In Good Company® compostable Products are mainly made from three products. Different compostable materials offer different combinations of benefits and limitations. In Good Company® products are made from materials that follow the cycle of life on Earth: beginning and ending as nutrient-rich soil. Our products are made from a variety of materials:

1) Compostable Plastics are made from Ingeo™, a bio-based plastic derived from renewable corn in the U.S. Chemically, this material is known as PLA, or Poly Lactic Acid, which can be derived from a variety of plant-based starches.
2) Sugar Cane. Harvested worldwide, sugar is extracted, and the husk is pulped into a slurry and then used to form products. This husk would normally be burned and release Carbon into the air. We remove that potential by utilizing it in our products.
3) Wheat Grass and Husk is utilized to add to the structure of Sugarcane or used alone to produce food trays and plates.

Unlike paper pulp our products are annually renewable

Sustainable products for a better world

We can choose new ways to live that tread lightly on a planet that’s already stretched to its limits of bio-capacity. Choosing plant based, eco-friendly products is one way to impact our ailing environment. And In Good Company® compostable products are lighter impact alternatives to everyday plastic and Styrofoam disposables. Our products are designed to transform waste into healthy, new soil through composting. They use less energy and water to manufacture, make less pollution than petroleum-based products and are made from renewable resources and waste materials… the list of benefits is almost endless. Best of all, they save biodiversity and habitats.
Products

Each of these compostable materials carries a unique set of benefits and limitations, and they all compost at different rates under different conditions.

We measure the environmental impacts of compostable products and their conventional counterparts. Choosing products that have lighter environmental footprints than their conventional counterparts is one small step toward the goal of sustainable living. We know it will take time for consumers and businesses to transition to a Zero Waste economy. Our In Good Company® compostable products are one measurable step in the right direction.

The environmental footprints of different products can be measured and compared through their “eco-profiles.” These profiles include ecologically relevant information about the manufacturing of the products, including energy consumption, water consumption, carbon emissions, and pollution. An eco-profile provides only a subset of the information in a complete life-cycle analysis, which also considers the impacts of packaging, distribution, consumer use, and disposal.

In Good Company® products are designed to be composted at commercial composting facilities. These facilities grind the material, turn the compost piles, and monitor conditions to create high temperatures. This reduces the amount of time it takes for products to break down and reduces methane emissions.

Compostable products break down at different rates, depending on the material they are made from and its thickness, as well as the composting conditions. Home composting rates are slower and can vary widely depending on how frequently the pile is turned over, the moisture and material content, and the temperature.
Time Required for Composting

<table>
<thead>
<tr>
<th>Product</th>
<th>Home Composting</th>
<th>Commercial Composting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compostable (PLA) cold cups, deli containers, clamshells, straws, etc.</td>
<td>Not recommended</td>
<td>2-3 months</td>
</tr>
</tbody>
</table>

Standards

There are several international organizations that have established standards and testing methods for composability:

American Society for Testing and Materials ASTM-6400-99 and ASTM-6868
European Standardization Committee (CEN) EN13432
International Standards Organization (ISO) ISO14855 (only for biodegradation)

These standards specify the criteria for biodegradation, disintegration and eco-toxicity for a plastic to be called compostable.

Biodegradability is determined by measuring the amount of CO2 produced over a certain time period by the biodegrading plastic. The standards require 60% conversion of carbon into carbon dioxide within 180 days for resins made from single polymer and 90% conversion of carbon into carbon dioxide for co-polymers or polymer mixes.

Disintegration is measured by sieving the material to determine the biodegraded size and less than 10% should remain on a 2mm screen within 120 days.

Eco toxicity is measured by having concentrations of heavy metals below the limits set by the standards and by testing plant growth by mixing the compost with soil in different concentrations and comparing it with controlled compost.
Petroleum Based Polymers - VS - Plant Based

The environmental advantages of plant-based plastics over petroleum-based plastics are measurable and significant.

Our Goal is to have all our products to be certified Biodegradable Products Institute (BPI), which uses the ASTM standards to test that products break down quickly and safely.

All of In Good Company®’s products are made from compostable, renewable, plant-based resins and fibers. These materials are not hazardous or toxic during production, and when they are discarded into commercial composting facilities, they decompose completely into carbon dioxide, water, and biomass. These qualities exert a much lighter environmental impact than the qualities of petroleum-based plastics, which are virtually never compostable, derive from non-renewable resources, are hazardous and toxic during production and cast massive amounts of pollution into our world.

Consider the tables below, which compare the environmental impacts of products made from plant-based plastics with the impacts of those made from petroleum-based plastics. Plant-based plastic (PLA) vs. petroleum-based plastic (PS)

<table>
<thead>
<tr>
<th>Wheat-Straw Products vs. Styrofoam Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imagine that your family used about 15 disposable plates every week (800 per year).</td>
</tr>
<tr>
<td>By choosing disposable plates made from wheat straw instead of disposable plates made from Styrofoam, you would be choosing to:</td>
</tr>
<tr>
<td>• Prevent approximately 9.8 pounds of CO2 emissions into the atmosphere, similar to the amount of CO2 that 1.3 trees would absorb in a year; 1-5</td>
</tr>
<tr>
<td>• Save approximately of 132 kilowatt-hours of electricity, enough to power a house for 4.5 days. 1-7</td>
</tr>
</tbody>
</table>
Comparative ratios among the production of different resins

<table>
<thead>
<tr>
<th></th>
<th>PLA plastic made from corn</th>
<th>PET plastic (Polyethylene)</th>
<th>PP plastic (Polypropylene)</th>
<th>PS plastic (Polystyrene)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy consumption ratio</td>
<td>1.0 : 1.9 : 1.7 : 2.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water consumption ratio</td>
<td>1.0 : 0.9 : 0.6 : 2.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2 emissions ratio</td>
<td>1.0 : 2.2 : 1.3 : 1.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solid waste production ratio</td>
<td>1.0 : 2.1 : 0.7 : 2.7</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
One pound of Plant Based-VS-Petroleum

<table>
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<tr>
<th></th>
<th>PLA plastic made from corn</th>
<th>PET plastic (Polyethylene)</th>
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<th>PS plastic (Polystyrene)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy consumption (kwh)</td>
<td>5.37</td>
<td>10.28</td>
<td>9.34</td>
<td>11.28</td>
</tr>
<tr>
<td>Water consumption (gal)</td>
<td>8.29</td>
<td>7.45</td>
<td>5.12</td>
<td>20.54</td>
</tr>
<tr>
<td>CO2 emissions (lb)</td>
<td>1.30</td>
<td>2.81</td>
<td>1.67</td>
<td>2.51</td>
</tr>
<tr>
<td>Solid waste (lb)</td>
<td>0.042</td>
<td>0.087</td>
<td>0.029</td>
<td>0.113</td>
</tr>
</tbody>
</table>
## PLA-VS-Poly Energy and CO2 Emissions

<table>
<thead>
<tr>
<th></th>
<th>PLA plastic – injection molding</th>
<th>PET plastic – injection stretch blown molding</th>
<th>PP plastic – injection molding</th>
<th>PS (polystyrene) – injection molding</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy consumption for injection molding, ratio = 1.0 : 0.5 : 1.6 : 1.9</strong></td>
<td><img src="fire_icon.png" alt="fire_icon" /></td>
<td><img src="fire_icon.png" alt="fire_icon" /> <img src="fire_icon.png" alt="fire_icon" /> <img src="fire_icon.png" alt="fire_icon" /></td>
<td><img src="fire_icon.png" alt="fire_icon" /></td>
<td><img src="fire_icon.png" alt="fire_icon" /> <img src="fire_icon.png" alt="fire_icon" /></td>
</tr>
<tr>
<td><strong>CO2 emissions from injection molding, ratio = 1.0 : 0.3 : 1.2 : 1.8</strong></td>
<td><img src="cloud_icon.png" alt="cloud_icon" /></td>
<td><img src="cloud_icon.png" alt="cloud_icon" /> <img src="cloud_icon.png" alt="cloud_icon" /> <img src="cloud_icon.png" alt="cloud_icon" /></td>
<td><img src="cloud_icon.png" alt="cloud_icon" /> <img src="cloud_icon.png" alt="cloud_icon" /></td>
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</tr>
</tbody>
</table>
## Manufacturing one pound of products from each resin

<table>
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<th>PS (polystyrene) – injection molding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy consumption for injection molding (kwh)</td>
<td>6.30</td>
<td>3.14</td>
<td>10.27</td>
</tr>
<tr>
<td>CO2 emissions from injection molding, (lb)</td>
<td>1.87</td>
<td>0.63</td>
<td>2.24</td>
</tr>
</tbody>
</table>


- Assuming 625 items of cutlery per year (12 per week);
  - 12.38 pounds of cutlery per year (5.5 g per item);
  - 3.17 lb of CO2 emitted per 1.0 pound of PLA cutlery (1.30 lb from material production + 1.87 lb from product production);
  - 5.79 lb of CO2 emitted per 1.0 pound of PS cutlery (2.51 lb from material production + 1.87 lb from product production);
  - 32.44 lb less CO2 in a year from 625 items of PLA cutlery than from 625 items of PS cutlery ((12.38 x 5.79)-(12.38 x 3.17));
  - 4.4 trees would absorb 32.44 lb of CO2 in a year, assuming an average of 7.38 lb of CO2 absorbed per tree per year.


- Assuming 625 items of cutlery per year (12 per week);
  - 12.38 pounds of cutlery per year (5.5 g per item);
  - 11.67 kWh to produce 1.0 pound of PLA cutlery (5.37 kWh for material production + 6.30 kWh for product production);
  - 23.21 kWh to produce 1.0 pound of PS cutlery (11.28 kWh for material production + 11.93 kWh for product production);
  - 142.87 kWh less in a year for 625 items of PLA cutlery than for 625 items of PS cutlery ((12.38 x 23.21)-(12.38 x 11.67));
  - 4.9 days for an average household to consume the same amount of energy, assuming consumption at 29.19 KWh per day.

Consumer Benefits and Limitations

PLA

Feels like conventional plastics
Is Freezer safe
Can handle hot food and drinks up to 100°F: Limitation: must be stored under 110 degrees
Composts completely in commercial composting facilities in 3 – 6 months Limitations: not recommended for home composting
12-18 months in home composting

Sugar Cane/Bagasse

Moisture resistant Limitations: Prolonged contact liquid for more then 72 hours will effect the look and functionality of the product
Heat Sealable Limitations: As you peel film from the tray micro fibers of sugarcane rise to the surface Non-Harmful
Microwave-able Limitations: excessive microwave time will dry out food products
Composts completely in commercial composting facility in under 16 weeks
PLA Lined Sugar Cane

Moisture / oil resistant

Heat Sealable

Microwave-able

Has proven to be ovenable in various field-testing

Limitations: the vast methods of oven cooking, manufacturers of equipment and the condition of ovens makes it impossible for us to insure the results of oven cooking. Please conduct your own field testing

Composts completely in commercial composting facility in 3-6 months

Properties

The compostable resins for the most part mimic plastic properties, and different resins have different properties related to heat resistance, tensile strength, impact resistance, MVTR, oxygen barrier etc. One of the main compostable resin PLA, for example has a heat resistance of only 110F, while other compostable resins can have a much higher heat resistance.
Biodegradability & Compostability

Bioplastics can take different lengths of time to totally compost, based on the material and are meant to be composted in a commercial composting facility, where higher composting temperatures can be reached and is between 90-180 days. Most existing international standards require biodegradation of 60% within 180 days along with certain other criteria for the resin or product to be called compostable. It is important to make the distinction between degradable, biodegradable and compostable. These terms are often (incorrectly) used interchangeably.

Compostable Plastic is plastic which is "capable of undergoing biological decomposition in a compost site as part of an available program, such that the plastic is not visually distinguishable and breaks down to carbon dioxide, water, inorganic compounds, and biomass, at a rate consistent with known compostable materials (e.g. cellulose). and leaves no toxic residue." American Society for Testing & Materials (ASTM). In order for a plastic to be called compostable, three criteria need to be met:

Biodegrade - break down into carbon dioxide, water, biomass at the same rate as cellulose (paper).

Disintegrate - the material is indistinguishable in the compost, that it is not visible and needs to be screened out.

Eco-toxicity - the biodegradation does not produce any toxic material and the compost can support plant growth.

Biodegradable Plastic is plastic which will degrade from the action of naturally occurring microorganism, such as bacteria, fungi etc. over a period of time. Note, that there is no requirement for leaving "no toxic residue", and as well as no requirement for the time it needs to take to biodegrade.

Degradable Plastic is plastic which will undergo a significant change in its chemical structure under specific environmental conditions resulting in a loss of some properties. Please note that there is no requirement that the plastic has to be degrade from the action of "naturally occurring microorganism" or any of the other criteria required for compostable plastics. A plastic therefore may be degradable but not biodegradable or it may be biodegradable but not compostable (that is, it breaks down too slowly to be called compostable or leaves toxic residue).
Standards

There are currently few international organizations which have established standards and testing methods for compostability, namely:

American Society for Testing and Materials (ASTM) - ASTM-6400-99

European Standardization Committee (CEN) - EN13432

International Standards Organization (ISO) - ISO14855 (only for biodegradation)

German Institute for Standardization (DIN) - DIN V49000

The ASTM, CEN and DIN standards specify the criteria for biodegradation, disintegration and eco-toxicity for a plastic to be called compostable.

Biodegradability is determined by measuring the amount of CO2 produced over a certain time period by the biodegrading plastic. The standards require 60% conversion of carbon into carbon dioxide within 180 days for resins made from single polymer and 90% conversion of carbon into carbon dioxide for co-polymers or polymer mixes.

Disintegration is measured by sieving the material to determine the biodegraded size and less than 10% should remain on a 2mm screen within 120 days.

Eco toxicity is measured by having concentrations of heavy metals below the limits set by the standards and by testing plant growth by mixing the compost with soil in different concentrations and comparing it with controlled compost.
About Compostable Plastics

Compostable Plastics are a new generation of plastics which are biodegradable through composting. They are derived generally from renewable raw materials like starch (e.g. corn, potato, tapioca etc), cellulose, soy protein, lactic acid etc., are not hazardous/toxic in production and decompose back into carbon dioxide, water, biomass etc. when composted. Some compostable plastics may not be derived from renewable materials, but instead derived made from petroleum or made by bacteria through a process of microbial fermentation.

Currently, there are a number of different compostable plastics resins available in the market and the number is growing every day. The most commonly used raw material for making the compostable plastics is corn starch, which is converted into a polymer with similar properties as normal plastic products. Other compostable resins are available made from potato starch, soybean protein, cellulose and as well from petroleum and petroleum by products. It is counter intuitive to think that compostable resins could be derived from petroleum, when all normal plastic products are derived from petroleum and are non compostable. However, there are certified compostable resins available in the market, derived from petroleum and the field of compostable plastics is constantly evolving with new materials and technologies being worked on and being brought to market. There is even research underway to make compostable plastics from carbon dioxide.

Properties

The compostable resins for the most part mimic plastic properties, and different resins have different properties related to heat resistance, tensile strength, impact resistance, MVTR, oxygen barrier etc. One of the main compostable resin PLA, for example has a heat resistance of only 110F, while other compostable resins can have a much higher heat resistance.
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- **Biodegrade** - break down into carbon dioxide, water, biomass at the same rate as cellulose (paper).
- **Disintegrate** - the material is indistinguishable in the compost, that it is not visible and needs to be screened out.
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A plastic therefore may be degradable but not biodegradable or it may be biodegradable but not compostable (that is, it breaks down too slowly to be called compostable or leaves toxic residue).

The rate of biodegradation for different biocompostables is dependent upon the composition and thickness of the material as well as composting conditions. Commercial composting facilities grind the materials, turn over the piles and reach high temperatures, thus reducing the amount of time it takes to compost and, is thus, the recommended method for composting these products.
Standards

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