OXO-BIODEGRADABLE PLASTICS ASSOCIATION

Website www.biodeg.org E-mail info@biodeg.org
Registered office 12 Compton Road, London SW19 7QD

A not-for-profit Association, Limited by Guarantee
EU reg. no. 186937011291-26

RECYCLING

The Oxo-biodegradable Plastics Association supports the recycling industry, and has proposed that an IDEAL carrier bag should be an oxo-biodegradable bag with 40% recycled content.

The OPA agrees with the recyclers that bio-based "compostable" plastic cannot be recycled with conventional plastic, and that it should not therefore be encouraged (see the Austrian TCKT report of Nov 2013[1] commissioned by EuPC). However, this is not the case with oxo-biodegradable plastics, for the reasons given in Roediger laboratories report of May 2012,[2] and their supplementary report of Dec 2013,[3] having reviewed the TCKT report.

Recyclers should be worried about bio-based "compostable" plastics, because they will certainly compromise an oil-based recycling stream if added at as little as 2%. Oxo-biodegradable plastics will not.

Oxo-biodegradable plastics have been in commercial use since the 1970s, and are intended to address the problem of plastic waste which escapes into the open environment and cannot realistically be collected. They are based on commodity polyolefins, particularly polyethylene and polypropylene. They can be manufactured with the same machines as conventional plastics at little or no extra cost, and their performance during manufacture and use is indistinguishable from that of regular polyolefins. Their biodegradation is caused by formulations that promote oxidation in the presence of oxygen, and convert the plastic into a biodegradable material.

OPA members' experience is entirely consistent with the Roediger reports. In the last two years enough masterbatch has been sold to make more than 600,000 tons of oxo-biodegradable plastic products, and we know that oxo-biodegradable plastic products have been successfully recycled for the past 10 years by companies around the world. In the UK Tesco's carrier bags were oxo-biodegradable until recently, and they were successfully recycled. In those ten years we have heard no reports of any difficulty encountered.

In its 2011 report for the UK Government, and in its 2012 supplementary report,[4] Intertek found that oxo-biodegradable plastic bags have better environmental credentials than conventional plastic, bio-based plastic, paper, or cotton.

Extensive tests by Roediger laboratories of Stellenbosch South Africa were reported on 21st May 2012. They concluded that "*Plastic products made with oxo-biodegradable technology may be recycled without any significant detriment to the newly formed recycled product.*" Roediger examined the report prepared by the Transfercenter für Kunststofftecknik GmbH ("TCKT") dated 12th November 2013 on

---

[1] http://www.plasticsconverters.eu/uploads/FINAL%20Impact%20of%20Degradable%20Plastic%20Carrier%20Bags%20on%20mechanical%20recycling.pdf
[2] http://www.biodeg.org/files/uploaded/ROEDIGER%20REPORT%2021%20May%202012.pdf
[3] http://www.biodeg.org/files/uploaded/Roediger%20on%20EuPC%205%20Dec%20'13.pdf
[4] http://www.biodeg.org/files/uploaded/Intertek_Final_Report_15.5.12(9).pdf

behalf of European Plastic Converters ("EuPC") and reported that there is no reason to change their conclusion.

Recycling of clean plastic off-cuts within the factory is commonplace and well understood, but recycling of contaminated post-consumer plastic waste is often uneconomic, and some national standards (eg Indian Standard 14534 para. 7.3.4) discourage it. Recycled plastic from post-consumer waste is not suitable for food-contact.

Recycled plastics are not normally degradable and will, like ordinary plastics, accumulate for decades if they get into in the open environment. However, recycled plastic as well as virgin plastic can now be made oxo-biodegradable by the inclusion of a pro-degradant formulation at the extrusion stage.

The length of the useful life of an oxo-biodegradable plastic product is determined by antioxidants (processing stabilisers and UV stabilisers) contained within the formulation, which can be modified so that the plastic product degrades according to whatever approximate timescale is specified.

Obviously, if any plastic is going to be recycled it will have to be collected and recycled before it has become embrittled, and if it has not been collected and recycled by then, it probably never will be.

The reason why oxo-bio additive is included @ 1% is that it will not work if added at a lower rate. Therefore if the new product was made with 50% recycled oxo-biodegradable plastic it would contain only half the amount of additive required to create oxo-biodegradability.

If a new product is to be made with recycled polymer which contains or might contain a pro-degradant formulation and the new product is intended to be degradable, the process is obviously straightforward, as a pro-degradant effect is actually desired. This applies particularly to recycling of oxo-biodegradable offcuts in plastic factories, or where oxo-biodegradable "back-of-shop" plastics (e.g. shrink-wrap pallet-wrap, bread-wrapping etc) are sent back for recycling into new oxo-biodegradable products.

Short-life products: If the new product to be made from recyclate which contains or might contain a pro-degradant formulation, is intended for short-life products such as refuse-sacks, bin-liners, shopping bags, bread wrappers etc. the effect of any pro-degradant formulation is unlikely to manifest itself during the intended service-life, and biodegradability for such items is in any event desirable. It is desirable because some of these items will always find their way into the land or sea environment, where they would otherwise subsist for decades after they had been discarded.

Long-life products: Since polymers lose stabilisers every time they are reprocessed, it is good practice to add new stabilisers each time, whether the feedstock contains oxo-biodegradable plastic or not. If suitably formulated, the stabilisers will also neutralise any pro-oxidant which may still be effective.

Building Films:

The British Packaging and Industrial Films Association Standard 6/83A-1995 for polyethylene damp-proof membranes specifies LDPE as a suitable material and allows "segregated traceable recyclates of such." Therefore, manufacturers do not use recyclate made from post-consumer plastic waste such as plastic carrier bags, which is not segregated and traceable.

Damp-proof membranes are made from LDPE, but supermarket carrier bags are normally made from HDPE + $CaCO_3$, which is not the same material. These carrier bags would not therefore be recycled into long-life films but into similar short-life products.

Even if HDPE + $CaCO_3$ did find its way into damp-proof membranes oxo-biodegradation requires oxygen, so it cannot proceed where the dpm is covered with concrete, except if the edges (which are not acting as a dpm) are protruding. Stabilisers would be necessary only for building films intended to be exposed to the open air, and stabilisers such as HALS are routinely included. The stabiliser would be added not by the recycler but by the manufacturer of the new product, having regard to conditions and Standards in his country for the particular product.

Pipes:

(a) ISO Standard 8779 "Plastics piping systems — Polyethylene (PE) pipes for irrigation" provides at para. 4.2 that only clean reprocessable material generated from a manufacturer's own production may be used if it is derived from the same resin as used for the relevant production. As the origin of the material will be known, it will not therefore be used for this purpose if it contains any pro-degradant formulation.

(b) European Standard EN 12201-1 provides at para 4.3 that items such as PE pipes for water for human consumption, cannot be produced from recycled material other than process regrind (ie in-house recycled plastic whose characteristics are known). Residues of oxo-biodegradable materials are therefore not an issue here. Some standards eg Indian Standard 14534 provide that recycled plastic may not be used at all for products which come into contact with foodstuffs, pharmaceuticals and drinking water.

(c) South African SABS piping is manufactured to a specification which permits the use of recyclate only from "in-house scrap." Small bore piping class 6 and 10 is usually LDPE and, larger sizes, HDPE. "In-house scrap" is scrap which has been generated during manufacture of the SABS grade pipe which can be chipped up and added back. There is therefore no difficulty with the manufacture of such piping, as the provenance of the recyclate is known and it will not be used for this purpose if it contains any pro-degradant formulation.

(d) "SABS Equivalent" piping is manufactured from 100% recycled material according to the SABS specification but is not marked. It is usually HDPE with from 5-20% LDPE blended for flexibility. For a quality product where a guarantee is demanded, clean industrial scrap is used where product history (material source and material grade) is known. This will not therefore contain a pro-degradant formulation.

(e) Agricultural and Domestic piping is manufactured in South Africa from 100% LDPE scrap. Normally the same scrap is used as in (c) above, but it should only be used in low-tech situations if the origin of the recyclate is unknown. Stabilisers should always be added if there is any doubt about the origin of the recyclate. "Low tech situation" refers to small bore piping Class 3 and 6 used for piping water to cattle or game troughs or on domestic irrigation systems, essentially at low pressures.

RECYCLING OF "COMPOSTABLE" PLASTICS

This second class of biodegradable plastics generally based on intermediates of vegetable origin derived from crops.

The report prepared by the Transfercenter für Kunststofftecknik GmbH ("TCKT") dated 12 November 2013 on behalf of European Plastic Converters ("EuPC") Hydro-confirms that this class of plastics cannot be recycled with normal oil-based plastics.

These biodegradable plastics, unlike oxo-biodegradable plastics, cannot therefore be recycled with the most abundant components of plastic waste. They would therefore have to be segregated from the waste stream and treated separately, with considerable increase in cost. Furthermore it is difficult for the manufacturers of recyclate to physically distinguish between hydro-biodegradable and normal plastic.

Crop-based plastics were developed some 20 years after their oxo-biodegradable counterparts, and there are two sub-classes of different origins.

The earliest was poly (3-hydroxy butyrate). PHB is produced biologically from sucrose. This is an expensive product with a relatively low thermal decomposition temperature, which was partially overcome by varying the alkanoate structure (PHA). The second sub-group of hydro-biodegradable polyesters are the synthetic aliphatic polyesters, which are in some cases based on biological intermediates (e.g. polylactic acid - PLA).

Both sub-groups are physically incompatible with main stream packaging wastes (PE, PP, ABS and PET) and aliphatic polyesters cannot be readily reprocessed with commercial polyesters, due to their thermal incompatibility

Plasticised-starch is a different type of bio-based plastic used in packaging. This material has acceptable initial properties but is sensitive to hydrolysis during use, and cannot normally be re-processed for use in the same application. Like other bio-based plastics, they are not compatible with mainstream plastics used in packaging and cannot be co-recycled into useful secondary products.

Hydro-biodegradable plastics (often referred to as bioplastics) have been called into question by recyclers and Recoup's project manager has warned that starch-based plastics could "have a negative impact on plastics recycling as a whole. …. the fear is that bioplastics will increasingly find their way into the plastics recycling stream – impacting on quality and un-doing the work done on raising public awareness of plastics recycling."