

# Polypropylene



**Cast and Blown Film**

**TOTAL PETROCHEMICALS**



## Retortable and Microwavable

Polypropylene is appreciated both for the mechanical properties it imparts to the film and for its excellent temperature stability. These properties are particularly advantageous for instance in the manufacture of retortable or microwavable package.

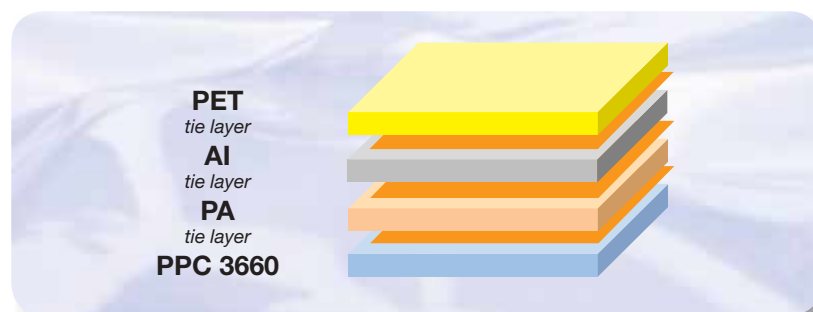
Polypropylene block copolymers **PPC 2660** or **PPC 3660** feature excellent mechanical properties as well as very high perforation resistance. In addition, both grades provide very high seal strength, which guaranties the seal integrity over the package shelf life. Films produced with **PPC 2660** or **PPC 3660** display high impact properties, which make them particularly suitable for lamination.

**PPC 2660** has very low viscosity, this makes it suitable for both blown and cast film technologies. Like **PPC 3660** it is a gel free material with good processability offering outstanding bubble stability on all kinds of blown film lines that are properly equipped for processing polypropylene.

Where a higher melt fluidity is required particularly in cast film production, Total Petrochemicals recommend the use of **PPC 5660**.

These heterophasic copolymers fulfill the food contact standards.

Figure 1: multilayer structure of a **retort** pouches with **PPC 3660** as the seal resin

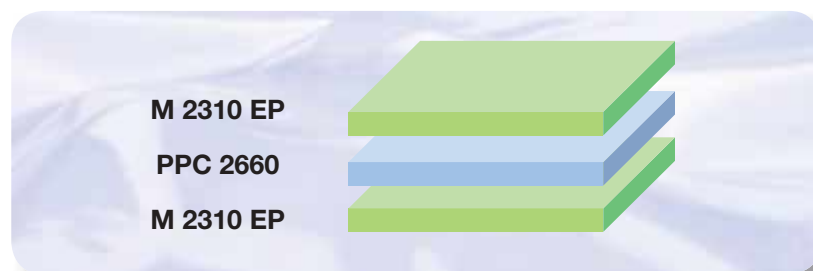


## Combining stiffness and tear resistance

The use of coextrusion technology delivers the combination of mechanical and optical properties of polypropylene with the tear resistance of polyethylene. This exceptional set of properties is obtained thanks to the use of metallocene polyethylene, which gives the great advantage of avoiding the use of tie layers between both materials. The blend of a small quantity of polypropylene in the polyethylene layer further improves the cohesion in between layers.

Figure 2 presents a structure based on **PPC 2660** produced by the blown film technology. This multilayer film is particularly suitable for film which require a good welding performance and a high tear resistance.

Figure 2: multilayer structure combining stiffness and tear resistance

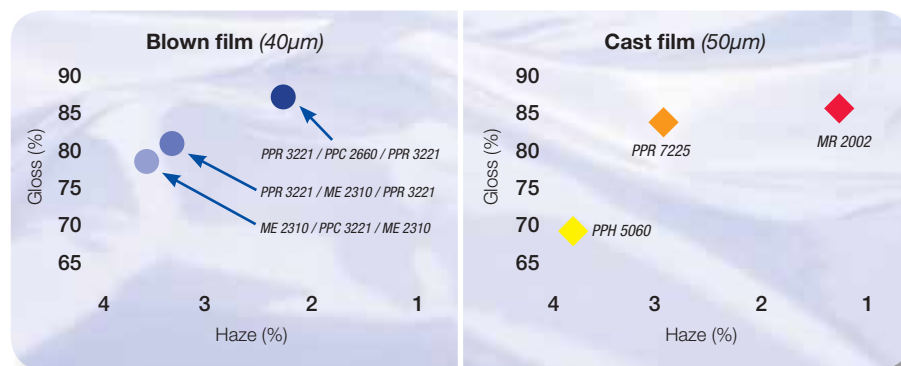


**M 2310 EP** is a metallocene linear low density polyethylene with a MFI of 0.9 (190°C) and a density of 0.923.

## Transparent film for food packaging

In blown film, Total Petrochemicals recommends the use of **PPR 3221** in the outer layer of multilayer films. In combination with **PPC 2660** or Total Petrochemicals metallocene polyethylene grades **remarkable gloss and transparency's obtained.** (figure 3) These films are particularly adapted for the manufacture of bread bags or tissue bags.

Figure 3: Optical properties of blown film and cast films



In cast film, **PPR 7225** a nucleated random copolymer with a MFI of 10g/10min provides a combination of very good optical and mechanical properties.

The specific design of the metallocene homopolymer **MR 2002** provides an outstanding processability on cast film lines. Moreover, film presents unmatched optical and mechanical properties (figure 3).

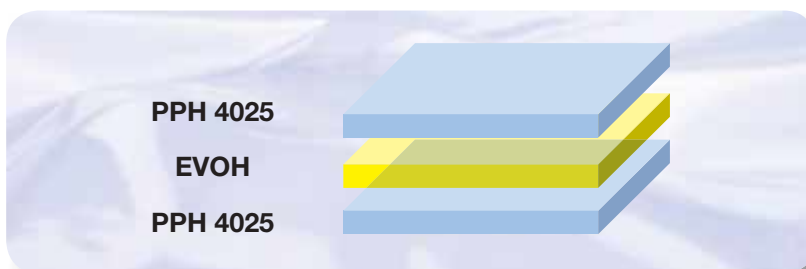
## Hood film

Random copolymer, **PPR 3260** features thermal properties between those of polypropylene homopolymer and those of polyethylene. These properties are particularly valuable in the inner layer of shrink-wrap palletizing film. It prevents film adhesion onto the surface of goods during the heating phase.

## High stiffness film

**PPH 4025** has been especially developed for the production of very high stiffness film. Processed on cast film lines, **PPH 4025** allows significant downgauging. Its specific design enables to maintain higher stiffness at elevated temperature compared to conventional resins. **PPH 4070** is especially suitable for the production of high stiffness film. Both product are beneficial for hot filling or the retort process.

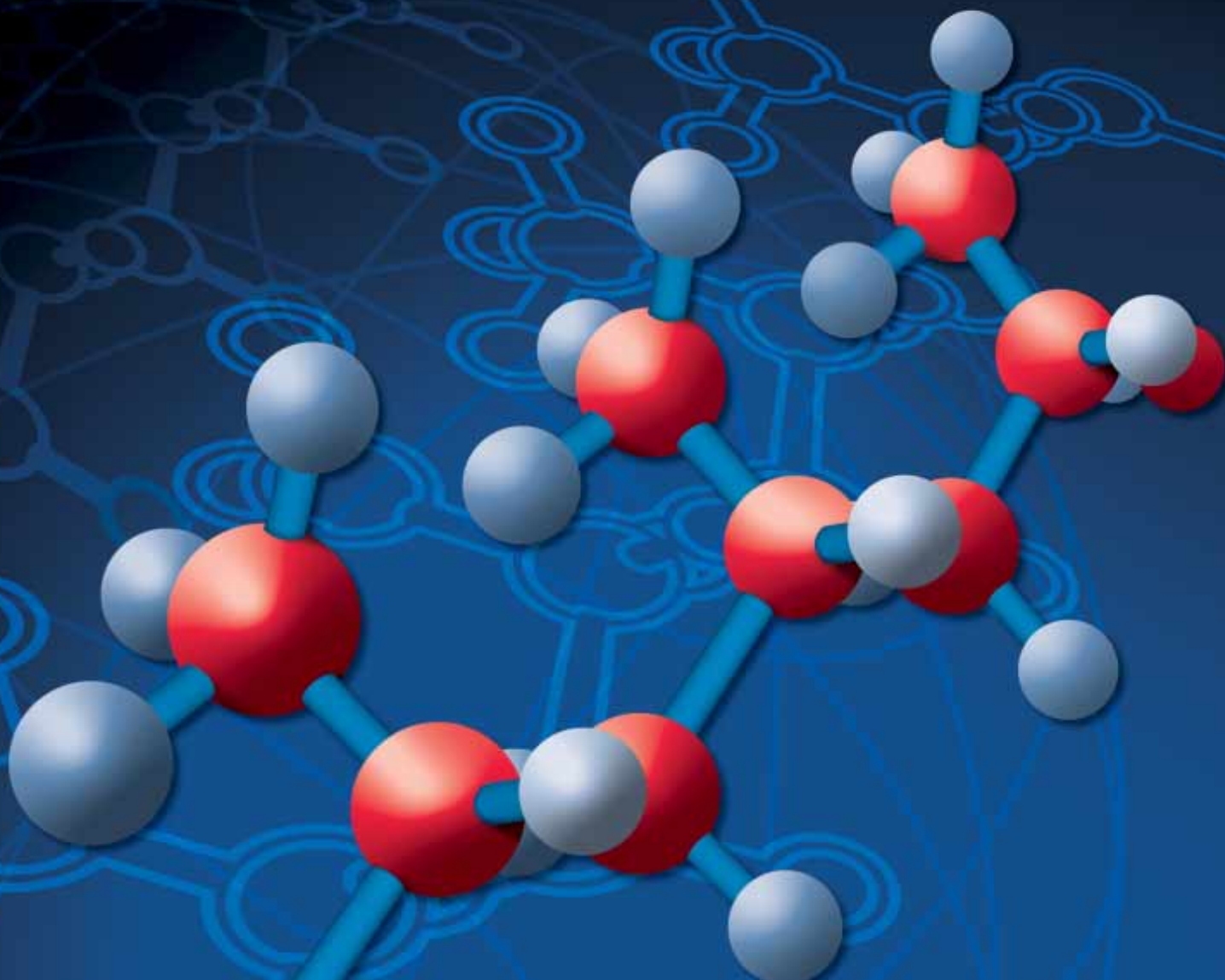
Figure 4: multilayer barrier for retortable and microwavable packaging



## Medical films

Random copolymer **PPM R021** is specially designed to fulfill the European and American pharmacopoeia. They are appreciated for the excellent mechanical properties and the high transparency of cast films. Films made with **PPM R021** are especially suitable for the production of sterilizable transparent medical pouches.





## Blown film

		Melt-flow (g/10min)	Applications
PPC 2660	Heterophasic copolymer	0.8	Food packaging, lamination, Heavy duty sac
PPR 3221	Random copolymer	1.8	Transparent and glossy film for packaging
PPR 3260	Random copolymer	1.8	Multi-layer films, packaging

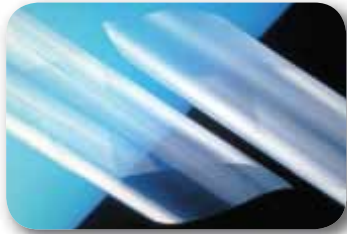
## Cast film

		Melt-flow (g/10min)	Applications
PPH 4025	Homopolymer	3.0	Very high stiff films
PPH 4070	Homopolymer	3.0	High stiff films
PPH 5060	Homopolymer	6.0	Packaging films
PPC 2660	Heterophasic copolymer	0.8	Mono-oriented films, strapping
PPC 3660	Heterophasic copolymer	1.3	Retort packaging, stand-up pouch
PPC 5660	Heterophasic copolymer	7.0	Non-transparent packaging film
PPR 7225	Random copolymer	10.0	Transparent and high gloss film
PPM R021	Random copolymer	1.8	Medical film
MR 2002	Metallocene homopolymer	15.0	Stiff, transparent high gloss film



## Total Petrochemicals, commitment to the packaging industry

A long-standing supplier to the packaging sector, Total Petrochemicals has developed a comprehensive range of polypropylene grades covering the various technologies used in the production of both monolayer and multilayer film.



Ever attentive to the needs of the packaging sector, Total Petrochemicals offers specific grades for the manufacturing of thermoformable sheets, injection molded articles or bi-oriented polypropylene film (BOPP). Total Petrochemicals also offers a comprehensive range of polypropylene grades for cast and blown film producers. Suitable for every type of production line, these products meet all the requirements in terms of film property and processability. The many technological advances coming from Research and Development help to keep the product range up to date and in line with evolving demand.



The strictest product quality control along with the mastery of our production technology guarantees outstanding product quality and consistency.



## Total Petrochemicals, a Petrochemicals World Major

The world's fifth largest petrochemicals producer, Total Petrochemicals consolidates the petrochemicals activities of the Total Group : base chemicals and their related polymers (polyethylene, polypropylene and polystyrene).



With over 7,000 employees, Total Petrochemicals conducts its operations in Europe, the United States, the Middle East and Asia. Its products serve a vast number of consumer and industrial markets, including packaging, construction and automotive.



As part of the Total Group, Total Petrochemicals draws on strong synergies with its refining activity, particularly in Europe and the United States, as well as with its exploration and production activity, in particular in the Middle East where the Company is now a major ethylene producer using ethane feedstock.

Information contained in this publication is true and accurate at the time of publication and to the best of our knowledge. The nominal values stated herein are obtained using laboratory test specimens. Before using one of the products mentioned herein, customers and other users should take all care in determining the suitability of such product for the intended use. Unless specifically indicated, the products mentioned herein are not suitable for applications in the pharmaceutical or medical sector. The Companies within Total Petrochemicals do not accept any liability whatsoever arising from the use of this information or the use, application or processing of any product described herein. No information contained in this publication can be considered as a suggestion to infringe patents. The Companies disclaim any liability that may be claimed for infringement or alleged infringement of patents.



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# Total Petrochemicals Polypropylene M 2310 EP / PPR 3221 / M 2310 EP Multilayer Structure



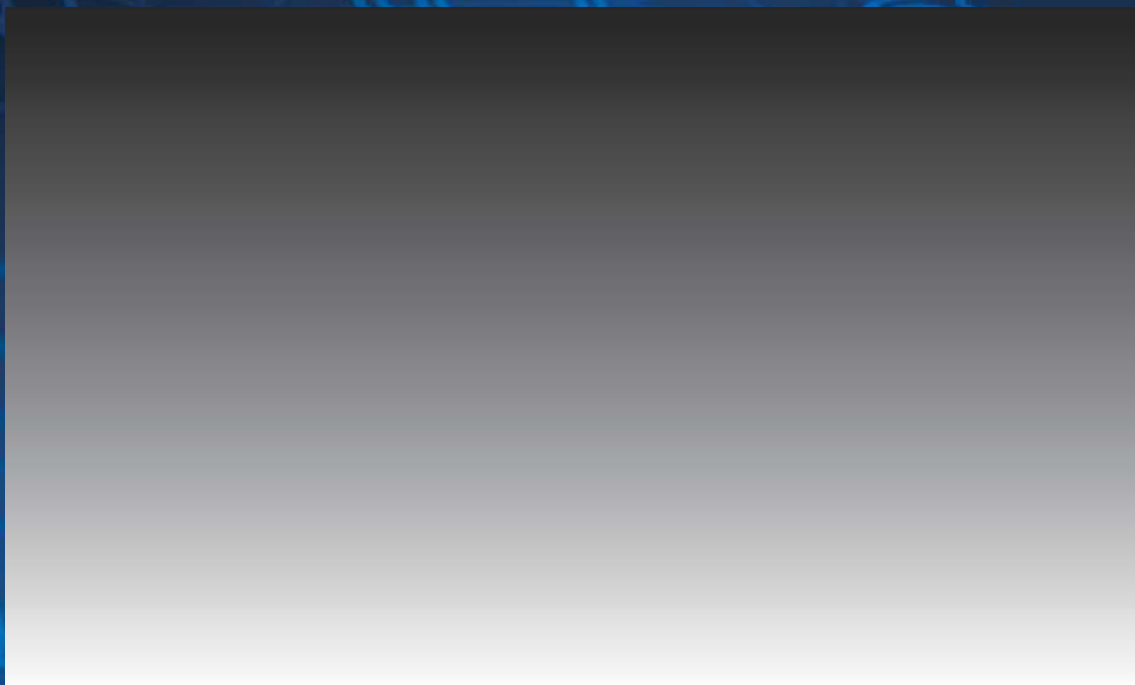
Multilayer structure	Main properties										
	Dart impact	Tensile strength at yield		Tensile strength at break		Elongation at break		Elmendorf		Haze	Gloss 45°
	g	MPa		MPa		%		N/mm		%	
	ISO 7765-1	ISO 527-3		ISO 527-3		ISO 527-3		ISO 6383-2		ISO 14782	ASTM D 2457-03
	ASTM D 1709	ASTM D 882		ASTM D 882		ASTM D 882		ASTM D 1922		ASTM D 1922	
		MD	TD	MD	TD	MD	TD	MD	TD		
M 2310 EP PPR 3221 M 2310 EP	75	20	20	65	55	625	750	16	120	3.5	79

40µm ( 10µm / 20µm / 10µm ) thick film blown on a Collin line (die diameter = 50mm, die gap = 2mm, BUR = 2,5, throughput = 12kg/h)

PPR 3221 is a clarified random copolymer, MFI 1.8 (230°C)  
M 2310 EP is a 0.923 metallocene linear low density polyethylene, MFI 0.9 (190°C)



# Total Petrochemicals Polypropylene PPR 3221 / M 2310 EP / PPR 3221 Multilayer Structure



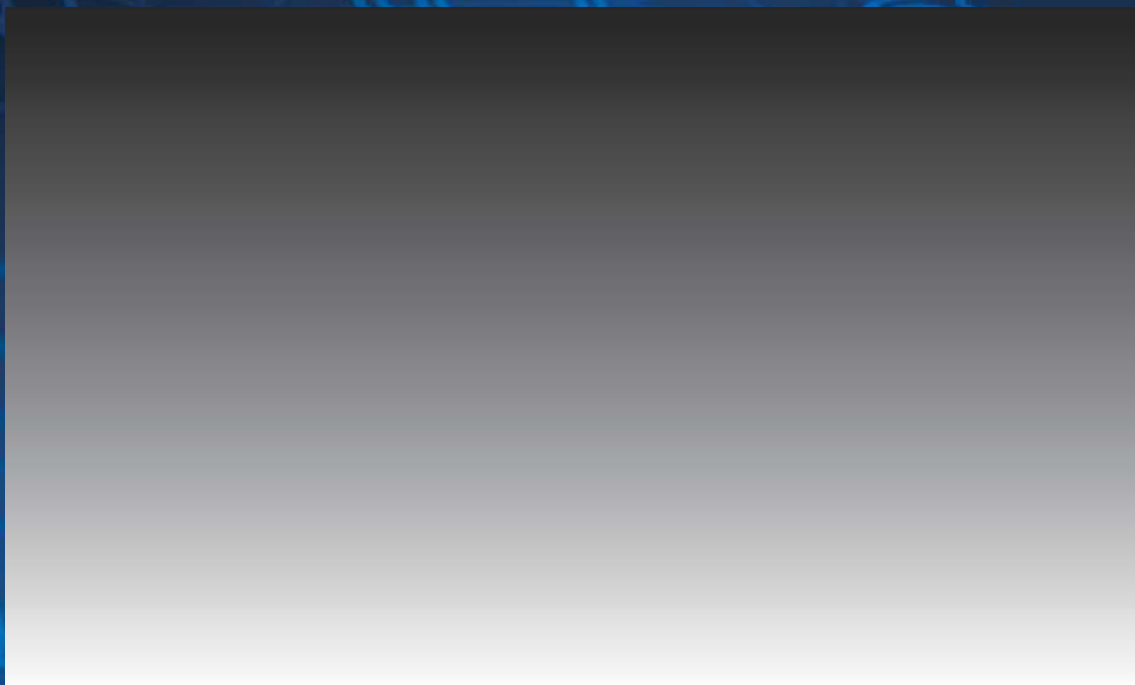
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	Dart impact	Tensile strength at yield		Tensile strength at break		Elongation at break		Elmendorf		Haze	Gloss 45°
	g	MPa		MPa		%		N/mm		%	
	ISO 7765-1	ISO 527-3		ISO 527-3		ISO 527-3		ISO 6383-2		ISO 14782	ASTM D 2457-03
	ASTM D 1709	ASTM D 882		ASTM D 882		ASTM D 882		ASTM D 1922		ASTM D 1922	
		MD	TD	MD	TD	MD	TD	MD	TD		
PPR 3221 M 2310 EP PPR 3221	95	22	20	170	45	600	700	30	170	3.3	81

40µm ( 10µm / 20µm / 10µm ) thick film blown on a Collin line (die diameter = 50mm, die gap = 2mm, BUR = 2,5, throughput = 12kg/h)

PPR 3221 is a clarified random copolymer, MFI 1.8 (230°C)  
M 2310 EP is a 0.923 metallocene linear low density polyethylene, MFI 0.9 (190°C)



# Total Petrochemicals Polypropylene PPR 3221 / PPC 2660 / PPR 3221 Multilayer Structure



Multilayer structure	Main properties										
	Dart impact	Tensile strength at yield		Tensile strength at break		Elongation at break		Elmendorf		Haze	Gloss 45°
	g	MPa		MPa		%		N/mm		%	
	ISO 7765-1	ISO 527-3		ISO 527-3		ISO 527-3		ISO 6383-2		ISO 14782	ASTM D 2457-03
	ASTM D 1709	ASTM D 882		ASTM D 882		ASTM D 882		ASTM D 1922		ASTM D 1922	
		MD	TD	MD	TD	MD	TD	MD	TD		
PPR 3221 PPC 2660 PPR 3221	40	32	28	70	35	550	550	3	35	2.3	87

40µm ( 10µm / 20µm / 10µm ) thick film blown on a Collin line (die diameter = 50mm, die gap = 2mm, BUR = 2,5, throughput = 12kg/h)

PPR 3221 is a clarified random copolymer, MFI 1.8 (230°C)  
PPC 2660 is a heterophasic copolymer, MFI 0.8 (230°C)

# Total Petrochemicals Polypropylene PPR 7225



Grade	Main properties (50μ monolayer cast film - chill roll 30°C)										
	Dart impact	Tensile strength at yield		Tensile strength at break		Elongation at break		Elmendorf		Haze	Gloss 45°
	g	MPa		MPa		%		N/mm		%	
	ISO 7765-1	ISO 527-3		ISO 527-3		ISO 527-3		ISO 6383-2		ISO 14782	ASTM D 2457
	ASTM D 1709	ASTM D 882		ASTM D 882		ASTM D 882		ASTM D 1922		ASTM D 1922	
	MD	TD	MD	TD	MD	TD	MD	TD			
PPR 7225	300	20	19	38	34	500	600	16	28	2.5	84

PPR 7225 is a nucleated random copolymer, MFI 10 (230°C)

# Total Petrochemicals Polypropylene MR 2002



Grade	Main properties (50μ monolayer cast film - chill roll 30°C)										
	Dart impact	Tensile strength at yield		Tensile strength at break		Elongation at break		Elmendorf		Haze	Gloss 45°
	g	MPa		MPa		%		N/mm		%	
	ISO 7765-1	ISO 527-3		ISO 527-3		ISO 527-3		ISO 6383-2		ISO 14782	ASTM D 2457
	ASTM D 1709	ASTM D 882		ASTM D 882		ASTM D 882		ASTM D 1922		ASTM D 1922	
	MD	TD	MD	TD	MD	TD	MD	TD			
MR 2002	200	24	23	47	33	670	470	12	27	1.3	86

MR 2002 is a metallocene homopolymer, MFI 15



# Total Petrochemicals Polypropylene PPC 5660



Grade	Main properties (50μ monolayer cast film - chill roll 30°C)										
	Dart impact	Tensile strength at yield		Tensile strength at break		Elongation at break		Elmendorf		Haze	Gloss 45°
	g	MPa		MPa		%		N/mm		%	
	ISO 7765-1	ISO 527-3		ISO 527-3		ISO 527-3		ISO 6383-2		ISO 14782	ASTM D 2457
	ASTM D 1709	ASTM D 882		ASTM D 882		ASTM D 882		ASTM D 1922		ASTM D 1922	
	MD	TD	MD	TD	MD	TD	MD	TD			
PPC 5660	400	25	24	36	31	560	530	9	16	41	15

PPC 5660 is a heterophasic copolymer, MFI 7

# Total Petrochemicals Polypropylene PPH 5060



Grade	Main properties (50μ monolayer cast film - chill roll 30°C)										
	Dart impact	Tensile strength at yield		Tensile strength at break		Elongation at break		Elmendorf		Haze	Gloss 45°
	g	MPa		MPa		%		N/mm		%	
	ISO 7765-1	ISO 527-3		ISO 527-3		ISO 527-3		ISO 6383-2		ISO 14782	ASTM D 2457
	ASTM D 1709	ASTM D 882		ASTM D 882		ASTM D 882		ASTM D 1922		ASTM D 1922	
	MD	TD	MD	TD	MD	TD	MD	TD			
PPH 5060	150	25	24	34	32	500	550	14	14	3.8	70

PPH 5060 is a homopolymer, MFI 6