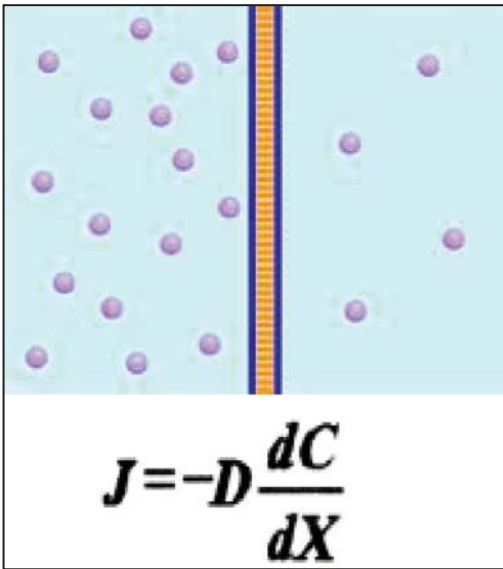


Effusion / Corrosion For PTFE Hose Assemblies

**The Information provided within this document is as outlined by the manufacturer.*

Effusion or Permeation as it is also called is the molecular migration of a vapour or gas through a membrane such as the polymeric wall of a hose. There are several factors that affect effusion. These factors include the media and the concentration, hose pressure, temperature, the hose wall (membrane) materials and some material processing characteristics such as the void content and crystallinity of the hose materials.



CAUTION Due to the wide variety of operating conditions and uses it is impossible for the manufacturer to have all of the relevant information for individual applications and installations. Therefore the system designer must consider component failures to minimize risk and develop a safe design that will not endanger persons or property. All hoses that pose a risk to health and or safety must be inspected, tested and validated prior to installation. Always route the hose to allow for proper ventilation and minimize damage.

When a hose is used to convey hazardous materials such as flammable, corrosives, toxic or materials that pose a health or other safety risk, effusion must be taken into consideration. In such application always route the hose in a well vented area. Hoses that have outer jackets or sleeves can accumulate the permeated material causing higher concentration under the jacket.

DANGER The use of chafe sleeves and abrasion jackets can lead to accelerated corrosion and higher concentrations of flammable or toxic material. Some jackets will make visual inspection of the braid difficult. These conditions can lead to unanticipated failures and high risk level.

The following lists of chemicals are just a sampling of common application media and are not intended to be an exclusive list. These materials can effuse through the PTFE (Polytetrafluoroethylene) wall under certain conditions.

The list is broken down into three categories:

1. Category A - Possible effusion without corrosion.
2. Category B - Possible effusion with corrosion and/or safety hazards.
3. Category C - Likely effusion with corrosion and/or safety hazards.

CATEGORY A

Argon	(Simple Asphyxiant)	Neon	(Simple Asphyxiant)
Carbon Dioxide	(Simple Asphyxiant, Toxic)	Nitrogen	(Simple Asphyxiant)
Freon	(Simple Asphyxiant, Toxic)	Steam	(Simple Asphyxiant)
Helium	(Simple Asphyxiant)	Xenon	(Simple Asphyxiant)
Krypton	(Simple Asphyxiant)	Oxygen	(Flammability accelerator)

Table Category A Example Materials



The primary concern with materials in Category A is that when the application is in a confined space the effused material can displace the oxygen in the air. These materials are commonly referred to as simple asphyxiants, non-toxic or very mildly toxic and (mostly) inert gas which can displace the amount of oxygen in the breathable air.

In the case of oxygen although it is not an asphyxiant, it is however a flammability accelerator. The presence of high levels of oxygen can accelerate a fire and will increase the flammability of other materials.

Hoses used in such applications where there are risks of asphyxiation should be installed in well vented areas.

CATEGORY B

The primary concern with materials in Category B is that after effusing they can corrode the stainless steel braid and/or injure those people in the area due to toxicity or flammability.

Acetaldehyde	(Flammable, Toxic)	Methyl Bromide	(Flammable, Corrosive, Toxic)
Benzene	(Flammable, Toxic)	Natural Gas	(Flammable)
Liquid Butane	(Flammable)	Methylene Chloride	(Toxic)
Carbon Disulfide	(Flammable, Toxic)	Methyl Formate	(Flammable, Toxic)
Diethyl Ether	(Flammable, Toxic)	Liquid Propane	(Flammable)
Ethyl Mercaptan	(Flammable, Toxic)	Propane Gas	(Flammable)
Lacquer Solvents	(Flammable)	Sulfur Trioxide	(Corrosive, Toxic)

Table Category B, Example Materials

It is important to note that for these chemicals, effusion is especially significant when “vapour phase” exists, i.e. when they reach their boiling point of approximately 52°C (125°F) atmospheric pressure.

It is mandatory that hoses used in these applications be installed only in well vented areas and be periodically inspected especially for corrosion.

CATEGORY C

The following are examples of materials that have the potential for effusion through the inner core as well as the danger that the effusion can cause corrosion of the stainless steel braid reinforcement. These materials are all gasses at ambient temperatures and pressures.

Acetylene	(Flammable)	Hydrogen Sulfide	(Flammable, Toxic)
Butadiene	(Flammable)	Hydro Cyanic Acid	(Flammable, Toxic)
Butane Gas	(Flammable)	Hydrogen Cyanide	(Flammable, Toxic)
Carbon Monoxide	(Toxic, Flammable)	Blast Furnace Gas	(Flammable, Toxic)
Chlorine* (Special hose)	(Toxic, Corrosive)	Coke Oven Gas	(Flammable, Toxic)
Chlorine Trifluoride	(Toxic, Corrosive)	Hydrochloric Acid	(Corrosive, Toxic)
Ethyl Chloride	(Toxic, Corrosive)	Silicon Tetrafluoride (STF)	(Corrosive, Toxic)
Hydrogen	(Flammable)	Sulfur Dioxide	(Corrosive)
Hydrogen Chloride	(Corrosive, Toxic)	Vinyl Chloride Monomer	(Toxic, Corrosive)

Table Category C Example Materials



PTFE fluoropolymer resins are essentially chemically inert. Up to the upper use temperature, only very few chemicals are known to chemically react with these polymers, i.e., molten alkali metals, turbulent liquid, or gaseous fluorine; and a few fluorochemicals, such as Chlorine Trifluoride, (ClF₃), Silicone Tetrafluoride, (SiF₄), or Oxygen Difluoride, (OF₂), which readily liberate free fluorine at elevated temperatures. Liberated fluorine and other halogens will effuse and corrode the stainless steel braid wire reducing its pressure capability.

It is mandatory that PTFE hoses used in these applications be installed only in well vented areas and must be constantly monitored and inspected especially for corrosion. Replace all hoses that show sign of corrosion. Applications that use flammable or toxic materials should monitor levels of such material to ensure safety.

Other information:

No hose has an infinite life. Our quality PTFE lined hoses offer superior pressure capability, flexibility, a wide operating temperature range, chemical resistance along with exceptional reliability.

Hoses that are installed improperly, damaged, or are not included in an effective preventive maintenance and inspection program pose a risk. When conveying materials that have catastrophic potential or high risk it is particularly important to understand the application and the capability of the hose being used.

Hose Inspection and Replacement Criteria:

Periodic Inspections of all hoses after installation should include at a minimum;

- Inspect the outer braid for any signs of corrosion. Replace any hose that has visible signs of corrosion.
- Inspect the bends to ensure that the hose is not being bent beyond the minimum allowable bend radius.
- Replace any hose that shows evidence of separation, movement, or slippage of the fitting with respect to the hose.
- Inspect the hose for abrasion to the braid, broken braid wires or bulges.
- If the hose has been removed from the installation for inspection, inspect the fitting seat for scratches and marring. Inspect the threads and ensure that they are clean and there is no evidence of cross threading.
- Look for twists, torque, kinks or impact damage.

For more Information on Care & Maintenance of Hose Products go to NEW-LINE.com/resources