Flexible Tanks for Liquid Bulk
Annex 2
Specific risks

Use of an unsuitable container

Due to the general risk in relation to the structural limits of the container, only containers that are structurally undamaged and heavy-duty should be used for flexitank transports. A common restriction is to limit the use of containers to a maximum age of five years. This restriction does however not take into account the use of containers beyond their permitted loads, e.g. containers often being intentionally overloaded and damaged by the use of flexible poly-material bladders. In addition, the age of a container does not allow any definitive conclusions to be drawn about its condition. A container with a valid CSC plate or with participation in the ACEP programme is generally suitable for the transport of liquid bulk cargo.

In addition to any structural damage or structural weakening of the container, repair points with sharp-edged areas and other sharp-edged objects inside the container or on the floor also often cause leakage:

Photo 5

Photo 6

Photo 5 shows a large repair area of the container at the bottom right. Photo 6 shows this repaired area from the inside with corresponding damage to the film of a flexible tank bladder.


Photo 7


Photo 8

Photo 7 shows the rough and abrasive repair weld seam on the container sheet, and photo 8 shows the resulting damage to the film, which led to the total loss of the cargo. Flexible tanks used in dynamic transport processes must be protected from such mechanical damage.

When using flexible tanks, the container becomes an integral part of the packaging which puts particularly high requirements on its surface preparation and general condition, as the direct interaction of flexitank and container creates a transportable unit.


Photo 9


Photo 10

Photos 9 and 10 respectively show nail and screw remnants that were found in the floor of the container. They led to the perforation of the film and thus to the leakage of the tank.


Photo 11


Photo 12

The fitness or suitability test of the containers before stuffing is of paramount importance and determines the success or failure of the transport. A clear pre-selection should already be made when ordering the container at the terminal. Furthermore, a detailed inspection of the container must always be performed and documented prior to loading.

Various installation mistakes

Flexible tanks are offered by a large number of manufacturers. Accordingly, the products differ from each other, detailing their specific requirements for installation in the container such as:

- correct positioning of the flexitank in the container
- correct positioning, securing and fitting of the bulkhead in the door area
- correct positioning and securing of the outlet valve
- suitable lining of the container side walls
- padding of the lashing eyes in the container

Tank specific installation instructions are issued by the manufacturers and must be followed. Personnel urgently need product-specific training to eliminate the multitude of possible sources of error during installation. Even minor deviations from the manufacturer's installation instructions pose risks.

Flexible tanks with heating capability are used for cargoes that are liquid and pumpable when warm; when cooled, they become solid and must be reheated for unloading. Unlike tank containers, consistent temperatures cannot be maintained during the voyage.

Heating coils, similar to underfloor heating, are laid underneath the flexitank, which are pressurised with hot water or steam at destination to return the product to a liquid state.

Photo 13

Photo 14

Photo 15

The photos show damage resulting from incorrect use of the installed flexitank heating system. The above irregularities led to localised melting of the flexitank material and resulted in leakage.

In light of this risk, it is very important to be aware of the following aspects before initiating the heating process:

- permissible heating medium: hot water or steam
- permissible heating temperature in view of the heating system
- permissible maximum temperature in view of the flexitank properties

The product properties of the flexitank must be compatible with the selected heating system.

Material and production errors

The manufacturers of flexible tanks publish requirements in their technical data sheets that are not always adhered to. These include, among others:

- wall thickness,
- material strength,
- material elongation.

In addition, there are quality fluctuations in the area of the seams and the films which may cause leaks (holes in the films or insufficiently welded seams).

Manufacturers of flexible tanks follow different approaches. The flexitanks are produced in single or multi-layered ways. In a multi-layer design, individual layers can perform different tasks, whereas in a single-layer design, one film must perform all tasks. A single-layer tank must naturally be made of stronger film than multi-layer tanks. With multi-layer tanks, which consist of three to four layers plus a poly fabric cover, there is a risk of clogging in the valve area. The film can move in front of the outlet valve or be sucked in by the liquid flow, resulting in product loss and additional expenses.

Further sources of error can be found in the integration of the inlet and outlet valves and any pressure relief valves that may be present, and in the valves themselves. Faults in

these areas lead to leaks. The containers are called drippers or leakers and are removed from the normal logistical process in the seaports and placed on so-called drip trays to absorb leaking liquids and prevent contamination. The product has to be cross-pumped, and cleaning and other respective costs are incurred.

Photo 16

Photo 17

The above photos show a failure of the flexitank material in seam areas in conjunction with normal transport strains which was due to an inadequate quality of the flexitank.

In view of potential qualitative limitations, only flexitanks from certified manufacturers should be used who subject their flexitanks or the poly base material to regular tests to ensure material quality and compliance with the promised product parameters.

Extraordinary transport strains / handling damage

Containers stuffed with flexible tanks have no higher risk of being damaged in transport, handling or storage processes than other containers. The consequences for the cargo, however, are fundamentally different. If the container is damaged due to handling errors, there is usually a risk of total loss of the cargo with considerable cleaning expenses for the vessel and/or superstructure.

Photo 18

Photo 19

Photo 20

Photo 21

Over or underfilling

Filling the flexitank beyond the manufacturer's specifications may lead to a failure of the flexitank material or the seams in connection with transport, handling and storage strains. Underfilling the flexitank according to the manufacturer's specifications can lead to swell movements of the liquid inside the flexitank which may also cause overstressing of the flexitank material.

Manufacturers often state tolerances of +/- 5% of the flexitank volume as the permissible limit. It is recommended that the manufacturer’s recommendations are strictly adhered to keep swell movements to a minimum. For products which are prone to oxidizing, care must be taken to ensure that ambient air is prevented from entering or kept to a minimum or loading is to be carried out in a nitrogen atmosphere.

Risks resulting from the goods being transported

Prior to loading a flexible tank, it must be ensured that the tank material (poly film) does not react with the product and that no mutual interference or contamination can occur. If flexible tanks are to be stuffed with substances that have a higher temperature than the environment, it must be checked whether the poly film of the tank is suitable for these temperatures. If the film melts, there is a risk of total loss of the cargo. The same applies to flexible tanks that are to be heated by hot water or steam.

Fruit juices and fruit juice concentrates can start a process of alcoholic fermentation if they are not preserved properly, and a considerable amount of CO_2 is produced in the process; wine can also ferment again, depending on the stage of development, which also results in the formation of CO_2. If the flexible tank does not have a pressure relief valve, the CO_2 formation can cause the tank poly-material bladder to burst. The following pictures show the deformations that a simple alcoholic fermentation and resulting CO_2 may cause:

Photo 22

Photo 23

Photo 22 shows a container that has been deformed in all directions as a result of secondary fermentation. Photo 23 shows the still intact flexitank in highly inflated condition as a result of CO_2 production during transport.

Photo 24

Photo 25

Photo 24 also shows a container that was deformed in all directions as a result of secondary fermentation. Photo 25 shows the burst flexitank and resulting leakage.