



Flexible Fuel Line Hoses with High Heat Resistance to meet PZEV Requirements

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The miracles of science™

Partial Zero Emission Vehicle (PZEV)

U.S. Government requirement for cleaner air

Low “SULEV” exhaust emissions

Near-zero evaporative emissions from fuel system*

15 year/ 150,000 mile (241,000 KM) emissions warranty

On-board diagnostics (OBD)

*Near-zero = < 0.054 grams/test

It is estimated 2 million vehicles/year will be PZEV certified by 2010.

Hyundai Elantra and Kia Spectra are PZEV Certified.



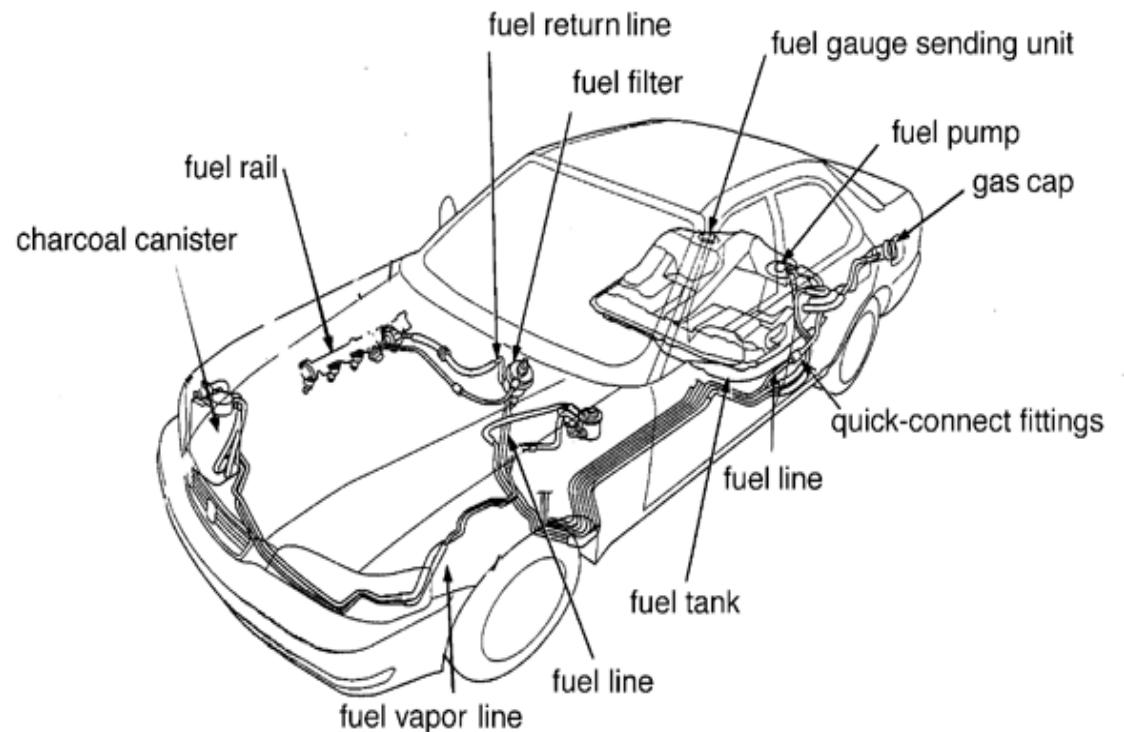
What are Vehicle Evaporative Emissions

Permeation through polymers and elastomers

Micro-leaks at connections and seals

Permeation doubles with every 10°C rise in temperature

Ethanol fuel blends significantly increase permeation





Impact of PZEV Regulations on Fuel Hose

Material:

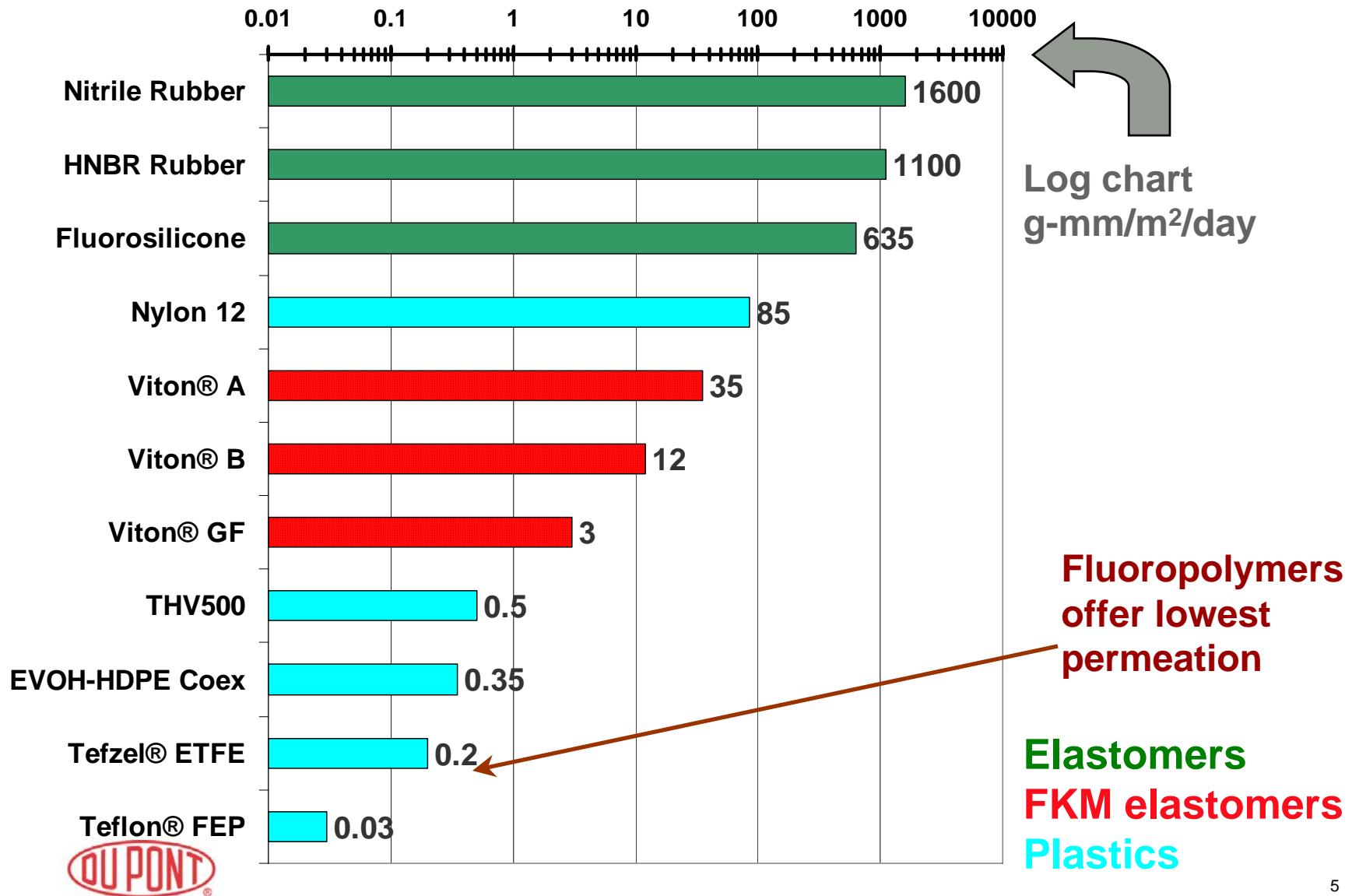
- **Lower permeating constructions using a fluoropolymer permeation barrier**

New design innovations:

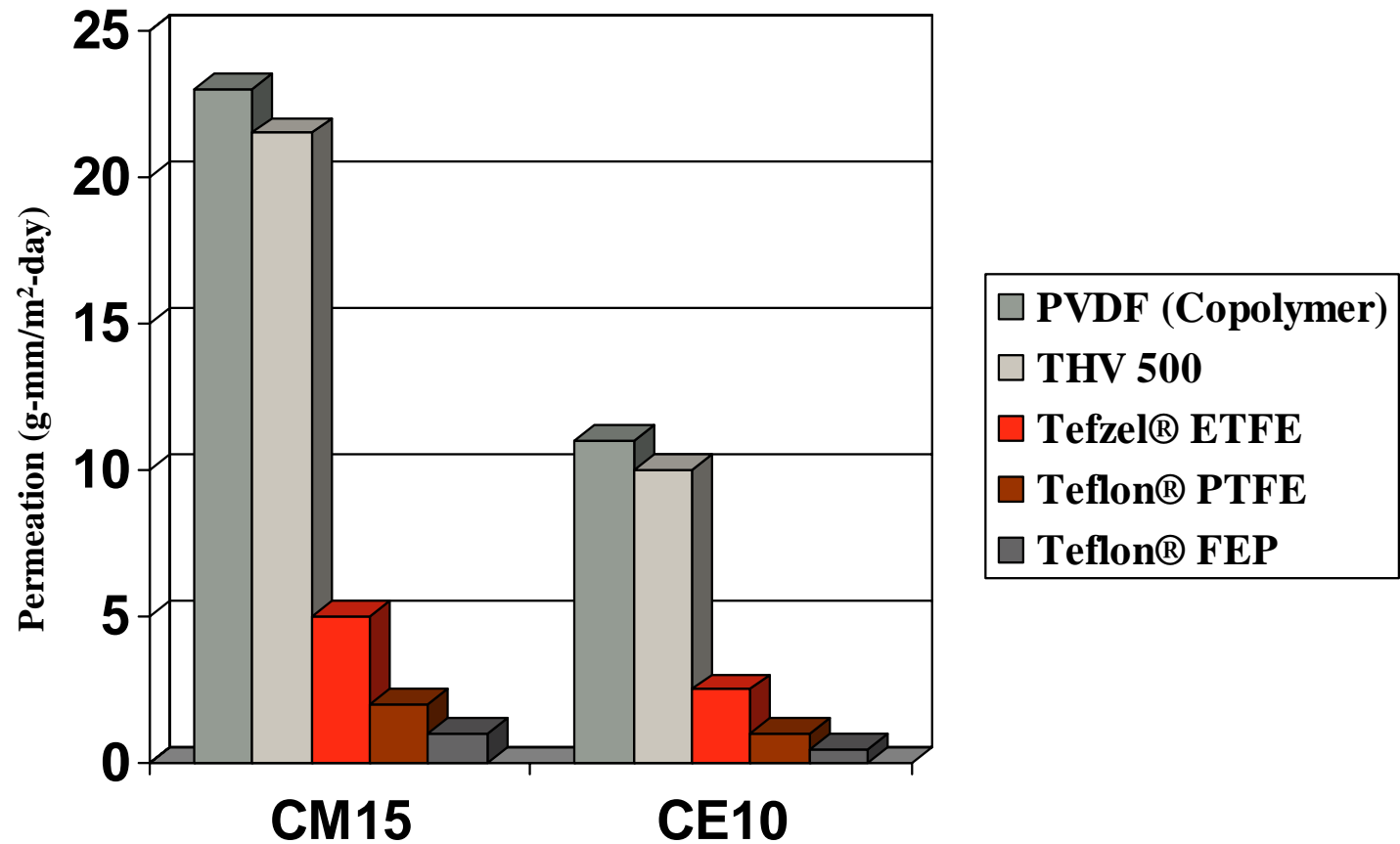
- **Near zero permeation**
- **Improved flexibility and high temperature resistance**
- **Ease of installation**
- **Excellent chemical resistance to all types of fuels including biodiesel and flex fuels.**



Permeation rate of fuel system polymers (1 mm thick) to CM15 fuel @ 23°C



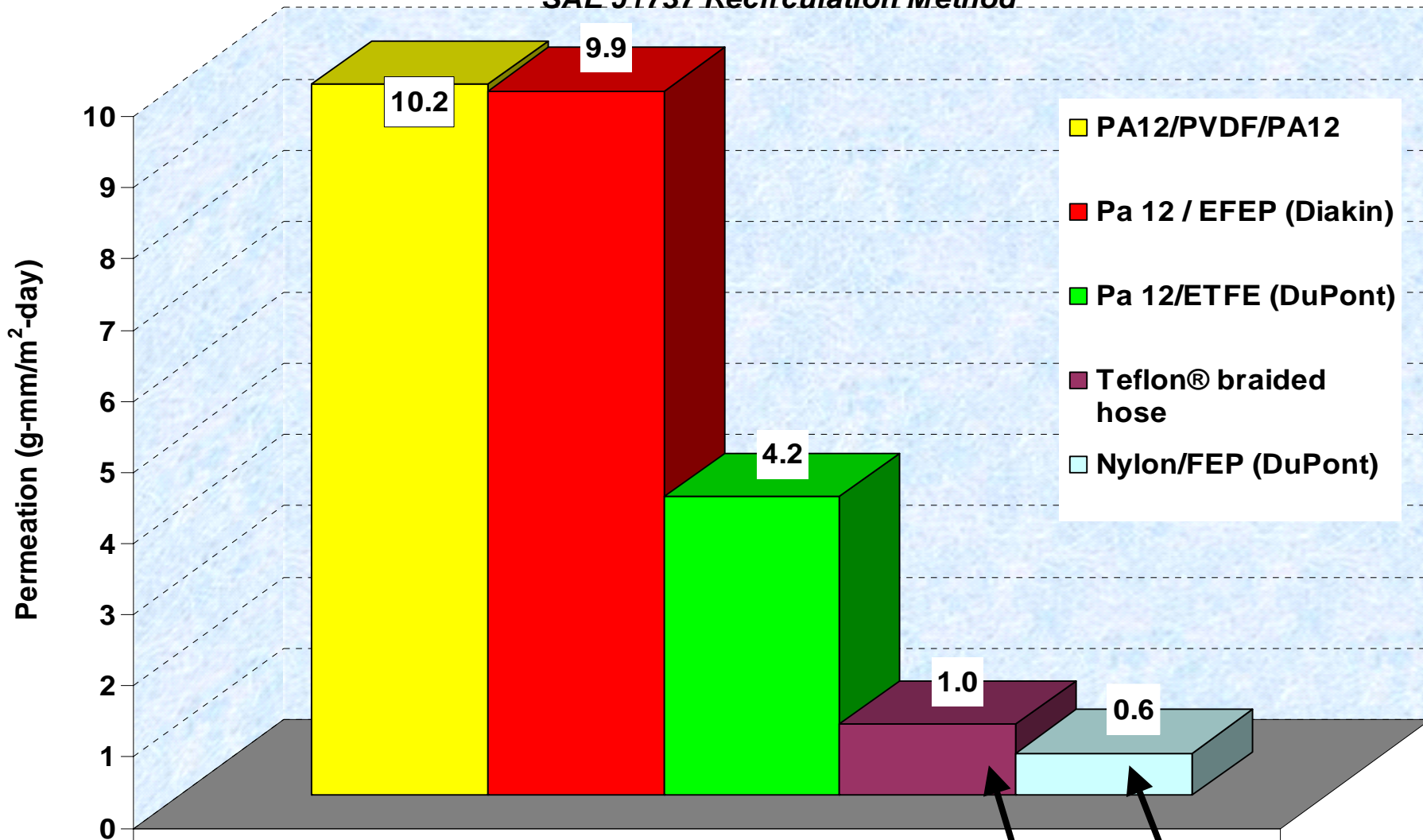
Permeation of Various Fluoropolymers @ 60°C (140°F)



The permeation rate and chemical resistance of various fluoropolymers can vary



**Permeation of Various Multi-layer Tube and Hose
Constructions in CE10 @ 60°C
SAE J1737 Recirculation Method**



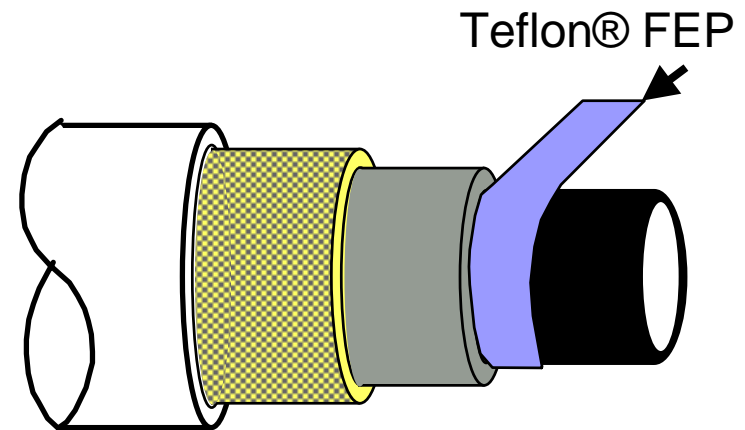
Side by Side - Tubing with PA Cover

Teflon® PTFE and FEP constructions⁷

Near-zero P-ZEV Fuel Hoses

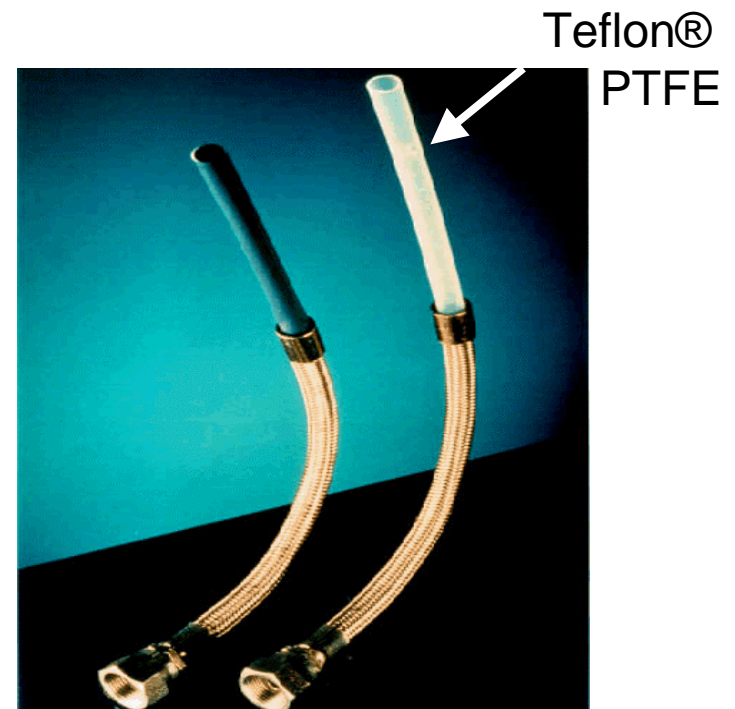
F-200 for elastomeric filler neck hose

- More flexible, easier to install, less permeable vs THV alternatives
- Uses a FEP film tape wrap



Teflon® PTFE braided hose

- High temperature resistance, 260°C.
- Replaces metal shock loops for lower cost, more space, quick connect assembly.
- High flex life and durable for 15 years (used extensively in aircraft and automotive).
- Tight bend radius
- Commercial on Hyundai Sonata and Kia Optima as brake hose. 2007 MY vehicles include Click, Santa Fe and Cerato
- High pressure and chemical resistance for diesel applications





DuPont Hose and Tubing using Teflon® Fluoropolymers

DuPont is interested in having more detailed discussions to determine how we can help HMC/Kia reduce costs and improve performance

Thank-you

