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PRODUCT UPDATE

LP Gas Hose/Assemblies — Permeation

Permeation of high-pressure gas (such as LP Gas/propane, anhydrous ammonia and steam) through a rubber hose is a common but often misunderstood phenomenon. During the manufacturing process, small perforations – sometimes called pinpricks – are applied to the cover of the hose. The perforations allow a path for the gas to safely permeate through the hose wall and into the atmosphere. Without this path, undesirable amounts of gas could accumulate in the hose body, blistering the cover and leading to premature hose failure.

The permeation process is invisible in most circumstances. However, when the hose is moist or sits in water, bubbles may be observed emerging from the pinprick holes in the cover. Or bubbles may be observed slowly escaping from the area where the ferrule attaches to the coupling stem. These emissions may be perceived as leakage.

The most common perceived leakage is the “normal” escape of permeating gas:

- Through the hose wall. The pinprick holes concentrate the permeation to specific areas of the cover. Due to the presence of moisture, this concentration of permeation may be observed as bubbling.
- Through the interface of the ferrule and coupling. In some instances the permeating gas may travel down the reinforcement of the hose and escape from the end of the hose encased by the coupling.

Another common perceived leakage is the escape of air from the hose reinforcement through the hose wall, most commonly noticed during the pressure testing of a hose assembly. During the manufacturing process, air may become trapped in the reinforcement of the hose. During the hose assembly testing process, the trapped air may be squeezed through the pinprick holes in the cover, or from the end of the hose encased by the coupling. In the presence of moisture, the venting air may be apparent as bubbling. The escape of trapped air through the pinprick holes and/or at the coupling should diminish over time, and should disappear after one to four hours of pressurization. Generally, air escaping from the pinprick holes will dissipate much more rapidly than air escaping at the coupling.

The question that remains: *How can one differentiate between a hose that is leaking or excessively permeating LP Gas, a hose that is appropriately permeating LP Gas, and a hose that is venting trapped air?*

When testing a new LP Gas hose assembly, only escaping air can be mistaken for leakage (because propane has not yet entered the hose). Two methods for assuring that the escaping air is not from a leak are:

- 1) Use water as the test media. A “true” leak will be a water leak and not an air leak.
- 2) Increase the test time. A test of sufficient duration will allow the escaping air to be purged. Note:
 - a. The use of a rubber cement or epoxy to seal the hose end may eliminate air escaping from the stem/ferrule lock-on area of the coupling.
 - b. The Parker 7661-LAR coupling in the 1-inch size is designed to prevent gas from escaping from the stem/ferrule lock-on area of the coupling.

When testing a hose in service, it is much more difficult to differentiate between a “true” leak and normal permeation. Generally, leaking propane will create a frosting or icing on the surface of the hose or coupling. On the other hand, permeation is generally at such a low rate that it can be detected only by the slow escape of bubbles. It is important to note that the rate of permeation is dependent on temperature. As the environmental temperature increases so does the rate at which the gas permeates through the hose. Therefore, on hot, rainy days, the likelihood of observing permeation is much higher. If the rate of escaping gas is enough to cause concern, the best way to determine whether a hose is leaking or not is to remove it from service and perform a hydrostatic pressure test.

In the transfer of LP Gas, the allowable permeation rate is controlled by the Underwriters Laboratories Standard UL 21 for LP Gas Hose. Per UL 21, the “Maximum Allowable Permeation Rate” for LP Gas hose is 171 cm³/ft/hr. Testing of standard Parker LP Gas hose has produced permeation rates which are five times better than the allowed maximum.

If there are any questions please contact Parker Customer Service toll-free at:
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