Adding Landfill-biodegradability to Plastics for Waste control

Dr Ross Headifen

Biogone

THE LOGICAL CHOICE

LANDFILL-BIODEGRADABLE

EVERYDAY PLASTIC PRODUCTS

How it began

Ross Headifen and John Mancarella
Our early work in the environmental industry, supplying equipment to clean up contaminated land, involved the supply of many products that were classified as single use plastic. After some years it became evident that while using our products to clean up contamination sites, another big problem was created: piles of plastic waste going to landfill
In 2012, FieldTech Solutions was established to supply environmental equipment to the contaminated land industry with the innovative idea of replacing the plastic consumables with biodegradable versions.

From there the brand Biogone was established to produce a much wider range of landfill-biodegradable business and consumer items, with the joint mission driven by a similar goal:

- Help reduce the amount of plastic waste in Australian landfills, with the current rate of 84% of single-use plastic ending up in landfills.
- Allow some of the plastic waste energy to be recovered

Biogone is now the market leader in landfill-biodegradable plastics. With an extensive and world first product range, helping businesses improve their plastic responsibility.

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Australia and Plastic

We use: **Approx 3.5 million tons per year**

We recycle: **Approx 15% per year. Why?**

- A lot is light weight-thin film
- Has low commodity value when used or dirty, or is contaminated by other materials, most plastic is currently uneconomic to recycle
- Inadequate infrastructure to make collection economically viable
- Perceived to have no value by the public
- Very little attention has been paid to it for many years
- Multilayered of different materials, different colours, sorting of different materials, LD, HD, PP, PVC

01.

2025 Packaging Targets

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2025 Packaging Targets

Target:

- 100% packaging needs to be either **reusable**, **recyclable** or **compostable**
- 70% packaging to be recycled or composted
- Plastic Packaging needs to be made from 20% av recycled content
- Phase out problematic single-use packaging

Target for Plastics

MATERIAL TYPE	CURRENT RECYCLED CONTENT RATE	2025 TARGETS
ALL PACKAGING	35%	50%
PLASTICS	2%	20%
PET	12%	30%
HDPE	2%	20%
PP	3%	20%
FLEXIBLE PLASTICS	UNKNOWN	10%

Graphic Reference: 2025 National Packaging Targets, APCO, 2021

How are we doing?

Production is expected to increase by 2050, 30+%

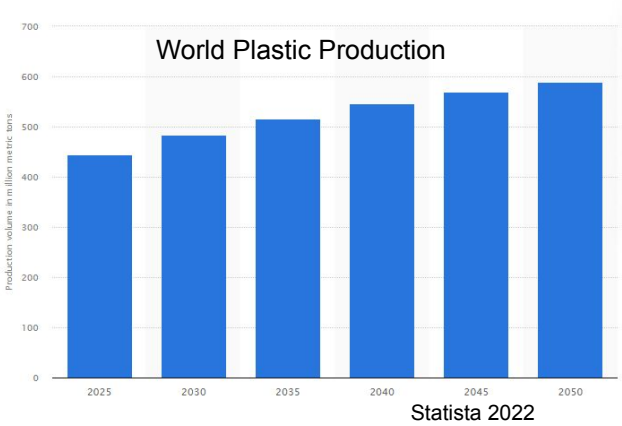
APCO's recent *Collective Impact Report*, which found that on current projections, Australia will fall short by 50 per cent of its 2025 target to recycle 70 per cent of plastic packaging by 2025.

Inside Waste Feb 2022

The recycling rate for plastic packaging has **fallen from 18 per cent to 16 per cent** and the reincorporation of recycled plastic in new packaging, which is crucial if we are to move towards a circular economy, has **fallen by a third**

The target of achieving 20 per cent of recycled plastic within new packaging is way off track, it has have **fallen from four per cent to three per cent**

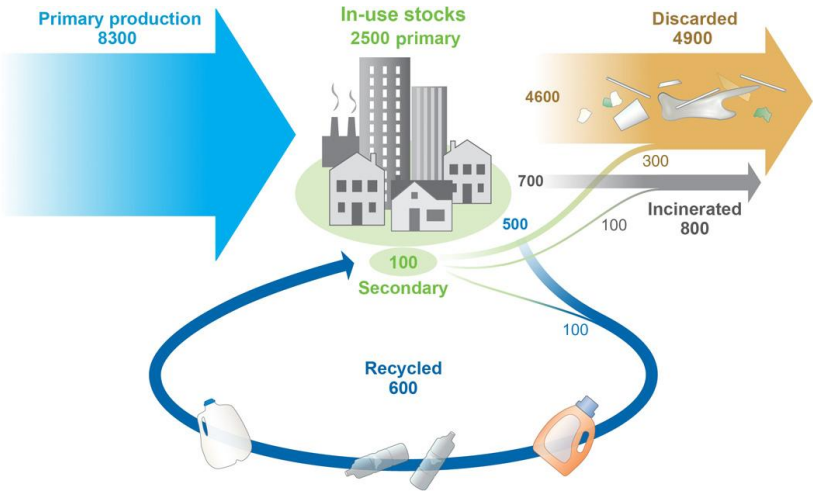
Inside Waste Feb 2022



Statista 2022

Recycling of plastic is not like recycling of a metal

Every time plastic is mechanically recycled, the polymer chain is damaged, so the QUALITY DECREASES. The same piece of plastic can only be recycled about 2-3 times before the quality decreases to the point where it can no longer be used and is disposed to landfill.



Mechanical recycling is only just delaying the inevitable

What does all this mean?

Landfilling of plastic will still be with us for a long time

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02.

About our Technology

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Landfill-Biodegradable Plastic

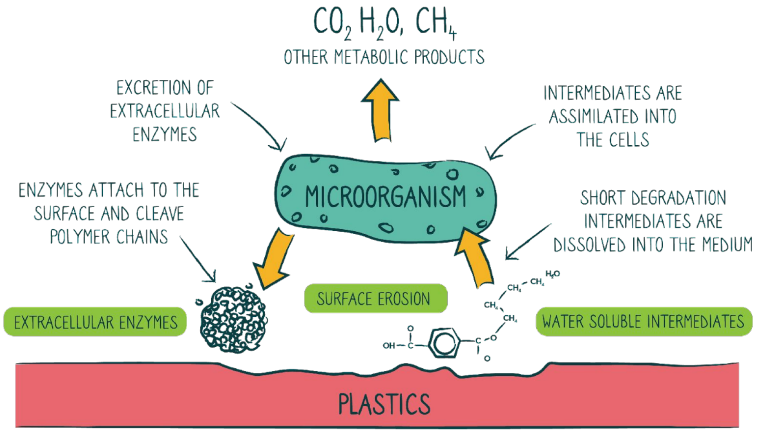
Biogone's landfill-biodegradable plastic technology is

- **made by combining traditional plastic with an organic additive**
- **no different production machinery is needed**
- **relatively new to Australia**
- **currently being used however across 25 countries**

This makes the plastic:

- Strong and durable like conventional plastics.
- Reusable and recyclable.
- Biodegradable, approx. 90+% faster than conventional plastics. *(Landfill-Biodegradation certified by independent laboratory in USA)*
- Not fragment to microplastics.
- Have no shelf life issues *(no microbes – no biodegradation)*

How does the Technology work?



Landfill-biodegradable plastic is an inert additive technology comprised of organic materials which:

- Attracts the correct species of microbes found in common waste environments.
- The process is the same whether microbes are biodegrading food waste or plastic waste, both are organic (carbon based) materials.
- Microbes secrete enzymes which are used to separate the atoms of a molecule so they can utilize the carbon atom bond for energy.
- The methane produced from faster biodegrading landfill-biodegradable plastics can be captured within the timeframe the landfill is actively managed, rather than being released into the atmosphere over hundreds of years after the landfill has closed and stopped being managed. This methane captured is being used for fuel and energy production.

From Mueller, R.J., Biodegradability of polymers: Regulations and methods for testing, in *Biopolymers*, Steinbuchel, A., Ed., vol. 10., Wiley-VCH, Weinheim, Germany, 2003.)

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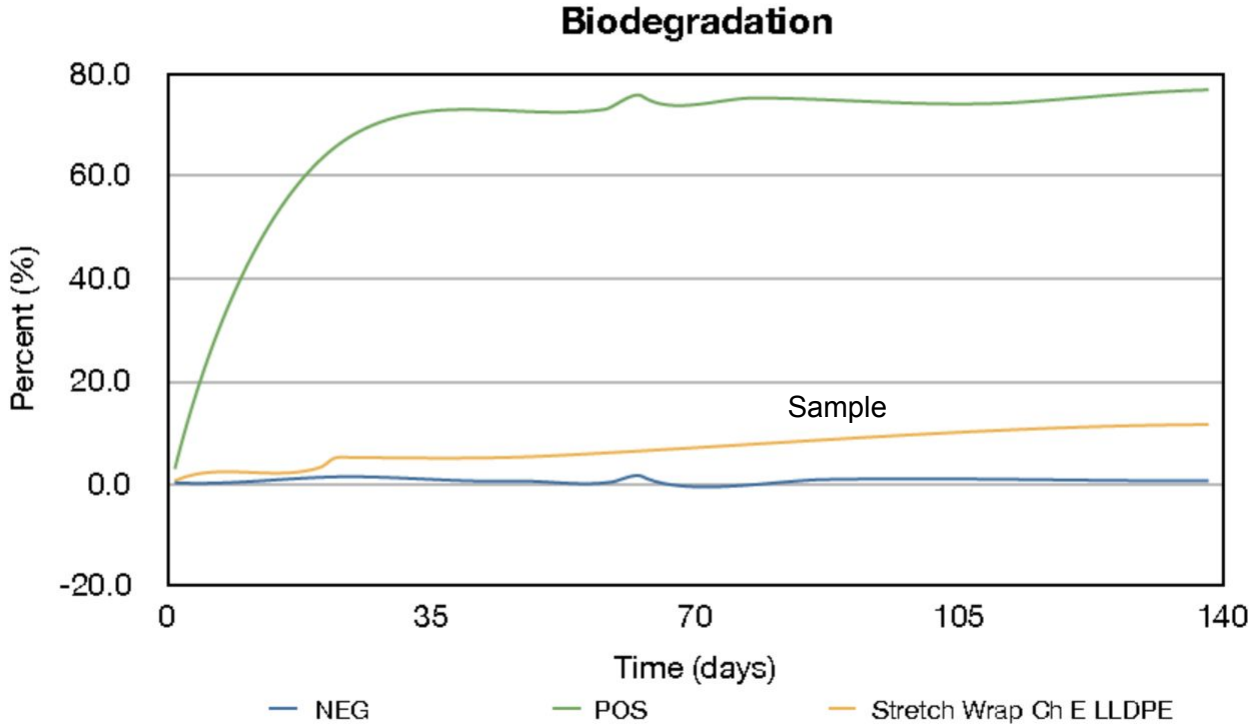
Biodegradability Testing of Stretch Wrap

USA Laboratory



Some Biogone products

And MORE

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Landfill-Biodegradable is NOT Degradable

Degradable approach (oxo-degradable)

Degradable technology uses a compound (prodegradant additive), which chemically bonds to the polymer molecules.

The compound used is a prodegradant which when comes in contact with oxygen, and UV light, causes the bonds between the molecular atoms to break, thus weakening and fragmenting the material. Over a few months it eventually fragments into smaller and smaller pieces of the molecule (plastic).

The molecule remains the same molecular composition, with the concern that it leaves microplastics in the environment.

Has nothing to do with bio-activity or biodegradation.

Degradable additives are to be addressed in the in 2025 targets

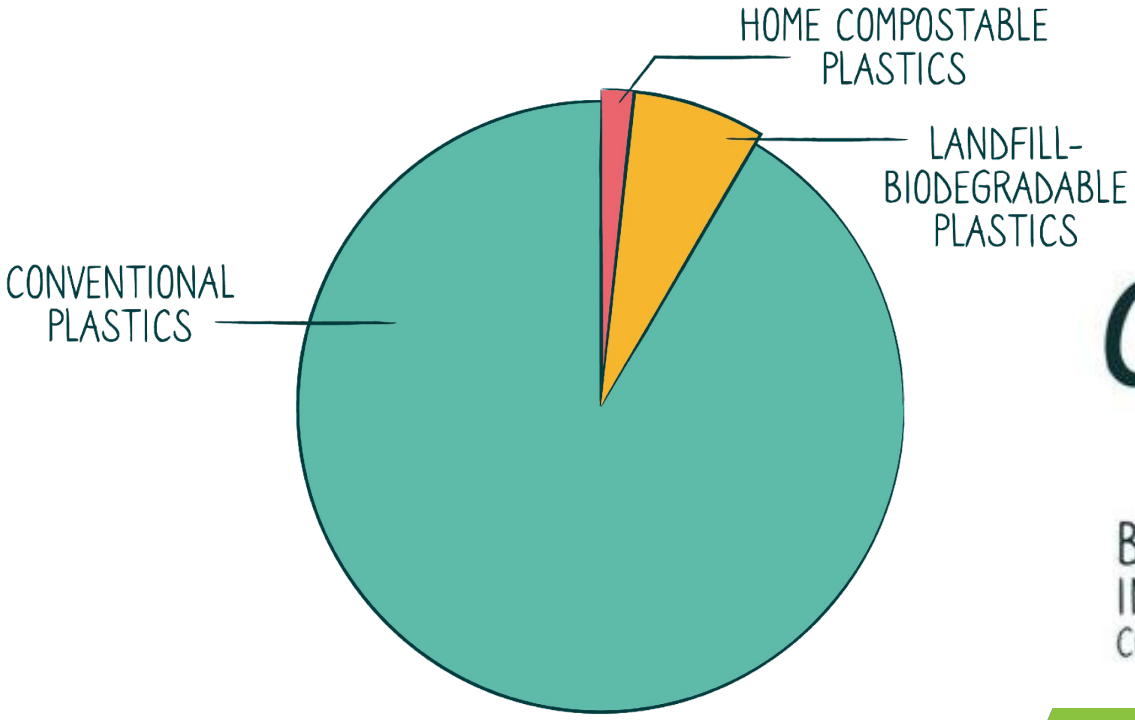
Home Compostable as a Solution?

Biogone also has a range of home compostable plastics which are certified in accordance with Australian/NZ home compostable standard AS5810. To make the materials Home Compostable, the manufacturers add an extra component (PBAT) to commercial compostable materials. Added at high percentages, 60%. This is a highly biodegradable material at ambient temperatures and allows the product to be disposed of in a home compost, commercial compost facility (if the waste stream is available) or landfill.

Some considerations for home compostable products:

- Still considered 'single-use' and currently a 'linear concept' rather than 'circular concept' also known as circular economy
- Depending on the product's use, not all home compostable products are suitable to be disposed to a home compost and are more likely to end up in landfill. For example a home compostable bag for collecting dog waste
- The PBAT is derived from fossil fuels.
- Not recyclable
- Limited shelf life of ≈ 12 months from manufacture

Biodegradation Time



90+% FASTER BIODEGRADATION IN LANDFILL THAN CONVENTIONAL PLASTICS

03.

Recyclability

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Landfill-Biodegradable Plastic

Landfill-Biodegradable plastics :

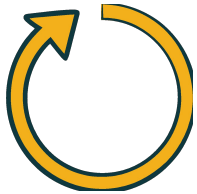
- can be **Recycled** with other mainstream soft plastics including REDcycle and commercial recylers. The proprietary additive used does not affect the recycling process.
- Once a plastic item can no longer be recycled, it can be **disposed of to landfill** where it will biodegrade 90+% faster than conventional plastics.
- Have no shelf life issues

How does this work?

- The additive only comes into play when the plastic product is disposed in a microbe rich environment.

Our position on plastics

Biogone promote -
if single-use plastic must be used then:



It should be
reusable

It should be
mainstream
recyclable

It should be made to
biodegrade where it will be disposed
(landfill*, commercial or home compost facility).

It should be made to
convert
waste to energy

*CURRENTLY 85% OF OUR PLASTIC IS GOING TO LANDFILL!

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Thank you

Come visit our Booth A132

LANDFILL-BIODEGRADABLE
HOME COMPOSTABLE
EVERYDAY PLASTIC PRODUCTS

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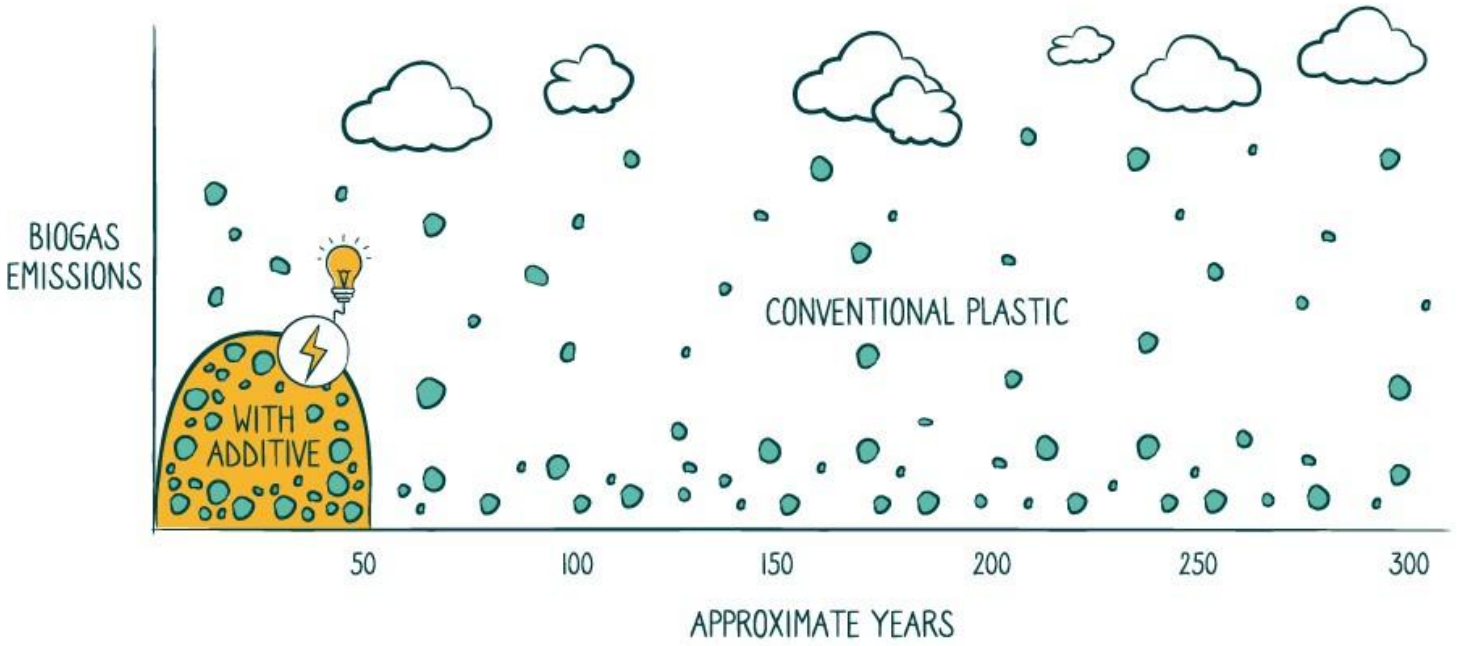
Biogone Additive
Methane Evolvement



Landfill Biogas

Brisbane Landfill is converting more green methane (landfill biogas) into renewable electricity following installation of two new 1.1MW landfill biogas engines at the landfill site in Rochedale. These new engines are expected to generate 18,250 MWh of renewable energy per annum, which is enough to electricity to power over 3300 Brisbane households on a 24/7 basis.

Landfill biogas is a by-product of the slow decomposition of organic material in landfills. This natural process produces a biogas, which consists predominantly of methane (50%) and carbon dioxide (50%). It is estimated that one tonne of garden waste in landfill produces 1.4 tonnes of carbon emissions over the life of the landfill and one tonne of food waste will produce 1.9 tonnes of carbon emissions over the life of the landfill.

Landfill-Biodegradable plastics are:

- Able to be made from **from virgin or recycled plastic**
- **Reusable** wherever practical
- **100% Recyclable** with mainstream soft plastics including REDcycle and Commercial Recyling.

The benefit to this technology, is the methane produced from accelerated landfill-biodegradable plastics, can be captured within the time frame the landfill is actively managed, rather than being released into the atmosphere as a conventional plastic does, over hundreds of years after the landfill has closed and stopped being managed. This captured methane can be used for fuel and energy production.