March 2010

Tests Show How Drip Lips Can Prevent Regulator Freeze-Ups

Freezing rain and sleet have long been potential sources of trouble for a LP-gas system. If the LP-gas regulator's vent becomes plugged by ice, high pressure gas can reach the appliances, creating a definite fire hazard.

The plugged vent scenario has been related numerous times, but it's still worth repeating. Once the regulator vent opening becomes obstructed by ice, snow, insects, or whatever, the regulator is no longer capable of breathing. A regulator's diaphragm moves up and down in response to differing gas loads. As it moves, air is taken in or expelled through the vent. Air can't move in and out of the spring case with a plugged vent, and the regulator is unable to keep doing its intended job.

One of two things happens within the regulator's spring case: (1) a vacuum develops, or (2) there's a pressure build-up. In the first instance the appliance pilot lights and any burners that are on may go out because the regulator's outlet pressure drops to 0 psig (0 bar).

Stove burners don't usually have safety shut-offs, and if the vent becomes unplugged, gas will flow out of the open burner into the house. On the other hand, a pressure build-up in the spring case can allow the regulator outlet pressure to go excessively high, such as between 5 to 15 psig (0,34 to 1,03 bar). In either case an obvious safety hazard exists.

Regulating Agencies Step In

These kinds of plugged vent situations have occurred due to vent freeze-overs often enough in the past to prompt regulating agencies to write new codes covering the installation of the LP-gas regulator and the design of the vent itself.

The 1974 edition of NFPA No. 58 "All regulators for outdoor installations, except regulators used for portable industrial applications, shall be designed, installed, or protected so their operation will not be affected by the elements. This protection may be integral with the regulator." (Actually NFPA No. 58 said much the same thing way back in the 1951 edition. This sentence appears in that edition: "Regulators shall be so installed that the elements will not affect their operation.")

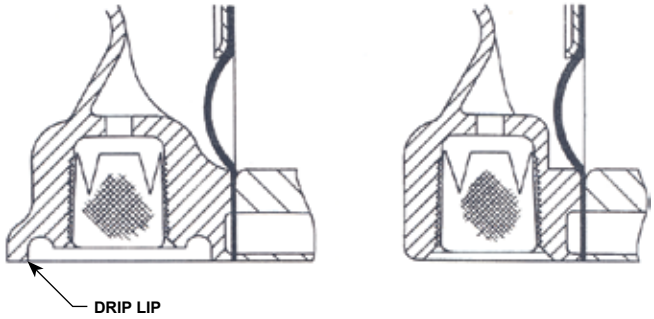

Figure 1. *Drip lip vent construction has a recessed vent opening while the non-drip lip version on the right does not.*

Further, Underwriters' Laboratories "Standard for Pressure Regulators for LP-Gas"—U.L. 144—calls for regulators that have a drip lip vent design and states, "Such regulators shall be marked to specify that if for outdoor installation, the vent opening shall be down, or the regulator shall be installed under a protective cover..." So a regulator with a drip lip vent of the minimum size specified by U.L., installed with the vent pointed down, does not need additional protection. If, however, the vent does not have the drip lip or the regulator is installed so that the vent is not pointing down, there will have to be some sort of cover to protect the vent from the elements.

Just what is a drip lip vent? Figure 1 shows a typical example along with a vent not having the drip lip construction. It can be seen that the lip acts as a shield to the recessed vent opening, thus making it much more difficult for the opening to become plugged by freezing rain. The effectiveness of the drip lip design in resisting the vent opening from being covered by ice has been proven in freeze tests performed by Fisher Controls Co. as well as U.L.

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Figure 2. *Ice completely covered the regulator Fisher Controls used in the freeze tests.*

Testing Freeze Resistance

Tests conducted at the Fisher engineering laboratory in McKinney, Texas, demonstrated that a properly designed drip lip permits icicles to form in such a way as to actually protect the vent opening from becoming blocked. As the icicles grow around the circumference of the drip lip, an ice cylinder tends to develop. This ice cylinder works to keep the vent unobstructed no matter how much ice accumulates.

Fisher selected the Type 912 regulator—the one with the smallest drip lip diameter—to subject to a simulated freezing rain in an environmental chamber. The unit was installed with the vent opening pointing down, and ice was allowed to collect on the regulator until it reached a thickness of approximately 3/4-inch (19,05 mm) (see Figure 2). Icicles grew to about 6-inch (152 mm) in length, forming a cylinder that kept the vent unplugged, as can be seen from the picture in Figure 3 looking up into the vent opening. The vent remained open until the bottom of the icicles reached a horizontal shelf or the floor of the environmental chamber.

Tests also showed that drip lip regulators installed in a horizontal position had their vents plugged by the simulated freezing rain in a matter of seconds (see Figure 4). U.L. has been and currently is conducting its own freeze test program with regard to regulator vents. The laboratories require a manufacturer to label regulators which fail to pass the U.L. vent freeze-over test with the following: **"CAUTION: For outdoor use, install under a protective cover."**

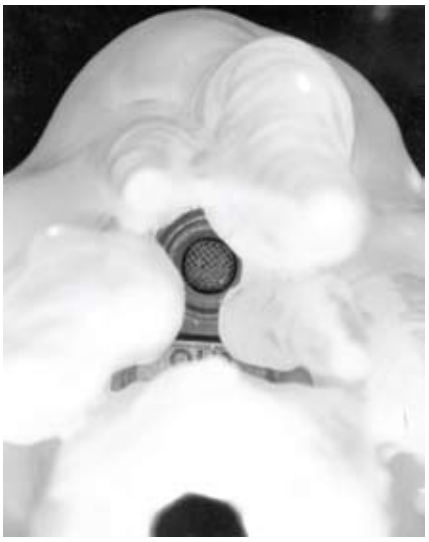

Figure 3. *Looking up into the vent of the same regulator as shown in figure 2 reveals that the opening remains unplugged.*

Figure 4. *Vents on horizontally mounted regulators became quickly plugged during Fisher's tests.*

Liability Considerations

The U.L. 144 ruling went into effect as far as regulators labeling is concerned on December 14, 1973. This requirement, along with the wording contained in NFPA No. 58, raises important questions as to an LP-gas dealer's legal liability.

Scarcely anyone in business is unaware of the tremendous increase in the number of law suits and the claims awarded by the courts to injured consumers. There has been a complete turnaround in the product

Figure 5. *An auxiliary vent assembly can be installed in threaded non-drip lip vents.*

Figure 6. *Angle style auxiliary vent assembly used on a horizontally mounted regulator.*

liability law, and it affects everyone in the distribution chain—the manufacturer, the reseller, the installer, and the gas marketer. Each can be sued (together or separately) if there is an accident with a particular piece of equipment or system. It's up to these people to be able to show that they were not at fault and that they acted in accordance with the codes and rules of the applicable governing bodies.

Here's reason enough to begin a systematic program of inspection and upgrading of all regulator installations. Being on the losing end of just one law suit could cost many times the amount of time and money expended checking out the regulator. And certainly no one wants an accident to happen in the first place, regardless of the legal consequences.

Going About Upgrading

It would seem on the surface that LP-gas dealers would have to spend a lot of money for protective hoods or new regulators with the drip lip if they want their older installations to conform to the current U.L. and NFPA requirements. Although this indeed may be the case, there are a few options open to dealers which would give compliance without being too costly. Let's go over the most common domestic hook-ups.

ASME Tanks—Nearly all domestic tanks have hoods to begin with. Make sure that the first stage or single stage regulator is completely under the hood. Another thing to watch for is to be certain the slot in the hood for the regulator outlet piping does not extend high enough to expose the vent to the elements. Slope the regulator vent downward enough to allow any condensate that might collect to drain out through the vent. Don't defeat the entire purpose of the hood by leaving it open.

Regulators at the House—Second stage regulators at the building being served should be checked to see if the unit has a drip lip and that the vent is pointing vertically down. Most non-drip lip versions have a threaded vent opening in which an auxiliary vent assembly could be installed (Figure 5) that gives all the advantages of an integral drip lip.

Twin Cylinder Hook-Ups—Many of these installations already have some kind of protective cover. On those that do not, the same auxiliary vent assembly can be used as described above if the regulator's vent is threaded. Smaller regulators most probably do not have a threaded vent, and many simply have a slotted vent opening. The decision to add a hood or install a new drip lip regulator ought to be made on the basis of the age of the old regulator. A regulator that has been in service for over ten years is a likely candidate for replacement.

Single Cylinder Installations—Here the regulator vent cannot be pointed down with conventional straight or angle POL adaptors because the regulator hits the top of the cylinder. So it would appear it makes a little difference whether the regulator has a drip lip or not because a hood is the only thing that satisfies the new rulings. There are, however, other possibilities for single cylinder hook-ups.

Regulators with threaded vents can use an angle auxiliary vent assembly like the one shown in Figure 6. Other alternatives are encasements and vent protectors (Figure 7).

Other Factors

While freezing rain or sleet are the most common causes of vent obstruction, they're not the only ones. Snow, insects, and mud can also plug the vent. It ought to be checked each time a gas delivery is made to see that it is free from any obstruction. In areas where snow can cover the entire regulator, a protective hood should be considered. Don't install a regulator directly under roof eaves, down spouts, or in other locations where there can be excessive water accumulation.

Mud and road splatter can pose special difficulties for regulators used on recreational vehicles. The 1974 edition of NFPA No. 501C (Standard for Recreational Vehicles) specifically states, "Regulators shall be installed so the regulator vent will not be affected by the elements such as by...mud or by wheel spray."

Sometimes the LP-gas container on the RV is installed in a spot where the regulator can catch the full brunt of any spray from the wheels. Conventional covers usually aren't effective against road splatter because the vent needs protection not only from the top and sides but from the bottom as well. LP-gas dealers can explain the problem to the RV owner when the container is being refilled and possibly remedy the situation.

All regulators should be inspected periodically for internal corrosion. Condensate or water can collect in the regulator's spring case, especially on horizontally mounted or insufficiently sloped units, and cause corrosion of the internal parts. If any corrosion or water marks are visible within the spring case, the regulator should be replaced. It is recommended that regulators in service over five years—or regulators moved from one location to another—be inspected for internal corrosion at regular intervals.

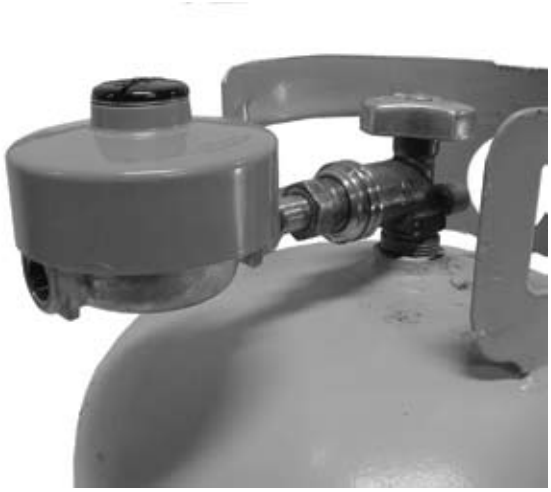

Figure 7. *Encasements or vent protectors may be able to solve the horizontal mounting problem.*

Checking and updating regulator installations is time well spent from both a liability and a customer acceptance stand-point. It's a policy that reduces the number of regulator malfunctions (and trouble calls) while at the same time helping to maintain customer satisfaction. And making sure all new regulators have the drip lip type construction will be a big aid in cutting installation costs on domestic hook-ups.

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