tosca

WHITE PAPER

The hidden costs of corrugated along the supply chain

In the past, a collapsed box was a nuisance. Today, it's a financial liability.

High damage rates and lost shipments were once offset by the cardboard's low per-unit price. Today, as the cost of corrugated materials continues to trend upward, a single damaged or contaminated shipment can now wipe out thousands of dollars in inventory.

Box failures don't just cost money—they severely damage retailer and supplier reputations. Suppliers take the direct hit through rejected loads and missed delivery windows, while retailers lose valuable labor time managing damaged goods.

Additionally, higher consumer expectations, fueled by new shopping options like discount grocers and e-commerce, have created a hyper-competitive grocer environment.

There is zero tolerance for out-of-stocks or damaged goods. These failures are occurring as food companies face historic challenges.

Manufacturers can't fill 622,000 open jobs. New food safety compliance costs millions, freight rates have doubled, and packaging materials cost 15-50% more than they did just two years ago.

All of this has led to a rapid decline in operating margins, falling by as much as 2.3% to 1.6% in one year. Between inflation, competition, damage, and hidden handling costs, cardboard is no longer pulling its weight.

As these pressures intensify, many producers and retailers are re-evaluating their packaging strategies—seeking options that reduce damage, improve efficiency, and protect both profit and product.

80%
of customers won't return after a poor grocery delivery experience

2/3
of consumers will switch retailers when items are out of stock

>95%
perfect order rate is now the industry standard

The costs of corrugated boxes don't add up anymore

Corrugated cardboard made sense as packaging when it was invented in 1894. More than a century later, corrugated is used across a wider range of products, but it's not serving the food industry in the same way.

Packaging needs to be built for today's supply chain

Modern supply chains operate under conditions that didn't exist when corrugated became the standard. The geographic distance of trade has grown incrementally since 2010, meaning point A and point B are now roughly 2,000 km farther apart than they were 15 years ago.

More time on the road, rails, or seas equals more jostling and vibration, plus more prolonged exposure to adverse conditions. Longer transit times also impact ripening, cold chain integrity, food safety monitoring, and the need to move perishables from harvest to trucks faster.

Most fresh food requires three critical conditions: protection from impact, rapid cooling, and moisture resistance. **On all counts, corrugated doesn't deliver.**

- Research shows corrugated loses up to 40% of its structural integrity when exposed to moisture, exactly the conditions found in refrigerated egg transport.
- With its solid walls and limited ventilation, corrugated prevents the necessary airflow for food to reach 45˚F quickly.
- Corrugated absorbs and retains moisture from condensation and ice packs, creating ideal conditions where bacteria can thrive.
- Corrugated boxes can't offer traceability measures that can help mitigate outbreaks and recalls.

Did You Know?

Just a little wind or rain can damage cardboard's structural integrity by 40%. This degrades a box's strength to that of a simple cereal box, far from what's needed to defend your shipment against the elements properly. Sourcing a one-time-use box that matches the strength of an RPC would cost about 25% more than a brand-new RPC.

The false economy of per unit pricing

When you look at the unit price alone, corrugated boxes appear cost-effective. However, this per-unit analysis doesn't account for product losses, nor additional labor costs from handling failures, baling, and hand-stocking. Nor does it account for the impact on reputation when damaged shipments reach customers.

Cardboard's rising costs challenge its budget-friendly reputation

Between 2020 and 2025, the Producer Price Index of cardboard (the relative movement of a price over time) has increased by a whopping 17.6% and shows little sign of slowing down.

Transporting goods in corrugated boxes used to be a negligible risk, but as the price of both the product and the package it rides in increases, it's no longer worth the gamble.

Stricter regulations, higher sustainability expectations

At the same time, sustainability has come to the forefront of business decisions — driven by Extended Producer Responsibility (EPR) laws and consumer demands.
In the U.S., more than a dozen states have enacted or proposed EPR laws that shift the financial burden of packaging waste back to the producers.

For example, Oregon's program sets packaging recovery fees between $0.17 and $0.23 per lb of covered material, a cost that quickly scales across high-volume supply chains.

For the food industry, that means re-evaluating packaging not only for cost and performance but also for its total environmental and regulatory footprint. Traditional corrugated is increasingly difficult to justify when waste, emissions, and disposal fees are all factored in.

Packaging, unpacked

Suppliers and retailers alike are navigating tighter delivery timelines and higher risk. Damaged shipments mean damaged relationships, and factors like feed costs or disease outbreaks remain beyond anyone's control. But packaging—the one variable you can control—has the power to bridge that gap between loss and resilience. That's where reusable plastic containers (RPCs) stand apart.

Let's take a deep-dive into the impact of modern transit packaging.

Corrugated vs RPCs:
Total cost savings in action

Meet Bob, the Supply Chain Director for a major grocery chain that moves 952 million eggs annually. He oversees everything from supplier partnerships to store-level operations, and works closely with his egg suppliers to optimize total supply chain costs.

Bob knows that the egg industry is facing unprecedented challenges on multiple fronts—many of which are beyond his control. That means problems can arise from the very start of his supply chain.

His job is to offset these issues, among others in a labor-scarce, hyper-competitive retail space, focusing on improvements at every node within his purview.

The journey of an egg

In 2024, hens in the United States laid 108.5 billion eggs. But many of those eggs never make it from farm to table—in fact, many don't even make it to the distributor.

According to a benchmark study published in Poultry Science, **eggs break** at every step: **2-11%** during initial handling, another **1.5-2.7%** during grading and packing, and then **0.2-2.7%** more during transportation.

These aren't the only pain points the egg industry is facing, though.

For producers, feed costs are also up 12% and replacement hens cost more than ever.

Since 2022, over 58 million birds have been lost due to Avian Influenza, which has caused a 5-7% drop in egg production. In December of 2024 alone, 13.2 million commercial egg-laying hens were culled.

For retailers, high production costs and low supply have driven egg prices beyond what consumers will bear, with eggs prices hovering around $4.15 per dozen.

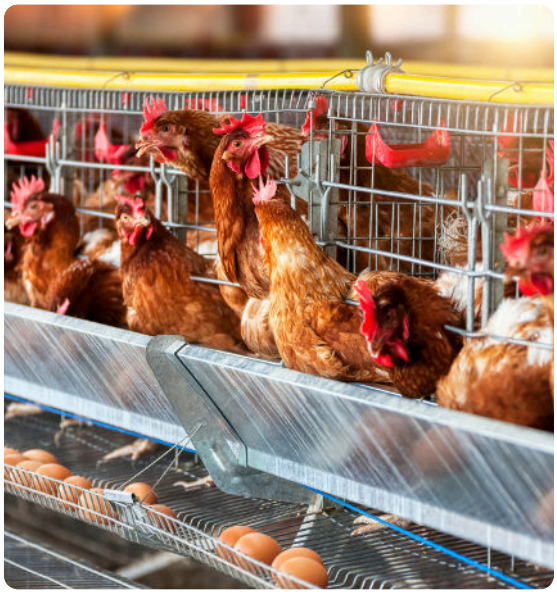
At the farm

To meet Bob's annual demand of 952 million sellable eggs, suppliers must account for losses that occur throughout handling, packing, and shipping.

With corrugated packaging, breakage and shrink average around 3.5 %, which means suppliers must produce nearly 985 million eggs just to deliver 952 million intact.

With RPCs, shrink drops to roughly 1.5 %, reducing production needs to 966 million eggs — **nearly 19 million more eggs kept in circulation instead of being lost to damage and waste.**

That difference directly translates to lower feed, labor, and energy inputs upstream — fewer resources consumed for the same sell-through.



Processing and packaging

Once harvested, eggs are washed, graded, and packed in chilled facilities. Temperature consistency is critical: eggs must be cooled quickly to preserve freshness and food safety.

Corrugated boxes, with solid walls and poor airflow, require roughly 20 hours to reach optimal cooling temperatures. The ventilated design of **Tosca's RPCs cuts that time in half to 10 hours**, ensuring faster, more even cooling throughout each crate.

Even airflow also means fewer "hot spots," lowering the risk of spoilage and bacterial growth — all while freeing up valuable cold-storage space and reducing refrigeration energy needs.

To deliver 952M eggs, corrugated requires **~33M** "cover eggs" (985M – 952M). RPCs cut that to **~14M**. That's **~19M** eggs reclaimed from shrink — inventory you can sell instead of produce to replace losses.

Transport to the distribution center

Once packed, the eggs move to Bob's distribution centers before heading to retail stores. Each corrugated shipper holds 15 dozen eggs, compared to 24 dozen in an RPC. That higher capacity means fewer total containers to move the same volume, plus better cube utilization on every truckload.

Although RPCs are slightly heavier, the overall system impact is positive: improved stacking efficiency, fewer trips, and far less product loss.

Estimated cost:

- Up to 5% increase in transportation cost to the DC for the first trip
- >51% reduction in cost from avoided shrink
- Net reduction in emissions tied to transportation and food waste

At the Distribution Center

By the time Bob's shipments reach his distribution centers, packaging quality determines how efficiently teams can move product.

- **Automated packaging compatibility:** RPCs and pallets are uniform in size and designed for automation, improving throughput and reducing labor demands compared to cardboard boxes and wooden pallets.
- **Lower pallet disposal costs:** Plastic pallets have a longer service life than wooden pallets and can be repaired and reused through Tosca, avoiding/reducing EPR fees associated with broken wooden pallets.
- **Reduced cooler space, costs, and emissions:** The ability to double-stack full Egg RPC pallets provides the potential to free up valuable cooler space and reduce emissions on a per -occupied square foot/square meter basis.
- **Future-proofing against regulatory changes:** And with new U.S. low-GWP refrigerant regulations taking effect in January 2025, **refrigeration equipment costs are expected to rise 7–10 %**— making Tosca's space-saving RPCs an even smarter, future-proof investment.

Transport to stores

Once the product leaves DC, the last leg of the journey is often where inefficiencies multiply. Eggs are once again vulnerable to shock (vibration), humidity, and temperature fluctuations, along with damage due to being stacked with other heavy products in the truck. All of these can compromise product quality, shorten shelf life, and increase the risk of breakage.

Placement in stores

Tosca egg crates can be placed directly on store shelves, reducing handling time and cutting associated costs by more than 37%. In contrast, transferring eggs to shelf from corrugated boxes can take up to twice as long.

Hours used for stocking or handling slip sheets/ corner boards, and collapsing corrugated boxes, can be reallocated to other tasks, further reducing overall labor costs. Using box cutters to open corrugated boxes can result in injuries, which can cost anywhere from $540 - $26,000 per injury.

Average time required to stock 8-foot display case

- **Tosca: 10 mins**
- **Corrugated boxes: 21 mins**

End of use and circular reuse

RPCs don't end up in landfills — they return to Tosca's wash and repair network. Each container is cleaned and sanitized through an ISO 22000-certified process, then redeployed into circulation, ready for hundreds of reuse cycles.

This closed-loop model eliminates single-use packaging waste entirely and substantially reduces the footprint of egg transport. Compared with corrugated, RPCs achieve:

Zero post-use CO_2 emissions from disposal	**100 %** recyclability within the pooling network	**≈ 188 m^3** of water saved per 10 million eggs moved	Extended asset lifespan with no capital burden for Bob's team

The result is a sustainable cycle that protects both the product and the planet — without asking Bob's operation to manage any of the logistics.

Wasted time adds up

- Folding and stacking empty egg crates takes about 5 minutes a day—**adding up to 4 full workdays a year.**
- Breaking down boxes and baling waste takes even longer: **30 minutes a day, or nearly 23 days per year.**

Switching to reusables eliminates this hidden labor drain.

The right partner gets you to measurable impacts fast

Working with Tosca means that your business gets all the benefits of RPCs without the heavy operational lifting of managing them yourself. This means:

Risk-free piloting

Test RPCs in your environment so you can see shrink reduction and labor savings in action before you commit.

Highest food safety standards

All pooled assets undergo washing with ISO 22000 certification, the industry's most stringent food safety program, ensuring compliance with your safety requirements.

Surety of supply

Industry-leading on-time delivery and the largest wash network in the U.S.; guaranteed consistent access to clean assets when and where you need them.

Hands-off asset management

Tosca handles all ownership, maintenance, and repairs, allowing you to concentrate on core business operations without asset-related distractions.

Protect your margins with every shipment

RPCs work with today's realities: expensive products, tight staffing, and automation requirements.

Ready to see the numbers for your operation?

Learn more about Tosca's solutions at toscaltd.com