

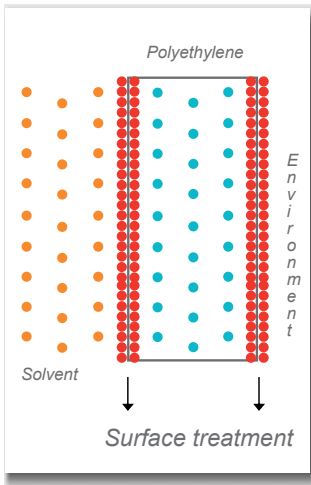


Your Value Partner

# PETROPLAS AND SURFACE FLUORINATION

Marley manufactures Petroplas in association with Pelchem, who conducts surface fluorination on the Petroplas pipes. The fluorination process renders the pipe resistant to permeation and the detrimental effects of petrol and diesel.

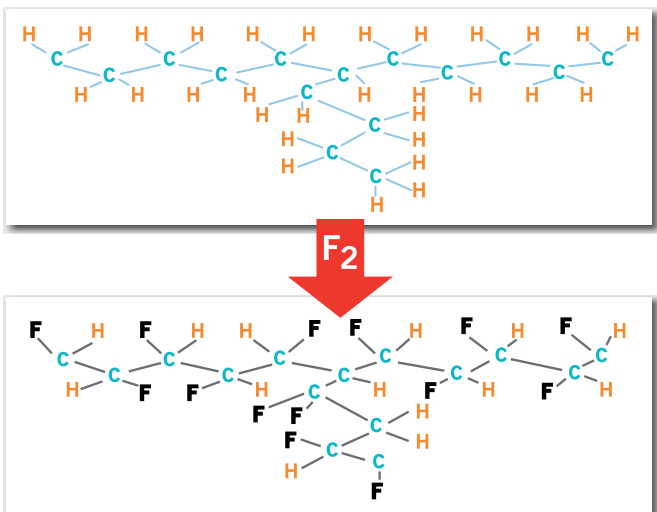
## The concept of fluorination



Fluorination changes the polarity and the surface characteristics of the polymer.

Treatment of the polymer with fluorine gas changes the surface properties of the polymer by partially substituting hydrogen atoms on the surface of a polymer with fluorine atoms, resulting in a fluorocarbon barrier layer, which prevents solvent permeation and fragrance loss.

## Schematic representation of the molecular structure:



## Typical performance of fluorinated HDPE containers

Tests are conducted according to the USA Department of Transport, Code of Federal Regulations / Transportation; Appendix B Part 173

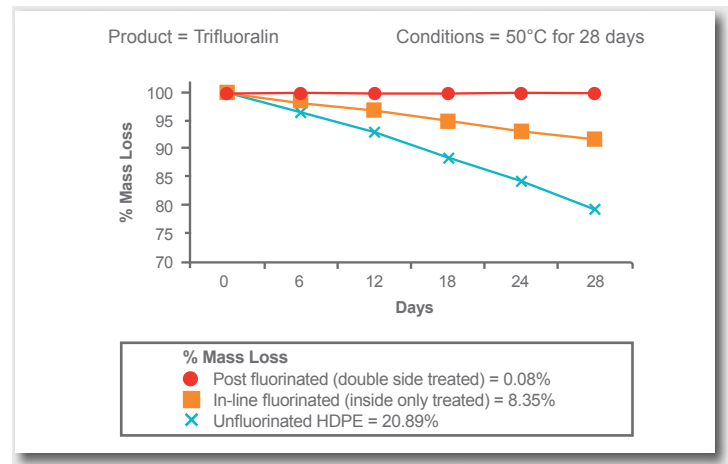
## Example of Fundamental R&D Results:

Product	% Mass Loss Unfluorinated	Appearance	% Mass Loss Fluorinated	Appearance
** Paraffin	18%	Panelled	0%	No panelling
** Xylene	78%	Extreme panelling	1%	No panelling
** QD Gloss Enamel ** Paint White	47.38%	Extreme panelling	1.28%	No panelling
** Toluol Thinners	100%	Extreme panelling	0.92%	No panelling
** Resin 901	31.64%	Severe panelling	0.77%	No panelling
** Cypermethrin EC	55.90%	Panelling	1.57%	No panelling

\* Tested at 60°C for 14 days

\*\* Tested at 50°C for 28 days

## Comparison Permeation Test Results:



## Advantages of fluorination

- Reduced permeation, results in a reduction in softening and swelling of pipe walls, panelling and leakage through the pipe walls
- Improved safety by containment of flammable liquids
- Prevents discolouration and odour emissions
- Improved adhesion properties to allow painting, printing, etc., of plastic surfaces
- The Surface Fluorination process generates minimum waste and adheres to the atmospheric pollution act
- Fluorinated pipes are 100% recyclable and cost-effective for the transfer of dangerous materials



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