New PFAS-Free Solutions

In light of new regulations requiring the elimination of fluoro-elastomer-based products in packaging, Tosaf R&D team has developed two PFAS-free processing aid solutions, based on alternative substances, that **comply with EU and FDA food contact requirements:**

AP9709PE EU AP9711PE EU

Laboratory tests were carried out comparing the new PFAS-free products to the standard fluorine-based processing aid (AP5645PE EU) and the raw polymer (LLDPE), in three core parameters: die pressure, optical properties, and COF measurements.

The new products showed comparable behavior.

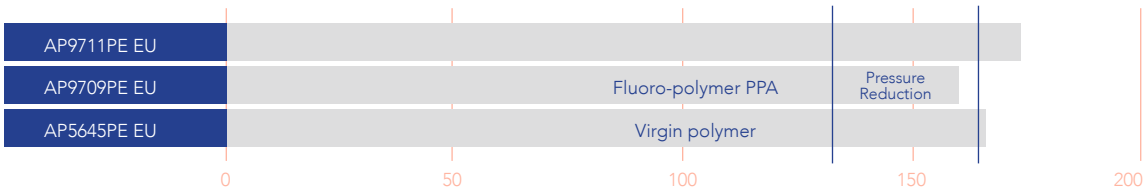
Tests were also conducted at several customers' commercial lines, both in mono-layer and multi-layer films. In these tests, too, the new products showed comparable behavior to the standard fluorine-based processing aid. For example, a customer performed a long trial on a 5- layer co-ex line, using AP9709PE EU at 1% LDR for 16 hours. This product reduced the melt temperature down by 15°C – 25°C and performed excellent in terms of melt fracture elimination and optical properties (such as Haze) compared to the standard PFAS based PPA. The films were then printed and converted in sealing equipment with no issues. Lamination process are not affected by these products.

Laboratory Test Results

Die Pressure

Two testing methodologies were used in the laboratory to evaluate the products' performance:

1. Capillary rheometer tests - to establish processing aid performance. The capillary rheometer monitored die pressure reduction of the PFAS-free solutions, compared to the standard fluoro-elastomer processing aid and to the raw polymer, carried out in typical extrusion conditions of T-160°C; shear strain 180 [1/sec].
2. Lab-scale blown extruder test - The results showed that the die pressure reduction capability of the new solutions was very comparable to the standard product.



Optical Properties - mono-layer film

50µm based on C6 - LLDPE (MFI 0.5 gr/10min)

The optical properties - transmittance, haze and clarity - of mono-layer film were measured when using the new PFAS-free products, and compared to those of film using the standard fluoro-elastomer processing aid, and to the raw polymer.

Optical properties were comparable across the products, with the new PFAS-free solutions showing a slight improvement in clarity.

	Transmittance		Haze		Clarity	
	%	STD	%	STD	%	STD
AP9711PE EU	92	0.1	15.0	0.1	97.4	0.1
AP9709PE EU	92	0.2	15.8	0.1	97.0	0.1
AP5645PE EU	92	0.1	15.3	0.1	97.0	0.1
LLDPE	92	0.1	14.9	0.1	96.9	0.2

COF Measurements – film to film

Dynamic COF values were measured after adding the new PFAS-free processing aids.

A negligible reduction in COF was observed once the new solutions had been added, compared to the raw polymer.

	Static COF	STD	Kinetic	STD
AP9711PE EU	0.37	0	0.33	0.01
AP9709PE EU	0.38	0.03	0.36	0.01
AP5645PE EU	0.39	0.02	0.37	0.01
LLDPE	0.40	0.01	0.40	0.06

For over three decades, Tosaf has been developing and manufacturing high quality additives, compounds and color masterbatches for the plastics industry. With the aim of providing for its customers' every need, the company has continuously grown and developed its offering, production capacity, and global reach, becoming a truly close-to-the-market, global organization.

Today, Tosaf serves customers in over 50 countries in Europe, North America, South America, Asia and the Middle East, and has over 1400 employees spread throughout its production sites, warehouses, sales and distribution offices around the world.