Cushioning Redesign Concept Note

Project: Plastic to Paper Packaging Transition
Subsystem: Internal Protective Cushioning
Date: Q3 2023

Background

During early rollout of paper-based packaging for Sleep Therapy Devices, increased cosmetic surface damage (minor abrasions and edge scoring) was observed during transport validation. While the outer carton met compression standards, internal cushioning performance was lower than the legacy plastic configuration.

This proposal outlines a revised internal cushioning concept to improve vibration and humidity resilience while maintaining sustainability objectives.

Proposed Design Changes

1. Molded Pulp Cushioning Tray
Replace folded paper inserts with higher-density molded pulp trays featuring ribbed geometry to improve shock absorption and load distribution.

2. Paper-Based Protective Sleeve
Introduce a low-friction paper sleeve around the device housing to reduce abrasion during vibration events.

3. Higher Wet-Strength Paper Grade
Adopt humidity-resistant paper grades (up to 85% RH) to reduce material degradation during transport in high-moisture regions.

Key Constraints

- Fully recyclable materials
- No polymer or foam-based inserts
- Compliance with ISTA 3A transport standards
- Minimal cost impact (<8%)
- Compatibility with existing packaging automation lines

Draft Verification Plan

- Extended vibration testing (72 hours)
- Multi-axis drop testing
- High-humidity exposure testing
- Cosmetic damage inspection against defined tolerance thresholds

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Assumptions and Risks

- Molded pulp geometry will sufficiently reduce micro-movement during extended vibration.
- Cosmetic damage thresholds remain aligned with prior program definitions.
- Supplier wet-strength consistency can be maintained across regions.
- Humidity resistance performance will match laboratory simulation results.