White-Paper on BIO-mannequins produced in PLA

Instore Agency

CONTENTS

INTRODUCTION TO POLYLACTIC ACID (PLA)

- Polylactic Acid (PLA) is different than most thermoplastic polymers in that it is derived from renewable resources like corn starch or sugar cane.
- Most plastics, by contrast, are derived from the distillation and polymerization of nonrenewable petroleum reserves.
- Plastics that are derived from biomass (e.g.PLA) are known as "bioplastics."
- Polylactic Acid is biodegradable and has characteristics similar to polypropylene (PP),polyethylene (PE), or polystyrene (PS).
- It can be produced from already existing manufacturing equipment (those designed and originally used for petrochemical industry plastics).

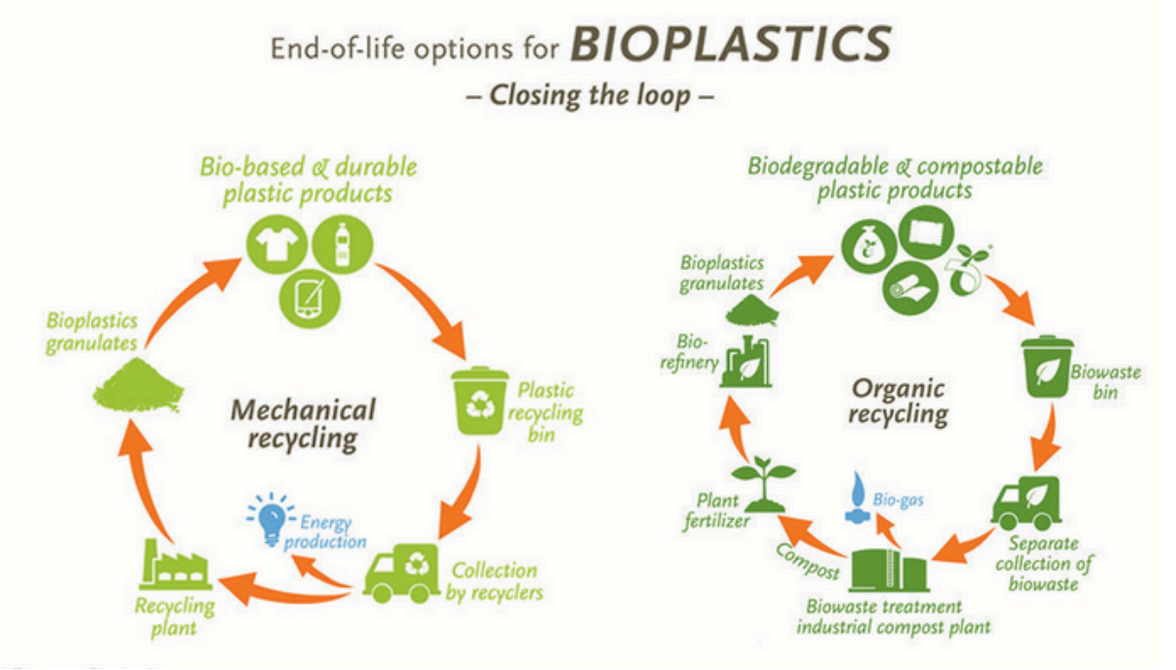
  This makes it relatively cost efficient to produce. Accordingly,
- PLA has the second largest production volume of any bio-plastic (the most common typically cited as thermoplastic starch).

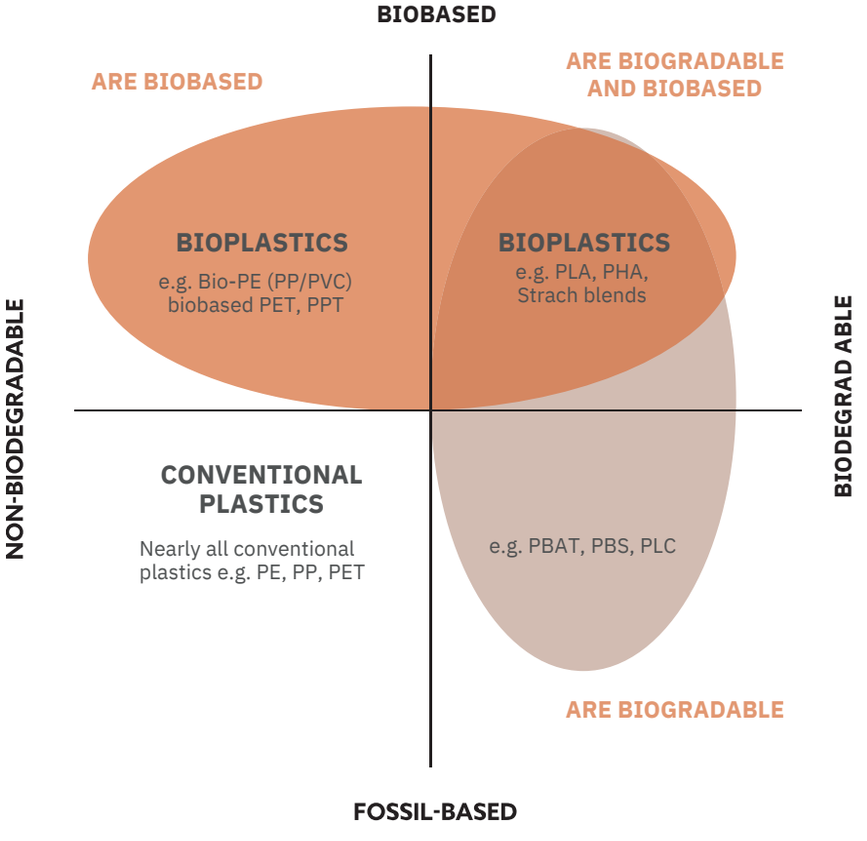
WHERE DOES POLYLACTIC ACID (PLA) COME FROM?

- PLA is a polyester produced by fermentation under controlled conditions of a carbohydrate source like corn starch or sugarcane.
- Its building blocks can either be lactic acid or lactide monomers. They will later be polymerized into PLA.
- Initially, corn goes through wet milling. Here's were the starch gets separated. The starch is then mixed with acid or enzymes and heated. This process "breaks" starch into dextrose (D-glucose), or corn sugar. Finally, fermentation of glucose produces L-Lactic acid, which will be the basic constituent of PLA.
- Two methods for manufacturing PLA plastic from lactic acid are applied.
- The first one uses lactide as an intermediate state, which results in greater molecular weight.
- The second method consists in the direct polymerization of lactic acid.

BENEFITS OF POLYLACTIC ACID (PLA)

- PLA is bio-based and biodegradable. These are the most outstanding properties, especially considering that one does not automatically imply the other.
- Being bio-based implies that the material is derived from biomass.
- As for being biodegradable, PLA undergoes a transformation into natural material, such as water, carbon dioxide, and composite. This process is carried out by microorganisms in the environment and is strongly dependent on conditions such as temperature and humidity.
- PLA is a thermoplastic, meaning that it can be melted and reshaped without significantly degrading its mechanical properties. Hence, PLA is mechanically recyclable. It is derived from renewable resources, a sharp contrast to the petroleum-based plastics, which have a finite availability.
- (Close to) carbon neutral: Its renewable sources actually absorb carbon.
  It does not release toxic fumes when oxygenated.
- Economic potential: Bioplastics offer a growing market,
- with opportunities for job creation and development of rural areas. European-bioplastics, estimates that by 2030 up to 300,000 highly skilled jobs will be created in the European biomarket, more than 10 times its current numbers.
- PLA plastic is recognized as safe by the United States Food and Drug Administration. Additionally, it is safe for all food packaging applications.
- It's non-toxicity has allowed its incorporation in medical applications.


End-of-life options for BIOPLASTICS
– Closing the loop –
Bio-based & durable plastic products
Bioplastics granulates
Mechanical recycling
Plastic recycling bin
Energy production
Collection by recyclers
Recycling plant
Biodegradable & compostable plastic products
Bioplastics granulates
Bio-refinery
Organic recycling
Biowaste bin
Plant fertilizer
Bio-gas
Compost
Separate collection of biowaste
Biowaste treatment industrial compost plant


BIOBASED
ARE BIOBASED
ARE BIOGRADABLE AND BIOBASED
BIOPLASTICS
e.g. Bio-PE (PP/PVC) biobased PET, PPT
BIOPLASTICS
e.g. PLA, PHA, Strach blends
NON-BIODEGRADABLE
BIODEGRAD ABLE
CONVENTIONAL PLASTICS
Nearly all conventional plastics e.g. PE, PP, PET
e.g. PBAT, PBS, PLC
ARE BIOGRADABLE
FOSSIL-BASED

PROS

1. PLA is derived from a renewable resource

   PLA, is derived from corn, a resource that can be renewed annually. One of the major problems with petroleum-based plastics is that they are derived from oil or natural gas which are only available in finite amounts throughout the world. Eventually, these fossil resources will run out.

2. PLA plastics are compostable where commercial compost facilities are available

3. PLA can break down into natural elements in commercial compost facilities, where they are available. It is estimated that traditional plastics can take centuries to break down and may never break down into natural elements. This is especially true when these products end up in landfills where sunlight and air exposure are drastically curtailed.

4. PLA does not produce toxic fumes if incinerated

   For decades, we've been warned of the dangerous chemicals that can be released when traditional plastics are incinerated. Being biologically based, PLA plastics do not produce these toxic fumes if they end up being incinerated instead of finding their way to a commercial composting facility.

CONS

1. PLA production depends on large fields of crops

While the corn used to create PLA is a renewable resource, many people point out that the fields use to grow these crops could be used to create foodstuffs for the world's growing population. They do have a point, but it is important to remember that the bioplastics industry is still young. Long term plans in the industry include determining effective ways to create PLA plastics from agricultural waste like stalks and stems which could result in bioplastics made from products that are not fit for consumption..

2. PLA plastics are only compostable in a commercial composting facility

Unfortunately, most PLA plastic will not break down into natural elements in your backyard composting pile. Instead, these products need to be sent to a commercial composting facility for processing. At this time, there are a limited number of such facilities. However, as the
industry grows, we believe that the infrastructure for commercial composting will follow. Disposing of PLA plastic products in a landfill is an acceptable end of life option

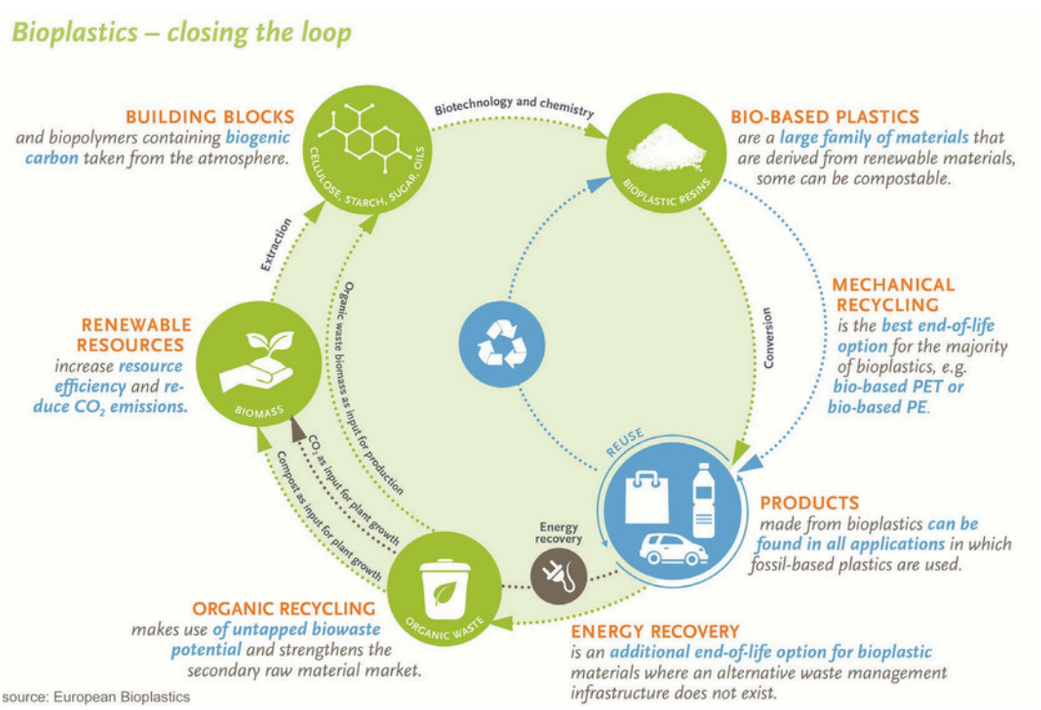
3. Whether or not commercial composting facilities are locally available, many PLA products end up getting mixed in with traditionally recyclable plastics.

Because they are chemically different from traditional plastics that are labeled #1 to #6, this can cause problems in the recycling process if the products are not properly sorted before recycling begins.

4. PLA products are identified as #7 (Other Plastics) plastic for recycling purposes.

CLOSING THE LOOP

- The lifecycle of Poly Lactic Acid (PLA) is based on a closed loop system.
- Instead of simply reducing negative environmental impacts, PLA looks to actually create a positive impact.
- How? By re-using and recycling products as much as possible and thereafter, at their end-of-life, using various reintegration options to transform them back into feedstock for a new product lifecycle.
- The end-of-life options for PLA include reusing, recycling, renewable energy recovery (incineration), compost/ biodegradation, anaerobic digestion and feedstock recovery.
- By closing the loop in this way, consumers, brandowners and manufacturers can use resources more efficiently securing the return of a valuable material stream and reducing waste.



source: European Bioplastics

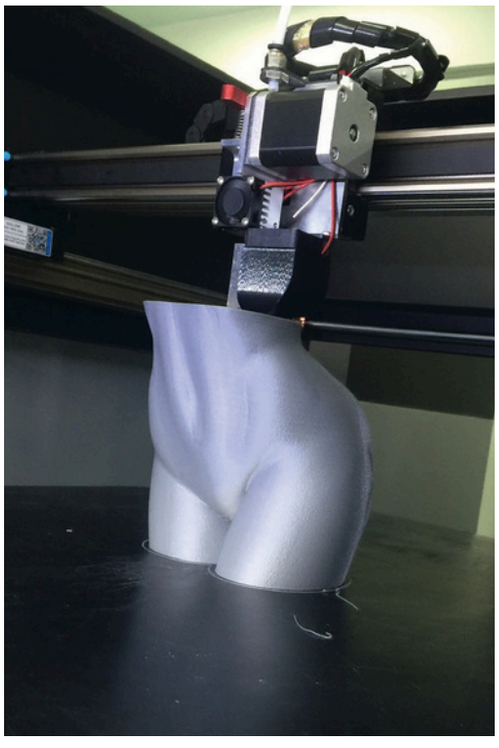
PRODUCTION OF PLA-MANNEQUINS

The production of PolyLactic Acid (PLA) mannequins is done in our 3D printing facility in Shanghai.

The printer-park consists of 3 different sizes of specially designed 3D printers! Designed especially with the purpose of, not ONLY prototype production, but actual massproduction of mannequins in mind.
Today we have the capacity to produce 10 full sized mannequins in PLA, every other day.
The goal is that we, within the next 18 months, will have increased this capacity to produce 100 mannequins every other day.

With our in-house 3D development team, we can offer to design unique, client specific mannequins and using the 3D printing technology there will be no mould costs, as by conventional types of mannequins.

Finally, there is no minimum-order-quantity on the production of 3D-printed, PLA mannequins.



THE PLA-MANNEQUINS FROM INSTORE AGENCY COMES IN 2 VARIATIONS:

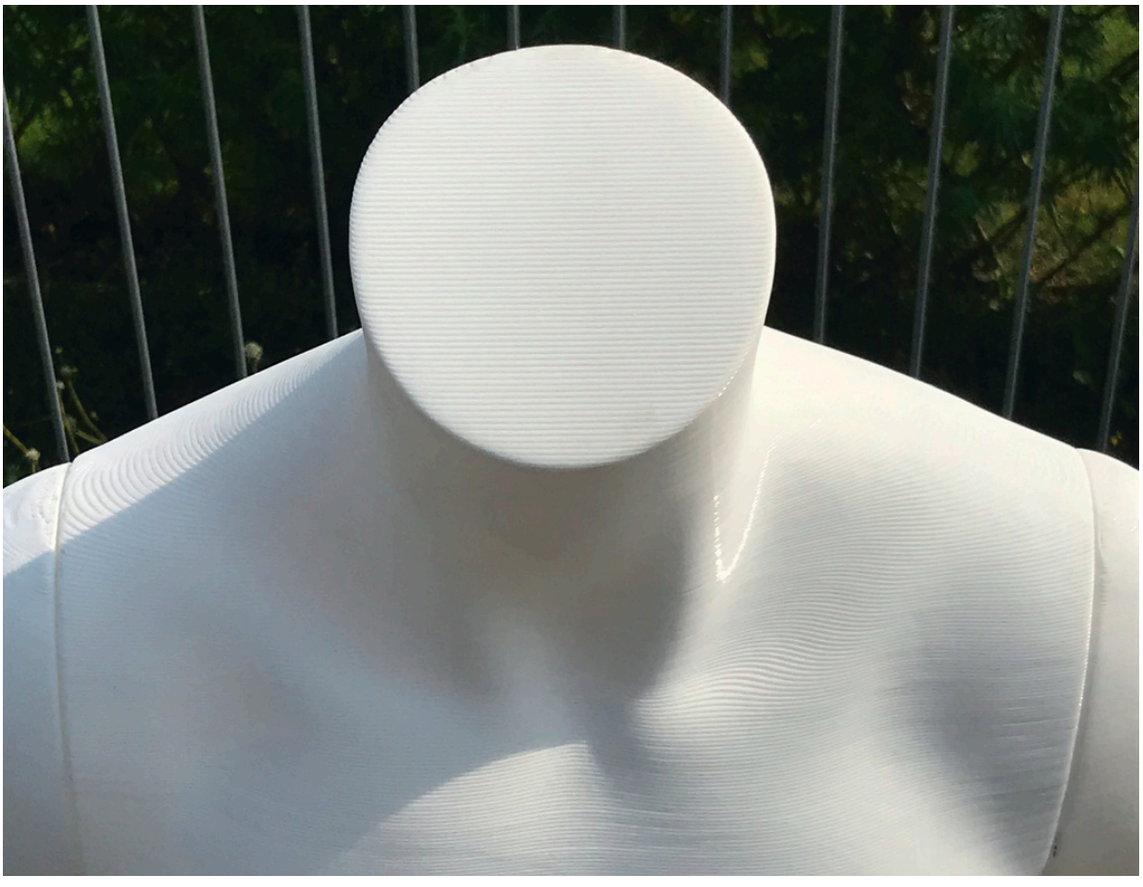
- RAW printed mannequins (including various standard fitting options)
- Printed, poslished and painted mannequins (including various standard fittings)
  1. The variation of models is almost endless and …
  2. The minimum-order-quantity is only one (1)

"RAW" PRINTED PLA-MANNEQUINS

- Just like any other mannequin the RAW printed mannequins can be delivered i basically any shape and form. With a variety of fittings, bases etc.
- The surface of the mannequin tells the story of what it is. You can see the print-lines clearly.
- The major advantage of this version of the PLA mannequin lies in its recyclability.
- By removing the various fittings the whole mannequin is ready for recycling as #7 (other) plastic.
  The metal fittings can be recycled as scrap metal
-

POLISHED AND PAINTED PLA-MANNEQUINS

- The polished and painted mannequins can be delivered in basically any shape and form. With a variety of fittings, bases etc.
- The surface of this mannequin is as smooth and elegant as any other type of mannequin.
- This version of the mannequins are a little more difficult to recycle, but can with advantage be incinerated to generate heat and electricity.



THINGS TO CONSIDER

WHEN CHOOSING MANNEQUIN MATERIAL

FIBERGLASS

- MOQ 10 pcs
- Mould costs low
- Potentially hazardous production
- Durable
- Not recyclable

CONVENTIONAL PLASTICS

- MOQ 100 +
- Mould costs very high
- Non-renewable fossil-feedstock
- Very durable
- Recyclable as plastics

POLYLACTIC ACID (PLA)

- MOQ 1 pcs
- No mould costs
- Safe non-hazardous production
- Annually renewable bio-feedstock
- Recyclable & Bio-degradable
- Durablity similar to Fiberglass MNQs

WOULD YOU LIKE TO KNOW MORE?

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