

# Oxo-Biodegradable Plastics Association

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## OPA RESPONDS TO EUROPEAN COMMISSION

A European Strategy for Plastics in a Circular Economy 16<sup>th</sup> January 2018 (“The Strategy”)

-and-

REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL

on the impact of the use of oxo-degradable plastic, including oxo-degradable plastic carrier bags, on the environment 16<sup>th</sup> January 2018 (“the Report”)

Plastic products made with oxo-biodegradable technology have been successfully used for nearly forty years. They have been used, and are being used, in more than 90 countries, in volumes that we estimate to exceed 10 million tons. In the past 3 years legislation has been passed in 15 countries in favour of oxo-biodegradable plastic and discouraging or banning the use of old-fashioned conventional plastic, because the governments of these countries know that they cannot fully prevent plastic getting into the open environment. The European Commission is out of step with this international trend.

**It is important to understand that oxo-biodegradable plastic is not a completely new product – it is ordinary plastic, upgraded so that it will not lie or float around in the environment for hundreds of years.**

The Commission admits<sup>1</sup> that *“Very large quantities of plastic waste leak into the environment from sources both on land and at sea, generating significant economic and environmental damage. Globally, 5 to 13 million tonnes of plastics — 1.5 to 4 % of global plastics production — end up in the oceans every year. It is estimated that plastic accounts for over 80 % of marine litter. Plastic debris is then transported by marine currents, sometimes over very long distances. It can be washed up on land, degrade into microplastics or form dense areas of marine litter trapped in ocean gyres. UNEP estimates that damage to marine environments is at least USD 8 billion per year globally.”*

The Commission’s Plastics Strategy contains policies to reduce, redesign, re-use and recycle plastics, and to encourage Europe’s citizens to be more environmentally-conscious. **We support all these policies**, but the fact remains that despite these efforts thousands of tons of plastic waste will still be getting into the environment, and especially the oceans, for the foreseeable future. This is so even in Europe where some countries have modern systems of waste-management, but the situation is far worse in the less developed-world, whose environmental policies the EU claims to lead.

The Commission is content to allow old-fashioned plastic to continue in use, knowing that if it gets into the environment it will lie or float around for hundreds of years as a problem for future generations. **The European Commission’s policy is irresponsible.**

Plastics upgraded with oxo-biodegradable technology have been specifically developed to address this problem, and they are often referred to as “Controlled-Life Plastics.”

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<sup>1</sup> Strategy para 2

All the properties of the plastic are unaffected other than the final outcome which is to convert the material automatically into harmless biodegradable components. It is a practical and effective solution because the plastic can be upgraded during manufacture by the same factories, using the same machinery and workforce, at little or no extra cost.

There is no impact on jobs or quality of raw materials or finished products, and nor is there any disruption of the supply-chain. No hardship would be caused to anyone, which is not the case with the introduction of bio-based plastics which has caused such distress among the poorest people in Italy, or with conversion to paper packaging.<sup>2</sup>

The Commission says<sup>3</sup> that it wants to see a smart, innovative and sustainable plastics industry, where design and production fully respects the needs of re-use, repair, and recycling, and brings growth and jobs to Europe. **We agree with this vision**, and this Association exists to encourage the highest standards among its members worldwide.

### **PLASTIC HAS ADVANTAGES AND DISADVANTAGES**

The Commission's Strategy says<sup>4</sup> that *"Plastic is an important and ubiquitous material in our economy and daily lives. It has multiple functions that help tackle a number of the challenges facing our society.... In packaging, plastics help ensure food safety and reduce food waste."* However, the downside is that thousands of tons of plastic are getting into the open environment every day.

### **OXO-DEGRADABLE PLASTICS**

Those thousands of tons of plastic getting into the environment are old-fashioned conventional plastics, and they can properly be described as "oxo-degradable" because they degrade by a process of oxidation. However, the Report acknowledges<sup>5</sup> that *in the open environment it may take a long time, up to hundreds of years, for conventional plastics to biodegrade*" Instead, they fall into microplastics, which lie or float around for hundreds of years, and cause the damage to marine life and danger to the human food-chain which we are all concerned to avoid.

We therefore welcome the Commission's proposal to place restrictions in Europe on this old-fashioned type of plastic, but they seem not to understand the difference between oxo-degradable and oxo-biodegradable.

### **OXO-BIODEGRADABLE<sup>6</sup> PLASTICS**

Let us be clear that there is a fundamental difference between these old-fashioned "oxo-degradable" plastics and oxo-biodegradable plastics, because oxo-biodegradable plastics (Oxo-bio) have been designed to convert at the end of their useful life into biodegradable materials and to biodegrade under any conditions in the open environment within a very much shorter timescale. They are then recycled back into nature by the naturally-occurring micro-organisms. The Commission has not found a single fragment of oxo-biodegradable plastic in the open environment, and they will be unlikely to find one, because it will not be there for long.

The Commission accepts<sup>7</sup> that the *"first stage of degradation prepares the [oxo-bio] plastic for biodegradation by reducing the molecular weight of the plastic to the point where it may be consumed by biological organisms."*

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<sup>2</sup> <http://www.biodeg.org/page29.html>

<sup>3</sup> Para 3

<sup>4</sup> Para 1

<sup>5</sup> Para. 2

<sup>6</sup> Oxo-biodegradation is defined by CEN TR 15351 as "degradation identified as resulting from oxidative and cell-mediated phenomena, either simultaneously or successively."

<sup>7</sup> Para 2

They also accept that *“this accelerated fragmentation would also accelerate biodegradation.”* The Eunomia report<sup>8</sup> says *“without exception, the scientific evidence suggests that the conditions present during the abiotic stage (which in most studies is simulated by some form of accelerated pre-treatment) of degradation will have a significant impact on the materials’ ability to subsequently biodegrade.”*

However, the Commission’s Report says<sup>9</sup> that *[oxo-bio] plastic fragments over time into plastic particles, and finally microplastics, with similar properties to microplastics originating from the fragmentation of conventional plastics, but this is a serious error.* The process is described as follows<sup>10</sup> by Prof. Ignacy Jakubowicz, one of the world’s leading polymer scientists. *“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.”* This point is absolutely crucial to an understanding of oxo-biodegradable plastic technology. It was explained to Commission officials on 30<sup>th</sup> November 2017 by the leader of the scientific team at Queen Mary University London who have made an in-depth study of oxo-biodegradation, but it seems that the officials were not listening.

**This is a fundamental misunderstanding of the principles of oxo-biodegradation, which invalidates the whole report,** and we continue to comment on the report as a matter of courtesy to the Commission only.

At para 4.3 the Report says *“As oxo-degradable plastic is designed to fragment faster than a conventional one it is less likely to be recovered during litter clean-up exercises, and likely to be more easily transported by wind and water. As these factors may contribute to oxo-degradable plastic being transported into the marine environment easier than conventional plastic it can be said that oxo-degradable plastic contributes to microplastics pollution and therefore poses environmental risks.”* and *“As oxo-degradable plastic is likely to fragment quicker than conventional plastic, the negative impacts associated with the presence of microplastics in the marine environment are concentrated within a shorter period of time. This could ultimately be worse than spreading out the impacts over a longer period, due to an increase in the proportion of individuals, species and habitats affected, as well as the burden of impacts for an individual.”*

They have clearly not understood the process explained by Prof. Jakubowicz above, and as further explained by the scientists from QMUL. The material fragments because its molecular structure has been dismantled. When the material has fragmented **it is not a microplastic**, and before it has fragmented it can be recovered during litter clean-up exercises. An intact plastic bag is more likely to be carried by the wind than the non-plastic, oxygen-containing molecules into which the plastic has converted.

How can it possibly be worse for plastics to biodegrade within a short period of time than to be left to float around collecting toxins and harming wildlife for hundreds of years?

The Eunomia Report says<sup>11</sup> *“From the information studied, the authors of this report can believe that it is possible for [an oxo-bio] plastic to fully mineralise in an open environment, with the prodegradant additives encouraging this action, and thus the polymers and entrained substances can be assimilated into the natural environment.”*

The Commission’s report says<sup>12</sup> *“It is clear that oxo-degradable plastic is prohibited from degradation if not first exposed to UV radiation and, to a certain extent, heat”* but **this is another serious error.** UV exposure and ambient heat will accelerate the process, but they are not essential.

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<sup>8</sup> Paid for by the EU Commission, and published in April 2017 see para 4.1.3.1

<sup>9</sup> Para 2

<sup>10</sup>

<http://www.biodeg.org/Reply%20to%20Ellen%20MacArthur%20Foundation%20from%20Prof%20Ignacy%20Jakubowicz%20-%202021-8-17.pdf>

<sup>11</sup> Page 45

<sup>12</sup> Para 3.1

The Report says<sup>13</sup> *“Even if biodegradation may be facilitated by careful engineering of the chemical package, evidence is not available to definitely conclude that this will happen in real world situations. If the circumstances for fragmentation to take place are absent or insufficient, biodegradation will not take place.”* However, it is difficult to envisage a situation in the open environment where the circumstances for fragmentation to take place are absent or insufficient, as only oxygen is required. Oxygen is everywhere in the air, and in the sea.

Biodegradation to the extent of 90% (which is all that is required by EN13432) has been documented in Spain, Sweden, and elsewhere, and the reports have been supplied to the Commission. How can they say that there is no evidence?

The tests for degradation are not done for the amusement of scientist but are designed by them to replicate what is likely to happen in the real world. Laboratory tests are designed to be performed in a shorter time than would be taken in the real world, but if this invalidated the tests the scientists would be wasting their time and would not do them.

### **TIMESCALE FOR BIODEGRADATION**

The Report says<sup>14</sup> *“Looking at biodegradation of plastics as a means to avoid pollution hence only makes practical sense if this is linked to a “reasonable” time frame, and “defining a ‘reasonable’ time frame might differ from product to product depending also on the use of the product and its impact on the environment; the environmental impact is correlated with the time taken for complete breakdown of the polymer.”*

Hundreds of years is clearly not a reasonable timescale, and the Report acknowledges<sup>15</sup> that *“It is undisputed that oxo-degradable (sic) plastic, including plastic carrier bags, may degrade quicker in the open environment than conventional plastic.”*

It is not useful to enquire exactly how long a particular specimen in a particular place would take to biodegrade, because the Commission is well aware that timescale depends on the conditions in the environment in that place at that time. **The key point is that an oxo-bio plastic item will become biodegradable very much more quickly than a conventional plastic item in the same place in the open environment at the same time - and that is the environmental benefit.**

Oxo-bio plastic has been degraded in real time in seawater at Bandol in France, and the scientists at Queen Mary University observed the resulting material being used as a food-source by bacteria commonly found on land and in the oceans. They even have photographs taken with an electron-microscope, of the microbes actually consuming the material, and in their view there is no reason why this process should stop in the natural environment until all the material has been consumed. How therefore can the Commission say that there is no evidence?

With particular regard to the marine environment Dr. Jean-François GHIGLIONE<sup>16</sup> says *“Oxo-biodegradable 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 seasurface microlayer are particularly adapted to a hydrophobic environment (e.g. where oil materials are floating) and these bacteria are known to have a high capability for hydrocarbon degradation. These bacteria are therefore potential oxo-bio-degraders, and such an environment does not exist at the surface of soil.*

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<sup>13</sup> Para 3.1

<sup>14</sup> Para 2.

<sup>15</sup> Para. 6

<sup>16</sup> Directeur adjoint de l'Observatoire Océanologique de Banyuls

*These bacteria are probably less abundant and less diverse in the ocean than in soil, but probably more effective to degrade oxo-biodegradable plastic.”*

Nobody maintains that oxo-bio is perfect, for there is of course a period of time during which it has to behave in the same way as conventional plastic, otherwise it would be useless. It is designed to have a service life during which it can be stored, re-used or recycled, which is wholly desirable. This is a necessary price to pay for a plastic which will rapidly degrade and biodegrade at the end of that period. This is surely much better than conventional plastic, which as the Commission admits, could lie or float around in the environment for hundreds of years, causing damage to living creatures and adsorbing toxins.

## **RECYCLING**

We are aware that biodegradable plastics should not interfere with the recycling process nor the integrity of new plastic items made with recyclate. The position is as follows:

### **-Bio-based Plastics**

The Commission accepts<sup>17</sup> that *if compostable and conventional plastics are mixed in the recycling process, it may affect the quality of the resulting recyclates.*

It is well known that bio-based plastics will damage both the recyclate and the new plastic items. In fact it was reported in the press in September 2017 that recyclers were finding that recyclate from Southern European countries is causing defects and ruptures of the film, and their analyses demonstrated that most of this is caused by materials used in “bio-based plastics” i.e. starch, polylactide (PLA) and polybutylene adipate terephthalate (PBAT).

This is because the governments of France, Spain, Italy, and now Greece have been persuaded by powerful lobbying groups that represent the manufacturers of “bio-based plastics” to prefer their product. Not only is it incompatible with recycling, and can be up to 400% more expensive than ordinary or oxo-bio plastic, but it contains up to 80% oil-based material. Nor does it achieve the objective of these governments to deal with plastic waste in the environment, as it is tested to biodegrade in the special conditions found in municipal composting, not in the open environment. These products are potentially harmful and can cause microplastics if they are not collected and placed into industrial composting.

### **-Oxo-bio**

According to the recycling charity RECOUP (“Recyclability by Design” 2006) *“In cases 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.”* These are the very products in which oxo-bio technology is commonly used.

Nevertheless, the Commission is concerned that oxo-bio plastic should be identifiable and separated from other plastics collected for recycling, and they say<sup>18</sup> that *“Currently available technology can not ensure identification and separate sorting of [oxo-degradable] plastic by re-processors.”* This is easily remedied, because the Commission could require that a tracer be included in oxo-bio plastics so that it can be identified by the existing sorting technology.

This is not however necessary. See <http://www.biodeg.org/recycling.html>

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<sup>17</sup> Strategy p 12

<sup>18</sup> Para 5.1

OPA members have in fact been successfully recycling oxo-bio plastic for more than ten years with no adverse reports, and last year alone it is estimated that more than 800,000 tonnes were processed worldwide. The recyclers have produced no scientific evidence to justify their concerns about oxo-bio, but they are rightly concerned about bio-based plastics.

## COMPOSTING

The Report points out that oxo-bio is not suitable for composting, but it is not marketed for this purpose, so why are the Commission even considering it in a report about oxo-bio? The types of plastic which *are* marketed for composting, do not convert into soil-improvers – because the relevant standard<sup>19</sup> requires them to convert into CO<sub>2</sub> gas within 180 days. There are at least 16 reasons why “compostable” plastic is useful only for niche applications and is not useful in the fight against plastic pollution of the open environment. See <http://www.biodeg.org/biobased.html> The Commission accepts<sup>20</sup> that they “*degrade under specific conditions which may not always be easy to find in the natural environment, and can thus still cause harm to ecosystems.*” The Commission have also accepted<sup>21</sup> that “*compostable*” plastic is not necessarily suitable for home-composting.”

## LANDFILL

The Report also points out that oxo-bio will not degrade in the anaerobic conditions found deep in landfill, but again it is not marketed for this purpose, but unlike bio-based plastics it will not generate methane in those conditions.

The Eunomia Report says<sup>22</sup> “*Whilst PAC plastic may biodegrade in the upper levels of a landfill in aerobic conditions and therefore produce CO<sub>2</sub>, it has already been demonstrated that this happens at a very slow rate, and only if abiotic degradation has already occurred. The limited evidence that is available suggests that deeper in landfill under anaerobic conditions there will be little or no biodegradation taking place. In this case, the carbon is effectively sequestered, avoiding the direct release of GHGs to the atmosphere.*”

## FARMING

Oxo-biodegradable plastics have been used and studied in farming for more than 4 decades as mulch films, and these studies demonstrate that the life of the film can be controlled within a short time-span without damaging the crop. This makes it unnecessary for the farmer to remove and dispose of thousands of tons of dirty plastic. Scott-Gilead were the first to publish their findings from studies in 1980 that show degradation and biodegradation in 92 days - and this is in natural ageing, not in the laboratory. See “Degradable Polymers, Principles & Applications,” edited by Professor Gerald Scott, who was Professor Emeritus in Chemistry & Polymer Science at Aston University, UK.

## NON-TOXICITY

The oxo-bio 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 according to OECD Standards to confirm that the residues are harmless. The Commission has not found even one gram of oxo-bio residue and shown it to be toxic.

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<sup>19</sup> EN 13432

<sup>20</sup> Strategy p12

<sup>21</sup> Strategy p12

<sup>22</sup> Para 4.1.4.1

Essentially oxo-bio is 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<sup>23</sup> as “compostable plastic” to ensure that there is no toxicity and no metals exceeding the prescribed limits.

The Report mentions the use of cobalt, but it is not listed as a substance of concern in EN13432 Annex A.1.2, nor in Art 11 of the EU Packaging Waste Directive. **It is not therefore correct for the Commission to say that there is no regulation of substances of concern.** Oxo-bio does not contain any of the substances to which Article 11 or Annex A.1.2 refers, and the Commission does not suggest that it does.

Other ingredients which manufacturers may wish to include in plastic products, or which may be generated by the manufacturing process of plastic products, are not the responsibility of the oxo-bio industry, and should be specifically regulated by government.

The Eunomia Report says<sup>24</sup> *“it does appear that the OBP industry can create products that have minimal toxic impact on flora and fauna. ... and it is encouraging that almost all existing test standards for OBP plastic specify some form of toxicity test using established methods (such as germination and earthworm survival tests).”*

The OPA has commented on the Eunomia report in detail at <http://www.biodeg.org/OPA%20Comment%20on%20EUNOMIA%20REPORT%204.9.17.pdf>

## FOSSIL RESOURCES

Oxo-bio does not cause oil-depletion, because it is made from a by-product of refining oil which has been extracted from the ground to make fuels. Perhaps one-day oil will not be needed for fuels and it will then be in abundant supply for other uses.

## PROPENSITY TO LITTER?

The Commission thinks that to encourage oxo-bio plastics would send the wrong signal and be likely to encourage littering. On the contrary it would send exactly the right signal – that in addition to its efforts to reduce plastic waste, the Commission is determined to protect the planet against conventional plastic, which can and does get into the oceans and subsists in the environment for hundreds of years. It would also be following the example of other countries who have required the use of oxo-bio technology.

Oxo-bio cannot be distinguished from ordinary plastic by sight, touch, or smell, but even if there were a label on the product describing it as oxo-biodegradable, it is unlikely that the people who cause litter will look for the label before throwing a plastic item out of a car window. Further, even if it were true that biodegradability encourages littering, and supposing for the sake of argument 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 months, or 100 plastic items which will lie or float around for hundreds of years?

We do not think it is 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 as a serious problem for future generations.

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)

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<sup>23</sup> EN 13432 Annex E and Annex A.1.2

<sup>24</sup> P 110

### THIRD PARTY REPORTS

The Commission places some reliance on the Ellen MacArthur report, with which we were not impressed, and to which we have published our response at

<http://www.biodeg.org/OPA%20response%20to%20MacArthur%20-%202012-11-17.pdf> The authors had submitted a draft to Professor Jakubowicz, who is one of the most eminent polymer scientists in the world, to which he replied that their statement about oxo-bio is not in line with his understanding nor the science in this field

<http://www.biodeg.org/Reply%20to%20Ellen%20MacArthur%20Foundation%20from%20Prof%20Ignacy%20Jakubowicz%20-%202021-8-17.pdf>

In particular, the Professor pointed out that **their understanding is not correct on the all-important question of whether oxo-bio merely fragments or whether it converts into biodegradable materials.**

The Commission also places some reliance on reports by “European Bioplastics” but this is a lobby group for the “compostable” plastic industry, which sees oxo-bio plastics as a threat to its profits.

What the Commission did not do, was to pay attention to the evidence provided by the experts in oxo-biodegradable technology.

### REGULATION

The Eunomia Report says<sup>25</sup> *“this does not mean that all products on the market avoid negative toxic effects, as there is no regulatory control currently exercised in this regard. Problems remain that (a) accreditation is not mandatory for products on the EU market, and (b) some of the standards do not have pass/fail criteria for the toxicological test results.”*

This is a criticism not of the oxo-bio industry, but of CEN and the regulatory authorities in Europe. They have not written an EU standard for oxo-biodegradable plastics, and it is necessary therefore to rely upon the American standard ASTM D6954 or the British standard BS8472.

No restriction of the sale of oxo-biodegradable plastic (which would be in restraint of trade) would be upheld by the European Court of Justice if it were not fully justified on the law and the evidence. The ECJ would wish to hear evidence from the oxo-biodegradable plastics industry as well as the Commission, and this report from the Commission would certainly not justify any restriction. It would be much more likely that the court would approve restrictions on conventional plastics, whose damaging effects on the environment are universally acknowledged.

Nevertheless, The Oxo-biodegradable Plastics Association has always been willing to work with the Commission and CEN to devise standards and procedures relating to both the marine and terrestrial environments.

19 January 2018