

DECOMMISSIONING OF NATURAL GAS ODORIZATION EQUIPMENT

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Background

Natural gas is a colorless and odorless gas. Because of these properties of natural gas, a chemical additive is added to the natural gas to give it a detectable odor in the event of a leak. These chemical additives are commonly called odorants and are generally mercaptans or thiophane. Natural gas utilities, distribution and transmission, are adept at odorizing the natural gas they handle. Odorization is primarily done with some sort of liquid injection system or a bypass (vapor) or slip stream odorizer.

Introduction

The natural gas industry is a fast-growing segment of our energy industry and there is a need to keep operations safe and environmentally friendly. Obsolete odorization equipment needs to be removed and disposed of in an environmentally sound and odor-free manner in order to avoid business disruption or potential liquid/vapor odorant leaks from obsolete equipment. This article will go through some of the drivers for decommissioning of odorizer equipment, the process of decommissioning of odorizer equipment, health and safety concerns revolving around decommissioning of odorizer equipment and environmental hazards to be considered when decommissioning odorization equipment.

Reasons for Decommissioning

There are numerous reasons why a natural gas utility would look to replace their odorization equipment:

Modernization due to aging equipment - The odorization equipment may have exceeded its safe useful life and thus be a candidate for replacement. Corrosion due to weathering or lack of anode/cathodic protection may require odorization equipment to be replaced.

Upgrading to more reliable/precise equipment - Technology is constantly changing and pushing forward. A utility may find that the newer technology on the market may be a better fit to their odorization program. The utility may find the need to switch to “smart” equipment that can be tied to SCADA or send out alarms. Another possibility is that the utility may find that more precise equipment allows them to better control their odorant consumption and save on odorant costs.

Changing of natural gas odorization requirements (population density changes, record keeping) - The population has changed in such a manner that the existing odorization equipment is not satisfactory to meeting the odorization needs of the pipeline. It could be that people are migrating out of the area and now the equipment is over-sized. On the flipside it could be that the community has had a population boom and now the existing equipment is under-sized and cannot adequately odorize the system. Some states are pushing natural gas utilities for more record keeping and some natural gas utilities are moving away from bypass odorizers that do not record. Instead of having an odorizer that is only checked on, maybe, a monthly basis and can only show over a period of time that a certain amount of odorant was injected versus an odorizer that keeps a paper trail and can show on any given date and time the amount of odorant that was being injected.

Station abandonment - The pipeline may have been feeding 1 large industrial customer (i.e. steel mill, natural gas fired power plant etc.) and the industrial customer shuts. A natural gas utility could be getting odorized feed gas and not have a need for using their own odorization equipment and now their equipment is mothballed. Another possibility could be a new pipeline was laid and gas is now being odorized upstream and the existing downstream odorizer is now shut down.

Maintenance of odorization equipment.

Removal of underground storage tanks - A 1986 study by the U.S. EPA stated the average non-leaking lifespan of underground storage tanks is 15-17 years ⁽¹⁾. This led directly to the Superfund Amendments Reauthorization Act. Many of the underground odorant storage tank systems that are still in place were installed during the growth

decades of the 1950s and 1960s and have now reached or exceeded the end of their serviceable lives. It is for this reason many underground odorant storage tanks are being decommissioned and removed or should be decommissioned and removed.

Failure of odorization tanks or odorizer equipment - Several times each year there are reports from utilities where an odorizer has been struck by lightning and damages the equipment to the point where it must be replaced. Rarely does this happen but there have been instances of pinhole leaks on new tanks. Chemical compatibility is a major concern for these odorants especially as it relates to gasket materials and soft goods in valves. Chemical compatibility is a pretty common occurrence for failures.

Expiration of DOT tanks – DOT tanks are built to different codes which have different lengths of time between recertification (typically 8-11 years). The code that the cylinder is built to must be compared against DOT codes to determine time between recertification. For a DOT approved odorant cylinder, is it frequently more economical to decommission and remediate the DOT cylinder due to the high costs of cleaning the cylinder and going through hydrotest on the cylinder to get it recertified and back into service.

Decommissioning Process

Prior to beginning decommissioning process, the utility should look at whether or not temporary odorization is required. If this is a swap of odorizers the station may continue to flow gas and have a constant need for odorization. In the event of constant odorization, then temporary odorization should be looked at. It may be that the station can be shut in or gas re-routed during construction and temporary odorization is not

needed. If the station is abandoned then obviously temporary odorization would not be an issue. Prior to beginning decommissioning process an odorant spill plan should be in place and reviewed. Gas control may need to be notified, local emergency responders may need to be notified; this should be spelled out in the procedure. SDS sheets should be reviewed as part of the procedure.

The first step in the actual decommissioning process is to isolate the odorization system from live gas so that the system can be depressurized. The odorant tank / odorant system must be completely emptied of odorant before it can be removed. This is typically accomplished by inserting a dip tube to the very bottom of the tank. The odorant in the tank can be filtered through a 10-micron liquid particulate filter and transferred to an alternate tank at the same site or an alternate location. If the odorant is being moved to a new location an odorant transfer truck may be required for this. If the odorant cannot be reused the other option is disposal (incineration). The odorant waste is packaged into DOT approved drums and sent to mercaptan disposal facility by a hazardous waste approved transporter. Filter/transferring the odorant is traditionally more economical than disposal but if the odorant is contaminated or off-spec disposal may be the only option.

If the tank is underground the safer way to handle its decommissioning is to drain and depressurize the odorant tank prior to excavation and removal from underground.

The tank is then removed from utility site and sent to a facility that does a destruction on the tank or equipment that destroys any residual mercaptan eliminates any mercaptan odor left behind in the tank.

After the treatment process is complete the tank or odorizer equipment is destroyed and the metal is scraped and recycled.

Waste Handling

If odorant cannot or is not reused it becomes a hazardous waste and is RCRA (Resource Conservation and Recovery Act) classified and must be:

- "manifested", that is, accompanied by an EPA document that verifies proper transport and disposal
- transported only by a company in possession of an EPA identification number
- treated and disposed of only at a facility also specifically permitted for hazardous waste management.

Environmental Impact

The Resource Conservation and Recovery Act (RCRA) gives EPA the authority to control hazardous waste from the "**cradle-to-grave**." This includes the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also set forth a framework for the management of non-hazardous solid wastes ⁽²⁾. Comprehensive Emergency Response, Compensation, and Liability Act (CERCLA, or Superfund) holds:

- tank owners, as the "generators" of the waste
- tank owners are responsible for any environmental damage caused by toxic residues.

Conclusions

Government regulations on a federal and state basis are increasing on both above ground and

underground storage tanks. It has been proven that with robust policies and robust procedures, proper training and proper equipment that decommissioning of natural gas odorization stations and equipment can be performed in a safe and odor free manner that is environmentally friendly. If natural gas utilities do not have the ability to do this work in house then a commitment must be made to this or partner up with an environmental contractor that specializes in this work.

It is a good practice to budget for replacing of natural gas odorization stations. This helps to ensure that the utility does not get behind with upgrades and end up with a system of obsolete equipment that needs to be replaced all at once. Maintaining robust odorization equipment lowers the risk to the utility because aging equipment poses a risk of liquid or vapor releases and will result in leak calls which can be quite costly to remediate. Having top notch equipment alone is not enough. The utility should have a procedure in place to maintain their odorization equipment. In conjunction with maintenance regular infrastructure audits are shown to be a solid way to manage these risks.

References

1. <https://www.epa.gov/ust/learn-about-underground-storage-tanks-usts>
2. <https://www.epa.gov/laws-regulations/summary-resource-conservation-and-recovery-act>