



Biodegradable FAQ

Below are some commonly asked questions about plastics and biodegradable issues.

1. What makes the BioBailers™ biodegradable*?

Our biodegradable* bailers, use a small amount of a third party engineered additive added to the material to entice microbes to attack the material once discarded into a landfill. The additive has passed the FDA review to be suitable for packaging of food products. It is completely organic, non-starch based and non destructive to the environment.

2. Why is this biodegradable treatment necessary?

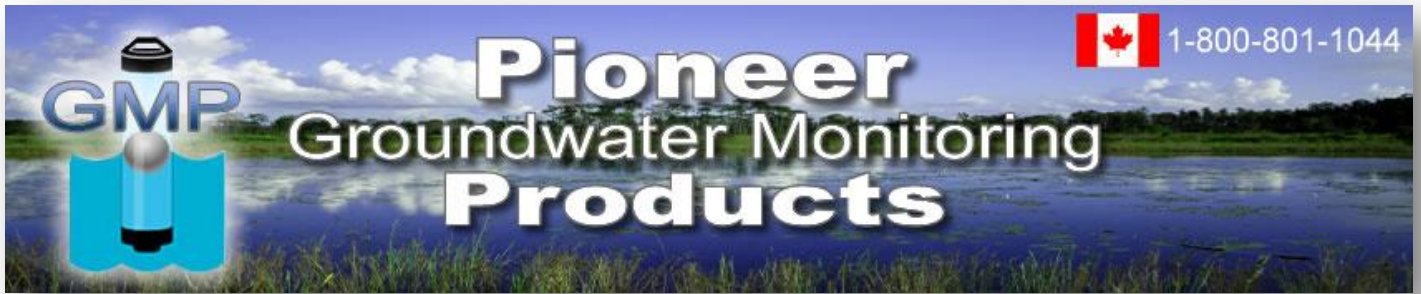
Plastics do not exist in nature, and this is what makes them so useful. They are inert and inexpensive to use. But it also creates a problem. Regular plastic is not easily biodegradable and will last in the environment for centuries, maybe forever.

3. What are some of the advantages of the additive?

When mixed into raw plastic at a small ratio, it allows plastic to break down—but only when placed in a microbe rich environment, such as a landfill or compost facility. It provides the best of both worlds. The biodegradable plastic product is still as useful as it ever was. Consumers like it because they still get all the safety and convenience that plastic brings, while at the same time knowing they are not leaving a nightmare for our children's children.

4. Does the additive affect the parent materials?

The base resin retains all of its original properties and shelf life. Recyclability of the product is completely unaffected; recycling number remains the same. The final product is essentially indistinguishable from the non biodegradable current product. But when it's finally discarded to a landfill it will return to the cycle of life.



5. **Are there plastics made from plants that are better to use?**

Poly-lactic Acid or PLA is the most common plastic referred to when bioplastics are mentioned. It is a plastic made from corn. It therefore utilizes a food source to create the plastic which results in higher food prices, requires the use of Genetically Modified Organism seed and requires heavy pesticides in the farming process. It does not biodegrade unless placed into an industrial composting facility, and overall requires the use of more fossil fuels in its planting and harvesting and processing than traditional plastics. For PLA to degrade it needs a composting facility with high heat and moisture. Without those conditions, PLA will not biodegrade and will sit in a landfill like other plastics.

Other manufacturers are claiming their bottle plastic material is derived from sugar cane. The final plastic product produced is still the same plastic molecule made from petroleum based sources.

<http://online.wsj.com/article/SB10001424052748703672104574654212774510476.html> This ideology is addressing only the front end or manufacturing end of the plastic and does not address the back end or final disposal of the material. As a consequence it has the same lack of decomposition properties and will not degrade in any faster time than a petroleum based plastic.

6. **What is Biodegradation?**

Biodegradation is the secretion of acids by microbes which break down the molecular structure and emit either methane gas or CO₂ and leave behind highly nitrous soil. The entire mass must be broken down into these three things to be considered biodegradable.

7. **How long will it take BioBailers™ to degrade?**

The biodegradation time of a product depends on a variety of factors. The thicker the plastic section, the longer it will take to degrade. Membrane films are expected to degrade in 45 days or so. Thicker sections may take 1- 5 years. If the plastic is put into a dry landfill it will degrade slower than a more actively managed water moistened landfill. The main point to realise is this: whether it takes a few months or multiple years it does not really matter. What does matter is that after some limited time, the product will no longer be around.

8. **Why do ASTM Testing?**

With so many manufacturers and retailers offering 'Green' products it has become confusing to distinguish what is a genuine biodegradable product, what is a compostable product, what is a degradable product and what are unsubstantiated claims. ASTM tests are tests recognised internationally as being the bench mark of verifications. The ASTM test D5511 is a test performed by an independent laboratory to verify claims of biodegradability in anaerobic conditions.

9. **What is the ASTM D5511 test?**

Biodegradation occurs through naturally-occurring micro-organisms and happens in both aerobic (compost) and anaerobic (landfill) environments. Once in a landfill and covered a few meters, the conditions become anaerobic. Hence the need for the ASTM D5511 test. This is a Test Method for Determining Anaerobic Biodegradation of Plastic Materials Under High-Solids Anaerobic-Digestion Conditions.



10. Will the BioBailers™ start to degrade before they are used ?

No. The BioBailers™ will only start to biodegrade once they are put into a microbial rich environment such as a landfill. Before that the BioBailer™ retains all its original properties.

11. What is the difference to composting?

There is significant confusion about composting and biodegradation. Composting is only one form of biodegradation. There are commercial composting facilities around but they are few and far between. In composting, oxygen is nearly continuously made available in the pile through mechanical means. Hence aerobic degradation is the only main degradation that occurs in a composting facility. The additive used in BioBailers™ will attract both aerobic and anaerobic bacteria and cause the BioBailer™ to break down in either situation. Therefore BioBailers™ will degrade both in a composting facility or a landfill environment.

At this time commercial composting is not wide scale in the United States and plastic products that are disposed of almost always end up in a landfill

12. What about the term degradable, is that the same thing?

No. Degradable means the plastic will break down into smaller and smaller parts. It does not refer to any biological activity. The products of degradation may simply be small parts of the original material and no conversion to biodegradation products has occurred.

13. What are the products of biodegradation?

In a composting or oxygen rich environment, the products are CO₂, water and humus (biomass) which can make a good fertilizer.

In an anaerobic environment, (such as deep in a landfill) the products of biodegradation are methane (CH₄) and humus (biomass).

14. Why use a biodegradable material instead of an oxodegradable material for BioBailers™?

An oxodegradable material uses metal ions as an additive in the plastic. As the ions attract oxygen they break down the plastic molecules into smaller and smaller lengths. This has nothing to do with biological activity. For an oxodegradable material to degrade it has to be in the presence of oxygen and sunlight. Without these the material will undergo little to no degradation and last just as long as an untreated plastic would. As long as the product is in the presence of oxygen, the material will start to break down, hence an oxodegradable product will start to break down while sitting on a warehouse shelf. This does NOT happen with a biodegradable product.



15. If biodegradation produces methane, is that a problem for global warming?

This has a two part answer.

a) Methane in the Earth's atmosphere is an important **greenhouse gas** with a **global warming potential** of 25 over a 100-year period. This means that a methane emission will have 25 times the impact on temperature of a carbon dioxide emission of the same mass over the following 100 years. Methane has a large effect but for a brief period (a net lifetime of 8.4 years in the atmosphere), whereas carbon dioxide has a small effect for a long period (over 100 years). Usually, excess methane from landfills and other natural producers of methane are burned so CO₂ is released into the atmosphere instead of methane. Since methane does have a higher global warming potential than CO₂ then one of the faster ways to mitigate global warming is to prevent methane reaching the upper atmosphere. (<http://en.wikipedia.org/wiki/Methane>) Hence part (b) of the answer.

b) As of October 2010, there are approximately 526 operational LFG energy projects in the United States and 515 landfills that are good candidates for projects that could turn their gas into energy, producing enough electricity to power more than 665,000 homes. Producing energy from LFG avoids the need to use non-renewable resources such as coal, oil, or natural gas to produce the same amount of energy. This can avoid gas end-user and power plant emissions of CO₂ and criteria pollutants such as sulfur dioxide (which is a major contributor to acid rain), particulate matter (a respiratory health concern), nitrogen oxides (NO_x), and trace hazardous air pollutants. <http://www.epa.gov/lmop/basic-info/>

16. Others say it is better to recycle used disposable bailers, is that true?

In theory yes. The EPA promotes a reduce, recycle or composting (a form of biodegradation) as ways to reduce waste. <http://www.epa.gov/osw/consERVE/rrr/index.htm>. In reality only 7% of plastics are recycled, the rest end up in a landfill. Therefore while some bailers can be recycled, only a few of them ever make that journey. Most would still end up buried in a landfill. The math of 100% of bailers discarded into a landfill biodegrading or only 7% of old style bailers being recycled is simple to perform.

A report was recently published (from <http://ensobottles.com/blog/2010/08/why-recycling-is-not-enough-to-solve-plastic-bottle-pollution/>) stating that recycling only begins to have a positive environmental impact once rates of 50% or higher are achieved. This is why it is a better environmental solution to have both biodegradable and recyclable. It is going to take decades to get recycle rates up to the 80 – 90% range. Unless changes are made to switch to biodegradable products we will be continuing to contribute to the overwhelming global plastic pollution problem.

BioBailers™ are a solution we have available to us today. The BioBailers™ fully integrate into the existing recycling infrastructure and for all BioBailers™ that end up in landfills, they will naturally biodegrade* to biogas and soil. Plus, the methane can be used, and is being used at hundreds of landfills to create clean energy thus offsetting the need to use additional fossil fuel for electricity.



17. Will a BioBailer™ affect the ability to be recycled?

No. BioBailers™ can be recycled like any product. The biodegradation aspect does not change any of its recyclability properties. It is worth noting that plastics only get recycled a number of times, then eventually they will all get discarded. Therefore biodegradation is the ultimate sustainable solution to our plastics problem.

18. Is there any toxic residue left after biodegradation?

No. There is no toxic residue when the BioBailer™ decomposes.

19. Is the additive safe?

Yes, the BioBailers™ are quite safe. In fact, food packaging film made with EcoPure additive is FDA compliant for food contact applications.