

Tech Update

Subject: LP Gas Hose/Assemblies Permeation Concerns

Date: March 30, 2004

In recent years there have been concerns about the permeation of LP Gas through LP Gas hose. While wet or sitting in water, bubbling has been observed from the pinprick holes in the cover. Others have observed gas slowly escaping from the area where the ferrule attaches to the coupling insert. Some users have wrongly assumed this to be excessive permeation or leakage.

One source of perceived leakage is the escape of air that is trapped in the reinforcement of the hose. This type of perceived leakage is most commonly noticed during the pressure testing of a hose assembly. When LP Gas hose is pressurized, air that has been trapped in the reinforcement of the hose can be squeezed out through the venting/pinprick holes in the cover, or out the cut end of the hose. In the presence of moisture, this may be apparent as bubbling at the pinprick holes in the cover or as air escaping out the area where the ferrule is attached to the insert. This escape of trapped air through the pinholes and the coupling should diminish over time and should disappear after 1-4 hours of pressurization. Generally, the air escaping from the pinprick holes will dissipate at a much more rapid rate than the air escaping at the coupling.

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 can be observed as bubbling. In some instances this permeating gas may travel down the reinforcement of the hose and escape out the end of the hose. This gas may then escape out the area where the ferrule is attached to the insert. Both of these phenomena may be wrongly assumed to be leakage of LP gas.

It is important to note that pinpricking of hoses that are exposed to high-pressure gas is a common practice (i.e., Steam, Anhydrous Ammonia, LP Gas). The purpose of the pinprick holes in the cover is to allow the normal permeation of gas to escape from the hose cover. Without the pinpricking of the cover, gas can become trapped between the reinforcement and the cover, creating blistering and premature failure.

The question that remains is how to determine whether a hose is leaking, or if the suspect leak is permeating LP gas or trapped air?

When testing a new assembly there is only the potential for escaping trapped air to be mistaken for leakage. Two methods for assuring that the escaping air is not from a leak are 1) Use water as the test media. If there is a "true" leak it will be a water leak and not an air leak, and 2) Increase the test time to a length that will allow the escaping air to be purged. Additionally, the use of a rubber cement or epoxy to seal the hose end may eliminate any escaping air from the coupling lock-on area. (Note: The LAR coupling in the 1" size is designed to prevent gas from escaping in the lock-on area)

It is much more difficult to determine if escaping gas from a hose in service is permeation or leakage. Generally, leaking propane will create a frosting or icing on the surface of the hose or coupling. Permeation is generally at such a low rate that it can only be detected by the slow escape of bubbles. It is important to note that the rate of permeation is dependent on temperature. As the temperature goes up so does the rate at which the gas permeates through the hose. Therefore, on hot, rainy, summer days, the likelihood of observing permeation is much higher. If the rate of escaping gas is high enough to cause concern, the only sure way of determining whether a hose is leaking or not is to remove it from service and perform a hydrostatic pressure test.

Permeation of high-pressure gas (such as propane) through a rubber hose is a common but often unknown phenomenon. However, in the transfer of LP Gas the allowable permeation rate is controlled by the Underwriters Laboratory Standard for LP Gas Hose (UL 21). Per UL 21, the "Maximum Allowable Permeation Rate" for LP Gas hose is 171cm³/ft/hr. Testing has shown that the standard Parker LP Gas hose has permeation rates which are 5 times better than the maximum allowable.

Parker Hannifin Corporation
Industrial Hose Division
17295 Foltz Industrial Pkwy
Strongsville, OH 44149
Telephone: (440) 268-2120
Fax: (440) 268-2230
www.parker.com/indhose