

Steaming and Unloading Procedure for High Freeze Point Alkylphenols in Tankwagons

The following is a suggested steaming and unloading procedure for high freeze point alkylphenols transported in a tankwagon. The intent of this steaming and unloading procedure is to give experienced material handlers, who are knowledgeable with their equipment, a general outline. The procedure should be modified to accommodate each plant's unique unloading system.

All personnel who work with high freeze point alkylphenols should read all of the information provided in the Material Safety Data Sheet (MSDS). The proper Personal Protective Equipment (PPE) for unloading these materials includes, but is not limited to:

- Rubber gloves
- Hard hat
- Respirator
- Slicker suit
- Full face shield
- Safety glasses with side shields

Container Acceptance

When the tankwagon is received:

1. Check the shipping papers (product name, quantity, container number, certificate of analysis).
2. The tankwagon should be spotted at the assigned unloading area or spot and the wheels should be chocked.

Preparing the Tankwagon for Steaming

1. Hook up steam to the steam station and blow steam through the hose to insure that the steam hose is clear of any debris or product.
2. Locate the steam inlet valve. (The steam inlet is generally located in the front of the tankwagon above the right or left fender or at the rear or center of the tankwagon.)
3. Hook the steam hose to the steam inlet valve of the tankwagon.
(NOTE: Check if there is a steam pressure relief valve on the tankwagon steam inlet valve. If not, then install one or find a fitting that will enable you to depressurize the tankwagon steam coils if necessary).

Steaming the Tankwagon

1. Wearing full PPE, with a brass hammer lightly tap the outside of the dome lid to remove frozen product around the inside of the dome lid. Loosen the manway bolts and open up the dome lid of tankwagon. Leave the dome lid slightly open to ensure proper venting during the steaming process.
2. If the tankwagon is under pressure, offload it with nitrogen. Remove the nitrogen fitting on the dome lid, rod out the opening and steam clean the nitrogen fitting.
3. At the rear of the tankwagon (generally near the rear bumper or near the center of the tankwagon) locate the steam trap.
4. Check to ensure there is a ball valve located above the steam trap, if so then make sure it is open.

5. When steps 1 – 4 have been completed, open the steam supply and let the steam circulate thru the tankwagon steam trap. You will notice some water coming out thru the steam trap, followed by wet steam. Normally it takes less than five minutes before you notice the water coming thru the steam trap.
6. If in five minutes, there is no steam condensation flow, check the following:
 - Is the steam trap operational?
 - Is the steam coil line plugged?
7. If one of these problems is evident follow these instructions:
 - Shut off the steam supply.
 - Depressurize the steam coils on the tankwagon using the pressure relief valve.
 - After depressurizing, close the ball valve above the steam trap and remove the steam trap.
 - Carefully open the ball valve as there may be hot condensate water trapped in the coils.
8. Once again open the steam supply. Steam should discharge from the steam outlet valve within seconds, if so replace the steam trap or use the ball valve to regulate the steam pressure (close the ball valve part of the way). This will ensure against purchasing or installing a new steam trap.
9. If you achieve good steam flow through the tankwagon steam coils, monitor the steaming closely.
NOTE: with a 70psi of steam pressure it generally will take 12 – 18 hours for the product to melt.
10. Continue to monitor the tankwagon, paying close attention to the temperature gauge.
11. After eight hours, wearing PPE, open the dome lid and check the product to ensure melting of the product is progressing.
12. Discontinue the steaming process when the temperature reaches the desired value, listed below:

Product	Unloading temperature	
	°C	°F
Para-tert-butylphenol (PTBP)	110°	230°
Para-tert-amylphenol (PTAP)	110°	230°
Para-tert-octylphenol (PTOP)	105°	220°*
Para-cumylphenol (PCP)	95°	205°*
2,4-Di-cumylphenol (2,4-DCP)	85°	185°
2,4-Di-tert-butylphenol (2,4-DTBP)	80°	175°*
2,6-Di-tert-butylphenol (2,6-DTBP)	55°	130°*
2,4-Di-tert-amylphenol (2,4-DTAP)	45°	115°*

*Suggested temperature for unloading

Distances from shipping container to storage tank vary. For longer distances we suggest heating the container 5° – 8°C/10° – 15°F hotter. The dissolution time varies according to the container size, and seasonal conditions.

13. After the product is completely melted, hook up a second steam hose to the outlet valve steam jacket and steam for another two hours before attempting to unload the product.
14. After completing all of the above steps, close and secure the dome lid, check the nitrogen intake and install the clean nitrogen fitting back on the dome lid.
15. Hook up the unloading hoses. You should be able to blow nitrogen back to the tankwagon thru the unloading hoses. If this is successful, you may begin to unload the product. If not, repeat from Step 1 of Steaming the Tankwagon.
16. NOTE: If unloading or delivery of the tankwagon is delayed, and the product is molten, leave an appropriate level of steam on the tankwagon to maintain the unloading temperature ($\pm 5^{\circ}\text{C}/\pm 9^{\circ}\text{F}$). The product quality (i.e., color) may be compromised if it cools and requires substantial re-steaming.