



OXO-BIODEGRADABLE PLASTICS ASSOCIATION

An Incorporated not-for-profit Association
EU reg. no. 186937011291-26

OPA comments on article by David Cornell on degradable plastics¹

It is a fact that every year, approximately 280 million tons of plastic is produced globally, and most consumer plastics end up in landfill or as litter polluting land and sea. Plastic pollution of the environment is a worldwide problem, and that is why campaigners around the world are trying to ban plastic bags.

It is also true that at the present time there is nothing to replace plastic, and for most applications it is the best option for protecting our food and other goods from damage and contamination. It is waterproof, strong and flexible; can be adapted for a variety of products and is not expensive.

Mr. Cornell refers extensively to landfill, but the problem has nothing to do with landfill, because if the plastic has been collected and sent to landfill it has been disposed of responsibly. Plastic should not be landfilled at all, and soon it will not be allowed in Europe – because plastic is useful for its calorific value and for recycling. Biodegradation should not be expected in landfill, because biodegradation in anaerobic conditions generates methane, which is a dangerous greenhouse gas, more powerful than CO₂.

In an ideal world all plastic waste would be collected, but we don't live in an ideal world and in most countries the only sensible way to deal with plastic that escapes into the environment, endangering wildlife and clogging up waterways is to make sure if we can that it does not remain as a plastic for decades. So here we have a dilemma - what do we do with the thousands of tons of plastic which are not collected for recycling or other forms of responsible disposal?

In order to meet this challenge oxo-biodegradable plastic has been invented. There is little or no additional cost, as it can be made with the same machinery and workforce as conventional plastic. For the sake of clarity, there are two very different types of biodegradable plastic. They are:

- “Compostable” - (also loosely known as “bio-based plastics” or “bioplastics”) tested according to EN13432 or ASTM D6954 to biodegrade in the special conditions found in industrial composting.
- Oxo-biodegradable - made from polymers such as PE and PP, containing extra ingredients (which do not include “heavy-metals”) and tested according to ASTM D6954 or BS8472 to degrade and biodegrade in the open environment.

There are in addition some additives marketed as “enzymatic” or “microbiological” but these are not oxo-biodegradable, and it is doubtful whether the plastic (as distinct from the additive) will degrade.²

¹ RESOURCE RECYCLING April 2012

² So called “enzymatic additives” have not been proved to cause degradation of the plastic as distinct from degradation of the additive itself. See http://www.biodeg.org/files/uploaded/biodeg/executive_summary/ENZYMATIC%20ADDITIVES%201.7.13.pdf

A bio-based “compostable” plastic will generate methane in anaerobic conditions but an oxo-biodegradable plastic will not, and as Mr. Cornell points out, generation of methane in landfill should not be encouraged. Some landfills are designed to collect methane but how do you know whether your bio-based plastic item will end up in one of them?

Intertek carried out an LCA in 2012 which included the litter metric and put the environmental credentials of oxo-biodegradable plastic ahead of bio-based and conventional plastic.³ It is already used by environmentally-responsible companies around the world, and is mandatory in Africa, Asia and the Middle East, where governments recognise that making plastic smarter is preferable to trying to ban it. They do not want to leave plastic waste in the environment as a problem for future generations, and they understand that oxo-biodegradable plastic offers an “insurance policy” if all else fails.

Mr. Cornell has misunderstood the FTC rules as to timescale for degradation. The one-year time limit is applicable only to cases where an unqualified claim is made - but not if the claim is qualified by stating the expected timescale, and making it clear that the plastic is not designed to degrade deep in landfill.

Oxo-bio plastic has the same strength as ordinary plastic, but it automatically and entirely converts in the presence of oxygen into a biodegradable material after its designated useful life. Light and elevated temperatures are not necessary for the conversion process, but they will accelerate it. Nor is moisture necessary. The plastic does NOT just fragment into small pieces. When it has become biodegradable it is no longer a plastic, and it has to pass the tests in BS8472 or ASTM D6954 to prove that it is biodegradable and non-toxic and that it does NOT contain heavy metals.

It does not therefore create microplastics, and the particles of plastic found in the oceans by NGOs and scientists are particles of ordinary plastic.⁴

Oxo-biodegradation is officially defined by CEN⁵ as “degradation resulting from oxidative and cell-mediated phenomena, either simultaneously or successively.” It has been studied by scientists for many years, most recently at the Technical Research Institute of Sweden and the Swedish University of Agricultural Sciences, and a peer-reviewed report of the work was published in Vol 96 of the journal of Polymer Degradation & Stability (2011) at page 919-928.

Starch is not used in oxo-biodegradable plastics, and Mr. Cornell is right to point out that the starch will degrade but not the plastic. Nor is degradation caused by creating a biofilm. Undegraded polymers will repel water, and commonly-occurring microbes have not been proved to be capable of biodegrading plastics unless the molecular weight of the plastic has been reduced by oxidation.⁶ This reduction can be promoted by an oxo-biodegradable catalyst, or by a natural process over many decades.

After the reduction has occurred the material will be bio-assimilated by commonly-occurring bacteria and fungi, and no special micro-organisms are required. When anything biodegrades in aerobic conditions CO₂ is released, and in the case of bio-based plastic this occurs very rapidly to satisfy EN13432 and ASTM D6400. Oxo-biodegradable plastics release CO₂ much more slowly in the open environment, and it is absorbed by surrounding vegetation.

³ [http://www.biodeg.org/files/uploaded/biodeg/executive_summary/Intertek%20Final%20Report%2015.5.12\(1\).pdf](http://www.biodeg.org/files/uploaded/biodeg/executive_summary/Intertek%20Final%20Report%2015.5.12(1).pdf)

⁴ http://www.biodeg.org/files/uploaded/biodeg/Plastics%20in%20the%20Marine%20Envmnt%20-%20Sym%203%20Aug%202013_1_.pdf

⁵ the European Standards Organisation

⁶ See footnote note 1

It is often said that biodegradable plastic is a licence to litter, but this is just an assertion. It is impossible to tell the difference by appearance, touch, or smell, and even if there were a label, the type of people who cause litter are not likely to look for the label before deciding to throw a plastic bag out of a car window.

Mr. Cornell seems to regard recycling as the greatest good, to which every other environmental and economic factor should be subordinated, and perhaps we need to revisit that assumption. Yes, recycle where it makes sense, but we must take into account the fossil fuel used, the road space occupied, the CO₂ and pollution emitted, and all other factors involved in collecting, baling, cleansing and reprocessing plastics. In some circumstances and with some types of plastic it makes sense, but not always.

Oxo-biodegradable and other oil-based plastic do not cause resource-depletion, as they are made from a by-product of oil which used to be wasted. The oil is extracted to make fuels, and the same amount would be extracted even if oil-based plastics did not exist. By contrast huge amounts of fossil fuel are consumed in the agricultural production and polymerisation process of “bio-based” plastics.

There is no oxo-biodegradable additive effective for PET bottles, so we are here concerned with short-life products such as shopping bags, garbage sacks, and other products made from PE, PP or PS.

Post-household plastic waste consists of a variety of different polymers, usually contaminated with other materials. Separation is possible but is expensive and may not be justified in economic or environmental terms. These polymers are not suitable for food-contact if recycled, and it is unlikely that they will find their way into products such as building films. If recycled at all they will typically be used for low-value, short-life items for which degradability is a desirable feature. Supermarket carrier bags are normally made from HDPE + CaCO₃, and these bags would not be recycled into long-life films but into similar short-life products.

Oxo-biodegradable plastic CAN be recycled if collected during the useful life of the product, without the need for separation⁷, but if separation were required the oxo-biodegradable plastics industry could easily include an inexpensive marker.

Unlike bio-based plastic the useful life can be controlled by adjusting the formulation of the additive as required. Typically degradation will not start for 6 months in the case of a bread wrapper, or 18 months for a plastic shopping bag (in order to allow re-use), and if the item is not collected for recycling during this time it probably never will be. Oxo-biodegradable plastics are designed so that they will not degrade in storage, and fitness-for purpose for the required period can be guaranteed.

A specialist laboratory carried out detailed tests in 2012, and examined the Austrian TCKT report in 2013⁸. They concluded that (a) bio-based ‘compostable’ plastics cannot be safely recycled with oil-based plastics, but that (b) plastics made with oxo-biodegradable technology could safely be recycled in a post-consumer waste stream without the need for separation.

It is time for a much better dialogue between the recyclers and the oxo-biodegradable plastics industry. If we can combine the use of oxo-biodegradable technology with the three R’s of ‘Reduce, Reuse and Recycle’, we can all help win the war against plastic waste for the lasting benefit of future generations.

⁷ <http://www.biodeg.org/files/uploaded/ROEDIGER%20REPORT%2021%20May%202012.pdf>

⁸ <http://www.biodeg.org/files/uploaded/biodeg/Roediger%20on%20TCKT%20Rept%205%20Dec%20'13.pdf>