Improvement of recycled polypropylene through the addition of **Calprene H6180X**

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Introduction

- **Sustainability** and supporting the **circular economy** in the global polymer industry are two of our main goals.
- The lack of **recycled polypropylene with good mechanical properties** makes it difficult to implement this polymer as a common raw material.
- Recycled PP compounds with **Calprene H6180X** show an important **improvement in impact resistance.**
- **Calprene H6180X** allows the material to **support extreme aging conditions.**
- **Calprene H6180X** provides very good results with **quantities of only 1%.**

Calprene H6180X

Calprene H6180X is an SEBS with low styrene content and very high melt flow rate. These properties achieve an extremely good compatibility with polypropylene.

M.F.I. (230ºC, 2,16kg)	10 g/10 min
Total styrene (on polymer)	15%
Specific Gravity	0,89 g/cc
Saturation	>99%
Hardness Shore A	50

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M.F.I. (230ºC, 2,16kg)	14 g/10 min	
Flexural modulus	1289 MPa	
Vicat point (50ºC/h)	145ºC	
Impact izod resistance (notched) (kJ/m2)	**23ºC**	**0ºC**
	12,2	9,8
Impact charpy resistance (notched) (kJ/m2)	**23ºC**	**0ºC**
	7,1	3,7

Compounding

The origin of the recycled PP used in this study is post-consume. Its main characteristics are shown above.

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Compounds Recipes

	Compound 1	Compound 2	Compound 3
Recycled PP	99%	97%	95%
C-H6180X	1%	3%	5%

Compounding Procedure

Twin-screw machine L/D:36
Tª profile: 190-200-210-210-210ºC
Pressure: 50 Pa
Speed: 180 rpm
Injection of test specimens at 210ºC

Compounding

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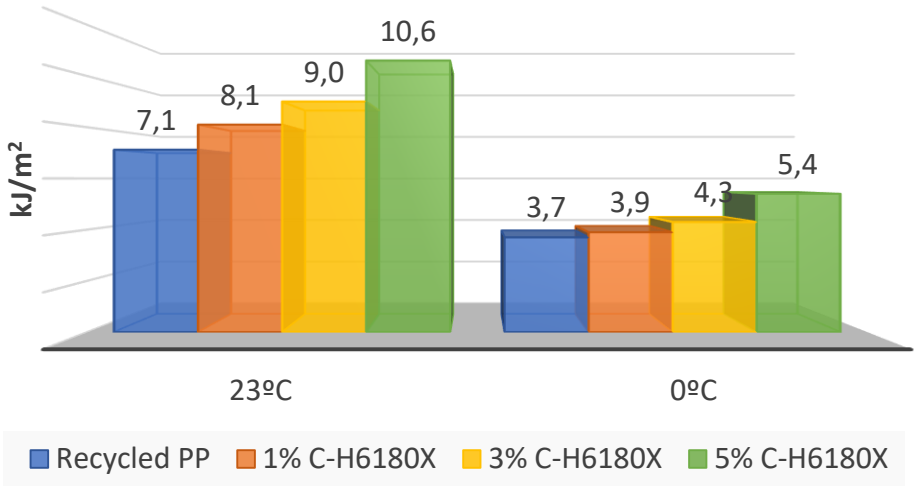
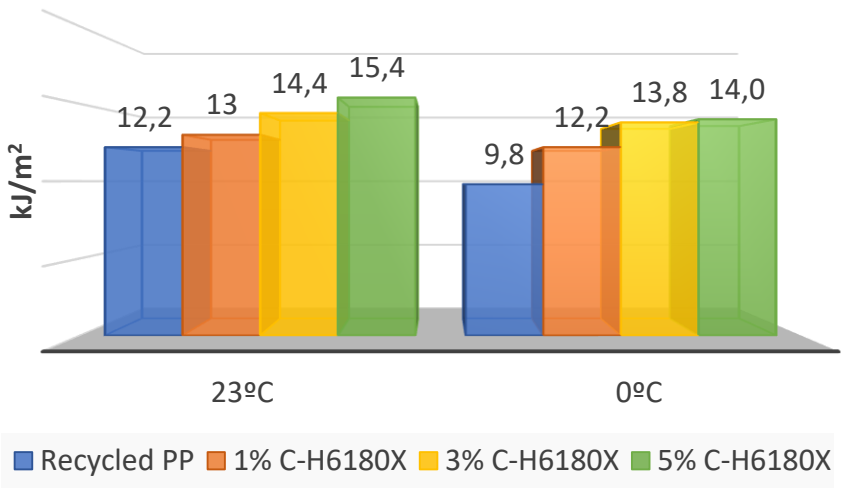
With only 1% of Calprene H6180X, the improvement in impact resistance is achieved. It is noticeable at both, room and low temperatures.

Charpy impact resistance (notched) (UNE 179-1:2011)



Izod impact resistance (notched) (UNE 180: A2-2013)



Results Recycle PP

Impact resistance at different temperatures (notched samples)

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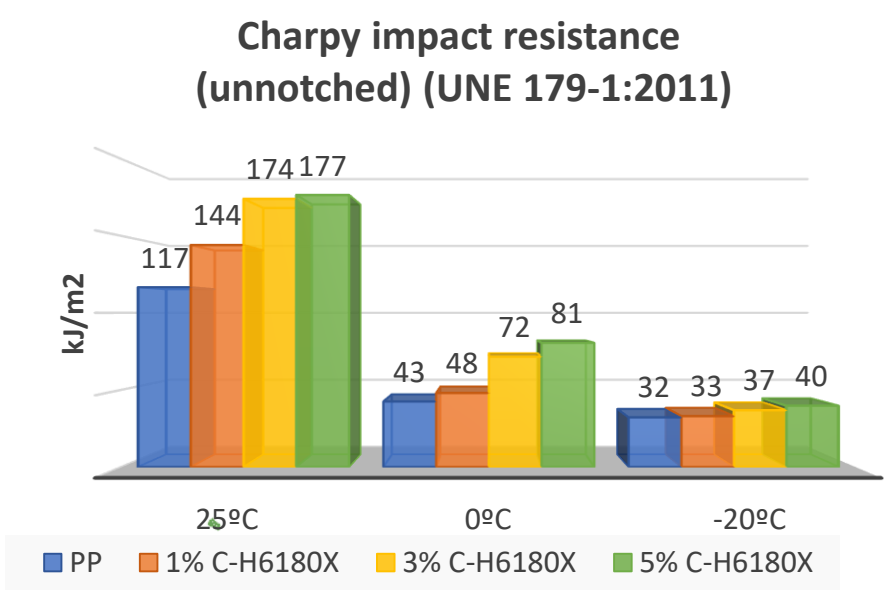
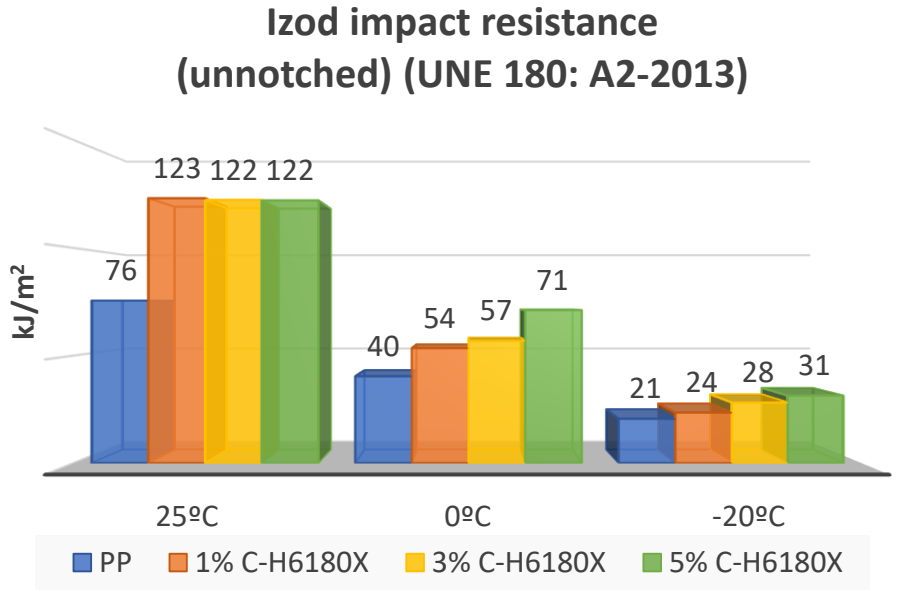
The increment in the impact resistance is observed even at very low temperatures like -20ºC





Results Recycle PP

Impact resistance at different temperatures (unnotched samples)

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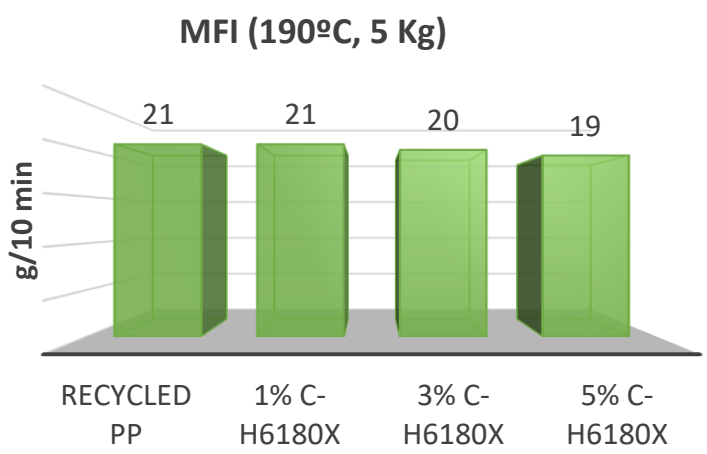
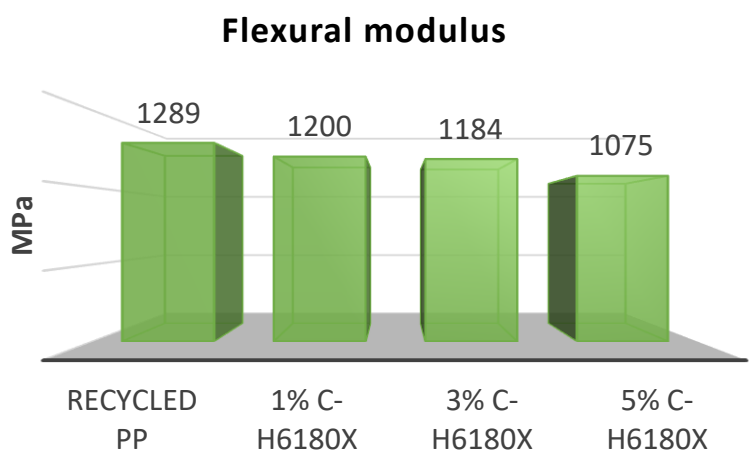
Melt Flow Index (ASTM D 1238-13)



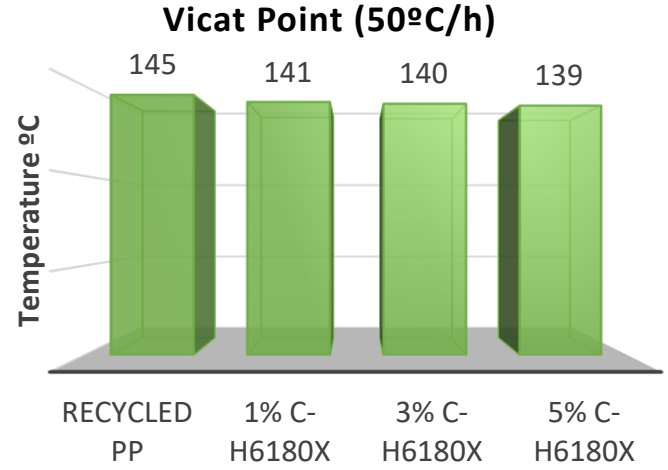
The procesability of the recycled PP is not affected by the presence of Calprene H6180X

Flexural modulus (ASTM E 691 2008)



The flexural modulus of the recycled PP is not strongly affected by the presence of Calprene H6180X

Vicat Point (UNE 306-15)



The vicat point remains nearly constant when increasing the content of Calprene H6180X

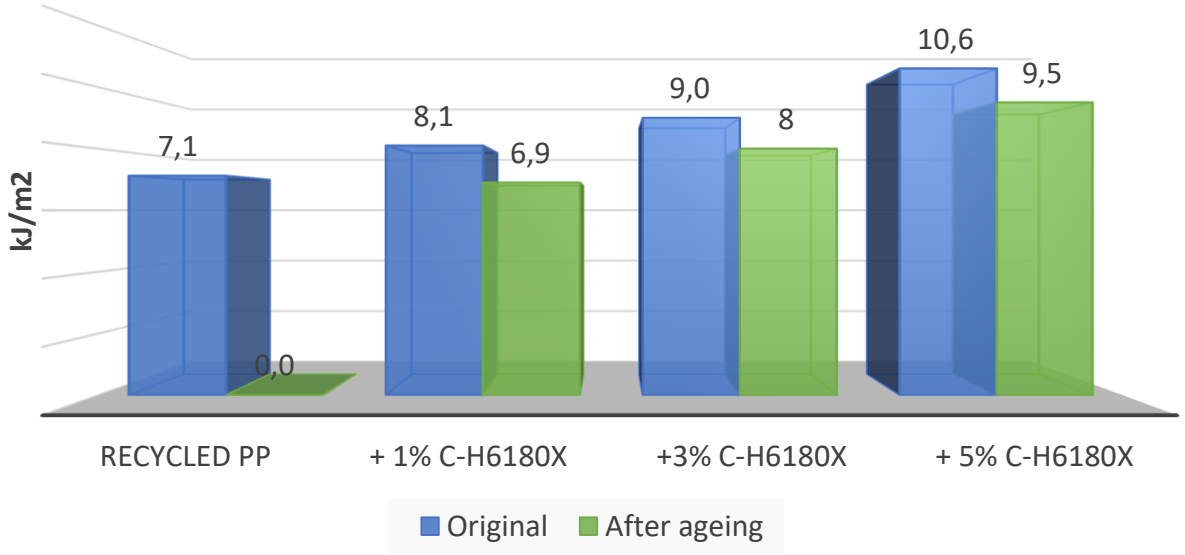
Results Recycle PP

Other important properties

Results Recycle PP Aging Test

Calprene H6180X makes recycled PP aging resistant.

Without it, the material is degraded after only 24 hours.



Some important sectors, like automotive or cable, have some requirements related to aging resistance.

The recycled material needs to have good impact resistance after 300 hours at 150ºC.

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Compounding of materials filled with talc

Many recyclers include fillers in the formulation of the new material to save costs. ***Dynasol*** has reviewed if the plastic modification is possible even within this context.

	Compound 4	Compound 5
Recycled PP	77%	67%
Talc	20%	30%
C-H6180X	3%	3%

Compounding procedure:

- Extrusion of the compound (twin-screw machine L/D:36):
  - Tª profile: 190-200-210-210-210ºC
  - Pressure: 50 Pa
  - Speed: 180 rpm
- Injection of test specimens at 210ºC

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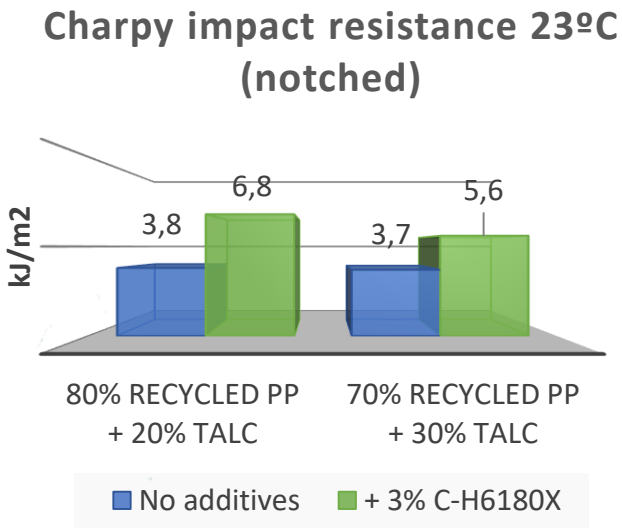
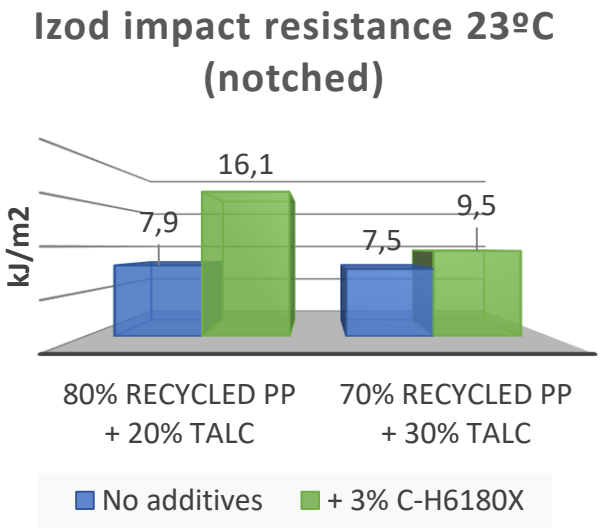
Results Recycled PP filled with talc

Impact resistance at different temperatures (UNE 179-1:2011 / UNE 180: A2-2013)

Calprene H6180X improves the impact resistance even when the material is charged with 20 or 30% of Talc





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