SSbD Guidelines

FOOD PACKAGING

0% VOC EMISSIONS

80-98% BIO-BASED CONTENT

100% PFAS-FREE

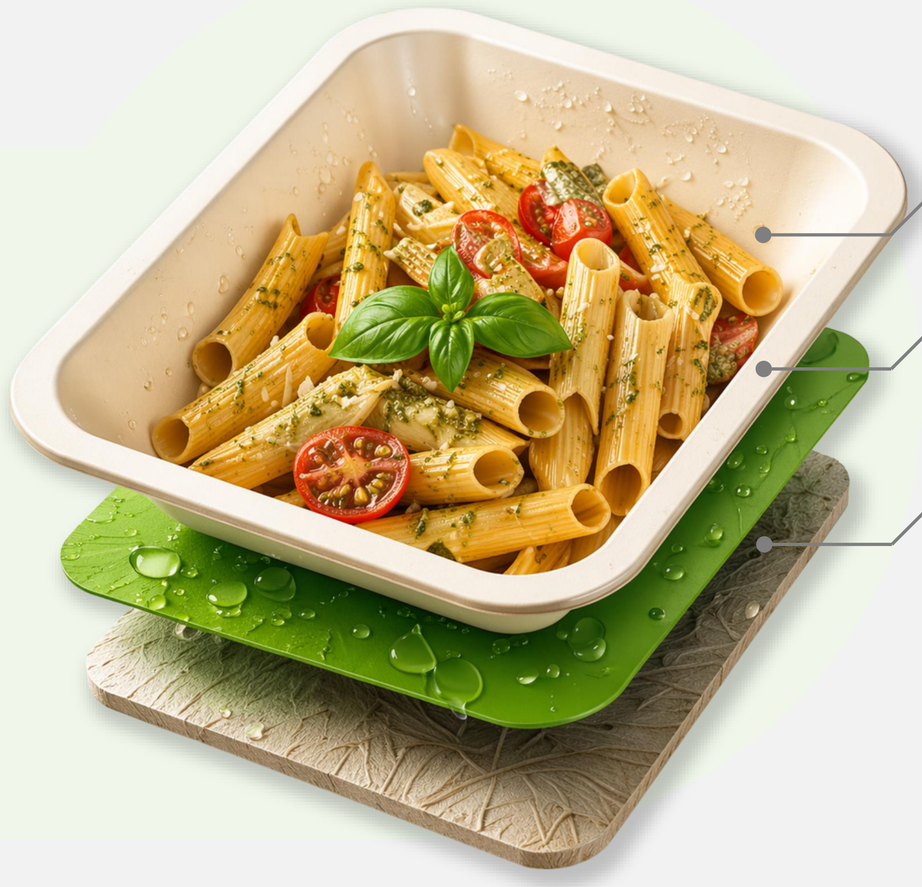
THE SYSTEM

APPLICATION
Paper-based food trays (rigid and semi-rigid, including 3D fiber-molded products) with bio-based barrier coatings. Designed as alternatives to PFAS- and PET-based packaging for hot food and compatible with thermoforming (120–180°C).

FUNCTIONALITY
High grease resistance (KIT 12), low water absorption (Cobb ≤10 g/m^2), and stable coating adhesion and performance under thermal and mechanical stress, achieved without hazardous substances

MATERIALS
Bio-based thermoplastic polymers (PHA), functional lignin-based fillers (1–50%), and natural waxes (e.g., carnauba), applied as solvent-free powder coatings on paper and cellulosic substrates.

TARGET STAKEHOLDERS
Material formulators and chemical industry, packaging converters and manufacturers, brand owners and retailers, and regulatory and certification bodies.



FOOD
Safe for hot food contact

BIO-BASED COATING
PHA + Modified Lignin

PAPER SUBSTRATE
Cellulosic Fiber
(e.g., Inverform 330 gsm)

KEY RISKS ADDRESSED

- **CHEMICAL MIGRATION** — Ensure food safety
- **PARTICULATE EXPOSURE** — Ensure food safety
- **RECYCLING INTERFERENCE** — Ensure food safety
- **PROCESS STRESS** — Ensure food safety
- **LCA & SOCIAL RISKS** — Ensure food safety

SSbD PRINCIPLES

Build safety and sustainability from the beginning.

- USE LOW-HAZARD SUBSTANCES
- AVOID PFAS & SVHCs
- USE BIO-BASED MATERIALS
- DESIGN FOR CIRCULARITY
- MINIMIZE EMISSIONS
- VALIDATE SAFETY EARLY

ROADMAP

1. **SCREEN SUBSTANCES** — Use CLP, REACH, QSAR & data-mining to assess hazards early.
2. **SELECT SAFER MATERIALS** — Choose PHA and bio-based fillers.
3. **ADAPT FORMULATION** — Optimize composition and powder size < 80 µm for performance and efficiency.
4. **VALIDATE SAFETY & PERFORMANCE** — Test barriers (KIT 12, Cobb ≤ 10), run MTT and migration tests.
5. **ASSESS END-OF-LIFE** — Ensure repulbability and compostability (EN 13432).
6. **SCALE-UP** — Pilot batches 3 – 5 kg, industrial thermoforming.

RECOMMENDATIONS

HIGH IMPACT — REDUCE TOXICITY
Replace petrochemicals and PFAS by using bio-based matrices (PHA) with modified lignin fillers.

HIGH IMPACT — ELIMINATE EMISSIONS
Implement solvent-free powder coating & hot pressing, which demonstrated 0 VOC emissions.

HIGH IMPACT — ENABLE CIRCULARITY
Select thermoplastic biopolymers that are repulbable and compatible with paper recycling (EN 13432).

HIGH IMPACT — ENSURE SAFETY
Pre-screen all chemical building blocks using QSAR & MTT assays. All substances should pass Step 1 of the SSbD.

INDUSTRIAL PROCESS

1. **POWDER COATING** — Electrostatic spraying; Particle size < 80 µm
2. **HOT PRESS** — Gelling & smoothing; 80 – 200°C (~ 60 sec)
3. **THERMOFORMING** — Dry molded fiber; 160°C (~ 1 sec)
4. **BIO-BASED TRAY** — High performance, safe & circular

BIO-SUSHY RESULTS

Validated performance, safety, and circularity.

- **0% VOC** emissions
- **KIT 12** Grease resistance
- **Cobb ≤ 10 g/m^2** Water resistance
- **80 – 98%** Bio-based content
- **Repulbable** EN 13432
- **100% Step 1** Chemicals passed SSbD Step 1 Hazard Assessment

LIMITATIONS

- **Higher material cost** than PET
- **Energy demand** 120 – 200°C
- **LCA data gaps** of biopolymers (PHA, PBS)

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BIO-SUSHY

Sustainable surface protection by glass-like hybrid and biomaterials coatings

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