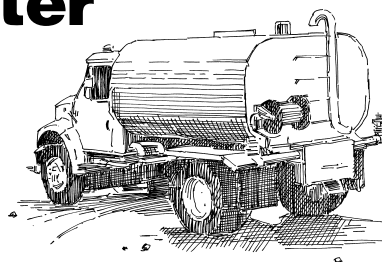


Cleaning and disinfecting water storage tanks and tankers



World Health Organization



Introduction

It is often necessary to quickly provide a basic water supply during and shortly after an emergency. This may be because the normal supply has been damaged or destroyed, or because people collect in a place where no water supply exists (a new refugee camp, for example).

Often the quickest way of providing a water supply is to transport water in tankers from a nearby source and store the water in tanks and reservoirs. However it is rare for water tankers and reservoirs to be readily available in such situations. The most common solution is to hire vehicles and tanks that have been used for other purposes but they must be cleaned and disinfected before they can be used.

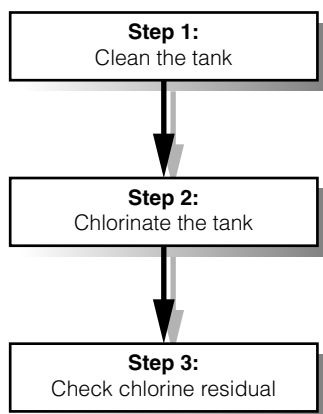


Figure 1. Steps for cleaning and disinfecting a water tanker

Steps of rehabilitation

Figure 1 outlines a three step approach to cleaning and disinfecting water tanks and tankers. It is an emergency response to disinfect polluted or disused tankers so they can store and transport water of satisfactory quality.

Large quantities of clean water will be required to clean and treat storage tanks and tankers before they can be used to store water.

Step 1: Cleaning the tank

The tank must be cleaned to ensure that water stored in the tank does not become contaminated by dirt or traces of the substance the tank previously held. This can be achieved by following the three steps below:

1. **Drain/empty the tank.** Open the outlet valve/tap and drain out any remaining liquid. Collect the liquids so that they can be safely disposed of. Most tankers have their outlet valve at the back, so park it on a slope so that all the liquids can be discharged (Figure 2).

Permanent storage tanks are usually fitted with a washout valve that draws water from the base. Use this for emptying rather than the normal outlet valve. The process of emptying the remaining liquids from portable tanks will depend on the shape and design of the tank. Some can be tipped on their side and others dismantled.

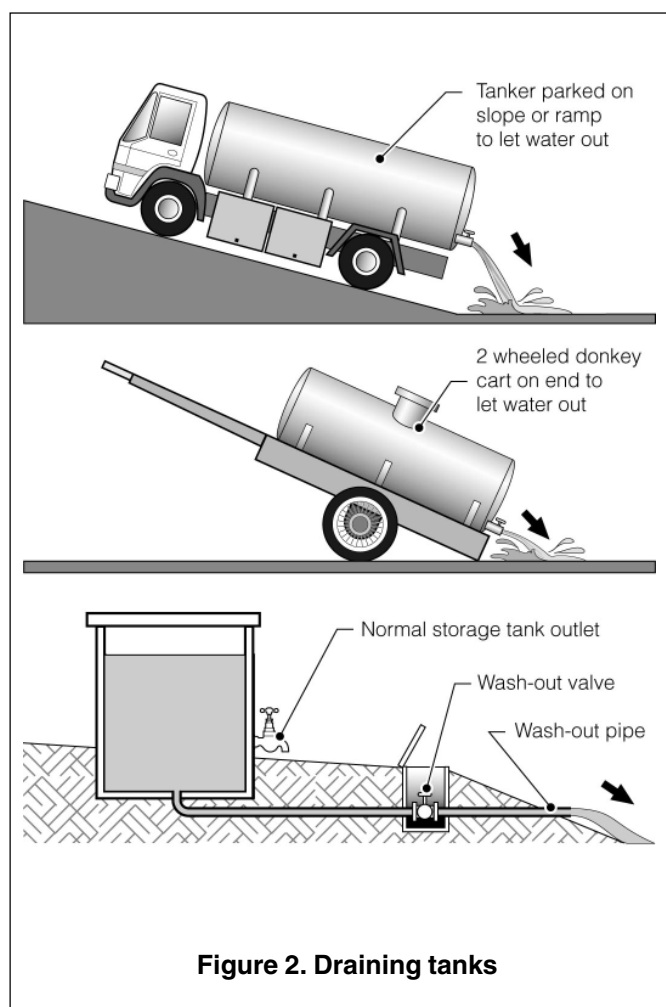
2. **Clean/scrub all internal surfaces.** Use a mixture of detergent and water (household laundry soap powder will do) to clean all internal surfaces of the tank. This can be done with a stiff brush or a high pressure jet. If the tank has contained volatile substances such as oil or organic liquids such as milk, try not to enter the tank as the gases given off by the liquids could be dangerous. (See page 4 for health and safety advice.) Attaching the brush to a long pole may make it possible to clean the tank without entering it. Take special care to clean corners and joints so that no small amounts of the original liquid remain. Even minute amounts of some liquids can give the water a bad taste and people will refuse to drink it.

Leave the outlet valve open whilst cleaning and collect the waste liquid for safe disposal.

Water storage tanks and tankers

3. **Wash all internal surfaces** to remove all traces of detergent. This is most easily done with a high pressure hose pipe or water jet but if they are not available the tank can be filled with water and left to stand for a few hours. Drain all the water from the tank and collect for safe disposal as before. Continue flushing the tank until there are no longer traces of detergent in the water.

Tank cleaning should be done in an open area away from houses to avoid possible health problems.



Step 2: Disinfecting the tank

- To effectively disinfect the tank, fill it with clean water up to $\frac{1}{4}$ level only. It is important to not fill the tank too much as this will reduce the concentration of the chlorine solution and limit the effectiveness of cleaning. To estimate $\frac{1}{4}$ of the tank, use a stick with graded markers to indicate the water level. The markers should be marked on to the stick at 10cm intervals beginning at 0cm at the base of the tank and then upwards to 10, 20cm etc (Figure 4).



Cleaning the inside of the tank with a broom

- Prepare a concentrated chlorine solution to disinfect the tank. The best source of chlorine to use is High Test Hypochlorite (HTH) granules or powder as this normally contains 50 to 70% chlorine. Box 1 outline methods for calculating the appropriate chlorine dose to disinfect a tank using HTH granules.
- Pour the solution slowly into the tank, mixing as you pour and then fill the tank up to full capacity with clean water.
- Let the chlorine stand in the tank for 24 hours to ensure that the tank is fully disinfected. If the tank has a cover (which is recommended) it should be closed.
- If the tank is required for use urgently double the quantity of chlorine added to the tank. This will reduce the standing time from 24 to 8 hours.
- Completely empty the tank and carefully dispose of the disinfecting water as it will contain a high concentration of chlorine.
- Remember to also clean and disinfect any pipes or hoses connected to the tank. Use the same procedure as described above.

Water storage tanks and tankers

Box 1. Chlorine disinfection of a tank

- Calculate the total volume of the tank.
- Fill a 20 litre bucket with clean water.
- Add 50g of HTH to the water and stir until dissolved.
- Add 10 litres (half a bucket) of the chlorine solution to the water in the tank for every cubic meter (m³) of tank volume.
- Remember 1m³ = 1000lt

Example

The tank on a water truck needs to be disinfected. The tank is 4 meters long 1.8m wide and 1.4m high (the tank is oval shaped).

The total volume of the tank is:

$$\left[\frac{(1.4 + 1.8)}{2} \right]^2 \times \frac{\pi}{4} \times 4.0 = 8.04 \text{ m}^3$$

Therefore add slightly more than four, 20 litre buckets of chlorine solution as you fill the tank with clean water.

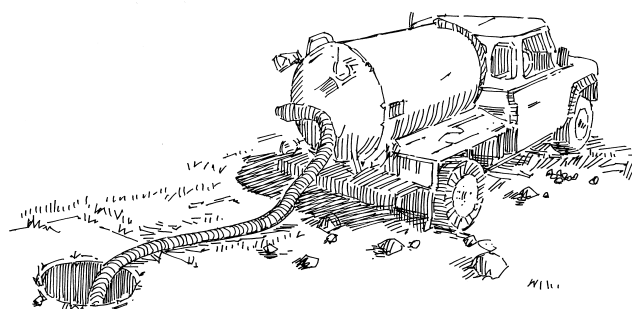
Disposal of waste liquids

Care must be taken when disposing of liquids from containers. Sudden discharge of water will cause localised erosion or flooding. Make sure the water is channelled into a natural water course such as a river, gully or lake.

If the tanker has been used for carrying other liquids, special arrangements must be made to prevent environmental pollution.

One disposal option is to collect the waste liquid in a temporary pond and then mix the liquid with sand. The mix can then be transported to a suitable site (such as a land fill site) for disposal.

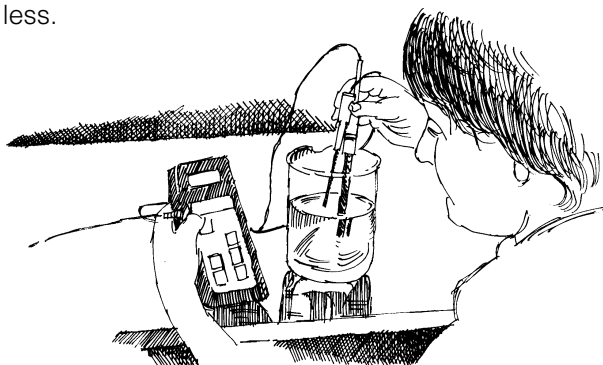
If there are large quantities of waste liquid, absorbing them into sand is not possible. In that case a vacuum tanker (such as one used for emptying septic tanks) will be needed to remove the liquid for safe disposal.



A vacuum tanker

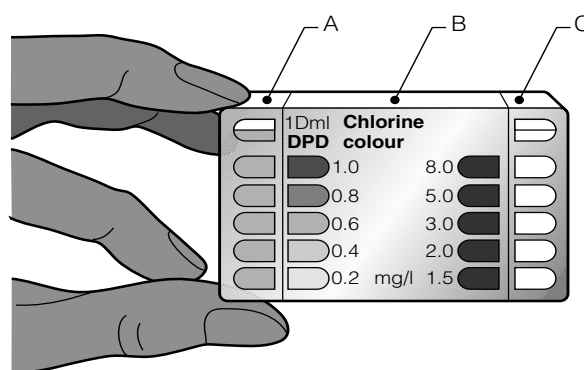
Stage 3: Chlorine testing

- Refill the tank with clean water and allow to stand for 30 minutes. Test the residual chlorine left in the tank using a comparator.
- If the residual chlorine concentration is 0.5mg/l or less the tank is safe to use for water storage. If the concentration is greater than 0.5mg/l, empty the tank again and refill with clean water. Re-test to check that the chlorine concentration is 0.5mg/l or less.



Hand-held comparator

The level of residual chlorine in mg of chlorine per litre of water (mg/l) is determined by dissolving a chlorine testing tablet in the water supply under test, in chamber (A). Compare the colour produced with the standard colours on the wall of chamber (B).



Note: A third chamber (C) would be used if a higher chlorine residual is to be measured.

A separate fact sheet is available on chlorine testing.

Figure 3. A chlorine comparator

Water storage tanks and tankers

Health and safety issues

Gaining access and working inside a water tanker can be difficult and dangerous. Frequently there is only a small access hatch on the top of the tanker through which to get in and out. Cleaners should be aware that some liquid carried in tankers can give off dangerous gases which may remain even when the liquid has been removed. The liquids may also cause physical dangers such as falling on slippery surfaces or burning from corrosive liquids.

Always blow fresh air into the tank for a period before allowing a person to enter the tanker. The cleaner should wear protective clothing, including gloves, boots, a hat and glasses.

Make sure someone remains outside, next to the access hatch all the time someone is working inside in case there is an accident. The availability of gas masks and portable ventilators would be an advantage.

Further information

Davis, J. and Lambert, R. (2002) *Engineering and Emergencies – A practical guide to fieldworkers*, 2nd Edition, ITDG Publishing, UK.

World Health Organization

WHO Headquarters
Avenue Appia 20
1211 Geneva 27
Switzerland

Telephone: (+ 41 22) 791 21 11
Facsimile: (+ 41 22) 791 3111
Telex: 415 416
Telegraph: UNISANTE GENEVA



This information has been prepared by WEDC

Author: Sam Godfrey **Series Editor:** Bob Reed **Design:** Glenda McMahon **Illustrations:** Rod Shaw **Graphics:** Ken Chatterton
Water, Engineering and Development Centre, Loughborough University, Leicestershire, UK.
Phone: +44 1509 222885 Fax: +44 1509 211079 E-mail: WEDC@lboro.ac.uk Website: www.lboro.ac.uk/wedc