Using Degradable Plastics in Australia

A Product Stewardship Guide and Commitment

A voluntary industry initiative developed in partnership with the Department of the Environment and Water Resources

Australian Government

Department of the Environment and Water Resources

Plastics and Chemicals Industries Association Incorporated

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Foreword

Statement from the Minister for the Environment and Water Resources

This Product Stewardship Guide and Commitment represents an important step forward by the Plastics and Chemicals Industries Association (PACIA) and the degradable polymers industry. Most degradable plastics are relatively new and their use is increasing rapidly. Given the potential for consumers to misunderstand claims relating to environmental performance of these new materials, companies need to introduce them into the market in ways that promote a more sustainable environment and lifestyle.

This publication encourages the plastics industry in Australia to apply sound science in developing products for the marketplace and takes into account any long-term impacts of disposing of the new materials. It also encourages the industry to use accurate and user-friendly labelling claims and will be underpinned by a committee to help advance Australian standards, address recycling issues and monitor and respond to emerging challenges.

The Product Stewardship Guide and Commitment highlights the important contribution that voluntary partnerships between governments and industry can make towards a more sustainable lifestyle. The Australian Government is pleased to have been able to support the development of this innovative document and place Australian industry at the forefront of world's best practice.

I congratulate PACIA and industry participants for this initiative. It is an excellent example of what can be achieved when industry and government work in partnership to deliver better outcomes for consumers and the environment.

The Hon. Malcolm Turnbull MP
Minister for the Environment and Water Resources

Statement from the Chief Executive, Plastics and Chemicals Industries Association (PACIA)

Plastics are the base material for many new and beneficial products that meet our current and future needs. Degradable plastics can provide us with increased flexibility in the design of materials to suit not only their life and use as a product, but also to minimise any detrimental impact on the environment when that product's intended use has ended. To ensure the most suitable material degrades in the appropriate environment, it is important that all of the relevant factors are understood and are applied by raw material suppliers, product manufacturers and brand owners within industry, and understood by governments and communities.

This Product Stewardship Guide and Commitment helps companies to make balanced and informed decisions regarding products, the environment and information provided to consumers. It also is a guide for a broader audience to improve understanding of these materials and how they might be used to the community's advantage with minimum environmental impact.

Achieving greater certainty for business and meeting the needs of the community and the environment requires cooperation between industry and government. PACIA is pleased to acknowledge the valued partnership of the Department of the Environment and Water Resources in this product stewardship approach and the Australian Minister for the Environment and Water Resources, the Hon. Malcolm Turnbull MP, for his assistance in providing funding to complete the work.

Michael Catchpole
Chief Executive

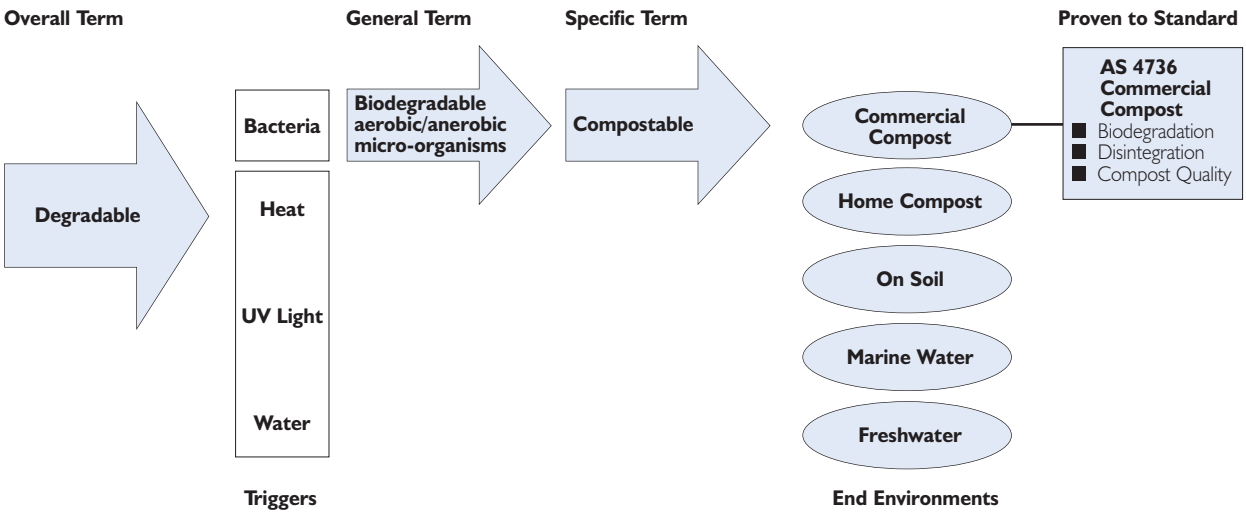
Introduction

Many of the existing, new and beneficial products that meet our current and future needs are made of plastic. Degradable plastics can give us increased flexibility in the design of materials to make products better-suited to their intended use and also minimise any detrimental impact on the environment when that product's intended use has finished.

At end-of-life, products made from degradable plastic need to degrade in the right place, at the right time and in the right end environment. For this to happen, industry must use clear, accurate and consistent information. When selecting a material, designers and manufacturers must consider a product's end environment and base their selection on sound science that includes proof of compliance to standards that can be independently verified. Consumers and governments must be assured that performance claims can be met and that and product labelling is clear, accurate and honest. This is product stewardship at work.

It is important that the plastics industry should take a leading role in the development and use of accurate information. It is also important that government should support the development of this information and the education of consumers. The Plastics and Chemicals Industries Association (PACIA) and the Department of the Environment and Water Resources formed a partnership to improve the understanding of degradable plastics and to help industry provide credible information on degradable materials. This Guide and Commitment is a result of that partnership.

This document helps the plastics industry in Australia to apply sound scientific principles to the development of products for the marketplace and to take into account any long term disposal impacts. It also assists the industry to use accurate and user-friendly labelling when making claims about product performance. A reference group has been established to help develop and apply Australian Standards, address recycling issues, and monitor and respond to emerging challenges. An independent verification system has been established to provide supporting evidence of a company's claim that it holds certification to a relevant standard. Terms used by the plastics industry have been explained in plain language and built into the following framework to assist with their consistent use.



This Guide and Commitment provides information for designers, manufacturers and consumers of degradable plastic materials and will help to give them greater certainty in their assessment of degradable plastic products. The document allows product manufacturers to better understand what they are buying and using and includes a whole-of-life design guide. It allows them to label products so that consumers understand the end environments best-suited for the degradation of particular products. The document includes answers to some frequently asked questions and is a living reference which will be updated online at **www.pacia.org.au/degradables** as improvements occur.

The signatories trust that this Product Stewardship Guide and Commitment improves the understanding and use of degradable plastics in Australia so that the most suitable materials are used in the most appropriate products for the correct purpose.

List of abbreviations

ACCC Australian Competition and Consumer Commission

AS/NZS Australian Standard / New Zealand Standard

ASTM American Society for Testing of Materials (Standards)

CEN Committee European de Normalisation (European Committee for Standardisation)

DEW Department of the Environment and Water Resources

ISO International Organisation for Standardisation

PACIA Plastics and Chemicals Industries Association

RMIT Royal Melbourne Institute of Technology

SMEC Snowy Mountains Engineering Corporation

Acknowledgements

PACIA wishes to acknowledge and thank the following parties for their assistance in the development of this Guide:

- Australian Competition and Consumer Commission
- Department of the Environment and Water Resources
- Royal Melbourne Institute of Technology
- PACIA Degradable Plastics Reference Group members
- Signatories
- SMEC Australia Pty Ltd

Purpose

This document provides

1. An improved level of information and certainty to users of degradable plastic materials so that they are better informed about:
   - what they are buying and using
   - how degradable plastics should perform
2. An outline of this voluntary industry initiative which suppliers, manufacturers, users and specifiers of materials and products commit to applying throughout their businesses.
3. Information on the verification system developed for degradable plastics which allows claims of certification to a standard to be assessed in a transparent and equitable manner.

Specific commitments and guidance

1. Commitments relating to clear and accurate information and labelling, and the continuance of a Degradable Plastics Reference Group.
2. Guidance on whole-of-life design principles including:
   - End-of-life management considerations
   - Product stewardship considerations with other parties
3. A Users Guide to Materials taken from information provided by raw material suppliers[1], setting out information on:
   - Suitable end-of-life environments for the products
   - Categories of degradable plastics
   - Degradation triggers
   - Breakdown products - products created or released as a result of breakdown
   - Performance and testing standards
4. Definitions for commonly used terms in relation to degradable plastics which are consistent with Australian and ISO (International) Standards.

A living document

This Guide is a living document which is able to change as needed to deliver through continuous improvement, the required level of certainty to users of degradable plastic materials.

It will be updated as required by the PACIA Degradable Plastics Reference Group and be available electronically from the PACIA website for ongoing use.

[1] Raw material suppliers are defined as either direct suppliers of the base ingredients or masterbatches or the first importer of finished goods claiming degradable characteristics.

Background to Australian Standards for degradable plastics

Australia is developing a range of performance standards and test methods for degradable plastics. Standards Australia coordinates this process through its Technical Committee EV-017 which comprises industry, government and environmental representatives. Standards also exist to specify what particular terms mean when used for making environmental claims. These can be referred to by regulators or others where false or misleading information is perceived or reported.

Performance standards describe what a material needs to do in particular end environments (in compost, air or water). For example, AS 4736-2006 sets out what a material needs to do in order for it to be claimed as biodegradable / compostable. Similar international standards also exist, including EN 13432 in Europe.

Test standards describe how certain properties of a material can be tested in a certified laboratory. Results from test standards will be used in the relevant performance standard assessment, which tests 'real world degradation and sets 'pass-fail' limits. For example, AS ISO 14855-2005 is one of the tests which sets out how a material will be prepared and tested to meet AS 4736-2006.

Certifying bodies are organisations with approved laboratories and practices able to conduct testing on materials using approved test methods. For example, AIB Vicotte and DIN Certco are two certifying organisations in Europe which test materials. At the time of publishing, Australia is undergoing a process of finalising the first local certifying organisation.

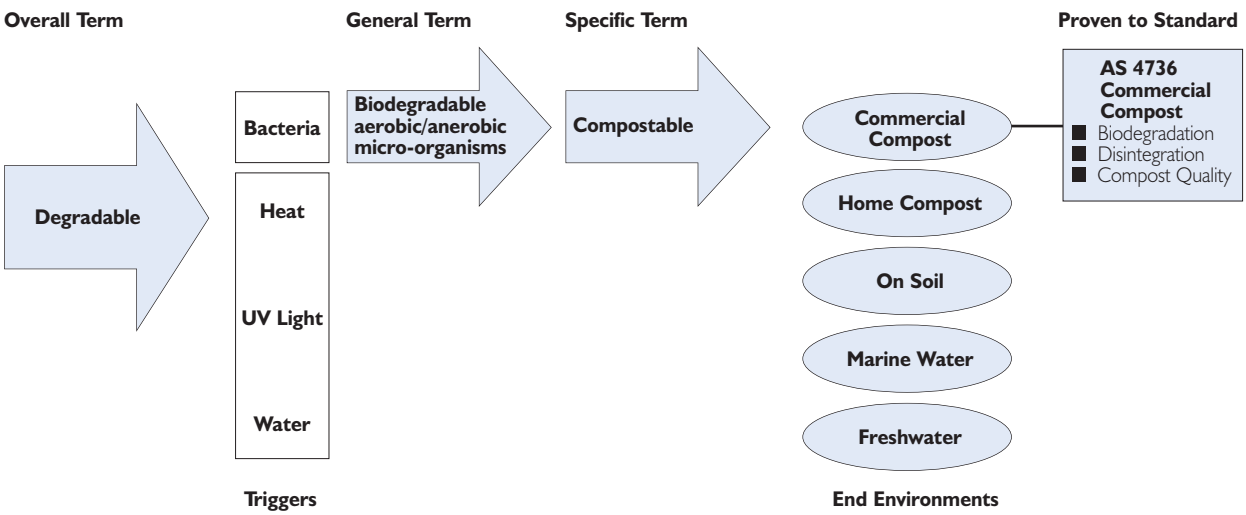
Progress on the development and publication of Australian degradability standards can be found at the Standards Australia, Department of the Environment and Water Resources and PACIA websites.

To help clarify which materials comply with recognised performance standards, PACIA has established a Verification System in Australia. This system verifies and lists materials which have been independently proven to comply with a stated claim.

All environmental claims that relate to degradability (such as compostability) need to meet the requirements of AS/NZS ISO 14021:2000 Environmental labels and declarations - Self-declared environmental claims (Type II environmental labelling).

Where concerns exist that environmental claims may not be accurate or may be misleading, the Australian Competition and Consumer Commission (ACCC) may become involved. Claims and performance against Australian Standards may be referenced in dealing with concerns.

Progression of degradable, biodegradable and compostable plastics



Principles

Information on material selection should be based on scientific merit to enable the most appropriate material to be used.

The application of this principle requires:

1. Information to be accurate, unambiguous and not misleading.
2. Information to identify and communicate the environments in which degradable plastics break down and the degradation processes.
3. The use of sound science.
4. The application of life cycle assessment and other evaluation tools where appropriate.
5. That all signatories support the development and application of appropriate Australian and international performance and test standards for materials and products.
6. Industry to assist with ongoing education and the adoption of product stewardship programs which:
   - Engage consumers, government and stakeholders in product supply and recovery chains
   - Provide credible information
   - Create a common understanding of materials and products, how they break down and in what environments
   - Review and update knowledge and how it is communicated
   - Report on activity, progress and developments

Stakeholders

There are a number of key stakeholders in the product cycle which are important in meeting the Guide's objectives:

- **Raw material suppliers** – companies involved in the manufacture or supply of raw materials used in the manufacturing of degradable plastic products. An example is a resin supplier to a plastic film manufacturer.
- **Product manufacturers and suppliers** – companies involved in the manufacturing, marketing and supply of consumer products using degradable plastics. These companies generally work with specifiers and users of manufactured goods and are often able to assist with the design of products over whole-of-life. An example is a plastic film manufacturer making packaging products.
- **Specifiers and Users** – companies that specify or design products and use them in their operations. This includes brand owners who market, package or sell products which benefit from the properties of degradable plastics. An example is a retail company which packages their product in degradable plastic film.

Summary of commitments and guidance

The Table below summarises the commitments and guidance provided in this document.

	ISSUE	AIM
Commitment 1 Clear and accurate information and labelling	How information is provided and used	Environmental claims which are clear, accurate and not misleading
Commitment 2 PACIA Degradable Plastics Reference Group	How the plastics industry coordinates policy and Standards development	The Reference Group will: ■ Oversee and review this Guide ■ Coordinate PACIA's representation with external parties ■ Contribute to the development of relevant standards ■ Annually report on activity and progress
Guidance 1 Sound whole-of-life design	How whole-of-life principles can be incorporated into design of degradable plastics	Decisions to use a degradable plastic should consider: ■ Where and how the product will degrade ■ Life cycle environmental impacts
Guidance 2 User's guide to materials	Key parameters that apply to end-of-life environments	PACIA will compile and maintain a list of materials for which certification to a recognised Standard for degradable plastics has been verified by a credible and independent organisation
Guidance 3 Terms and definitions	Consistent use and understanding of terms	Improved consistency, knowledge and understanding of commonly used terms that relate to degradable plastics

Commitment One

Clear and accurate information and labelling

Clear and accurate information and labelling is a foundation of reliable and consistent decision making.

Communities and governments rely on industry to provide clear, useful and verifiable information to help them make decisions about products in the marketplace. Communities, governments and industry also rely on regulatory agencies and courts to uphold the law when false or misleading information creates confusion amongst users or creates an uneven commercial playing field.

This commitment is common to all signatories.

A. Common commitments

All signatories commit to the following when labelling materials and products:

1. The principles of this Guide as outlined on page 8

2. The application of AS/NZS ISO 14021:2000 Environmental labels and declarations – Self-declared environmental claims (Type II environmental labelling)[2]. The objective of this Standard is to harmonise the use of self declared environmental claims. This should result in:
   - Accurate and verifiable environmental claims that are not misleading
   - Increased potential for the market to stimulate environmental improvements in production, processes and products
   - Prevention or minimisation of unwarranted claims
   - Reduction in marketplace confusion
   - Facilitation of international trade
   - Increased opportunity for purchasers, potential purchasers and users of the product to make more informed choices

3. Application of all relevant Australian Standards for degradable materials, including AS 4736-2006[3].

4. Recognising the value of reporting and communicating the Guides use. Signatories will keep a simple count of the Guides use and report this number annually to the Reference Group.

B. Specific commitments

In addition to the common commitments, stakeholders commit to seek and use accurate information to guide decision making.

Raw material suppliers

- Will provide information on material performance and suitability for applications. This includes first importers of finished goods claiming degradable properties.

Product manufacturers

- Will request, use and pass on verified information and advice on material suitability for product applications.

Specifiers and users

- Will request, use and pass on verified information on material product performance.
- Will use this information to guide product design over whole of life. This includes brand owners and retailers.

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[2] This Standard is relevant in determining the requirements of fair trading, competition and consumer protection as established by the Australian Competition and Consumer Commission (ACCC).
[3] At the time of printing AS 4736-2006 has been published as a standard for compostable plastics.

Commitment Two

PACIA Degradable Plastics Reference Group

Industry leadership is vital in providing accurate information, and in fostering confidence in consumers, governments, industry and regulators that best practice and responsible management underpins business activity.

PACIA commits to participating in and supporting the Degradable Plastics Reference Group to the following extent:

Oversight

PACIA will oversee the future development of the Guide including:

- Supporting at least two meetings per year of the Degradable Plastics Reference Group to consider local and overseas developments and whether these may need to be addressed in this document
- Managing the process for introducing various standards and certifying bodies into the verification system described in this document
- Maintaining the Guide as a living document
- Ensuring that the Guide is updated and available electronically
- Conducting a review of the Guide after 5 years (2011) and updating the Guide where necessary in consultation with government, stakeholders and users

Advice, reference and liaison

PACIA will assist in providing advice to external groups including:

- Commentary on the development of relevant Australian Standards
- Liaising with other groups where product stewardship guidance and development is required - for example plastic recyclers and organic composters

Consistent, current information and education

PACIA will liaise with the Department of the Environment and Water Resources to ensure that information and education sources provided by both parties are consistent and up to date.

Accountability and reporting

PACIA will report annually on the Guide including its use and development. The report will be incorporated into the PACIA Annual Report. Data will be collected and aggregated from a variety of sources including:

- Counts of signatory use
- Visits to target websites
- Relevant activity of the Reference Group

Sound Whole-of-Life design

Sound design principles for whole-of-life can play a valuable role in determining the appropriate materials, processes and resources to create a product which meets technical and environmental specifications.

Any decision to use a degradable polymer should:

- Be based on a good understanding of where and how the product may end up and how it will degrade
- Recognise and minimise life cycle environmental impacts (not just end of life)

Good design for degradability means that:

1. Degradation will occur in the right place at the right time
2. Function and mechanical properties of the product are not compromised
3. Potential impacts on other stakeholders, including plastic recyclers and organic composters are eliminated or minimised
4. Potential environmental impacts are identified, considered and managed
5. Additional manufacturing does not compromise the performance and degradability of the base material
   - This includes the addition of materials, inks or coatings or other processing
6. Consumers are informed and educated with robust and verifiable information
7. Degradability adds value against a Triple Bottom Line assessment[4]

The key steps for good design using degradability are summarised in the following flow chart.

Good design for degradability – Flow chart[5]

How degradable plastics can add value against the triple bottom line
- Commercial viability
- Social responsibility
- Environmental quality

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The environments where degradable plastics are expected to end up
- Terrestrial environment – eg. composting, in soil, above the ground, litter
- Aquatic environment – eg. freshwater, marine environment, seawater
- Wastewater – domesstic, commercial and trade waste
- Will it float or sink?
- Will in contaminate any recycling streams?
- Discuss concerns with recyclers and consider product labeling

↓

Select a shortlist of materials, for example:
- Compostable to AS 4736 or EN 13432
- Oxodegradable
- Hydrosoluble

↓

Determine the functional product requirements
- How will the material be processed?
- What end-of-life environment is it likely to break down in?
- How fast or slow does it need to break down?

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Select the best degradable plastic for the application
- Design the product to meet degradability standards
- Avoid dispersion of toxic substances into the environment

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Issues for degradability
- Wall thickness
- Pigments and coatings (particularly heaving overprinting or lacquers)
- Multiple materials

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Issues for environmental impact
- Heavy metals in pigments, eg. lead, cadmium, mercury, chromium
- Heavy metals in printing inks
- Degradable residues

↓

Proceed with product development

↓

Design, labeling and information
- Comply with Trade Practices Act and AS/NZS ISO 14021 for Environmental Claims
- Claims should be accurate and not misleading
- Consumers should be advised on preferred end-of-life environments for disposal

[4] Triple Bottom Line includes a balanced assessment of total value based on social, environmental and economic impacts.
[5] Adapted from Helen Lewis, RMIT Centre for Design.

User's guide to materials

To assist in the use of accurate and verifiable scientific information, signatories to this Guide have provided information on their material types for verification of their claims.

Degradability claims

The degradability claims have been verified under the PACIA Degradable Plastics Verification System, established in accordance with the requirements of member organisations of PACIA and the Department of the Environment and Water Resources. This confirms certification to one of the following internationally recognised standards for degradable plastics.

Standard	Certifying Body [6]
AS 4736-2006[7]	TBA[8]
EN 13432 (Europe)	AIB Vincotte DIN Certco

It should be noted that as differences exist between test methods, the stringency of environmental requirements, prescribed by the different standards for degradable plastics, may also vary.

A register of verified degradable materials is available at the PACIA website.

General product information

Information on a range of properties that can be used in guiding decisions regarding the design of products is also listed on the PACIA website. This includes information on:

1. End of life environments
2. Categories of degradable plastics
3. Degradation triggers
4. Breakdown products
5. Performance Standards

PACIA has received the information in this guide from third parties and provides this information as supplied. Independent verification has been conducted, in good faith, to substantiate the conformance of certain products to the certified standards noted. Persons or organizations referring to this guide should conduct their own assessment of material suitability and performance for any intended use. Neither PACIA nor its employees or agents makes any warranty in respect of the information supplied and accepts no liability for any loss or damage which may arise as a result of anyone using or relying on this guide or the accuracy or continued accuracy of information contained therein.

[6] This list was correct at the time of publication, however updates will be provided through the PACIA and DEW websites. For the most recent list, please refer to **www.environment.gov.au** or **www.pacia.org.au**
[7] AS 4736-2006 is based on EN13432 and contains an additional eco-toxicity test requiring local testing for certification
[8] An approved Certifying Body is yet to be identified for AS 4736-2006. Updated information will be provided on the PACIA website.

Guidance Three

Definitions and terms

Definitions for commonly used industry terms are provided in the following section.

A degradable plastic is a plastic designed to undergo a significant change in size or chemical structure under certain conditions and over specified periods of time. Performance standards specify requirements for disintegration, biodegradability and toxicity and set out the appropriate test methods that need to be used to enable certification bodies to validate and support claims of degradability. Following the approval of AS 4736 in 2006, the Standards Australia Committee EV 017 - Degradability of Plastics are considering developing Australian Standards (AS) for home compost, on-soil, marine and freshwater end-of-life environments.

The table below sets out a summary of the key parameters that apply to specific end-of-life environments.

End of Life Environments	Category	Degradation triggers	Breakdown products	Performance Standards
Commercial compost	Compostable	Bacteria, Heat	90% biodegradation 2mm size CO2, H2O	AS 4736 EN 13432
Home compost	Compostable	Bacteria, Heat		AS to be developed
On soil (eg mulch)	Photo degradable Hydrosoluble	Sunlight, UV, Heat Water		AS to be developed
Marine water	Water soluble (salt water)	Sunlight, UV, water		AS to be developed
Freshwater	Water soluble (freshwater)	Sunlight, UV, water		AS to be developed

The following pages provide definitions for a range of terms used in relation to degradable plastics. Where possible, the definitions have been sourced from or are consistent with (in order of preference):

- AS 4736-2006
- AS/NZS ISO 14021:2000
- DEW Glossary of Terms or other DEW literature

[9] Refer to **www.environment.gov.au/settlements/waste/degradables/glossary.html** and **www.environment.gov.au**

TERM	MEANING
End-of-life environments	
Aerobic digestion	Degradation in the presence of air. Composting is a form of aerobic degradation.
Anaerobic digestion	Degradation in the absence of air, as occurs in dry landfills or in purpose built anaerobic digesters. Anaerobic degradation may also be referred to as biomethanisation.
Compost	A mixture of various decaying organic substances, such as dead leaves or manure, used for fertilising soil.
Compost - commercial	Compost produced in an industrial scale compost plant, a feature of which is the controlled and sustained elevation of temperature.
Compost - home	Compost produced in a small scale home composting system which is usually less managed than a commercial facility and thus tends not to achieve sustained elevated temperatures.
Flushable	Suitable for disposal in the sewerage system by flushing down a toilet.
Freshwater	Water that is not salty.
Landfill: dry-tomb	A landfill that is constructed to restrict contact between waste, and air and water.
Landfill: other	Method of solid waste disposal, including wet cell landfills, where refuse is buried.
Litter	Scattered rubbish, not properly disposed of in landfill, recycling, composting or other formal rubbish disposal methods.
Marine water	Salt water that comes from the sea.
Mulch[10]	Any pasteurised organic product such as a covering of straw or compost (excluding polymers which do not degrade such as plastics, rubber and coatings) that is suitable for placing on soil surfaces.
Open air environment	Any environment that is open to the surrounding atmosphere.
Plastics recycling	The recovery of scrap or waste plastics and reprocessing into useful product.
Plastic to fuels	The conversion of plastics to fuel sources such as diesel.
Septic tank	A tank in which solid organic sewage is decomposed and purified by anaerobic bacteria.
Sewerage sludge	Sludge with active, live degradation microorganisms.
Soil	The portion of the earth's surface consisting of disintegrated rock and humus.
Wastewater	Water that has been used in washing, flushing, manufacturing, etc., sewage.
Categories of degradable plastic	
Biodegradable[11]	Any organic substance capable of being broken down by micro-organisms in the presence of oxygen (aerobic) to carbon dioxide, water biomass and mineral salts or any other elements that are present (mineralization). Alternatively, any organic substance able to be broken down without the presence of oxygen (anaerobic) to carbon dioxide, methane, water and biomass.
Compostable[11]	Organic matter capable of being broken down by aerobic and anaerobic means to make compost.

[10] See AS 4454-2003 for reference.
[11] See AS 4736-2006 for reference.

Guidance Three [continued]

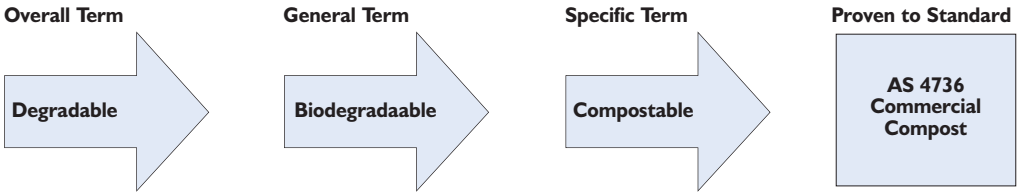
TERM	MEANING
Categories of degradable plastic (cont)	
Degradable[12]	Broadly describes plastics which are designed to break down into smaller particle sizes to a specific extent within a given time and within a specific end environment.
Oxodegradable	A catalyst-based, multi-stage degradable plastic which breaks down first by oxidation and later by bacteria (NB: no standard definition currently exists).
Photodegradable	A plastic capable of degradation by ultraviolet radiation degrading the chemical bond or link in the polymer or chemical structure of a plastic.
Water soluble	Capable of dissolving in water.
Material types and sources	
Thermo-plastic starches	Thermoplastic starches have a starch (amylose) content greater than 70% and are based on gelatinised vegetable starch and, with the use of specific plasticising solvents, can produce thermoplastic materials with good performance properties and inherent biodegradability.
Polyesters	Polymers with ester groups in their backbone chains. All polyesters degrade eventually, with hydrolysis being the dominant mechanism. Degradation rates range from weeks for aliphatic polyesters (e.g. polyhydroxyalkanoates) to decades for aromatic polyesters (e.g. PET).
Starch – Polyester blends	Starch-based polymers which are blended with high-performance polymers, such as polyesters to achieve the necessary performance properties for different applications.
Renewable sources	Sources of raw material from which plastics may be produced which are able to be replaced by new growth.
Performance Standards and protocols	
ASTM	American Society of Testing and Materials.
EN	European Standard.
Environmental claim verification[12]	Confirmation of the validity of an environmental claim using specific predetermined criteria and procedures with assurance of data reliability.
Environmental Impact[12]	Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities or products.
ISO - International Standards	A standard published by the International Organisation for Standardisation and commencing with ISO (eg ISO 16929).
Material Selection Information	Information available to consumers that describes the qualities and applications of a material and may aid selection of an appropriate material for a particular purpose.
Performance Standard	A standard that references one or more test standards and stipulates the results required.
Self-declared environmental claims[12]	Environmental claims that are made, without independent third-party certification, by manufacturers, importers, distributors, retailers or anyone else likely to benefit from such a claim.
Test Standard	A standard that sets out a method for testing a characteristic of a degradable plastic, but that does not indicate what result is required when performing that test.

[12] See AS/NZS ISO 14021:2000 for reference.

Frequently Asked Questions

What is the difference between degradable, biodegradable and compostable plastics?

- "Degradable" broadly describes plastics which are designed to break down into smaller particle sizes to a specific extent within a given time and within a specific end environment.
- "Biodegradable"[13] generally describes plastics which break down and change their physical composition into (for example) water, carbon dioxide and mineral salts by aerobic or anaerobic based processes.
- "Compostable"[12] specifically describes a biodegradable process where material breaks down in a defined environment, known and controlled conditions and to a minimum particle size with no toxic impacts on the surrounding environment. There are different Standards for commercial and home compost.
- All compostable plastics are biodegradable, however, not all biodegradable plastics are compostable (see diagram below):



Refer to the full diagram on Page 7 of the Product Stewardship Guide and Commitment for more detail.

What type of degradable plastic should I be using?

Consideration of the whole-of-life cycle of the product, including the end environment, will help determine the type of plastic needed. Raw material suppliers and product manufacturers can help guide your decision including the following considerations:

- The product cycle including manufacture, transport and handling
- The likely end environment - commercial or home compost, soil, marine or freshwater
- Interactions with the environment, people or business as a result of the breakdown

How long does it take for degradable plastics to degrade?

The length of time it takes a degradable plastic to completely degrade can range from minutes, to several months, to several years. The length of time depends on the type of degradable material, the end environment, and the conditions it is exposed to including light, heat, bacteria and water. Specific information can be found by referencing the relevant standards cited in this document.

Will degradable plastics interfere with plastics recycling?

- Plastic recycling relies on the durable properties of traditional thermoplastics while degradable plastics rely on break-down mechanisms. It is important that recyclers can accurately identify degradable materials coming into their systems.
- Recyclers and others have concerns that degradable plastics will contaminate the feedstock for their polymer manufacturing and these need to be addressed. Therefore, feedstock integrity is vital for all polymer manufacturers and processes.
- Product stewardship provides an opportunity for companies to work cooperatively to find the best system to manage their products if they enter recycling systems. More work is needed to better understand what impact they have.

Will degradable plastics change the amount of litter or people's littering behaviour?

- Littering is a complex problem created by consumer behaviour and unsuitable infrastructure including bin type, location and recovery services.
- It is unclear that introducing degradable plastics will change consumer behaviour, and consequently, the amount of litter in the environment.
- Some concerns exist that people who are currently likely to litter, would still litter, or may litter more, if they believe that the product will degrade.
- Overall, addressing litter and littering is best managed through a combination of education, infrastructure and enforcement of suitable laws

Will compostable plastics decompose in my home compost bin?

Compostable plastics have been tested in commercial compost environments as well as home compost systems under specific temperature, humidity and other conditions. Home composting conditions are different to commercial composting conditions. There are separate testing procedures and certification for each.

[12] See AS/NZS ISO 14021:2000 for reference.
[13] See AS 4736-2006 for reference.

Further references

Australian Competition and Consumer Commission
www.accc.gov.au
Guidelines for developing effective voluntary industry codes of conduct, ACCC Publishing Unit, February 2005.

American Society for Testing of Materials (Standards)
www.astm.org
ASTM D6400-04 Standard Specification for Compostable Plastics, ASTM International, 2004.

Department of the Environment and Water Resources
www.environment.gov.au/settlements/waste/degradables/certification.html
Publications: **www.environment.gov.au/settlements/publications/index.html**

Committee European de Normalisation
www.cen.eu
EN 13432 Packaging - Requirements for packaging recoverable through composting and biodegradation – Test scheme and evaluation criteria for the final acceptance of packaging, CEN, 2000.

***National Packaging Covenant Environmental Code of Practice for Packaging*, Australian Chamber of Manufactures, Beverage Industry Environment Council, Packaging Council of Australia Inc, Plastics and Chemicals Industries Association Inc; March 1997.**
www.environment.gov.au/settlements/publications/waste/covenant/code-practice.html

Standards Australia:
www.standards.org.au/
AS 4736-2006 Biodegradable Plastics – Biodegradable plastics suitable for composting and other microbial treatment, Standards Australia, November 2006.
AS/NZS ISO 14021:2000 Environmental labels and declarations – Self-declared environmental claims (Type II environmental labelling), Standards Australia and Standards New Zealand, February 2000.

SAI Global:
Australian Standards can be found at: **www.saiglobal.com/shop/Script/search.asp**

Plastics and Chemicals Industries Association:
www.pacia.org.au
Degradable plastics information can be found at:
www.pacia.org.au/index.cfm?menuaction=mem&mmid=010&mid=010.004

Signatories to the Guide and Commitment

The initial signatories are listed over the page.

An electronic register of signatories is also maintained containing the following information for each entry:

- Organisation
- Date signed
- Name of signatory
- Position in organisation
- PACIA membership

Admission of new Signatories

Stakeholders which are not signatories to this Commitment, but who are willing to make the commitments set out in the Guide, may apply to become signatories by applying to the Degradable Plastics Reference Group. Approval will not be unreasonably withheld or delayed.

Applications will be reviewed by the Degradable Plastics Reference Group which is authorised to admit new signatories.
The name of the new signatory organisation will be included in the list of signatories on the PACIA website and in annual reporting.

De-listing of Signatories

Signatories are expected to honour the Commitments set out in this document and as they are added to or updated. Signatories who, in the assessment of the Degradable Plastics Reference Group, have not met their commitments, and are not demonstrating dedicated effort to meet these commitments, may be removed from the list of Signatories[14].

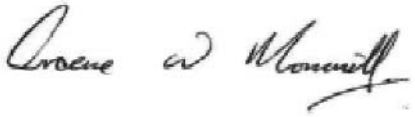
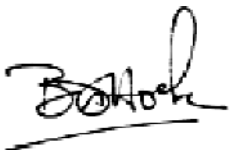
Concerns regarding signatories can be raised in writing to the

Degradable Plastics Reference Group
c/- PACIA
Level 1, Unit 7 Skipping Girl Place
651 Victoria Street
ABBOTSFORD VIC 3067

[14] Organisations need to consider pending action against companies including signatories to this Guide and Commitments when selecting suppliers.

Signatories to the Guide and Commitment [continued]

Signatories - as at May 2007

COMPANY LOGO	SIGNATURE
allviron	
AMCOR	
AK	
BASF The Chemical Company BASF Australia Ltd	
Biograde	
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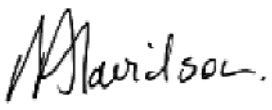
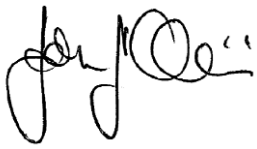
DETMARK	

A full list of Signatories is provided on the PACIA Website (www.pacia.org.au) and includes those Signatories that have signed up since the publication of this document

COMPANY LOGO	SIGNATURE
INTEGRATED PACKAGING	
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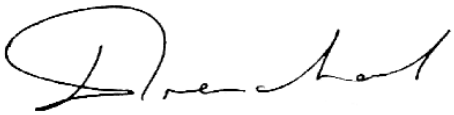
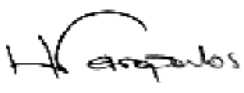
OMNIpac	
PLANTIC Changing the nature of plastics	
Plastral	
Symphony environmental	
ProPlanet.com.au	
Ten Optimum (M) SDN BHD (Co.No.: 270221-T)	
VALPAK (Aust) Pty Ltd	

A full list of Signatories is provided on the PACIA Website (www.pacia.org.au) and includes those Signatories that have signed up since the publication of this document

Appendix 1 – Verification system

What is verification?

The concept of verification involves understanding the use of standards and certification. Standards are documents which are developed by authorised bodies and are designed to specify a recommended approach for testing the performance of a product, system or practice. Standards can be developed and recognised at an international, national or regional level.

In Australia, Standards Australia has recently developed a standard for biodegradable and compostable plastics - AS 4736-2006. In Europe and the USA, standards also exist for biodegradable plastics - EN 13432 and ASTM 6400 respectively. The US and Australian standards are national standards while the European standard is a regional standard. Currently there is no international performance standard for degradable plastics, however, the international standard AS/NZS ISO 14021:2000 Environmental labels and declarations - Self-declared environmental claims (Type II environmental labelling) serves as an accepted guide for claims.

Certification is the process of having an independent body test the adherence of a particular product, system or practice to a nominated standard. For example, if a company would like a product to be certified to EN 13432, it would need to prove to an independent certifying body that the material had been tested using the test methods prescribed in EN 13432, and that the material conforms to any performance levels prescribed in the standard. Having confirmed that this is the case, the certifying body issues a certificate certifying that the product performs acceptably against EN 13432. The company then has the right to claim publicly that its product is certified to EN 13432.

Verification is the process of having an independent body sight the certificates of certification and to confirm a claim of certification. In order to confirm the veracity of claims of degradability for the plastics industry in Australia, PACIA has developed and put in place a verification system.

Why verify?

In Australia, verification is particularly important because the development of Australian standards and certifying bodies for degradable plastics is still evolving. As a result, degradable plastics marketed in Australia can be certified:

- to various standards other than the Australian standard,
- by certification bodies operating outside of Australia.

A verification system allows claims of certification to a range of standards to be assessed in a transparent and equitable manner as part of the one system. It can also be very confusing for consumers to be faced by a range of claims of degradability and a verification system gives consumers confidence that the claims made in relation to degradable plastics are supported by certification to a recognised standard though an independent certifying body.

For a manufacturer of degradable plastics, having a product verified under this system gives support to claims of degradability by readily demonstrating to consumers that the claims have been verified by an independent body appointed by the Australian plastics industry's representative body - PACIA.

Standards equivalence

There is no international performance standard for degradable plastics and not all national and regional standards for degradable plastics are equivalent. This means that although being certified to any of these standards gives the right to claim that a plastic is degradable, the standards may not prescribe the same test methods to test the performance or degradability of a product and they may also specify different levels of performance as acceptable. For example, the US standard ASTM 6400 allows a higher maximum concentration of lead in a degradable plastic than do the European standard EN 13432 and Australian standard AS 4736.

The verification system developed for PACIA deals with a number of standards to which certification is assessed by a number of certifying bodies around the world. Table 1 illustrates which standards are considered equivalent to AS 4736. It should be noted that the Australian standard has been developed as the most appropriate standard for application in Australian conditions.

Table 1. Equivalence of other National or Regional Standards to AS 4736

Standard	Equivalent to AS 4736-2006
EN 13432	Yes[15]
ASTM 6400	No

This table will be updated periodically and the most recent version may be found on the PACIA and Department of the Environment and Water Resources websites.

The verification process

The Verification process is outlined below and is summarised in Figure 1.

Step 1 - Application

To apply to have a product verified, a company will either need to access the application form which can be sourced from either the PACIA or DEW websites at Appendix 2. This form specifies all the information an applicant is required to provide to have certification for a product verified:

- The nominated product must be a plastic that is certified to one of a number of national or regional certification systems;
- An applicant must provide originals or certified copies of certification certificates from an accepted certifying body to an accepted standard. For an up to date list of accepted standards and certifying bodies, refer to the PACIA or DEW website; and
- Applications should be forwarded, along with the application fee, to the nominated independent verifier. Details of this verifier and of the fee payable can also be found on either the PACIA or DEW website.

Step 2 - Processing

Once an application has been received by the verifier, a letter confirming that the application has been received and is being processed will be sent to the applicant. The verifier will review the application, ensure all necessary details have been provided and that the standard and certifying body specified are accepted under the verification system.

Once the verifier is satisfied that all conditions have been met, a letter confirming that the application has been successful will be sent to the applicant. If an application has not met all conditions, a letter explaining why the application has been unsuccessful will be sent. The letter will also indicate that it is possible to reapply at any time.

Step 3 - Verification listing

Once an application has been successful, the product and details of certification will be listed on the PACIA website and linked from the DEW website. This listing provides a quick reference to consumers and other interested parties as to the companies and materials which have had their claims of degradability verified.

[15] AS 4736-2006 is based on EN13432 and contains an additional eco-toxicity test requiring local testing for certification

Appendix 1 – Verification system [continued]

Steps 4 through 6 - Renewal process

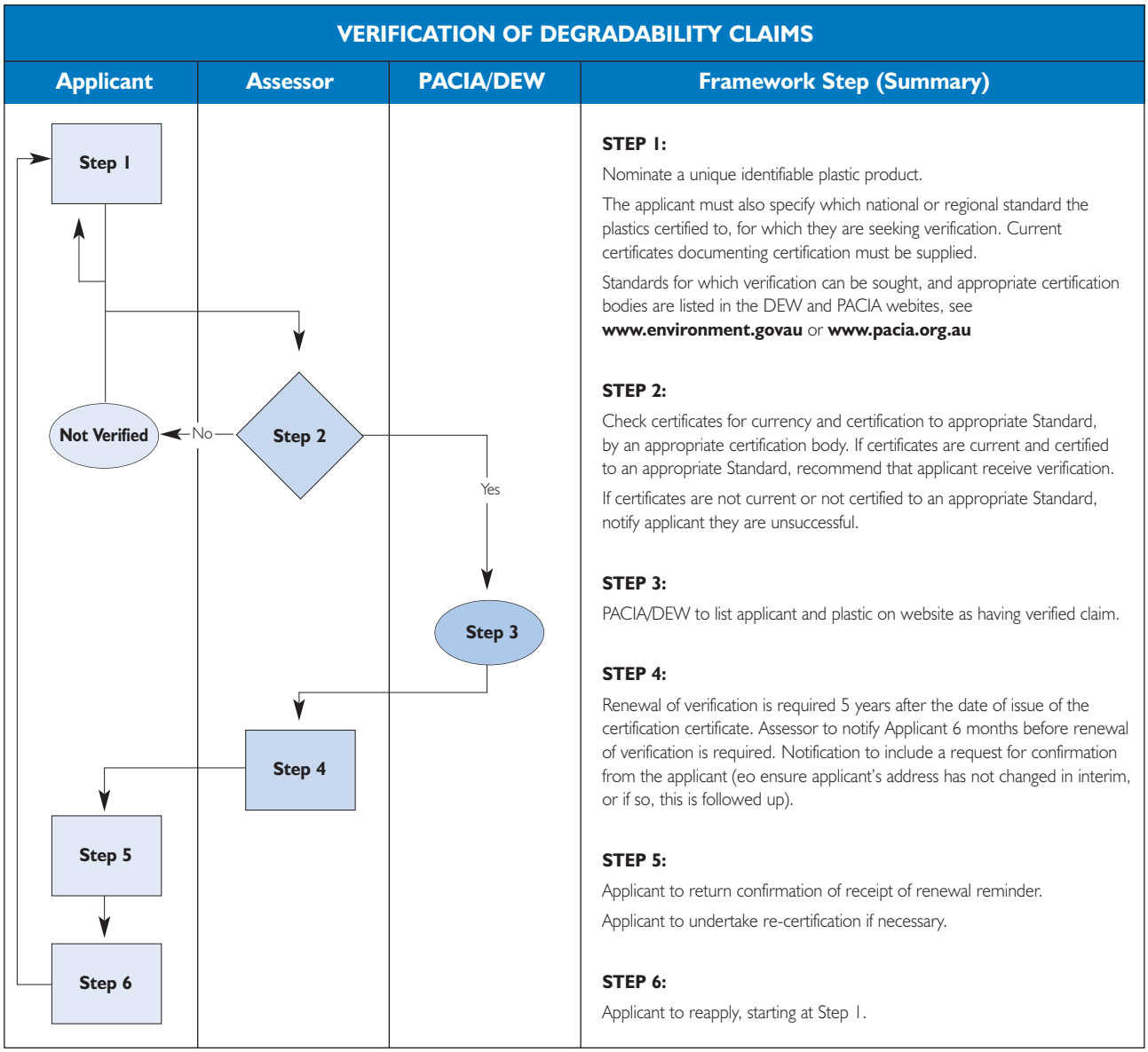
Renewal of verification is required 5 years after the date of issue of the certification certificate for the verified product. The verifier will send a reminder 6 months in advance of the date for renewal to allow the applicant time to re-certify if necessary. Confirmation of receipt of this reminder is requested to assure the verifier that the reminder has been received by the applicant.

Verification has to be renewed to maintain a product listed on the PACIA and DEW websites. The renewal process is the same as the original application process.

List of verified materials

A full list of verified materials is provided on the PACIA Website **www.pacia.org.au** and includes those materials that have been verified since the publication of this document.

Figure 1: Verification system process flowchart



Appendix 2 – Application Form

Application Date	
Application Organisation	
Department/Title	
Contact Officer (name)	
Address	
Phone Number	
Email	
Category of material or product for verification	
Is this a new application or a renewal?	
Standard to which applicant claims certification (see **www.environment.gov.au** or **www.pacia.org.au** for details of acceptable certification Standards and certifying bodies)	
Certificates attached (please attach all relevant original certificates from the certifying body, or certified copies of the same)	
Certification date (renewal of verification is required 5 years after this date)	

Notes

PACIA

Australian Government

Department of the Environment and Water Resources

Plastics and Chemicals Industries Association Incorporated