TECHNICAL INFORMATION SHEET 19

Reverte masterbatches – Recycling Quantified.

1. Introduction

Reverte oxo-biodegradable additive masterbatches are added to polyolefin products such as polyethylene packaging to impart an oxo-biodegradable property to the final article.

The special technical characteristics of the Reverte additive ensure that the product has a useful, pre-programmed, fit-for-purpose lifetime followed by a post disposal breakdown process that consists of embrittlement, microfragmentation and, finally, complete biodegradation to Carbon dioxide, water and biomass.

However, before their final disposal, products made from polymers, such as polyethylene bags, may be required to enter a recycling stream.

A large part of this re-use is through in-plant recycling of plastic waste generated in the production process, but some post consumer waste also finds its way into the recyclate stream.

Waste products such as these that contain Reverte oxo-biodegradable additive masterbatches are suitable for recycling as the additive will not normally be triggered before disposal and even post consumer waste is unlikely to be significantly degraded before re-use.

This Technical Information Sheet has been compiled to demonstrate the suitability of Reverte containing products for recycling.

2. Overview of Experimental Procedure

Polyethylene film recyclate consisting of in-house production waste was obtained from a packaging film manufacturer.

The same grade of polyethylene film, but in this case containing 1% by weight of oxo-biodegradable additive masterbatch additive was also obtained from the same source.

Samples of film were manufactured using the standard in-house recyclate plus varying levels of the oxo-biodegradable film recyclate.

Generally the level of re-introduction of such recyclate in industry is thought to be not more than 10% by weight. However, for the purposes of this study, levels of 10 and 20% were investigated.

Physical, mechanical and ageing properties of the resultant films were determined to quantify the effect of the addition of the oxo-biodegradable feedstock.

3. Results

3.1 Effect of Addition on Physical Properties

Oxo-biodegradable film in final product (%)	Final MFI (g/dmin)	Elongation at break (%)	Tensile Modulus (MPa)	Tensile Strength (MPa)
0	0.9	150	82	11.8
10	0.8	185	74	12.2
20	0.8	193	71	12.4

3.2 Effect of Addition on Degradation Properties

Oxo-biodegradable film in final product (%)	Relative Embrittlement Time
Virgin PE film	100
Recycled film with 0% OB additive	87
Recycled film with 10% OB additive	86
Recycled film with 20% OB additive	79

4. Discussion

It can be seen that the addition of quite large amounts of in-process oxo-biodegradable scrap to the normal polymer stream utilised has had a negligible effect on the physical properties of the films produced.

Generally the Melt Flow Index of a polymer would be expected to increase if the product is degraded. Inspection of the above results shows that in this case the MFI did not significantly change – in fact it slightly decreased, not indicating any premature degradation.

In comparison, the Elongation to Break would be expected to decrease as the polymer is degraded and this property was found to slightly increase with the level of OB additive. This is again indicative of no premature degradation taking place.

The Modulus (stiffness) and the Tensile Strength values obtained were also not significantly changed in a way that would indicate any degradation of properties.

It would be expected that a recycled polymer feedstock would give somewhat inferior ageing properties to a virgin feedstock. This small deterioration in time to embrittlement would not be expected to be of any consequence in the fit-for-purpose lifetime of the final product (film). It can be seen that in this case the recycled feedstock gave a 13% reduction in the time to embrittlement after ageing in an accelerated ageing light cabinet at 50^{o}C.

it can be seen that the film containing 10% recycled oxo-biodegradable film did not significantly alter the accelerated ageing properties, giving a 14% reduction compared with the virgin polymer control, virtually the same as the sample without any oxo-biodegradable recyclate.

4. Discussion (continued)

The film containing 20% oxo-biodegradable recyclate gave a 21% reduction in time to embrittlement compared with the virgin product and a 9% reduction when compared with the 100% recycled product.

Whilst these results are slightly higher than those obtained from the 10% addition samples, they are not thought to be such as to significantly detract from the useful working life of the polymeric product.

5. Conclusion

The addition of high levels of oxo-biodegradable film recyclate has not significantly affected the immediate physical properties of a recycled polyethylene film and has had a minimal and insignificant effect on the film's ageing properties.

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