May 2005 Safety Meeting

Maximum Filling Densities of Propane Containers

Meeting Purpose

Filling propane tanks and cylinders is about as routine as it gets in the propane business. Thousands of these containers are filled each day without incident. However, mistakes have been made in the past causing containers to be overfilled. Overfilled containers pose an imminent threat to the entire propane industry and customers alike. The purpose of this safety meeting is to review the precautions against overfilling tanks or cylinders and a review of the hazards when overfilling occurs.

Reasons for Not Overfilling

Propane containers are designed to hold a finite amount of product depending on their size and application. In most cases, the maximum fill percentage is 80% of the container's liquid volume. However, many cargo tanks, large ASME storage tanks and underground tanks can be safely filled above 80%. Always refer to the container's data plate to determine the maximum fill level. Because propane liquid will expand quite dramatically when heated, it is necessary to provide adequate space for expansion of the liquid when it heats. Overfilled containers are extremely dangerous as they could become liquid-full, causing the safety relief valve to open, allowing an uncontrolled release of product to the atmosphere. In some instances, safety relief valves might not open when needed causing the container to fail, allowing a massive, uncontrolled release of propane creating a fire and explosion hazard. Additionally, overfilled containers could "push" liquid propane into the appliance system causing fire, explosion and operational hazards.

Steps to Ensure Tanks or Cylinders are Never Overfilled

Listed below are various steps to ensure containers are never overfilled:

1. Check to ensure you know what the container's maximum filling density is before starting the fill operation. Refer to the data plate or cylinder stampings.
2. Ensure the container has an operable liquid level gauging device. Note: some older 100 lb exchange cylinders do not have a liquid level gauging device. As long as you fill them by weight, such a device is not required.
3. Remember, cylinders with overfill prevention devices (OPDs) must never be filled solely based on the operation of the OPD. OPDs are **not** the primary means to determine the maximum fill level of a cylinder. The maximum fill level of cylinders should be determined by weight or by the fixed liquid level gauge.
4. Remember, the maximum propane in pounds a cylinder can safely hold is 42% of the cylinder's water capacity. Example: a cylinder that has a water capacity (WC) of 47.7 pounds can safely hold 20 pounds of propane (47.7 lbs of water times .42 = 20.03 pounds.)
5. Remain in attendance during filling so you can stop the propane supply when the container is filled to its maximum liquid capacity.
6. If you are filling cylinders by weight, periodically check the accuracy of the scales to ensure they are accurate.
7. Ensure that if you are filling a cargo tank on a truck that the tank is level. Tanks that are not level can give false readings.
8. Never fill a container by its magnetic liquid level gauge, use its fixed liquid level gauging device.
9. Immediately stop the fill operation when the maximum fill level is achieved.
10. On production filling of cylinders by weight, never make the assumption that all cylinders have the same tare (empty weight of cylinder) weight. They don't.

11. On cargo tanks equipped with Rotogauges and similarly-designed variable liquid gauging devices, take a reading both on the left and right side of the gauge and average the two readings to arrive at the fill level. This procedure will help ensure the most accurate reading.
12. Never depend on your bobtail's liquid meter to determine the maximum liquid level of a customer's tank or cylinder. Your customer's variable gauging device might not be accurate, making the use of the liquid meter inaccurate.

Actions to Take if You Overfill a Container

If you accidentally overfill a container it is important that you take appropriate actions to ensure it is not released to a customer in an overfilled condition. If your company has a specific set of procedures for this situation you should consult those procedures at this time. Listed below are some procedures that might help you deal with an overfilled container.

Cylinders

- Depending on the equipment at your location, pump out, evacuate or flare the contents of the cylinder to a safe liquid level. If a flare stack is used, make sure its flame is a safe distance from propane operations. Never vent the contents to the outside atmosphere, as this procedure creates an extreme fire and explosion hazard. Some operations use a compressor or vacuum pump to remove contents from a cylinder.

Cargo Tanks

- Transfer the excess product back into the bulk storage tanks immediately. Consult your manager or operations support staff personnel for specific instructions on how to transfer product back to the bulk storage tanks. Do not operate the truck on-highway with an overfilled cargo tank.

Customer Tank

- Make immediate arrangements to pump out the overfilled tank using a liquid withdrawal connection and associated equipment. Or in some cases, it might be appropriate to vent the excess product through a flare stack if all necessary safety precautions are taken. Consult your manager or operations support staff personnel for specific instructions on how to transfer product out of the customer tank. Some operations use a compressor or vacuum pump to remove contents from a tank.

As you can see, it's much easier to prevent a tank or cylinder from being overfilled than to try to deal with one that is. Know the size and capacity of the containers you are filling and be in attendance during all filling activities. Pay close attention at all times during the transfer operation and stop the filling immediately when the maximum liquid level is achieved.

Instructor Notes

At this time, the trainer should review with each attendee your company's policies and procedures relative to overfilling propane containers, if one exists. Ask your employees about specific times when containers were overfilled and what was done about them in the past? Ask employees what procedures they enlist to ensure the containers they are filling are not overfilled? Discuss specific company procedures on how to remove excess propane liquid from various containers. Demonstrate this activity to them as a group out in the yard or on a truck as appropriate.

May 2005 Test

Maximum Filling Densities of Propane Containers

Name: _____ Date: _____

Instructions: Read and answer each of the following questions. When complete, grade the test and review incorrect answers so each employee is "armed" with the correct answers before they leave the training.

1. Overfilled containers exhibit the following hazards
   a. Possible uncontrolled release of product
   b. "Push" liquid propane into an appliance system
   c. Container could fail, releasing all its propane contents
   d. All of the above

2. Cylinders can be filled by only using the OPD to determine the proper fill level.
   a. True
   b. False

3. The maximum propane capacity a cylinder can safely hold is _____ percent of the cylinder's water capacity.
   a. 11
   b. 20
   c. 42
   d. 80

4. Because of propane's vapor pressure, it doesn't matter if a cargo tank is level when filling it to its safe maximum liquid capacity.
   a. True
   b. False

5. It is preferable to not overfill a container, as opposed to dealing with a container that has been overfilled.
   a. True
   b. False

6. Typically, the contents of an overfilled container should not be vented directly to the atmosphere.
   a. True
   b. False

7. You should never depend on the reading of a liquid meter to determine the maximum liquid level of a propane container.
   a. True
   b. False

8. If you are filling cylinders by weight, it's a good practice to periodically check the accuracy of the scales by using a test weight.
   a. True
   b. False

9. On most propane containers, the maximum filling density is _____ %.
   a. 20
   b. 40
   c. 60
   d. 80

10. Always refer to the container's filler valve to determine the maximum filling density.
    a. True
    b. False

May 2005 Test

Answer Sheet

1. d.
2. b.
3. c.
4. b.
5. a.
6. a.
7. a.
8. a.
9. d.
10. b.