



# NatureWorks® PLA in the Recycling Stream in the United States

## Overview of NatureWorks® PLA

Derived 100% from annually renewable resources, NatureWorks PLA is a nature-based alternative to traditional, petroleum-based plastic materials and is highly desired by consumers, brand owners and food retailers. It can be used in a variety of commercial applications ranging from food packaging to disposable tableware. Plastic bottles made from PLA entered the marketplace in the fall of 2004.

PLA is a bottle polymer, not an additive. It can fit into all landfill diversion options including mechanical recycling, and it can be recycled as PLA. PLA resin is not a #1 or #2 polymer. The existing infrastructure for recycling can be used for the collection of PLA bottles.

- Single use—bottle applications
  - Small regional still water
  - Fresh dairy
  - Fresh juice
  - Edible oils
- Currently technology does not allow for packaging carbonated beverages.

## Effect on Recycle Stream

NatureWorks is following testing guidelines identified in the Association of Plastics Recyclers' (APR) *Champions for Change* program to ensure the successful integration of NatureWorks PLA into the U.S. recycling stream.

NatureWorks commissioned an independent third-party study to better understand the recyclability of a bottle, or bottle variant, to determine the material's impact on the current waste collection stream. Based on initial research, it has been determined that PLA is a neutral contributor in the existing recycling stream and can be effectively sorted using available detection technology.

### Some of the key findings

#### PLA Bottle Flake in HDPE Flake

- Visual Difference
- Sink/Float
  - PLA = 1.24 g/cm<sup>3</sup>
  - HDPE = 0.96 g/cm<sup>3</sup>
- NIR Sorting Equipment
  - 97.5% effective (conservative)
- Color Sorting Equipment
  - PLA = clear, HDPE = opaque

#### PLA Bottle Flake in RPET Flake

- Less than 1,000 PPM: no haze issues
- Unique IR footprint for sorting
- No effect on IV of solid stating rate up to 10,000 PPM

#### PLA Bottle to Bottle (0.150 wall preform thickness)

- Acceptable haze
- No B value difference
- PLA in preform/bottle at 1,000 PPM; no effect on bottle blowing was seen

PPM = parts per million





## Today's Sorting Solutions for NatureWorks® PLA

NatureWorks has been working with the recycling companies to determine the best methods for managing NatureWorks PLA in the recycling stream. Trials in actual recycling facilities have shown that PLA can be effectively managed via the following steps:

1. PLA will be collected through normal plastic recycling channels.
2. PLA can be sorted from other plastics in the recycle stream, at approximately 98% accuracy, using NIR detection technology. This is the same sorting equipment used today to remove non #1 and non #2 plastics.
  - “PLA can either be separated into a new fraction or it can be identified as a non #1 or non #2 for the sorting of HDPE, PET and other potential recyclables.” – **TiTech VisionSort GmbH**
  - “PLA was classified as “Other Plastics” (separate from PET and HDPE), but a separate category for PLA could be set up on the touch screen if requested by an operator.”
    - **MSS Aladdin System**
  - “We anticipate that existing infrared machines will not need to be modified to separate PLA from the PET stream.” – **National Recovery Technologies (NRT)**
3. In a commercial scale test at a recycling MRF, the following sorting results were obtained:
  - NIR Sorting Equipment
    - Already in place for sorting PP, PVC, HDPE
    - Trial at commercial recycler
      - 5,000+ lbs/hr
      - In-feed stream 45% PET, 35% HDPE, 10% PP, 10% PLA
      - 97.5% PLA removed from stream

## Large Volume Post-consumer “Buy Back”

As an environmental leader, NatureWorks LLC has instituted a “buy-back” program to create opportunities for MRF/reclaimers for future market opportunities. NatureWorks LLC will buy back approved bales at an agreed-upon price. The program requires commercial MRF facilities in geographic areas to separate post-consumer NatureWorks PLA bottles into distinct PLA bales (40,000 lbs). This program allows a bridge to the development of a commercially viable post-consumer PLA market.

The amount of PLA in the PET recycle stream for several years will have a neutral impact in recycled PET for bottle to bottle applications. NatureWorks LLC will continue to work to evaluate the impact of PLA on the recycling of plastics in the United States. For specific questions about recycling and PLA, contact Glenn Johnston, Manager - Global Regulatory Affairs, NatureWorks LLC, at 952-742-0457.

NatureWorks LLC is the first company to offer a family of commercially available polymers derived from 100 percent annually renewable resources with cost and performance that compete with petroleum-based packaging materials and fibers. The company applies its unique technology to the processing of natural plant sugars to create a proprietary polylactide polymer, which is marketed under the NatureWorks® PLA and Ingeo™ fiber brand names. For more information about NatureWorks and its brands, please visit [www.natureworksllc.com](http://www.natureworksllc.com).

