APPLICATION NOTE

FLUORINATION OF PLASTICS

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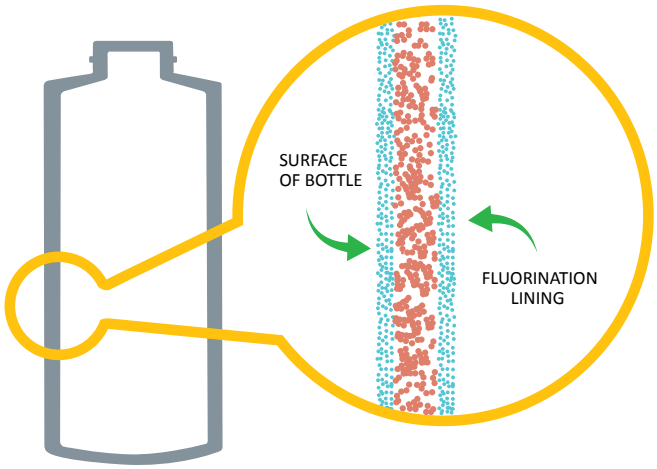
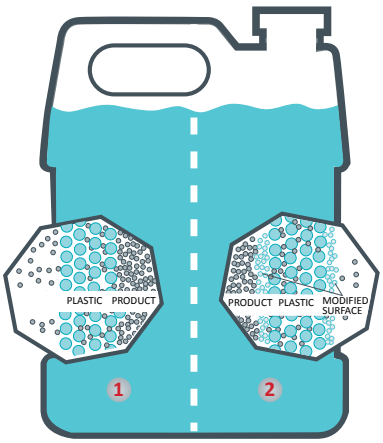
DESCRIPTION

Plastics are fluorinated to enhance its surface properties – such as surface wettability, better bonding and adhesion, or to reduce friction, stickiness permeation, diffusion and migration.

Plastic surfaces are fluorinated by offline batch process for three-dimensional parts, or by inline fluorination to make films, fabrics and foams of almost any origin and thickness hydrophilic before coating, applying adhesive, painting, etc. This is done by exposing components to a mixture of fluorine gas under highly controlled conditions.





1 **Before fluorination**
The molecules of some products inside the container can easily permeate the container walls. This can cause product and weight loss, leading to panelling.

2 **After fluorination**
The Fluorination Barrier Treatment seals the entire container, inside and out, creating a double-sided barrier to resist permeation.

Process

Before the fluorination process, components are first conditioned in the vacuum chamber to eliminate moisture which might impair the formation of a barrier layer.

Fluorination mixture is introduced in the chamber under 10 mbar vacuum pressure. Heat exchangers on the chamber accelerate the reaction of the component's surface with the fluorination mixture.

Once the fluorination process is complete, the chamber and pipelines are flushed with nitrogen multiple times by bringing the vacuum chamber to 1 mbar and releasing to the atmospheric pressure to rinse the components, and to evacuate the chamber of exhaust gases.

Plastic bottle moulding

FLUORINATION OF PLASTICS

1. CHALLENGE

Temperature, time and pressure are critical to the fluorination process. Vacuum systems must be capable of handling reactive fluorine, deliver fast pump-down pressure, provide flexible vacuum during the evacuation cycle and must have excellent seal to prevent the fluorine leaking in the environment.

3. MAIN BENEFITS

Due to the reactive nature of fluorine, the vacuum system to be used needs to be dry, as an oil-sealed or liquid ring pump will simply absorb fluorine and create an unstable environment.

Edwards' state-of-the-art dry screw pumps like the premium GXS with intelligent control system, the new EDS dry pump with improved robustness and the GV dry pump with proven performance, provide an optimum solution in combination with EH dry boosters for offline as well as inline plastic fluorination process.

2. SOLUTION

GXS + EH500 Booster combination

Premium GXS dry pump offers enhanced features:

- Intelligence to monitor pump conditions
- Intelligent control panel to optimise and automate the process
- Hermetically sealed variants ideal for fluorination
- Integrated solvent flush options to remove fluorine accumulation

EDS + EH500 Booster combination

- Patented screw profile and hydrokinetic booster technology delivers the best-in-class performance with shorter evacuation times and increase production output
- Flexible pumping with booster combinations meet the critical fluorination process requirement
- Robust pump mechanisms capable of handling reactive gases and harsh process environments

GV80/110 + EH500 Booster combination

- Proven pump technology designed to handle large volumes of condensable vapours and particulate loads for a consistent pumping performance
- Pre-configured pumping systems enabling ease of installation and operation
- Able to operate continuously at high pressure levels
- Consistent and repeatable performance in the most demanding of applications such as in fluorination

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