Solenis

Compostability in Packaging

Testing, Certifications, Regulations

Emily Parsons – Solenis

10 December 2024

Compostability

Compostability today has no set definition.

Science, certifications and regulations each has their own mutually exclusive definition.

Compostability Today

1. Testing
2. Certifications
3. Regulations
4. And tomorrow…

Testing

The Science behind Composting

Compostability Testing

To be considered compostable, packaging products must be tested and pass four requirements.

Bio-degradation

The chemical degradation of the organic packaging. Conversion of C to CO_2 during aerobic degradation.

Disintegration

Physical degradation over a specified amount of time. For ASTM D6868 and EN 13432 this is 12 weeks.

Ecotoxicity

Impact of disintegrated packaging product on plant growth, germination rate, or color.

Chemical Characteristics

Volatile solids, fluorine and heavy metals testing.

Certifications

Main Certifying Bodies

Certification Bodies

OK Compostable

- Home and Industrial Certifications
- Based on EN 13432

BPI Compostable

- Main North American Certification Body
- Based on ASTM D6868

CMA Compostable

- Alternate NA Certification
- Based on ASTM D6868 or EN 13432 alongside field compost testing

Note: This is not a wholistic list of all the certification bodies, these are just the main bodies in NA and EU.

Challenges with Certifications

OK

- Home compostable standard
  - Every home compost differs

BPI

- Requires embossing in the bottom of the article
  - Expensive tooling
- Long process
  - Many companies have task forces focused just on how to improve speed of obtaining a BPI certification

CMA

- Varying rules for each type of product
  - Molded Fiber
  - Coated Paper
  - “Compostable” Plastics
- Standard composting across all facilities is nearly impossible

Certification Process

Three Levels to Certify:

1. **Compostability Test Method**
   - ASTM D5338: Standard Test Method for Determining Aerobic Biodegradation of Plastic Materials Under Controlled Composting Conditions

2. **Compostability Norm/Standard**
   - ASTM D6868: Standard Specification for Labeling of Items that Incorporate Plastics and Polymers as Coatings or Additives with Paper and Other Substrates to be Aerobically Composted in Municipal or Industrial Facilities

3. **Compostability Certification Body**
   - BPI (Biodegradable Products Institute)

Basic Requirements for EN 13432 and ASTM D6868

Chemical Characteristics

Analysis	Europe EN 13432	ASTM D6868
Heavy Metals (ppm)		
Zn	≤ 150	< 1400
Cu	≤ 50	< 750
Ni	≤ 25	< 210
Cd	≤ 0.5	< 19.5
Pb	≤ 50	< 150
Hg	≤ 0.5	< 8.5
Cr	≤ 50	No specification
Mo	≤ 1	No specification
Se	≤ 0.75	< 50
As	≤ 5	< 20.5
Co	No specification	No specification
Fluorine (ppm)		
F	≤ 100	No specification

Basic Requirements for EN 13432 and ASTM D6868

Biodegradation

< 90% Conversion of organic C into CO_2

Industrial: maximum **6 months** at **50 – 60°C**
Home: maximum **12 months** at **20 – 30°C (OK Compost)**

Note: Important difference between BPI, CMA and OK Compost

- Components with concentration > 1% are required to have biodegradation testing completed based on ASTM D6868, but not EN 13432
- BPI – Total components that do not pass biodegradation > 5% cannot be considered compostable
    - Changing to > 3% in June 2026

Basic Requirements for EN 13432 and ASTM D6868

Physical Disintegration

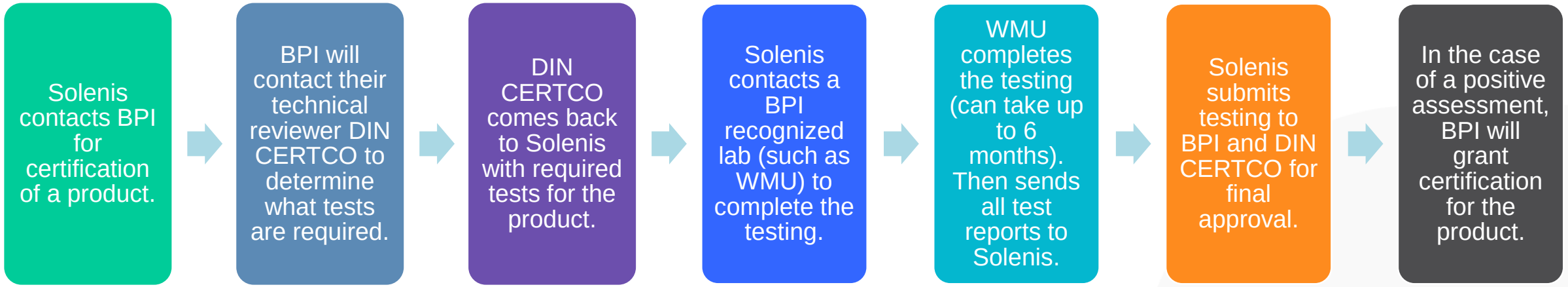
- **< 10%** remaining particles larger than **2 mm** after **12 weeks**
- For CMA < 20% is allowed for certain products such as molded fiber articles in real field testing

This test often gets pushback because commercial compost facilities can turn compost in as fast as 30 days, so 12 weeks is a long, typically inaccurate, testing period.

Ecotoxicity

- **> 90% germination rate** and **plant biomass** compared to control sample

Example Certification Process



Example BPI Requirements – Molded Fiber Article

Certification of MF article produced with internal chemistry

1. Chemical Characterization
   - Volatile solids > 50%, heavy metals not exceeding limits, F not exceeding 100 ppm – Tested on **MF article**
2. Biodegradation > 90% to be demonstrated on:
   - **MF article**
   - **Substances > 1%** individually (e.g. internal oil barrier)
   - Exemption for substances < 1% (e.g. retention aid and water sizing)
3. Physical disintegration (< 10% remaining larger than 2 mm) to be demonstrated for **MF article**
4. Ecotoxicity to be tested on the **MF article**

What is the total cost to get a material certified?

Short answer: ***it depends…***

In most cases the costs for testing are dominant in the total costs

Cost influencing factors:

- Required test reports - case by case pre-assessment by certification body to determine which test reports are required
- Sometimes certain testing is exempted due to chemical nature of the material
- Already existing test data or certificates for certain components

Reality check – Total costs for certification

Example 1 – “favorable” sample to be certified against TUV Austria’s Ok Compost program

- Costs for testing:
  - Heavy metals, volatile solids, F: $ 0.8k
  - Biodegradation (suppose three components to be tested and 90% biodegradation reached in 45 days): $ 5.5k
  - Physical disintegration: $ 8.5k
  - Ecotoxicity: $ 3.5k
- Costs for certification: $ 3.5k
- Total: **$ 21.8k**

Reality check – Total costs for certification

Example 2 – “unfavorable” sample to be certified against BPI’s certification program

- Costs for testing:
  - Heavy metals, volatile solids, F: $ 0.8k
  - Biodegradation (suppose three different materials to be tested and 180 days needed to demonstrate 90% biodegradation): 3 x $ 12k
  - Physical disintegration: $ 8.5k
  - Ecotoxicity: $ 3.5k
- Costs for certification: $ 1.5k (excluding membership fee)
- Total: **$ 48.8k**

Regulations

EU SUP Directive & California SB54

EU Single Use Plastics Directive

> “A material consisting of a **polymer** to which **additives** or **other substances** may have been **added**, and which can function as a main structural component of final products, with the **exception of natural polymers** that have **not been chemically modified**.”

Challenges

+ Includes products such as modified starches (many which are allowed in the food we eat)
+ Puts modified starches, water sizing products such as AKD and bio-based polymers such as PHA in the same bucket as Acrylic Latex
+ Becomes an enemy of progress in the compostable packaging space by including materials that are considered compostable
+ Putting the ability to obtain EPR funding over the main goal of reducing harmful packaging

California SB54

EPR bill for source reduction and infrastructure improvement. Implements strategies to tax corporations that don’t meet goals for source reduction. The source reduction goals includes 100% of single sue products being recyclable or compostable by 2032.

Challenges

+ Includes a covered materials category (CMC) list that marks products such as molded fiber as not compostable
+ Similar to the EU Single Use Plastics Directive it lists bio-based, certified compostable polymers such as PLA, PHA, PBAT as non-compostable and non-recyclable alternatives which only allows non-chemically modified seaweed based plastics such as products for Notpla and Sway as options
+ Requires that by January 1, 2026 all products labeled compostable must follow the NOP guidelines and be covered on their synthetic materials list
+ Putting the ability to obtain EPR funding over the main goal of reducing harmful packaging

The Future

True Biodegradability
Moving towards polymers such as PHA that degrades naturally in marine and soil environments.

Home Compost
Packaging that can be managed at the consumers home, requiring no industrial facility.

SUP Extinction
All single use food packaging products can be composted. Reducing microplastic contamination.

Standard Labeling
Consistent label for compostable packaging making it easier for producers, consumers and composters.

Circular Economy Alignment
Fully closes the sustainability loop by addressing end-of-life challenges with all packaging. This includes improved infrastructure for reusable, renewable, compostable and recyclable packaging.

Thank you!

Any questions?

- Emily Parsons
  - Product Launch Engineer, Barriers and Molded Fiber
  - eparsons@solenis.com
  - 585-465-1884