water tank pedestals. In liquid storage containment, wire wound prestressed designs with a steel diaphragm continue to provide good quality containment for tank sidewall applications. Concrete cover applications for liquids continue to be replaced in the industry by aluminum geodesic dome covers.

Clarifiers Bolted RTP Hybrid Construction

Jump-Form Pedestal
For Elevated Water Tank

XL Storage Tank Construction Under Review (Figure 3a.)

Tank Construction	Definitions	Quality & Perf. Rating	Advanced Coating Systems	Advanced Field Construction Processes	Product Review
Bolted RTP	Horizontal rolled, tapered panel	Tier A	X	X	Best
Bolted RTP - Glass	Horizontal rolled, tapered panel	Tier B	X	X	Good
Bolted API 12B	Rolled, flanged panel	Tier C	--	--	Average
Bolted Vertical FP	Vertical rolled, flat panel	Tier D	--	--	Poor
Bolted FP	Rolled or unrolled flat panel	Tier D	--	--	Poor
Bolted Corrugated FP	Rolled corrugated panel	Tier D	--	--	Poor
Field Weld	API 650	Tier A	--	X	Best
Field Weld	API 620	Tier A	--	X	Best
Field Weld	Non-code	Tier C-D	--	--	Avg. - Poor
Hybrid	Tier A combinations	Tier A	X	X	Best
Hybrid	Tier B combinations	Tier B	X	X	Good
Hybrid	Tier C combinations	Tier C	--	--	Average
Hybrid	Tier D combinations	Tier D	--	--	Poor
Concrete	Slip-form construction	Tier A	--	--	Best
Concrete	Wire-wound prestressed with steel diaphragm	Tier B	--	X	Good
Concrete	Jump-form construction	Tier C	--	--	Average

ALWAYS SPECIFY WISELY

When you specify or request a quotation on a storage system, always cover the bases by following the STORAGE checklist:

- ALWAYS request the tank vendor specification and make sure every detail is specific. Custom tailor the specification for your application. (At TCAG, we list all types of steel tank specifications. Tank specifications can be downloaded at any of our websites and other information locations including www.tankconnection.com and www.storagesilos.com.)

- ALWAYS request the tank design plate thickness broken down separately (i.e., sidewall, hopper/bottom and deck) at the quotation stage, not after order placement. This will allow for a side by side design comparison of vendor storage products.

- ALWAYS review the tank vendor performance guarantee in writing at the quotation stage… again not after order placement. In dry bulk storage applications, make sure that the tank vendor will guarantee material flow from the tank. If the tank vendor does not guarantee that the product is going to discharge properly from the tank, then move on to a different vendor. (As an example: We receive calls routinely from companies that have "other brand" storage tanks and their stored material will not discharge properly or reliably. If you have no guarantee from your vendor that the stored product will discharge properly, then in essence you are dealing with a supplier that is acting solely as a fab shop, assuming no responsibility for the application.)

- ALWAYS request safety information (i.e., EMR, etc.) on any subcontractors that will be utilized for field construction services, if the company does not have its own field erection crews. Over the years, we have received a number of inquiries from buyers that had purchased an "other brand" storage tank, only to find out that the company was subcontracting the field construction services. Although some storage tank manufacturers represent that they have their own field construction services, the reality is that most tank manufacturers subcontract their field construction labor. In 2008, the year known as the "bad subcontractor", we received daily calls from potential clients trying to secure TCAG field services. Always do your homework up front on the field installation crew prior to order release and you will minimize or eliminate your headaches in the field when it comes time for field construction.

- ALWAYS request coatings information and DFT's (dry film thicknesses) applicable for the tank interior and exterior coating systems. This has become a major issue in today's market. Some tank vendors are applying coatings at less than the recommended minimum mil thickness to save costs. We have even measured coatings in the field that were applied at less than 2-3 mils. There is absolutely no reason for tank coatings to be applied at readings less than 2-3 mils… none. As the right coating selection is critical to the success of a project, the proper mil thickness is equally as important to protect the stored product internally and the tank exterior from the exposed environment. (As an example: Tank Connection utilizes an exclusive coating system developed by Akzo Nobel, the largest powder coat supplier worldwide. The system is proprietary and Tank Connection is the only bolted tank manufacturer certified by Akzo Nobel to use and apply this system. The minimum mil thickness for this coating system is 5 mils.)

- ALWAYS request from your supply vendor the name of the tank manufacturer. There are a number of tank suppliers/vendors today that represent themselves as tank manufacturers, which could not be further

from the truth. Don't be fooled by tank suppliers that have fab shops or field construction crews… as they are not the storage tank manufacturer… but rather are independent dealers representing themselves as tank manufacturers. In other words, always know who you are dealing with or you will be surprised, typically at the wrong time.

- ALWAYS conduct prequalification to verify a vendor's shop and field capabilities, financial stability, bonding capacity, safety record, etc. Again, don't assume . . . today's market is not yesterday's market.

- ALWAYS request whether or not your tank quote is subject to price escalation after order placement? Unless steel pricing becomes volatile as it did in late 2008, the pricing you receive should be firm through the agreed to "scheduled date" for shipment or field installation.

- ALWAYS set a firm schedule with the tank manufacturer and hold their "feet to the fire" to ship the tanks on time and on schedule.

In summary, if you follow the checklist of items noted, then product specification and procurement will be made as an informed buyer. Don't assume that an old vendor name in the marketplace should go unquestioned. In actuality, some of the old names in the marketplace have become the worst offenders in cheapening their storage products, coatings and installed quality. Most importantly, the biggest problem witnessed in today's market is vendors that do not assume any responsibility for the tank in the storage application. (Remember… if the storage tank supplier is not responsible for the outcome, then the specifying engineer or client has assumed the responsibility.) In all cases, cover your bases and specify a premier quality storage system that will stand the "test of time" as a major infrastructure investment.