Best Practices Guidelines:

Bladder Tank Above Ground Temporary Fuel Storage Systems – Desert Regions

Background

The Desert King Tank™ was engineered specifically to store liquid fuel in desert climates. Originally developed in 1999 for the Egyptian Military for use in the Sahara Desert, the Desert King has become a standard tank for other militaries, oil and gas and mining companies working in remote, hot or cold, climates with low humidity and high UV. The Desert King tank has been designed to handle rapid vapor expansion and resist diffusion caused by high aromatics. It has a longer life expectancy than any other urethane collapsible fuel tank in desert environments. The Desert King is a light tan to reflect sunlight and reduce surface temperature as well as to camouflage the tank.

SEI can provide the tank individually or as part of a desert fuel system which includes

- Primary storage tank w. high capacity
- Secondary containment berm
- Rainwater filter system
- SunShade

1. Fuel Bladders

a. The fuel bladder should be manufactured from a polymer fabric that consists of substrate (Scrim) and topcoat (polyester) or (polyether) based polyurethane. The top coating must be compatible with the fuel being stored and the climate at the installation site. The Substrate (Scrim) is typically polyester or nylon woven base material.

b. Material shall be suitable for environmental conditions found in desert operations (hot/cold/dry and high UV climate). Key fabric specs include:

- Coating: Polyester polyurethane with UV resistance
- Diffusion rate (permeability), ASTM D-814 (JP-8 Fuel): 0.02 fl oz/ft²/24 hrs

c. All seams shall be radio frequency (RF) welded, complete with top and bottom cap strips, and body panels should be segregated. The welded seam strength shall be equal to or greater than the base material strength.

d. Exposed substrate along top and bottom cap strips should be sealed inside and outside of the bladder.

e. Tank capacity should be engineered to ensure the tank dimensions are correct for the intended volume with min 5% over capacity for volume expansion due to temperature changes. Static loading on base fabric and seams shall be less then one fifth the tensile strength of the base fabric.

f. Corners should be designed according to acceptable engineering practices. Square corners should be protected from abrasion.

g. Tanks shall be leak tested at place of manufacturing and certified by the manufacturer to be free from leaks. Furthermore, tanks should include a vent and any interconnecting piping shall be pressure tested for leaks.

h. Tanks shall include test strips for 12 years of annual integrity testing.

i. The bladders shall include design criteria and drawings that are stamped by a professional engineer.

j. The bladders should be installed with light weight tropical vents that prevent water from entering the tank during high rain fall events.

2. Secondary Containment Above Ground Berms

a. Secondary containment above ground berms should be constructed from a material impervious to petroleum products and be suitable for the environment they are being used in.

b. Above ground berm wall supports should be made from aluminum metal and be able to hold the entire berm while full of liquid.

c. Metal frame supported above ground berms with single or double horizontal wall supports and vertical wall supports at every 5’ (1.5 m) intervals should be used for bladder tanks with a volume of 10,000 USG (37,854 litres) or greater.

d. Each above ground berm should be engineered specifically for the supplied fuel bladder or installation to ensure the berm is able to accommodate 110% of the maximum bladder volume in the event of spillage including catastrophic failure.

e. Above ground berms to be used with fuel bladder storage tanks should be supplied with stamped professional engineered drawings and engineering approval check list.

f. Above ground berms should include corner drains with plugs installed in four corners of the berm.

3. Secondary Containment Berm Liners

a. Secondary containment berm liners may be constructed as per ULC-ORD-C58.9-1997 or meet EPA CFR 40 part 112 regulations.

b. The material shall be impervious to petroleum products and be suitable for the environment they are being used in.

c. Each berm liner should be engineered specifically for the supplied fuel bladder or installation to ensure the berm is able to accommodate 110% of the maximum bladder volume in the event of spillage including catastrophic failure.

d. Each berm liner should include a sump to collect rain water/snow melt and include a provision for an oil/water separator.

i. **Note:** decommissioning of secondary containment berm liner systems must include on/off site soil reclamation that should be specified by a soil scientist**.** Consult local regulations for further information.

4. Oil/Water Separator

a. An oil water separator shall be used to treat precipitation collected in the bermed secondary containment prior to discharge.

b. The oil water separator must be designed to produce a discharge of water that will not contain more than 15 mg/L of free oil and grease as per EPA CFR 40 part 112.

c. The oil/water separator must be designed to withstand freezing of liquid inside the system.

5. Installation

a. All fuel bladders should be installed as a system that includes a secondary containment system as listed above, with an oil/water separator

b. Systems should be installed on level ground.

c. The installation of fuel bladder systems should be under the direction of a trained field service representative. Upon completion, as-built drawings and an installation report should be provided to the operator.

d. The operator should be trained on proper use and maintenance procedures for fuel bladder systems and shall be provided operator manuals.

e. In areas with vehicle traffic, crash protection should be erected around the collapsible fuel tank.

f. In areas with security risks, a fence with locking gate and proper lighting should be installed to discourage theft. Only authorized personnel should be permitted into the area.

g. Operational personnel should have spill prevention and response training,

h. Fire extinguishers should be located near to the fuel equipment.

I. Spill equipment should be located near to the fuel equipment.

j. Where possible SunShades should be used to minimize UV exposure.

6. Maintenance and Inspection

a. Regular monthly maintenance inspections shall be conducted for fuel bladders, secondary containment and oil/water separator systems and records should be kept.

b. Fuel bladders are equipped with twelve (12) integrity strips. A strip is cut from the bladder after the second year of use and annually after year two. The test strips are sent to the manufacturer where they are tested for integrity. Reports are returned to operators for inspection purposes. Wet date and fuel type should be recorded once the bladder is installed.

c. Operators shall provide provisions for fuel inventory reconciliation at timed intervals.

d. Operators should keep the surface of the tank clean, removing any sand or dirt that has fallen on it.

e. Operators should clean out dirt or sand and make sure the vent is working properly.

f. Operators should ensure that secondary containment berms are drained of water. This can be accomplished by an oil/water separator.

7. Other

a. A spill prevention plan should be developed for each site in accordance with local regulations.

b. A spill kit should be provided at site.

c. Fire suppression equipment should be provided at site.

d. No smoking signs should be provided at site.

e. Secondary containment should be placed around all fuel transfer areas and equipment.

f. The site must be clearly marked and access restricted to trained personnel.

g. Addition requirements should be reviewed with local regulation and legislation and must be adhered to.

8. Websites

www.sei-ind.com

9. Comments

Please forward comments to:

Paul Reichard
Div Manager
SEI Industries Ltd
Tel: (604) 946-3131
Email: paul@sei-ind.com