Formosa Plastics®

Polypropylene

Processing Guide
Polypropylene Fiber & Slit Film Applications

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Polyolefin is a general term used to describe a family of polymers derived from a particular group of base chemicals e.g. olefins. The Polyolefin family includes polypropylene, as well as polyethylene. Polypropylene is made by building up long chains of propylene monomers.

Due to its inherent nature of chemical resistance, low density, outstanding property balance and process versatility, polypropylene has a broad range of applications such as flexible fibers for carpet, carpet backing, and personal hygiene products.

Formosa has two separate and unique gas phase polypropylene polymerization processes. These processes compliment each other and yield high degree of isotacticity (for physical properties) and a degree of Xylene Soluble Extractables for smooth and continuous processability. Formolene® Polypropylene grades are used in a variety of extrusion applications including Slit Films, Strapping, Straws, CF & BCF, as well as unique non-woven staple fibers.

Polypropylene grades for the fiber market sector range from reactor grade high MFR PP for BCF in rugs and carpets, to staple for geotextiles and non-wovens, to slit tape for raffia and strapping applications, to Controlled Rheology PP grades for fine denier upholstery yarns. Details of each grade can be found at www.fpcusa.com.

Formolene Fiber & Extrusion Grades

Applications	Grade	Comments
Slit Tapes	1102KR, 1102L, 1103K, 1112H	Excellent Water Carryover
BCF-Face yarn	4101O	Excellent Gas Fading
Carpet Backing	1102KR & 1102K	Excellent Shrinkage & Processibility
CF Yarn & Geotextlies	5101M	Excellent UV Resistance
Cordage & Rope	1102H & 1102KR	Excellent Thermal Stability & Strength
Netting	1102K & 5181K	Excellent grade for thin gauge
Staple Fibers	4101M	Excellent balance of tenacity & softness for consumer products
Strapping	5100H	Fractional MFR Homopolymer PP
Compounding Profile (Large Part Extrusion)	6501A	Low MFR Copolymer
	6600A	Fractional MFR Copolymer
Straws	5181K	Homopolymer PP

Typical Fiber & Extrusion Product Properties

	BCF (Medium MFR PP) (20)	BCF (High MFR PP) (35)	Slit Film (3-4 MFR)	Straw (4-6 MFR)	Staple Fibers (6-8 MFR)
Denier	~1800	~600-1800	--	--	>500,000
DPF	18-20	2.5-18	--	--	6-8
Melt Temperature (ºC)	230-240	200-215	220-240	235	230-240
Chill Roll Temperature (ºC)	N.A.	N.A.	~20	N.A.	N.A.
Draw Ratio	>2.9	>3.0	>6-8	--	>3

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Slit Film Applications

Problems Observed	Possible Causes	Corrective Actions
Excessive Water Carryover	• Processing temperature too high • Water Quench bath temperature too high	• Adjust the temperature profile in extruder zones • Lower the quench tank temperature • Review the concentrate & regrind level • Rearrange the mechanical brush positions. • Slow Down the speed
Tape/yarn breakage	• Melt Temperature too low • Godet temperature too low • Draw speed too high	• Up the melt temp & optimize the extruder temperature profile; also review the godet temperature . • Review the A/O level in PP • Alter the draw ratio • Check the regrind level.
Excessive Shrinkage	• Heat set temperature too low • Draw ratio too high	• Alter the draw roll temp. to reflect higher set temperature. • Reduce the draw ratio.
Low Tenacity	• PP-MFR too high • Residual elongation	• Review the MFR of the starting PP; In general, the lower the MFR->higher the tenacity, however at the expense of higher back-pressure. • Adjust (^) the draw ratio. • Lower the draw temperature.

Bulk Continuous Filaments Applications

Problems Observed	Possible Causes	Corrective Actions
Yarn Breakage	• Draw ratio too high • Godet Temperature too low • Process Temperature too low	• Either increase the godet temperature or reduce the draw ratio. • Optimize the temperature profile • Check the A/O level in resin • Check the color concentration level • Alter the spin draw temperature
Color of the filaments	• Improper mixing of the components (concentration + resin) • Process temperature too high	• Check the compatibility of two components from MFR • Check the additive levels • Pre-blend PP with concentrate
Low Tenacity	• PP-MFR too high • Process Temperature too high	• Attempt slightly lower MFR • Check the A/O levels • Increase the draw ratio • Alter process & spin draw temperatures
Bulk Characteristic	• Heat setting temp. too low • Tension in the final region too high	• Increase the heat set tempurature • Alter process/SD temperature

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