Safety Meetings are important!
They: get your employees actively involved
encourage safety awareness
help identify problems before they become accidents
motivate employees to follow proper safety procedures
We are happy to provide you with a monthly topic for your agenda.

ROUTE TO:
- ☐ General Manager
- ☐ Safety Coordinator
- ☐ Supervisor Dept. _____
- ☐ Other _____
- ☐ Date of Meeting _____

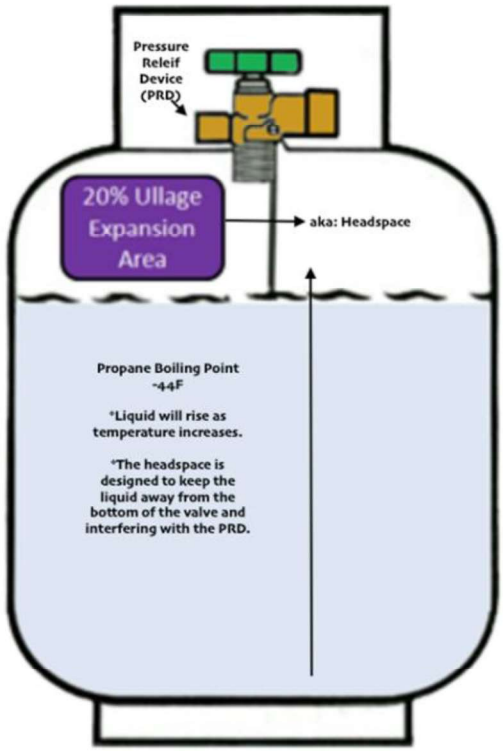
April 2024

LPG Filling, Transportation and Storage Safety
Lessons Learned: Dust Collection

LPG Filling, Transportation and Storage Safety

This month is a good time to review Propane safety, before the warm weather sets in and the demand for small propane cylinders increases. There are five safety issues with propane that I'd like to remind you of this month.

1. Cylinder Overfilling - Propane liquid If cylinders are overfilled the liquid will expand into the headspace and potentially into the PRD. The issue is that the liquid itself expands when heated and then you get hydraulic pressure and it can expand so much that the tank is completely full. This will then cause a release of liquid that immediately turns into gas (270x volume) as it leaks out into the atmosphere. Propane should be filled by weight not volume since volume changes with temperature.



2. Cylinder Overfilling and Spit Filling - Propane gas is colorless, heavier than air and will pool in low places; if a source of ignition comes into contact with the propane gas (e.g. spark, cigarette butt, static electricity) it could ignite.

3. Cylinders Storage - Propane cylinders should Never be stored upside down.

   The regulations state the safety relief valve (PRD) must be in contact with the gas vapor NOT the liquid. Placing propane cylinders upside down to designate them as "empty" is a violation of the regulations and if the cylinder were to vent, it would release liquid. The liquid would then expand 270x into a gas phase, this would occupy a much greater area thus expanding fire hazard much further.

   If the PRD was unable to release the liquid, then the pressure would continue to increase until the welded seams (or any weakened area on the cylinder) would catastrophically rupture.

   Cylinders, empty or full, at your facility or at a customer site, must be stored in an upright position - UNLESS the cylinders are stored in racks with employees trained to place the cylinders into the racks with the PRD pointed up.

Cylinder on the left = PRD in liquid phase space.
Cylinder on right= PRD in vapor phase space.

4. Cylinder Storage - Consider storing propane in small separated groups; because in the event of a fire emergency, smaller groups of cylinders would be easier to handle than large groups/ or groups that are not separated.

Cylinders should be stored in dry areas, away from sources of ignition/heat and combustibles.
Not as in this picture.

5. Cylinder Transportation by Customers - Propane cylinders should be transported secured, in open vehicles, NEVER in automobile trunks. GAWDA has safety posters about consumer transporting compressed cylinders available on their website.

Training

OSHA requires employees to be trained for the jobs they perform. This is a good time to review your operating procedures (SOP) with your fillers to see if the procedures should be updated or if the filler needs refresher training. If your company does not have pre-fill, fill and storage procedures, this is a good time to create them.

DOT requires employees filling cylinders to be trained, tested and certified every 3 years. This falls under the "Function Specific" training requirements in 172.704.

Training may be found:

- Propane and Education Research Council
- Propane training services, inc.
- CETP
- Your bulk propane supplier

Other resources noted:

GAWDA members only documents
CGA S-8 "Guideline for the Safe Handling of Liquefied Petroleum Gas Cylinders"
NFPA 58 "Liquefied Petroleum Gas Code." 2020 edition.
Quora.com, Hahn, Eric, elgas.com.au/blog. Nov 21, 2015

Lessons Learned: *GAWDA members share their experiences in their own words*

Combustible Dust

Did you know that the dust from mechanical processes are combustible and can pose a severe hazard to your employees, facilities, and operations if not properly controlled? The incident below describes such an event.

One mild day in April an independent distributor found this lesson out the hard way. The day started out like any other with employees working in the cylinder refurbishing area, completing shot blasting, and repairing cylinders. The shot blaster chipped off metal and paint chips which were deposited into a dust collector located inside the same area the employees work in. The dust collector had been leaking dust and not operating with sufficient suction for a while and there was dust that had accumulated around surfaces in the room.

Midafternoon the weather was so nice the employees cracked a door to the outside to let in a breeze. This breeze combined with the dust from the surrounding area that had not been collected by the dust collector began to swirl to what one employee described as almost a “mist” like quality. Shortly after that employee left the building there was a large explosion and subsequent fire. The force of the explosion was so strong it blew the overhead door off of the building 15 feet away which luckily allowed the employees to be able to escape but severely injured.

The 5 employees at the scene were taken to the hospital and for some employees the recovery process is still ongoing. The building was a complete loss. According to news reports there were streams of fire 100 ft in the air and there were second and tertiary explosions from the dust being recirculated and re-ignited from the prior blasts. No direct sources of ignition from hot work or heating appliances were in the area. This led fire investigators to determine that the lack of dust tight electrical connections or even static spark could have been the initial ignition source. Flammable gasses were not involved in the explosion.

Does your company do cylinder refurbishing and could this happen to you?

Theses are some of the lessons learned from this tragic accident:

- The metal dust from shot blasting should have been properly evaluated
  - Most solids can become combustible when ground fine enough
  - It is a best practice to have the dust tested to determine if it's combustible or if it isn't tested you can make the assumption and treat it as a combustible.
- The dust collector should have been outside the building.
- Dust accumulation should have been cleaned regularly.
  - If a cloud can be observed by shining a light through it, there is the right dust distribution for an explosion.
- Operation of shot blasting should have stopped and service of the dust collector performed when dust was observed to accumulate
  - Needs adequate velocity to remove dust from the area
  - Regular maintenance should be completed
  - Re-balance every time vents or equipment are changed
  - Avoid excessive elbows and bends
  - Avoid transitions with lips and improper fittings
- Conduct ignition source evaluation (e.g. electrical, HVAC, spark producing work). No sources of ignition should be in the immediate area where dust may accumulate or be produced.
- All electrical and appliances in an area where combustible dusts are likely to be present should be Class II Div 1 dust tight fixtures and conduit.
- Other safety features that could have prevented an explosion:
  - **Explosion protection-** Examples of this are spark arrestors, backdraft vents, explosion venting, deflagration venting, flame arresting devices, inerting systems,
  - **Explosion Isolation**- Examples are chemical isolation suppression systems, Fast Acting Explosion Valve or Gate, fire suppression systems in dust work, abort gates, isolation valves and backdraft dampers.
  - **Fire protection-** Typically wet or dry sprinkler or chemical agency extinguishing systems specific to the dust and particulate in the duct. Must be calculated for the volume of dust present and the size of the system and contemplate the entire system not just a small section to be adequate. These systems should be interlocking to shut-down in the event of hazardous conditions.

If you have any questions about this article or other OSHA, EPA, DHS, please contact me.

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