

INERT BIODEGRADABLE PLASTICS IN THE RECYCLE STREAM



Plastics Environmental Council

**XCALIBER
ASSOCIATES, INC.**

**Charles J. Lancelot, Ph.D.
Principal Consultant**

RALEIGH, NC
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CHARLES J. LANCELOT, PH.D., EXEC. DIRECTOR; PEC



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The PEC – biodegradability of conventional plastics in landfills

- ❑ ***In landfills, not before they get there!***
- ❑ Develop a biodegradability **standard specification** against which products can be certified as to their biodegradability **in landfills**.
- ❑ Leverage the plastics expertise of the PEC's membership and their networks to assist recyclers, reprocessors and endusers in the technology and business of cost-effective **plastics recycling**.

XCALIBER ASSOCIATES, INC. – plastic materials expertise

- ❑ ***New and Reprocessed*** plastic materials and technologies – identification and implementation.
- ❑ Plastic testing and failure analysis – assess **repro plastic quality**.
- ❑ ***Closed loop*** plastics recycling – very successful at Rubbermaid. Delivered recycled polyethylene stretch wrap at 2 cents/lb under virgin PE.



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DEGRADABLE PLASTICS

TWO BROAD CLASSES:

- ❑ **Bioplastics** – derived from renewable sources (a few exceptions)
 - Some are degradable (eg: PLA, (Mirel™, etc.). Will contaminate a recycle stream due to incompatibility, not to premature degradation.
 - Some are not degradable (eg: PE derived from sugar-fermented ethanol). Will not contaminate a recycle stream due to incompatibility.
- ❑ **Conventional plastics** – derived from petrochemical feedstocks
 - **Oxobiodegradable** - an additive programs the plastic to degrade after a period of time in air (oxygen), which may happen between normal use and final disposal – **that's what NC is concerned about.**
 - **Biodegradable** – an additive causes biodegradation under the influence of microorganisms **in landfills – not before they get there.**

IT APPEARS THAT BIODEGRADABLE AND OXOBIODEGRADABLE PLASTICS ARE BEING CONFUSED WITH ONE ANOTHER



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BIODEGRADABLE CONVENTIONAL PLASTICS

(polyethylene (PE, #2;4); polypropylene (PP; #5), polystyrene (PS; #6), PET (#1)

- ❑ Additives typically are proprietary organic materials that are compounded in steps into the conventional plastics such as those listed above.
- ❑ Final additive levels of 0.5-2.0% in the plastic are typical.
- ❑ Until the additive-treated conventional plastic reaches the landfill environment, the additive does *nothing* to the host conventional plastic. It does not make it sensitive to air (oxygen). In other words, the additive system is **inert outside of a landfill**, like an ordinary colorant or dye.
- ❑ Once in the presence of the landfill microorganisms, only then does the additive initiate and promote solely a biodegradation process.
- ❑ This happens via a well-understood series of biochemical processes facilitated by the microorganisms' enzyme systems once they are acclimatized to the conventional plastic.



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- ❑ The PEC has worked with **ASTM** throughout 2012 to create a new **standard specification for biodegradation** of additive-treated biodegradable conventional plastics in landfills.
- ❑ The standard is based on laboratory simulation technology developed by Prof. Morton Barlaz at NC State University, and on his lab/landfill modeling approach.
- ❑ The draft standard has gone through several rounds of balloting with extensive revisions and is now approved by the Biodegradable Plastics Institute (BPI).
- ❑ The current draft will be re-balloted at the upcoming general meeting of ASTM in November.