

# Oxo-Biodegradable Plastics Association

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## PLASTICS IN THE ENVIRONMENT

A Briefing Note

### PLASTIPHOBIA

This is a new word which entered the English language in 2019. It describes the emotional reaction against plastic which spread like wildfire when David Attenborough's "Blue Planet" programme appeared on the BBC. Environmentalists and politicians leapt instantly to ban plastics all around the world - but in most cases they are making a mistake.

A report was published by the Green Alliance in January 2020 [https://www.green-alliance.org.uk/plastic\\_promises](https://www.green-alliance.org.uk/plastic_promises) who had interviewed representatives from five of the UK's major supermarkets as well as from major consumer goods and beverage companies. One of them had received many complaints saying that "plastic is evil and has no place, regardless of any positives it might have in addressing food waste and what not... It's been ferocious."

However, these companies need to resist Plastiphobia, because the report finds that "Worryingly, the brands report that decisions to switch away from plastic are often made without considering the environmental impact of the substitute materials chosen." Multiple interviewees indicated the desire to avoid "kneejerk reactions", suggesting that, while they know they need to have a better approach to plastic and packaging, they "need to have time to get the right solution in place." One respondent added: there is "not a lot of joined up thinking going on." Another noted: "I think there's a lot of pressure to move to alternatives, which aren't necessarily better from an environmental and climate impact point of view."

The Report says that some decisions have been taken knowing it could actually increase environmental burdens. One supermarket representative was frank: "We are aware that [by switching from plastic to other materials] we may, in some cases, be increasing our carbon footprint." A brand representative bluntly complained about misinformation being spread about the environmental credentials of non-plastic single use packaging formats: "The past year has just really annoyed me with companies coming out and boasting about not using plastic, even when they're in single use glass, and their carbon emissions are going to be off the scale."

Paper? Some supermarkets had shifted to single-use paper bags, but this is a worrying trend, as paper bags can have much higher carbon impacts, and will disintegrate if they get wet. A 2011 study for the Northern Ireland Assembly found that paper bags generally require four times as much energy to manufacture as plastic bags. A February 2018, Life cycle assessment of carrier bags in Denmark concluded that "When factors like ozone depletion, human and ecosystem toxicity and water and air pollution are accounted for, a paper bag would need to be reused 43 times to have a lower impact than the average plastic bag."

Refillables? concern with the in-store refill model is the reduction in shelf-life for some products, with one respondent noting that some fresh drinks would last just two days if poured into a customer's own bottle, compared to 20 to 30 days in a factory sealed container.

Plastic is actually the best material for a wide range of everyday uses, and is much the best for protecting our food from contamination and preventing food-waste and disease. It also has a much lower global-warming potential than other materials used for packaging according to LCA's performed by Intertek. Plastic is made from a by-product of

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refining oil, which is extracted to make fuels, and these fuels would be made whether plastic existed or not, so plastic is not itself causing any depletion of fossil-resources. When the plastic becomes waste, its calorific value can be used to generate heat and electricity if, instead of being sent to landfill or unsuitable for recycling, it is sent to modern, non-polluting, thermal-recycling units

The only problem with plastics is the length of time they can lie or float around if they escape into the open environment, but this problem can now be solved with oxo-biodegradable technology.

## MICROPLASTICS

These are tiny pieces of plastic, which are being found on land, in the sea, and now even in the air we breathe. They are created by the fragmentation of ordinary plastics caused by the effects of uv light and mechanical stress. The problem is that although these plastics are fragmenting, their molecular-weight remains too high for biodegradation, so they persist in the environment, getting smaller and smaller over a period of many decades. The answer to this problem is to use oxo-biodegradable technology, so that if they do get into the open environment the molecular-weight of the plastic will rapidly reduce and it will cease to be plastic. It will then have become a source of nutrition for micro-organisms, who recycle it naturally, back into nature.

A report was published in 2017 by the Ellen MacArthur Foundation and endorsed by some of the world's largest producers of the very plastic packaging which is polluting the oceans. It was also supported by the German and Italian producers of crop-based plastics who see oxo-biodegradable plastics as a threat to their market-share. The Report claimed that "oxo-degradable" plastics simply fragmented into tiny pieces of plastic - but having engaged with our scientists they no longer say that.

They now admit in their May 2019 report that "oxo-degradable" (they mean oxo-biodegradable) plastics are manufactured so that they can degrade faster than conventional plastics and that they do become biodegradable, but they say that "it is not yet possible accurately to predict the duration of the biodegradation for such plastics."

For that reason a broad indication only can be given as to timescale. It is however possible to say with certainty that at any given time and place in the open environment an oxo-biodegradable plastic item will become biodegradable significantly more quickly than an ordinary plastic item. Sunlight and heat are not essential, but they will accelerate the process and it will therefore proceed more quickly in hot countries than in the UK.

It is not important how long a particular piece of plastic in a particular place will take to biodegrade – the importance of oxo-biodegradable technology is that it will gradually reduce the overall burden of plastic in the environment.

There is huge resistance to this technology from some of the largest companies in the world who make "bio-based plastics" and from other large companies who will not spend even an extra 1% on oxo-biodegradable technology to protect the environment from their products, which we can see with their name on them, littered all over the globe. They have all heavily lobbied governments and international institutions, especially from Germany and Italy.

## THE SCIENCE

The biodegradability of oxo-biodegradable polymers has been extensively studied and reviewed in scientific articles over more than 40 years since the publication by Professor Scott of his academic textbooks on the subject "Polymers in the Environment" - (Royal Society of Chemistry), "Degradable Polymers, Principles and Applications" (Kluwer Academic Publishers) and many peer-reviewed academic papers on this subject. In these publications Professor Scott has made it clear that oxo-biodegradable plastic will degrade and then biodegrade in the open environment very much more quickly than ordinary plastic, leaving no persistent fragments and no toxicity.

In 2018 the scientific evidence was reviewed by a distinguished former deputy judge of the High Court in England. <https://www.biodeg.org/uk-judge-find-the-case-for-oxo-biodegradable-plastic-proven/> This has been confirmed by later research published by Queen Mary University London in February 2020. <https://www.biodeg.org/wp-content/uploads/2020/02/published-report-11.2.20.pdf>

## RE-USABLE BAGS

Ordinary thin plastic shopping bags are not “single-use” items. They can be used several times for shopping, and can then be used as bin-liners for kitchen waste.

Scientists at RMIT University, Melbourne found that reusable shopping bags are only beneficial to the environment if they are used at least 104 times. This is because thicker plastic bags require more plastic and more energy to produce than regular bags. Also, they will create more pollution, including microplastics, if they escape into the sea or the desert at the end of useful life, unless they are made with oxo-biodegradable technology, which can be programmed to start degrading in whatever timescale is required.

Re-usable bags are rarely, if ever, washed, and are often stored in a cupboard or boot of the car where germs can multiply. Deadly micro-organisms such as Coronavirus, E.coli and Campylobacter can be transferred to food inside the bag.

However, there is a solution for those who still prefer re-usable bags. They can buy bags made with anti-microbial technology which can be added to the polymer used for making the bags, and it can also be added to the laminate coating inside jute bags.

## COMPOSTABLE PLASTIC

“Compostable” plastic is addressing the wrong problem. The problem is that there is too much plastic getting into the open environment.

A “Grocer” magazine survey of more than 1,000 individuals in 2019 found that “consumers think that plant-based compostable plastics are the most environmentally friendly packaging materials, ahead of paper, glass, cardboard, conventional plastic and aluminium, in that order.” But most consumers don’t realise that “compostable” plastic does not convert into compost, and that it is tested to biodegrade in an industrial composting facility – not in the open environment. It is required by ASTM D6400 and EN13432 to convert rapidly into CO<sub>2</sub> gas, and the last thing the planet needs is more CO<sub>2</sub>.

In fact people should not be allowed to market any kind of plastic as “compostable.”

Even the industrial composters do not want it. In a January 2020 Report the composters of Oregon <https://www.biodeg.org/oregon-composters-dont-want-compostable-packaging/> gave nine reasons why they don’t want “compostable” plastics, and in the same month the City of Exeter, UK rejected “compostable” plastic and paper. <https://www.biodeg.org/exeter-rejects-compostable-plastic/>

See also <https://www.usinenouvelle.com/article/sacs-plastiques-compostables-le-grand-malentendu.N926789>

<https://bioplasticsnews.com/2020/02/17/the-composting-fairy-tale/>

## RECYCLING

Just as plastic cannot be collected from the oceans and deserts for composting, it cannot be collected for recycling.

Whilst almost all pre-consumer waste (eg factory offcuts) is recycled or reused, almost all post-consumer waste plastic is not. There are reasons for this, one of which is that a great deal of water is needed to wash post-consumer waste to make it useable, so the amount of waste-water generated is enormous. Moreover, this process leaves prodigious quantities of dirty solid waste, including biological waste that is hazardous and highly undesirable.

The recycling charity RECOUP says (“Recyclability by Design”) that “where plastic products are particularly lightweight and contaminated with other materials, the energy and resources used in a recycling process may be more than those required for producing new plastics. In such cases recycling may not be the most environmentally sound option.” It is too costly in financial and environmental terms to collect it, transport it, sort it, bail it, store it, and then reprocess it. These are exactly the kind of products for which oxo-biodegradable technology is used.

Recycling is sometimes used as an objection to biodegradable plastic, on the basis that it would contaminate a post-consumer waste stream, but this is clearly inapplicable if the relevant waste plastic is not going to be mechanically recycled anyway.

The best way to deal with contaminated post-consumer waste plastic is to send it to modern, non-polluting, thermal recycling facilities and to use the energy released from the plastic to generate electricity, instead of wasting it by sending to landfill.

Although oxo-biodegradable plastic is used for low-value items which are not worth recycling, experts in Austria and South Africa have found it suitable for recycling with ordinary plastic if anyone still wanted to recycle it. See <https://www.symphonyenvironmental.com/resource/new-tckt-report-confirms-oxo-biodegradable-plastic-can-be-recycled-with-ordinary-plastic/>

They also found that bio-based plastics are not recyclable.

## STANDARDS

The main Standards which have been written for testing oxo-bio plastic are ASTM D6954 (USA); BS8472 (UK); AFNOR AC T51-808 (France); and SPCR 141 (Sweden). Variants of these standards have also been adopted in other countries.

There is no European standard for OBP because the technical committees of CEN are dominated by representatives of the bio-based plastics industry who do not wish to see a standard which might increase competition from oxo-bio. Accordingly the OBP industry has worked at its own expense in the other standards organisations around the world to assist in developing new and better standards.

ASTM D6954 contains no less than six pass/fail criteria. 1. For the abiotic phase of the test (6.3 - 5% e-o-b and 5,000DA) 2. The tests for metal content and other elements (6.9.6), 3. Gel content (6.6.1), 4. Ecotoxicity (6.9.6 -6.9.10), 5. PH value (6.9.6) and 6. For the biodegradation phase (for unless at least 60% of the organic carbon is converted to carbon dioxide the test cannot be considered completed). It is for customers and governments to decide what timescales are acceptable to them.

## NON-TOXICITY

The OBP industry is as much concerned as anyone that its products should not introduce toxicity into the environment, and for this reason the standards for oxo-bio require testing to confirm that the residues are harmless. Essentially oxo-bio plastics are made from the same materials as conventional plastics, with the addition of only 1% of a masterbatch (most of which is itself ordinary polymer), and they have to pass the same tests in EN 13432 as "compostable" plastic to ensure that there is no toxicity and no metals exceeding the prescribed limits.

## THE MARINE ENVIRONMENT

According to Dr. Jean-François Ghiglione "Oxo-bio plastic will float and be at almost all times subjected to UV light, which accelerates the abiotic phase of degradation. This is not always the case on land, where plastic pieces are often covered by soil, leaves etc. and are less exposed to UV light." He points out that "there are specific bacteria living in the "seasurface microlayer" (the top millimetre of the ocean surface), where bacteria are different from those further below the surface. The bacteria in the sea-surface microlayer are particularly adapted to a hydrophobic environment (e.g. where oil materials are floating) and these bacteria are known to present a high capability for hydrocarbon degradation."

"Some marine bacteria, such as *Alcanivorax borkumensis* and *R. rhodochorous* are noted for their ability to biodegrade hydrocarbons and they are ubiquitous in the oceans. They occur in low concentrations in unpolluted seas but are observed to accumulate in waters polluted by oil spills. When presented with a source of carbon which is recognisable to the microorganisms as food, it seems therefore that they will respond with increased populations. The relatively low concentrations of microorganisms found in unpolluted oceans is not therefore a reason for expecting slow biodegradation."

Evidence is available - from tests done in real time at Bandol on the coast of France that oxo-bio plastic will degrade to low molecular-weight materials under natural conditions in water, and samples aged under those conditions were studied at Queen Mary University London where the abiotically degraded plastic was presented as the only source of carbon available to the bacteria. The samples were proved to be biodegraded by bacteria commonly found in the oceans, and separate samples were biodegraded by bacteria commonly found on land. The degraded plastic was also proved to be non-toxic to those bacteria.

## PROPENSITY TO LITTER

It is often claimed that biodegradable plastics are likely to encourage littering, but this is rarely advanced as an objection to bio-based plastics.

Even if there were a label describing a product as oxo-biodegradable, it is unlikely that the people who cause litter will look for the label before deciding to throw a plastic item out of a car window. Further, even if it were true that biodegradability encourages littering, and supposing that there would be 10% more litter - is it preferable to have 110 plastic items in the environment which will degrade and biodegrade in a few years or even months, or 100 plastic items which will lie or float around for decades?

It is not acceptable to continue debating this speculative proposition any longer, while thousands of tonnes of conventional plastic are getting into the environment every day, which will accumulate and pollute the environment for decades into the future.

A Life-cycle Assessment by Intertek shows that when the litter metric is included OBP is actually the best material for making carrier bags. See [http://www.biodeg.org/New%20LCA%20by%20Intertek%20%20-%20Final%20Report%2015.5.12\(1\)%20\(1\).pdf](http://www.biodeg.org/New%20LCA%20by%20Intertek%20%20-%20Final%20Report%2015.5.12(1)%20(1).pdf)

## THE EUROPEAN UNION

The January 2018 report of the EU Commission was concerned about microplastics, and recommended that the European Chemicals Agency (ECHA) be requested to make a study. This request was made under Art 69 of the REACH Regulation 2006/1907, and we submitted a substantial body of evidence to ECHA.

Ten months into the study, ECHA informed us that they were not yet convinced that microplastics are formed, and requested more time. The Commission then terminated the study, so there is no scientific justification for any ban from the European Union's own scientific experts and the purported ban is unconstitutional. ECHA also received a large number of submissions from all over the world that a ban of this technology would be seriously damaging for the environment if it were followed in their countries.

2<sup>nd</sup> March 2020