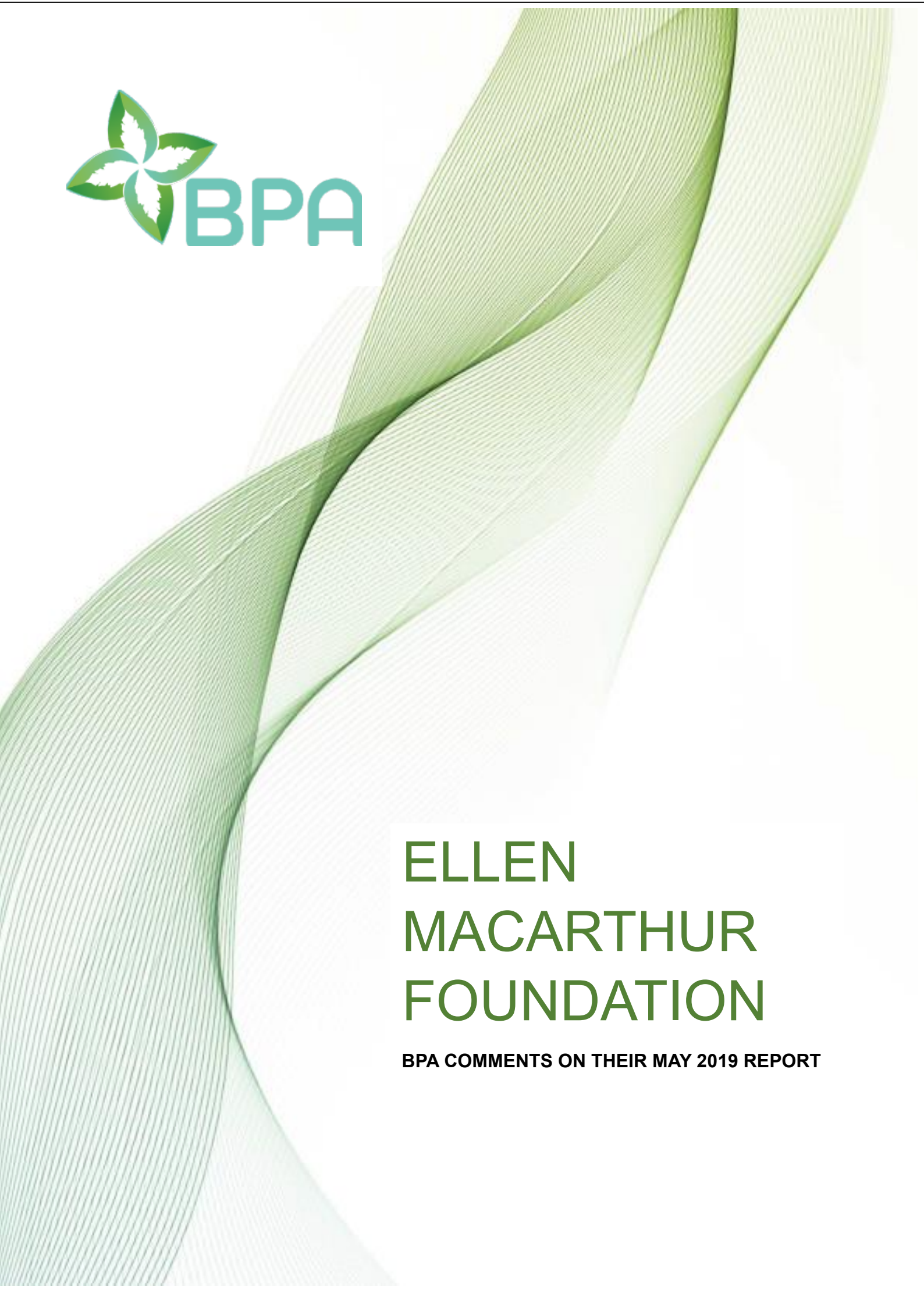

ELLEN MACARTHUR FOUNDATION

BPA COMMENTS ON THEIR MAY 2019 REPORT

The scientists who developed plastics have been working for more than 30 years to upgrade plastic products so that they remain fit for purpose but will become biodegradable if discarded at the end of their useful life, and will then be recycled back into nature by bacteria and fungi much more quickly than ordinary plastic. Their efforts have resulted in a technology which has become known as oxo-biodegradable (or oxo-bio) plastic. This is essentially environmental insurance, which automatically removes unwanted plastic if it becomes litter.

No special conditions are necessary for this technology to work. The only conditions necessary for oxo-biodegradation are oxygen and bacteria, both of which are ubiquitous in the open environment.

However, some stakeholders are still being influenced against oxo-biodegradable plastic by the Ellen MacArthur Foundation (EMF) report of November 2017 on what EMF call "oxo-degradable" plastic, on their website.

EMF say that "This report was originally published on 6 November 2017. In June 2018 the report was temporarily removed whilst the Foundation investigated queries raised by a third party." The third party was Symphony Environmental, who had engaged lawyers to point out to EMF that their report was inaccurate and misleading.

Symphony had a meeting with EMF, and discovered that the author of the reports is not a scientist, and that he had misunderstood the papers which he has cited – see below. It is notable that in their report they say *"we do not assume any liability whatsoever for the accuracy and completeness of such information."*

EMF avoided a court action by publishing a revised report with a fundamental difference. The 2017 report said that oxo-bio plastic simply fragmented, but they admitted in their May 2019 report that "oxo-degradable" plastics **are manufactured so that they can degrade faster than conventional plastics and that they do become biodegradable."**

In their report (which for some reason has become known as "the oxo statement") EMF say "Oxo-degradable plastics are being produced and sold in many countries, with society being led to believe that they completely biodegrade in the environment within relatively short timescales." It seems that EMF do not understand the difference between oxo-degradable and oxo-biodegradable plastics.[1] In fact, oxo-degradable plastics are ordinary plastics, which degrade abiotically, but do not biodegrade in the environment at all – except over a very long period of time.

By contrast, it is perfectly reasonable to lead society to believe that oxo-biodegradable plastics "completely biodegrade in the environment within relatively short timescales." See below.

EMF continue that "compelling evidence suggests that oxo-degradable plastics take longer than claimed to degrade." This is a meaningless statement, because nobody makes degradation claims in respect of oxo-degradable plastic.

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[1] "Oxo-degradation" is defined by CEN (the European Standards authority) in TR15351 as "degradation resulting from oxidative cleavage of macromolecules." This describes ordinary plastics, which abiotically degrade by oxidation in the open environment and create microplastics, but do not become biodegradable except over a very long period of time.

By contrast, "oxo-biodegradation is defined by CEN as "degradation resulting from oxidative and cell-mediated phenomena, either simultaneously or successively". This means that the plastic degrades by oxidation until its molecular weight is low enough to be accessible to bacteria and fungi, who then recycle it back into nature.

If EMF are intending to refer to oxo-biodegradable plastic, they do not say who is making the claims, and what timescale is being claimed. It is possible to produce oxo-biodegradable plastics so that degradation starts immediately after manufacture, (but they would have no useful life) Therefore, nobody is claiming that they will degrade instantly, but it can certainly be claimed that they will degrade and biodegrade very much more quickly than ordinary plastic. Indeed, the length of the useful life of the plastic item can be programmed by adjusting the formulation of the oxo-biodegradable masterbatch. This cannot be done with plastics marketed as "compostable."

EMF continue that "they fragment into small pieces which contribute to microplastics pollution." Nobody doubts that this is true of oxo-degradable (i.e. ordinary) plastic, and this is why it should not be used for short-life products unless upgraded with oxo-biodegradable technology. However, as mentioned above, EMF admit that oxo-biodegradable plastics do become biodegradable, so the only remaining issues are rate and extent. Research at Queen Mary University London has shown biodegradation 90 times faster than ordinary plastic. https://www.biodeg.org/wp-content/uploads/2020/05/published-report-11.2.20-1.pdf and Symphony has a report from Intertek showing 92.74% biodegradation (only 90% is required by EN13432 or ASTM D6400 for plastic marketed as compostable).

The "precautionary principle" is often relied upon by EMF, who seem to think that it means "ban first and ask questions later." It was described by Lord Sumption on 31st December 2021[2] as "essentially a principle for making decisions radically affecting people's lives without adequate evidence." Lord Sumption is one of the United Kingdom's most distinguished jurists.

The view of the European Court of Justice in T-13/99 Pfizer Animal Health SA v Council ECLI:EU:T:2002:209 is that "…if it is not to adopt arbitrary measures, which cannot in any circumstances be rendered legitimate by the precautionary principle, the competent public authority must ensure that any measures that it takes, even preventive measures, are based on *as thorough a scientific risk assessment as possible."*

"As thorough a scientific risk assessment as possible" would be made in Europe by the European Chemicals Agency, who are the European Union's scientific experts in this field, but EMF do not mention that in 2017 the Agency made a call for evidence on this very subject. They received a large amount of evidence from a wide range of stakeholders (see eg the Evidence from Intertek at https://www.biodeg.org/wp-content/uploads/2021/01/Intertek-Report-to-ECHA-24.5.18.pdf) and informed the BPA on 30th October 2018 that they are not convinced that it creates microplastics. ECHA has never produced a dossier justifying any restriction on oxo-biodegradable plastic.

Notwithstanding this, EMF still urge stakeholders to believe that "oxo-degradable plastics should be banned until further detailed research is carried out on their behaviour in real world environments."

As to "real world environments" Oxo-biodegradable plastic was tested by Oxomar in the marine environment, and the research at Queen Mary University was samples of LDPE and oxo-LDPE which were surface-weathered in sea water for 82 days, undergoing natural variations in sunlight and UV intensity. See also the evidence cited below of Dr.Graham Swift, Vice-chairman of the ASTM Technical Committee on Biodegradable Plastics.[3]

"As thorough a scientific risk assessment as possible" would also include the Oxomar study sponsored by the French government, but the EMF 2019 report was published before publication of this study. The Oxomar scientists reported in March 2021, after four years of research on oxo-

[2] Daily Telegraph

[3] Evidence to UK Government Oct 2019 https://www.biodeg.org/wp-content/uploads/2021/02/Swift-evidence-to-BEIS.pdf

biodegradable plastic in the real-world environment. that it does properly biodegrade even in the oceans much more quickly and efficiently than ordinary plastic. The Oxomar report can be found at https://www.biodeg.org/subjects-of-interest/agriculture-and-horticulture/the-marine-environment/

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

It never will be possible, for the reasons mentioned below, and 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 biodegrade significantly more quickly than an ordinary plastic item. That is the point - do we want ordinary plastic which can lie or float around for decades, or oxo-biodegradable plastic which will be recycled back into nature much more quickly? Of course, we don't want plastic in the sea at all, but that is not the present reality.

PLASTIC LITTER

Plastic is immensely useful and is the best way to prevent food wastage and sickness, by protecting our food from contamination and damage[4] - but there is one fundamental problem – that if it gets into the open environment as litter it will lie and float around for decades, and perhaps 100 years. That is the reason why there is so much opposition to plastic, but it is now possible to solve this problem by redesigning the plastic itself, with oxo-biodegradable technology.

Plastic waste has been identified as a serious environmental problem by many governments around the world, and measures have been proposed for reducing the amount of plastic in use and for redesigning and recycling plastic products. These are laudable aims and we support them, but it is unrealistic to think that these measures are soon going to prevent all plastic waste getting into the open environment in the foreseeable future, even in the developed world.

La Tribune reported on 7th June 2019 that 600,000 tonnes of plastic are being dumped by 22 countries in the Mediterranean Sea every year, and the situation is even more alarming at global level, with 8 million tonnes ending up in the sea each year. This plastic will rapidly fragment into microplastics which can lie or float around for many decades, and banning peripheral items like drinking straws, cotton buds, and microplastics in cosmetics, is not going to solve the problem. A substantial amount of plastic will continue to get into the open environment from which it cannot realistically be collected, and it is this fraction of plastic waste for which most governments have no answer.

INNOVATION

Oxo-biodegradable plastics are not intended to replace litter control, but to deal with the consequences of *failure* to control litter on the surface of land or water. Although plastic litter is usually found on the surface, if it should become buried after a short exposure to sunlight the oxo-biodegradable technology will still work, as it is not dependent on constant exposure to sunlight. Oxo-biodegradable plastic is designed to be inert deep in landfill, because biodegradation of anything in anaerobic conditions generates methane.

It is said by EMF that oxo-bio plastic packaging is - by its very design - not meant for long-term reusable applications. This is correct. It is meant mainly for packaging which might become litter,

[4] See the Denkstatt Report https://www.biodeg.org/wp-content/uploads/2019/11/denkstatt-report-v1.pdf

and which is not normally reusable or worth recycling. This does not for example include PET bottles, which *are* worth collecting. As to recycling see https://www.biodeg.org/subjects-of-interest/recycling-2/

Oxo-biodegradable plastic products are made from ordinary polyethylene or polypropylene. They are made in the same way as normal plastic, but the manufacturer adds a masterbatch which accelerates a change in the molecular structure soon after its useful life has expired so that it ceases to be a plastic. This type of plastic can therefore be made by ordinary plastics factories at little or no extra cost. It places a much lower burden on scarce resources than crop-based plastic, because it is made from a by-product of refining oil for fuels, most of which would otherwise be wasted.

A Life-cycle Assessment by Intertek in May 2012[5] confirmed that oxo-biodegradable plastic had the best LCA of all materials used for making carrier bags and bread bags.

One would expect organisations such as EMF, ostensibly dedicated to protecting the environment, to want to work with the oxo-bio industry and other suitably qualified experts, to understand the technology and campaign for it to be used as an alternative to ordinary plastic. They should be asking themselves "is oxo-bio plastic better for the environment than ordinary plastic?"

CONFUSION

It is said by EMF that *"Oxo-degradable plastics and similar materials are marketed and referred to in different ways, including oxo-biodegradable, photo/thermo-degradable, oxo-fragmentable or pro-oxidant additive containing plastics - a terminology we believe may confuse consumers, policymakers and companies."*

EMF themselves create confusion by failing to distinguish between oxo-degradable plastic (which fragments but does not biodegrade except over a very long time) and oxo-biodegradable plastic (which has a different chemical structure and becomes biodegradable much more quickly). See the scientific definition at fn 1 above.

So as to avoid further confusion it should be noted that oxo-biodegradable plastic is not made from food-crops such as corn-starch. Those are hydro-biodegradable plastics (often misleadingly described as "compostable" plastics), which are not a solution to plastic litter, and are unsuitable for everyday use.[6]

We agree that there is a need for clarity, and policymakers and commentators such as EMF should stop referring to oxo-biodegradable plastics as "oxo-degradable," "photo/thermo-degradable," "oxo-fragmentable," or "pro-oxidant additive-containing" (PAC) plastics.

EMF say that unless otherwise stated, all references to oxo-degradable plastics are deemed to refer to oxo-degradable and oxo-biodegradable plastics. This is misleading because these two types of plastic have fundamentally different characteristics and cannot be treated alike. They cite (but then forget) the CEN definition of oxo-biodegradation mentioned above, as *"degradation resulting from oxidative and cell-mediated phenomena, either simultaneously or successively."*

The distinction between degradation (the abiotic phase) and biodegradation (the biotic phase) is crucial. These two steps involving first the oxidation and breakdown of the polymer, and then the consumption of the oxidized residues by microorganisms, occur continuously during the process of degradation.

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[5] http://www.biodeg.org/wp-content/uploads/2018/11/intertek-final-report-15.5.121.pdf
[6] https://www.biodeg.org/subjects-of-interest/composting/

Further confusion is caused by including a discussion of compostable plastics in a report on oxo-bio plastic, when it is well-known that oxo-bio plastics are not marketed for composting, and are not designed to comply with the standards for compostable plastics such as EN13432 and ASTM D6400. Further confusion is caused by including enzymatic plastics, as these are neither oxo-degradable nor oxo-biodegradable.

As to oxo-biodegradable plastics, it is said that there are *"claims that such plastics, when they end up in land or aquatic environments, degrade into harmless residues within a period ranging from a few months to several years."* These claims are correct, and the difference in timescale results from the formulation of the plastic product (some are designed to degrade faster than others) and the conditions in the environment where they are lying or floating (sunlight and heat will accelerate the process but are not essential). Polyethylene and polypropylene, have a specific gravity less than 1, so they will float on the surface.

It is said by EMF that *fragmentation should then accelerate the process of biodegradation i.e. the breakdown triggered by microorganisms into naturally-occurring molecules such as carbon dioxide and water, but the speed of this biodegradation process depends on multiple criteria. These criteria include the fragment size, the quantity of additives, and the environmental conditions to which the material is subjected.* This is partly correct, but it is not fragmentation into small pieces which makes the material available to micro-organisms, it is the reduction of the molecular weight of the material. Also, the rate of degradation does not depend primarily on the *quantity* of additives, but the balance within the masterbatch between prodegradants and stabilisers.

According to EMF *"During this time evidence suggests that fragments from oxo-degradable plastics contribute to microplastic pollution and this poses an environmental risk, particularly in the ocean."* In fact, as mentioned above, after a call for evidence and studying oxo-bio technology for ten months the European Chemicals Agency informed the BPA on 30th October 2018 that they were not convinced that microplastics are formed, and they have never produced a dossier to support any restriction of oxo-biodegradable plastic. As to the marine environment see the Oxomar report below.

However, even if microplastics were formed, this is not a good reason to be opposed to oxo-bio plastics, because it is known that the conventional plastics which they are designed to replace, will without doubt fragment and contribute to microplastic pollution which is much more persistent, and which therefore poses a greater environmental risk.

Oxo-biodegradable plastic is expected to degrade and biodegrade *"over a time-scale short enough for particles not to accumulate in ecosystems.*" Clearly oxo-biodegradable plastic products cannot be designed to degrade instantly, for they would have no useful life, but they are designed to degrade and biodegrade much more quickly than conventional plastics so that there is a much shorter dwell-time for any particles to accumulate in eco-systems. In fact, if oxo-bio plastics had been brought into use even 20 years ago the enormous ocean garbage patches would not have accumulated, and the plastic would have biodegraded and returned to nature.

No government has ever defined what they mean by "a reasonable timescale" but they need to understand that oxo-bio plastic takes a much shorter time than ordinary plastic. It is well known that ordinary plastic fragments do not become biodegradable for many decades.

EMF say that they are not sure that oxo-bio plastic will fully biodegrade, but they know that it is much more likely to fully biodegrade than ordinary plastic. EMF do not give any reasons why, once biodegradation has commenced, it should not continue until it is complete.

EMF create further confusion in fn 5 when they say “US Federal Trade Commission (FTC), FTC Issues Revised, Green Guides (2012), Claim 260.8: it is deceptive to misrepresent, directly or by implication, that a product or package is degradable, biodegradable, oxo-degradable, oxo-biodegradable, or photodegradable.” This does not prevent a claim of oxo-biodegradability provided that the claim is substantiated, and qualified by appropriate wording.

There is a further misleading statement in fn 5 where EMF say “FTC Staff Warns Plastic Waste Bag Marketers That Their “Oxodegradable” Claims May Be Deceptive.” This related only to garbage sacks, and was concerned with a marketing claim. The technology is not designed to degrade in anaerobic conditions in landfill and the FTC advised marketers to make this clear.

THE SCIENTIFIC EVIDENCE

As mentioned above, the best scientific evidence is the four-year “Oxomar” study, sponsored by the French government, of oxo-biodegradable plastic in the real-world environment. https://www.biodeg.org/subjects-of-interest/agriculture-and-horticulture/the-marine-environment/The Oxomar scientists reported in March 2021 that oxo-biodegradable plastic does properly biodegrade even in the oceans much more quickly and efficiently than ordinary plastic.

EMF cite a large number of earlier reports, but as a general point, we have found that reports and literature-reviews by researchers who are not experts in oxo-biodegradable technology show a lack of understanding of the mechanism by which oxo-biodegradable plastics acquire biodegradability, and the function of the stabilisation package. This leads to testing in conditions, and according to standards, inappropriate for oxo-biodegradable plastics. For example, failure to run the TIER 1 test in ASTM D6954; or failure to run that test until the TE[%] < 5% or Mw < 5000 Da; or testing under anaerobic conditions, or failure to understand that the product contains stabilisers which delay the onset of degradation, means that their attempt to study oxo-biodegradation is often confused and of little value.

A case in point is the 2015 Michigan State University Report by Selke et al on which a BPA member-company commented at the time.[7]

Another case in point is the 2007 Chico report. The author does not mention the source of “oxo-degradable LDPE” used in the tests, while other materials are clearly described and the source specified. It is not therefore known which OBP masterbatch was used, in which concentration, and with which stabilization package. One cannot therefore know the timescale for which it was designed, nor even be sure that it was oxo-biodegradable plastic at all. In addition, the Chico report makes the statement: “LDPE with additive is not biodegradable as it does not meet the requirements of ASTM D-6400”. This is irrelevant, as D6400 is a standard for biodegradation in the special conditions found in industrial composting, and not for biodegradability in the open environment for which oxo-bio plastic is designed. They ought to have known that the appropriate standard for OBP is ASTM D6954.

The material studied by Chico was not abiotically degraded, as required by Tier 1 of D-6954 as a first, critical step, and it is not therefore surprising that subsequent attempts to measure biodegradation according to ASTM D-5338 showed little result. Further, testing the material in anaerobic conditions shows a fundamental misunderstanding of the technology, as it is axiomatic that oxygen is required. Finally, the Chico experiments cannot have been properly designed and/or performed, as even the Kraft paper control, PLA lids, sugar cane lids, corn starch trash bags, and Ecoflex bags showed no degradation after 60 days.

[7] http://www.biodeg.org/MSU%20Reponse%2024.4.15.pdf

The 2015 UNEP report[8] does not show that oxo-degradable plastics simply fragment into small pieces including microplastics. Indeed it admits that they may be utilised by micro-organisms, but questions the rate and extent (to which we have referred above). Further, this report is not based on original experimental work and the author is a geologist rather than a polymer scientist. The micro-particles of plastics found in the oceans were from ordinary plastics.

Another case in point is the recent experiments at Plymouth University[9] by marine biologists. If the researchers had been polymer scientists who understood the process of abiotic degradation they would have understood that an oxo-biodegradable shopping bag contains stabilisers to give the product a useful service life and which would have delayed the onset of abiotic degradation of the bag. Simply to say that it had not degraded after two years is meaningless.

The researchers at Plymouth should also have understood that oxo-biodegradable bags are intended to degrade if they become litter in the open environment on land or sea with an abundance of oxygen and usually exposed to sunlight, and that the experiment they performed was not therefore a representative test. This is because they had submerged it in a dark environment under a pontoon.

EMF say that *"oxo-degradable plastics left in the open environment, in the UK, degrade to small fragments in two to five years, and they will still remain visible as litter before they start to fragment."* What they do not say is that they convert into biodegradable material which is no longer a plastic, and that ordinary plastic will degrade to small fragments in a similar timescale and will persist for very much longer before they biodegrade.

The biodegradability of oxo-biodegradable polymers has been extensively studied and reviewed in scientific articles (e.g. Ammala et al., 2011; Koutny et al., 2006a; Singh and UK - 617509644.1 5; Sharma, 2008. Albertsson and Karlsson, 1980; Chiellini et al., 2006; Jakubowicz et al.,2006; Ojeda et al., 2011Albertsson et al., 1987; Bonhomme et al., 2003; Corti et al., 2010; Jakubowicz et al., 2011).

According to Gewert et al[10] "Abiotic degradation produces carbonyl groups that increase the hydrophilicity of the polymer and thus increase its availability for biodegradation".

Dussud et al[11] compared three polyethylene-based polymers, with similar surface roughness, and observed increase in oxidation and hydrophilicity brought about by the inclusion of a prodegradant additive and then by oxidative degradation, which is a clear factor in the ability of organisms to colonize the material. During these experiments, the degree of colonisation (cell count) is not only an indication of the ability of microorganisms to physically populate the surface of the material, but is also influenced by each material's ability to act as a source of nutrients for the microorganisms.

Eyheraguibel et al[12] identified the products of degradation facilitated by a prodegradant additive in an OBP as oxidised oligomers. The characterisation of the oligomers, before and after exposure to the bacterial strain R. rhodochorus, provides insight into the oligomeric products of polyolefin degradation and their biodegradability. The paper demonstrates that after sufficient molecular weight reduction, the oligomers are soluble in water and undergo near-total biodegradation: 60% biodegradation after only four days, 95% after 240 days.

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[8] For BPA comment see https://www.symphonyenvironmental.com/resource/opa-comment-on-unep-report/
[9] For BPA comment see https://www.biodeg.org/wp-content/uploads/2019/11/opa-comments-on-plymouth-10.pdf
[10] Environ. Sci.: Processes Impacts, 2015, 17, 1513
[11] Frontiers in Microbiology 1 July 2018 Vol. 9,1571
[12] Chemosphere 184 (2017) 366e374

Arraez et al[13] say “The design of materials with the ability to degrade once their service life has finished is one of the industrial approaches to face the problems of accumulation of plastic wastes in the environment. The purpose of such process is to generate chemical changes in the polymer structure as a result of oxidation in air. This is achieved by using special additives called pro-oxidant/pro-degradants (oxo additives) consisting of organic salts of metals …. “

“The degradation process induced by the incorporation of oxo additives in polymers is called oxo-biodegradation and is defined as the process of transforming complex molecules into simpler elements from oxidation reactions that promote the cleavage of the chemical bonds, the incorporation of polar groups, and the reduction in molecular weight in polymer chains favouring their interaction with microorganisms in the environment, transforming them into bio-assimilable materials. Microorganisms such as bacteria fungi and algae use the oxidation products of the polymer chains as carbon sources resulting in the formation of carbon dioxide, water, and biomass.”

In August 2019 Queen Mary University London published a report[14]the main findings of which were that:

- Oxo-Biodegradable plastic demonstrated up to 90 times more biodegradation than conventional plastic, when aged for the same period of time.
- The degraded material was biodegraded by bacteria found in soil and marine environments.
- Molecular-weight reduction is a critical factor in the rate and extent of biodegradation, showing that biodegradability increases as molecular-weight reduces.
- The use of a prodegradant catalyst such as that in a d2w masterbatch, caused a rapid reduction of molecular-weight.
- The plastic samples tested for biodegradation were abiotically degraded under both real life and laboratory conditions.

The most recent review of the scientific evidence[15] is by Peter Susman QC, a former Deputy Judge of the High Court in England. He found that:

• oxo-biodegradable plastic does facilitate the ultimate biodegradation of plastics in air or seawater by bacteria, fungi or algae, within a reasonable time, so as to cause the plastic to cease to exist as such, far sooner than ordinary plastics, without causing any toxicity;
• that “the benefit is obvious of reducing future contributions to the scourge of plastic pollution of land and sea”;
• that oxo-biodegradable technology is compatible with composting and recycling.

EMF often cite European Bioplastics, SPI Bioplastics Council, European Plastics Converters, Biodegradable Products Institute, and Sustainable Packaging Coalition as authorities, without making clear, contrary to FTC Claim 260.6(e) Example 2, that these are trade organisations supporting commercial products in competition with oxo-biodegradable plastic. By contrast, EMF did not cite any of the peer reviewed scientific publications published in 2017 and 2018 considered by Peter Susman QC.

[13] J. APPL. POLYM. SCI. 2017, DOI: 10.1002/APP.46088
[14] https://www.symphonyenvironmental.com/resource/queen-mary-university-london-publishes-positive-study-on-biodegradable-plastic/
[15] http://www.biodeg.org/wp-content/uploads/2018/11/15-page-written-opinion.pdf Also available in French and Spanish

In particular they fail to cite the evidence from Professor Ignacy Jakubowicz,[16] which EMF had themselves requested, that *"The degradation process is not only a fragmentation, but is an entire change of the material from a high molecular weight polymer, to monomeric and oligomeric fragments, and from hydrocarbon molecules to oxygen-containing molecules which can be bioassimilated."* They are then recycled back into nature by the naturally-occurring micro-organisms. This point is absolutely crucial to an understanding of OBP.

The evidence of Dr. Graham Swift, Vice-chairman of the ASTM Technical Committee on Biodegradable Plastics[17] is that *Oxo-biodegradable plastics have been known and used commercially for over half a century. They were developed by the scientists who had developed conventional plastics, who found a way to render ordinary plastic susceptible to controlled oxidative degradation, by using catalysis to produce simple hydrophilic compounds, many known and recognized as biodegradable in widely disparate aerobic environments."*

He continued *"It has been my experience that results from laboratory testing are very likely to be reproduced in the real world. I can see no cause for concern that they would not, and have seen no evidence that they have not. In particular I do not consider that persistent plastic fragments and smaller, microplastics would be left behind which could have any harmful effect on the open environment, and in particular marine life."*

Dr. Swift is one of the authors of ASTM D6954. He says *"Of course, conditions in the open environment are variable but there is no need for a standard for each of these conditions. Provided that oxygen is present, a plastic complying with ASTM D6954 will become biodegradable much more quickly than ordinary plastic, and that is its purpose. Oxygen is ubiquitous, and most of the plastic litter is found lying or floating around with abundant access to oxygen, but it is possible to imagine a piece of plastic in anaerobic conditions where abiotic degradation cannot proceed. However if this is in a landfill it does not matter, because the plastic has already been properly disposed of.*

It is also possible for a piece of oxo-biodegradable plastic to find itself in anaerobic conditions outside a landfill but this would be very unusual and does not invalidate the general proposition. It is for example possible for plastic to be deprived of oxygen by being heavily bio-fouled in the ocean or buried in sediment, but this is unlikely to happen quickly enough to prevent sufficient exposure to oxygen for abiotic degradation. If it did, then that small proportion of the global burden of plastic litter would perform in the same way as ordinary plastic – no better and no worse."

CLAIMS

It is alleged by EMF that some claims made by companies in the biodegradable plastics industries are misleading. These allegations are not specified so it is not possible to verify this, but misleading claims are sometimes made in every industry. Misleading claims are sometimes made about motor cars, but the way to deal with that is to ban the misleading claims, not the cars.

As mentioned above, the "precautionary principle" is often relied upon, but the correct way to give effect to the precautionary principle in the EU is to refer any concerns to the European Chemicals Agency (ECHA) under Article 69 of REACH[18] for an investigation and report. The EU

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16 http://www.biodeg.org/Reply%20to%20Ellen%20MacArthur%20Foundation%20from%20Prof%20Ignacy%20Jakubowicz%20-%2021-8-17.pdf

17 Evidence to UK Government Oct 2019 https://www.biodeg.org/wp-content/uploads/2021/02/Swift-evidence-to-BEIS.pdf

18 Regulation 1907/2006

Commission published a report in January 2018[19], but that report did not recommend a ban on "oxo-degradable" plastics, and no such ban was included in the draft Directive submitted by the Commission to the Parliament and Council.

Instead the Commission had said that "a process to restrict the use of oxo-plastics in the EU will be started" and it asked ECHA to investigate "oxo-degradable" plastics under Art 69 of the REACH Regulation because the Commission thought that they created microplastics. However, in October 2018 ECHA informed the BPA that it was not convinced that microplastics are formed.

It was at about this time that a ban on "oxo-degradable" plastic[20] was added to the draft Directive in the Parliament.

There is a well-established procedure for restricting products, laid down in Articles 68-73 of REACH, but the EU have ignored these procedures, and the Directive is therefore open to legal challenge. The EU have pre-empted the conclusion of the ECHA study (which they have now terminated) and have thereby deprived all stakeholders, of the safeguards which those Articles contain, including a scientific dossier under Annex XV, review by two committees, and public consultation. - This is astonishing.

The ECHA investigation into oxo-degradable plastics is the only one to have ever been terminated due to legislation circumventing the process.

The action of the EU institutions is under challenge in its own courts.[21]

OTHER ARGUMENTS

There are a number of make-weight arguments in the Report – for example that biodegradable plastic will encourage littering. EMF do not make this argument against crop-based biodegradable plastic, and in any event it is mere speculation. In the opinion of Peter Susman QC "the criticism alleging that oxo-biodegradable plastic technology would materially encourage littering [can only be regarded] as fanciful and unrealistic."

Would the kind of person who throws plastic litter out of a car window look first at the label to satisfy himself that it is biodegradable? Suppose however for the sake of argument that they are right and that there would perhaps be 10% more plastic litter - is it better to have 110 oxo-bio items that will have biodegraded within a few months or even a few years, or 100 ordinary plastic items that will persist for a century or more?

Degradable plastic products (both oxo and hydro biodegradable) have been available to the public for more than 20 years but there is no evidence that people dispose more carelessly of them. In our view 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 pollute the environment for decades into the future.

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[19] For OPA comment see http://www.biodeg.org/OPA%20responds%20to%20European%20Commission%20%20-%20%20%2019%20January%202018.pdf

[20] The Single-use Plastics Directive (Recital 15) is intended to ban plastic that "does not properly biodegrade and thus contributes to microplastic pollution in the environment, is not compostable, negatively affects the recycling of conventional plastic and fails to deliver a proven environmental benefit." It is therefore clear that it is not intended to ban oxo-biodegradable plastic, because there is solid scientific evidence that d2w oxo-biodegradable plastic does properly biodegrade, does not contribute to microplastic pollution and does not negatively affect the recycling of conventional plastic.

[21] Case T-745/20 Symphony Environmental Technologies plc and Symphony Environmental Ltd V European Parliament; Council of the European Union; European Commission

EMF claim that oxo-bio is incompatible with a circular economy, but the opposite is true. Ordinary plastic and oxo-biodegradable plastic can certainly be recycled if collected, but what of the plastic on land or sea which cannot be collected? If that plastic were oxo-bio it would complete the circle by being recycled back into nature by bacteria and fungi.

It is said that oxo-bio products go against two core principles of the circular economy: designing out waste and pollution; and keeping products and materials in high-value use. However, Oxo-biodegradable plastic products can be redesigned, and they are not intended to be wasted – unlike "compostable" plastic, which is intended to be wasted by being converted into CO_2 in a composting facility. [22]

OBP can be reused and recycled during its useful life, and is designed to biodegrade only if it has not been collected for re-use and recycling, but has instead escaped into the open environment as litter.

RECYCLING

It is claimed that *"oxo-degradable plastics negatively affect the quality and economic value of plastic recyclates."*

As to this, see https://www.biodeg.org/subjects-of-interest/recycling-2/

There is a fallacy in footnote 15 of the 2019 Ellen MacArthur Report, that "both the heat and UV ageing tests were performed on samples that were 'recycled' (blown into film and then re-pelletised) in-house from primary materials rather than from recovered post-consumer waste material. Therefore, this does not demonstrate the effects of any oxidation as a result of UV ageing that has occurred during use, and/or between disposal and being recycled as in real world environments."

The fallacy is that if oxidation has occurred in *any* plastic it should not be recycled.

In the last four years alone, enough masterbatch has been sold by one BPA member (Symphony) to make 600,000 tonnes of OBP products from polyethylene and polypropylene. We know that OBP products have been successfully recycled for the past 15 years by BPA members and their customers around the world, and in those 15 years we have heard no reports of any difficulty encountered. Our experience is entirely consistent with the specialist reports, that oxo-bio plastic can be safely recycled, and the recyclers have presented no technical evidence and no actual experience, to the contrary.

Even if the points made in relation to recycling were valid, that is no reason to continue to use ordinary plastic, thousands of tons of which are getting into the oceans every day and will not be recycled. There is no doubt that this will create microplastics and will pollute the environment for many decades into the future.

It is time for a much better dialogue between the recyclers and the OBP industry. If we can combine oxo-biodegradable technology with the three R's of 'Reduce, Reuse and Recycle' and add a fourth R – "Remove," we can all help win the battle against plastic waste - for the lasting benefit of future generations.

CONCLUSION

[22] https://www.biodeg.org/subjects-of-interest/composting/

The EMF Report indicates that it is endorsed by a large number of companies and organisations, some of which are aggressively promoting a competing plastic technology, and others are themselves producers of many of the plastic articles which are found as litter in the environment. EMF has been formally requested by lawyers acting for an OPA member to declare the amounts of money which it has received from those companies and organisations, but it has failed to do so.

The Charity Commission should investigate whether the Report was published by EMF with the improper motive of assisting a commercial and political campaign against the oxo-biodegradable plastics industry.

If EMF succeed in their campaign against oxo-biodegradable plastic, they will have deprived the world of the *only* means available to deal with long-term pollution of the environment by the plastic waste which has not been collected for responsible disposal.