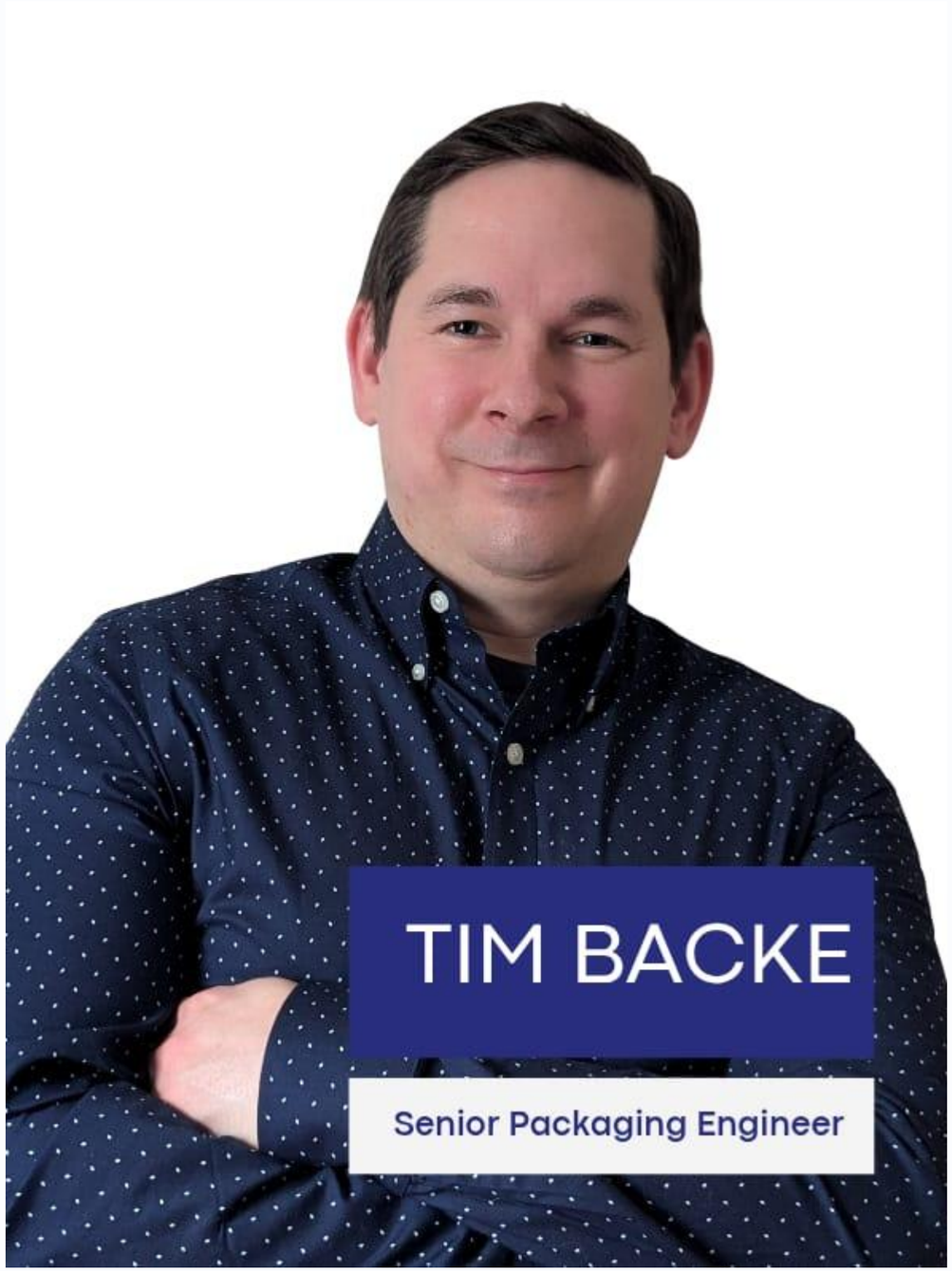
Optimizing Packaging for Performance, Sustainability, and Cost Efficiency



Understanding Current Packaging Challenges

Common Issues

- High costs
- Excessive waste
- Operational inefficiencies

Customer Feedback

- Identify pain points
- Improve satisfaction
- Address concerns

Packaging can present challenges if not optimized. Waste, cost, and inefficiency are the most common issues. Customer feedback can provide valuable insights to improve packaging.

Packaging Optimization Strategies

Material Selection

Automation

Design Innovations

Optimize material use for product safety and sustainability. Automate processes in logistics for cost savings. Improve design for better ergonomics. These strategies enhance overall packaging performance.

Key strategy and design considerations for line trials

1. Dimensional Consistency - Tight tolerances are critical—variability in size can jam forming, filling, sealing, and labeling equipment. Standardize dimensions wherever possible. Use CAD/3D tools to simulate equipment fit before tooling.

2. Structural Stability - Rigid enough to hold shape during filling but not too stiff to seal. Avoid floppy or overly flexible materials in vertical FFS systems. Ensure box flaps close and square up correctly on automatic cartoners.

3. Machine-Readable Features - Include registration marks, barcodes, or QR codes in consistent, scan-friendly locations. Use glossy finishes carefully—high sheen can cause barcode scanning failures.

4. Closure and Opening Mechanisms - Avoid reclosable zippers or tear features that may interfere with seal jaws or crimpers. Design easy-to-seal top closures (tapered necks, heat-sealable film, etc.). Consider tapered case flaps to cut down on pinch points and jamming

5. Material Compatibility - Film webs must run flat and not curl during unwinding. Use slip agents or coatings to reduce static and sticking. Carton board must have the right score-bend ratio to fold without rebound.

Key strategy and design considerations for line trials

6. Stacking & Conveying Optimization - Flat bottoms and predictable stacking for smooth conveyance on belts or chutes. Pouches should nest, not slide, on inclined conveyors. Add anti-slip coatings or embossed patterns if needed.

7. Prototype Testing & Line Trials - Conduct small-batch runs on the actual line or a test rig. Evaluate KPIs like: Machine downtime, scrap rate, and OEE throughput speed

8. Collaborate With Line Operators - Engage the plant’s packaging engineers and OEMs early. Co-develop changeover procedures and train operators on the new format. Validate packaging under worst-case scenarios (max fill weight, high humidity, etc.)

9. Use of Automation-Friendly Formats - Examples: Auto-bottom cartons. Laser-scored tear areas for clean opening, Snap-fit or press-formed closures. Nested thermoforms for multi-packs

Results You Can Expect:

- Faster throughput with fewer stoppages
- Reduced labor intervention
- Lower scrap and packaging material loss
- Improved ROI on automation investments

Integrating Sustainable Materials

1

Sustainable Materials

Use bioplastics and paperboard. They are sustainable options.

2

Weight and Volume

Reduce packaging for less waste.

3

Case Study

Company X reduced waste by 20% using eco-friendly materials.

Switch to sustainable materials to help the planet. Reduce weight and volume for less environmental impact. Learn from Company X's success.

Integrating Sustainable Materials

Plastic Free Packaging

- Papertarian movement
- Rethinking products like toothpaste and using chewable tablets, laundry detergent sheets

Reduced Plastic Packaging

- GPI – Boardio
- UPM Coated Paper -https://www.upmspecialtypapers.com/products/paper-catalogue/categories/packaging-papers/upm-confidio/
- Michelman Barrier Coatings
- Mitsubishi -https://www-cft.mitsubishi.com/

Recycled Packaging

- PCR
- PIR
- Down/Upcycling

Measuring Environmental Impact

- Trayak – Lifecycle Assessment (LCA) software to compare different packaging formats and materials, analyze environmental impact metrics like - Greenhouse gas emissions, Fossil fuel usage, Water consumption, Landfill and recyclability impact. Provides a way to evaluate trade-offs between performance, cost, and sustainability

- CEPI Repulpable Test - Laboratory procedure emulating the most relevant phases (pulping, screening, sheet formation) of a typical paper mill dedicated to the recycling of the most common grades of paper and board without flotation-deinking technology or other special features. Uses a grading system to measure Coarse Reject (%), Fine Reject (%), Dissolved/Colloidal Substances (mg/g), Sheet Adhesion (Tackiness: Absent / Partly Present / Present)Visual Appearance (impurity levels), Macrostickies area (mm^2/kg) (optional)Evaporation residueOptional: COD and BOD. Used for compliance verification with EN 13430 (recyclable by material recovery)

- FBA Repulpable Test – US standard for recyclability for paperboard. Test calls for less than 20% solids but MRF’s and paper manufacturers typically won’t accept above 5%. Your paper may be repulpable but will not be used again if it has high solids. Design features that could hinder recycling, like plastic linings, wax coatings, or embellishments, are assessed.

Regulatory Compliance and Retail Demands

Key Regulations

Meet food safety standards. Keep products safe.

Retailer Needs

Follow retailer demands like Amazon’s sustainability goals.

Winning Consumer Preference

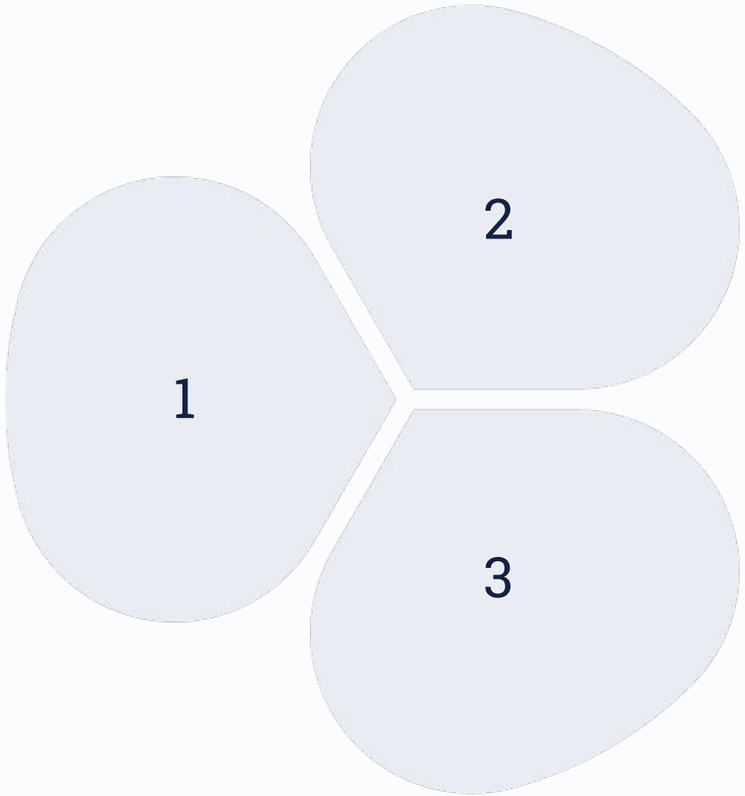
Balance compliance with what consumers want. Attract buyers.

Stay compliant with industry regulations. Fulfill retailer demands. Win over consumers with responsible packaging.

Technology in Packaging Optimization

Simulation Software

Test prototypes virtually.



Automation

Reduce human error.

Robotic Systems

Improve product handling.

Use simulation software to check new designs. Automate processes for fewer mistakes. Implement robotic systems for handling products carefully.

Best Practices for Sustainable Packaging

1

Reduce Packaging

Minimize packaging.

2

Engage Stakeholders

Involve consumers.

3

Data-Driven

Use customer feedback.

Reduce the amount of packaging used. Engage consumers in design. Use data to drive improvements.

Conclusion: The Future of Packaging Optimization

Recap

Focus on performance, sustainability, and cost.

Emerging Trends

Track improvements in sustainability and operations.

Final Thoughts

Iterate packaging design for continuous improvement.

Prioritize performance, sustainability, and cost. Stay updated on trends. Always improve packaging design. Aim for iterative improvement in packaging design.