Controlled-life

Plastic Technology

d2w®

www.d2w.net

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Some things,
You want to keep forever.
But definitely not the plastic!

A British Public Company

Isn’t plastic fantastic?

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The benefits of Plastic Packaging

- Lightweight
- Flexible
- Strong/Durable
- Heat sealable
- Impervious to moisture
- Printable
- Recyclable
- Reusable

but…


*FACT
PLASTICS CAN TAKE DECADES TO BREAK DOWN
TRUE
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The Plastic Disposal Issue

Current options for disposal of plastic waste:

- **Traditional landfill**
- **Incineration**
- **Recycling**
- **Composting**

- **BUT ONLY IF IT CAN BE COLLECTED**

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Examples

TOP OF THE DROPS

According to the Daily Mail the five worst brands in the UK, by percentage of total litter are:

1- Coca-Cola	4.9%	
2-Walkers Crisps	4.1%	
3-McDonald's	3.6%	
4-Cadbury	2.7%	
5-Red Bull	2.0%	

What the litter was:

- Drink cans and bottles	34%
- Confectionery wrappers	16%
- Fast-food packaging	13%
- Cigarette packets	10%
- Crisp packets	8%
- Miscellaneous	19%


STOP !

The solution

d_2w Controlled-life Plastic Technology

A No-Change Added-Value Solution

→ d_2w Controlled-life Plastic Technology

- Self-destructs automatically 2 – 5 years* after the end of the product's service-life predetermined.
- Heat, light, and stress accelerate the process - if littered, degradation can take place within a few short months when exposed to hot climatic conditions.

* Depends on product type and exposure conditions

A No-Change Solution

Normal Plastic

- Used throughout industry and has been tested and proven safe for food, medical, farming and many other applications.
- Can be reused.
- Will eventually degrade to CO_2 and H_2O but will take up to 400 years.
- Will not meet any biodegradable or degradable standards
- Can be recycled, though stabilisers will normally be required to replace properties lost during the reheating process.

d_2w Controlled-life Plastic Technology

- It takes seconds to make normal plastic but much too long to disappear.
- d_2w improves the excellent properties of normal plastic by controlling and reducing its lifespan and therefore making it more acceptable.
- No change in performance and optical properties of the normal plastic product.
- Low cost, because products made with d_2w technology comprise more than 99.5% normal polymer, and are made with the same machines.

A No-Change Solution

- The purpose of d_2w plastic is to self-destruct if it gets into the open environment much more quickly than normal plastic, and to do so without causing ecotoxicity.
- d_2w plastics are not currently marketed as compostable, nor are they designed to degrade under anaerobic conditions in landfill.
- They can be recycled with other oil-based plastics (see www.biodeg.org/recycling.htm) - unlike “compostable” plastics, which will damage a normal plastic recycling process.

Responsible use of plastic
The Three R's

REDUCE: **d_2w** can help to reduce the burden of persistent plastic waste in the environment

REUSE: **d_2w** based products can be re-used many times during their service-life

RECYCLE: **d_2w** based products can be recycled and made from recycled plastic polymers

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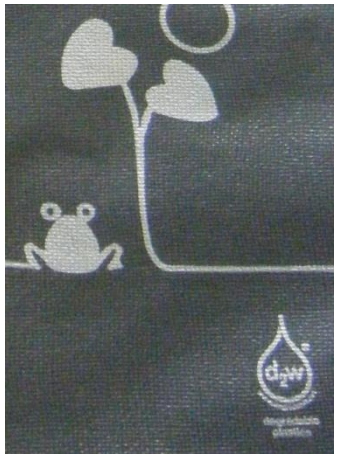
Bag for life,
but not for ever

Reusable bags made with d_2w Controlled-life Plastic Technology



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d_2w controlled-life additive system

- Used with virgin & recycled polymers
- Compatible with Polypropylene, Polyethylene & most short-life plastic packaging (HDPE, LDPE, LLDPE)
- Inclusion rate normally only 1%
- 12 months to 2 years* shelf life - The stabilisers in the d_2w additives allow for controlled degradation

* Shelf-life will be prolonged if kept away from heat, uv light, and oxygen

How does d_2w Controlled-life Plastic Technology work?

- d_2w technology is an additive that is included in the basic polymer resin during the manufacturing process
- Breaks the molecular chains
- Plastic starts degrading at end of pre-determined service-life
- Process of oxidation – in presence of oxygen, and accelerated by light, heat and stress
- Bio-degradation completed by micro-organisms

Non-toxic Residues

- Water
- CO_2
- Biomass
- **NO "HEAVY METALS"**

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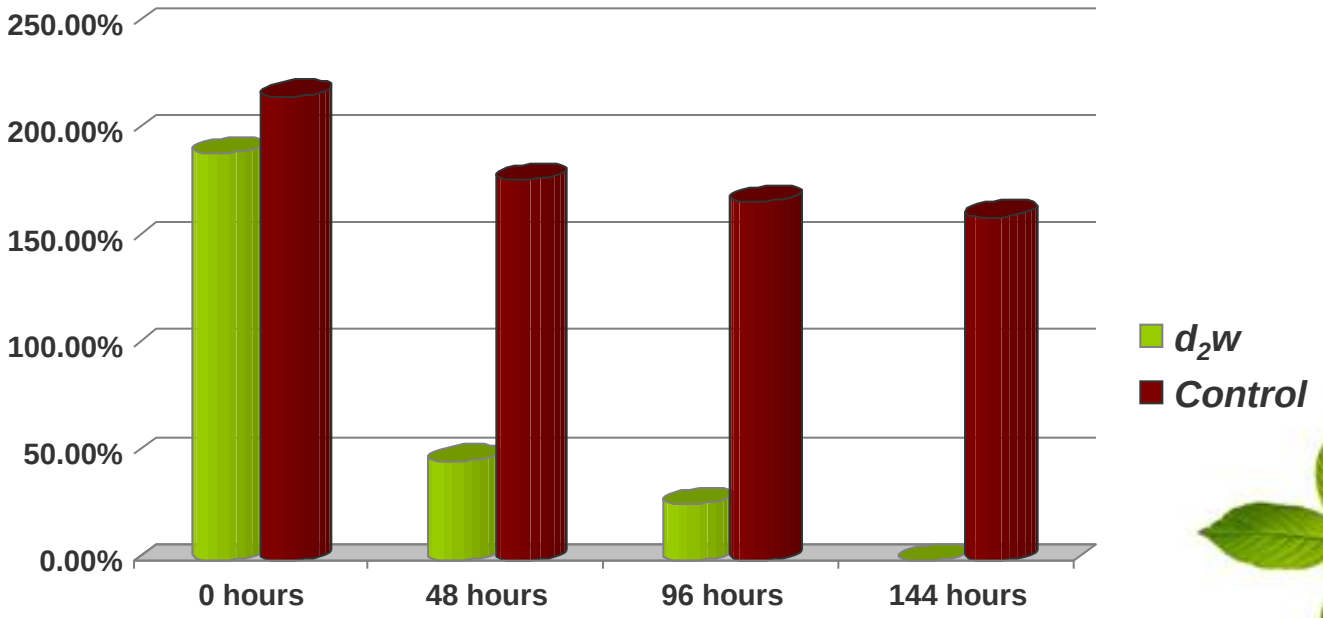
Life Comparison Profile



Tensile-elongation under UV

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THE PROCESS – the intermediate stage

Embrittlement of plastic bag

Continuing fragmentation

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d_2w main features

- No compromise in functionality:
  strength, clarity, barrier properties, sealability and print
- No special machinery or workforce
- No change of supplier or raw materials
- Compatible with PP, PE & most flexible plastic packaging
- 12 months to 2 years shelf life
- Comprehensively tested and proven

A brand you can trust!

Certifications

- Safe for food contact (EU & US) – confirmed by RAPRA (US Owned) and Keller and Heckman LLP (US Law Firm)
- All grades of d_2w are compliant with the requirements of:
  - → The European Union 2002/72/EEC regulations for Direct Food-contact and all amendments.
  - → The FDA requirements for direct food-contact materials.
  - → Brazilian ANVISA requirements for Direct Food-Contact
- No-Eco-Toxic (EN 13432) – tested by AP Plast, OWS, Belgium
- Biodegradable – tested by AP Plast, PYXIS, UK, CSI, Italy; RAPRA, UK and UFSCar / UNESP Brasil
- Compostability – tested by AP Plast – Spain, Ecosigma Brazil
- Certified by Oxo-biodegradable Plastic Association – www.biodeg.org

Certification programme

- After Q/C approval by Symphony, all manufacturers making products using d_2w additive are issued with a **Certificate for display** at their premises and the unique number provides Q/C traceability.

- All users are entitled to a certificate as part of the PR/ marketing programme.

Unique number that provides traceability and validity

Products Available

PE and PP, (PS and PET in development)

- Bread wrappers and snack-food packets
- Bags to contain dog faeces collected in parks, gardens, etc
- ‘‘Bubble-wrap’’
- Carrier bags or “Shopper-bags”
- Frozen food packaging Garbage sacks and Bin Liners
- Gloves and aprons
- Newspaper and magazine wrappers
- Rigid products such as bottles, tubs, and cups
- Shrink-wrap and pallet-wrap




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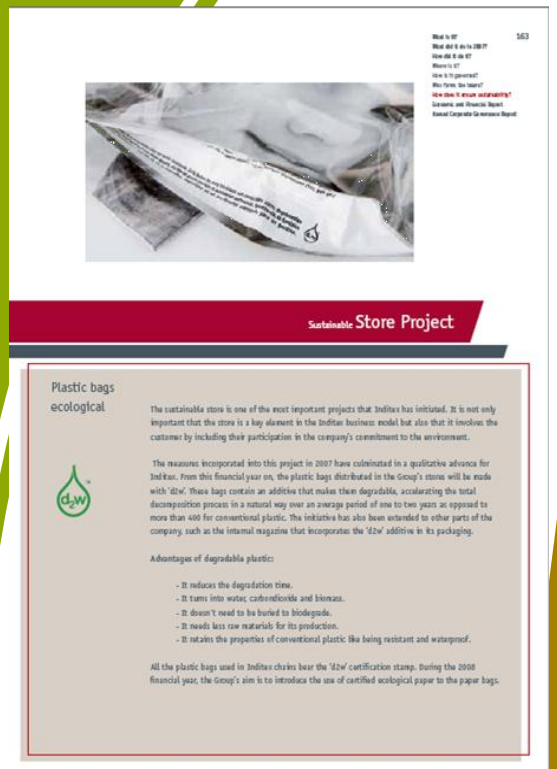
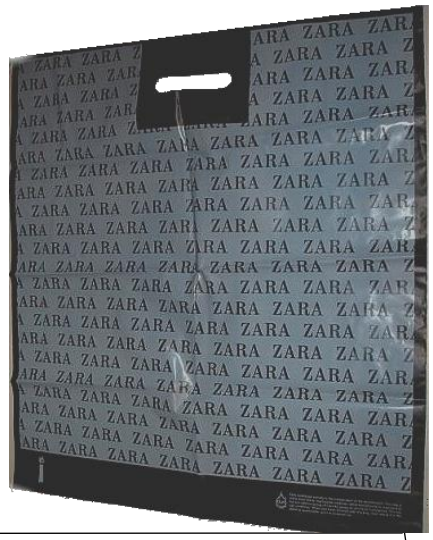
Some Major Users of d_2w

ZARA





WAL★MART Argentina

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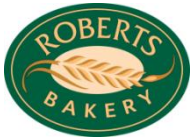
Some Major Users of d2w






Certification
European Normalization

The Official Definition

Oxo-degradation is defined by the European Standards Organisation TC249/WG9 as "degradation resulting from oxidative cleavage of macromolecules."

Biodegradation is degradation of a polymeric item due to cell-mediated phenomena.

Oxo-biodegradation is "degradation resulting from oxidative and cell-mediated phenomena, either simultaneously or successively."

Defining Degradability

Compostability

- The standard testing guidelines for compostability are *EN13432 (European) and *ASTM D 6400 (American)
- Composting is an artificial process with a much shorter timescale than natural biodegradation
- Both of these standards therefore require rapid emission of CO_2
- These standards are not appropriate for biodegradation in the open environment
- Even naturally-occurring lignocelluloses (leaves, twigs, stems, sawdust) would not pass the test in these standards

Oxo-degradability

- The standard for oxo-biodegradability is American Standard 6954-04
- The British Standards Institution is drafting a similar standard for Europe
- Oxidation in the presence of oxygen is followed by bio-degradation
- The process is accelerated by heat, UV light, and stress
- The additive facilitates slow carbon-release favourable to the environment as a nutrient for plants
- June 2009: a Life-cycle Assessment was published by Germany's Institute for Energy and Environmental Research (IFEU),which concluded that polyethylene sacks made from Post Consumer Recyclate have generally the smallest environmental impact profiles and can be considered the most "eco-friendly" materials for waste bags; (Oxo-biodegradable garbage sacks are made from polyethylene and can be made from either recycled or virgin material).

*ASTM: American Society for Testing and Materials

*CEN: European Centre for Standardization

The brand you can trust!

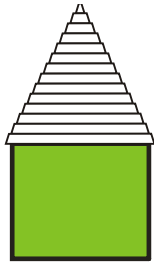
The value-added technology

The advantages of d_2w controlled-life Plastic Technology are many:

- ✓ will harmlessly self-destruct within the timescale specified
- ✓ will not degrade prematurely
- ✓ until it degrades it is just as strong and serviceable as conventional plastic
- ✓ can be made using existing machinery and workforce, at little or no extra cost
- ✓ is safe for food contact
- ✓ can be recycled and can be made from recyclate
- ✓ does not just fragment but totally degrades to nothing more than CO_2, water, trace-elements and humus, leaving no harmful residues

Sustainable energy and eco-friendly products
for Bermuda's present and future life styles

thegreenhousebermuda



For More information on recycled plastic bin liner/trash bags, that are bio-degradable, for commercial use, please contact Michael Burke at:

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www.thegreenhousebermuda.com