NTT DATA

Packaging optimization

How to reduce product damage risks and improve supply chain results

Many packaging and supply chain professionals responsible for an organization's packaging strategy are — to some degree — removed from the daily activities involving the design and specifications of packaging. In fact, many organizations rely solely on material vendors to design and supply their product packaging. And while packaging serves many purposes, one of its core responsibilities is to protect the product throughout the supply chain. Narrow financial targets often encourage personnel to make packaging changes without considering the entire engineered supply chain. Deep vendor integration can limit design and supply flexibility as well.

Additionally, a first-rate packaging system often serves as a critical element of your product's success and customer satisfaction.

Define and map the supply chain for distribution hazards

Start with a complete supply chain map. It should include all the nodes and flows of the supply chain — manufacturing sites, warehouses and distribution centers. Identifying shipping methods, material handling equipment, handling methods and frequencies is critical. This guide can be a powerful tool for the broader organization to understand challenges and risks within the given distribution channels. Often, the intended means of handling may not align with the actual means of handling, especially if the product is sold through a third party. Unforeseen risks can be proactively factored into the package development and testing and verification stages. The supply chain mapping process should include both qualitative and quantitative data. A more robust approach can include data recorders — to collect shock and vibration events and handle data (whether mechanical or manual). The data should be shared broadly with key stakeholders to align expectations and to select or develop test protocols.

As supply chains evolve, the dynamics need to be considered for developing an accurate distribution test protocol and guaranteeing the protection of your products.

Determine the best testing approach for your products and value chain

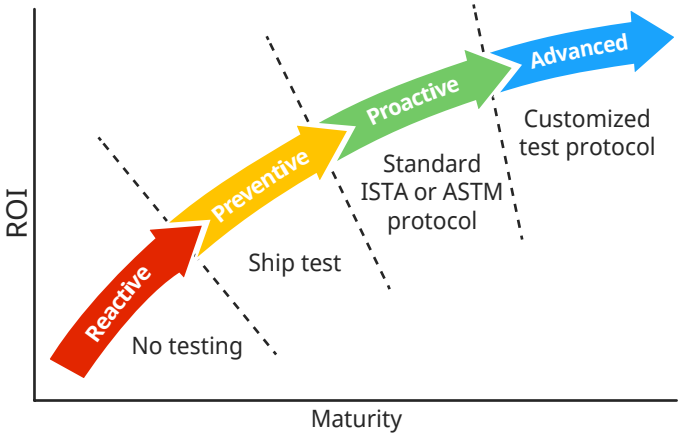
Once the supply chain flow and distribution hazards have been documented, the next step is to align on an appropriate test protocol. When it comes to testing and validating their package design, product manufacturers often fall into one of four categories:

Reactive: Don't do any type of distribution testing

While this may be an acceptable practice for some companies, most prefer to learn and understand how their product will perform when shipped to its destination. Not performing any type of package testing is a risky scenario, as the results are unknown and there's the potential for considerable damage. There's also significant potential for either over- or under-packaging the product. Improperly designed packaging can have adverse effects that include, but aren't limited to:

Over-pckaging effects
Unnecessary packaging material spend
Unnecessary assembly labor
Unnecessary inventory and storage
Unnecessary vendor management
Additional shipping costs

Figure 1. Four approaches to package testing



Under-packaging effects
High damage frequency
Customer dissatisfaction
Replacement shipping costs
Replacement production

Preventive: Conduct "ship tests" to another facility and inspect the results

Ship tests are a common way to do a quick evaluation of the performance of a packaging system. They're usually considered for low-value, low-risk or post-proactive laboratory testing. One of the drawbacks, however, is that a ship test takes place in an uncontrolled environment. Variables can be radically different on any given day. For example, the route taken by the driver, road conditions — potholes, gravel, curves and roundabouts — driver behavior, the warehouse's level of care during trailer loading and seasonal or environmental factors. Additionally, a packaging engineer can't evaluate packaging in real time for performance or failure modes.

At the end of a ship test, it can become a guessing game as to the specific cause of a failure. The uncontrolled nature of a ship test makes it more of a supplemental evaluation process rather than a preferred, primary method.

Proactive: Use industry standard test protocols from ISTA or ASTM D4169

The International Safe Transit Association (ISTA) and American Society for Testing and Materials (ASTM) are internationally recognized organizations and have packaging testing standards that simulate the normal rigors of transport and handling for various distribution channels. Using these testing protocols at a certified laboratory allows packaging engineers to design and view real-time packaging system performance in a repeatable testing environment. They can quickly fine-tune packaging systems, which helps make sure that the correct amount of packaging has been used. Note: You may need multiple tests for omnichannel products.

Advanced: Employ customized test protocol

Map a supply chain (inter- and intra-facility) and develop customized test protocols. This will allow your organization to target specific dynamic hazards or handling events not represented in a generalized ISTA or ASTM testing protocol. Advanced testing protocols are best when you use non-standard handling methods to handle a package. They're also appropriate when an engineer is trying to target a specific damage mode or a final-mile delivery simulation. For example, does the final mile include a shopping cart or a car trunk? Will it be moved through stairwells? Defining your unique supply chain upstream is a proactive approach to minimizing damage and customer returns.

Take a broader view of damage reduction and mitigation

Packaging serves as a key element of your product's success and your customers' satisfaction. A poor user experience with a damaged product can trigger a return, turn away a repeat customer or have a negative impact on your product's online reviews or "star rating." Providing a thorough test protocol will help reduce returns and negative customer experiences.

Evaluate the end-to-end value chain

When evaluating potential root causes of any packaging-related damage, you must evaluate the entire supply chain — from start to finish. This includes raw materials, automated packing or palletizing equipment as well as material handling at the manufacturing site. Most test protocols start at the palletized level. However, product/packaging interactions that occur further upstream in your system may also be a direct cause of damage. These can create an initial challenge to the packaging that weakens your packaging system.

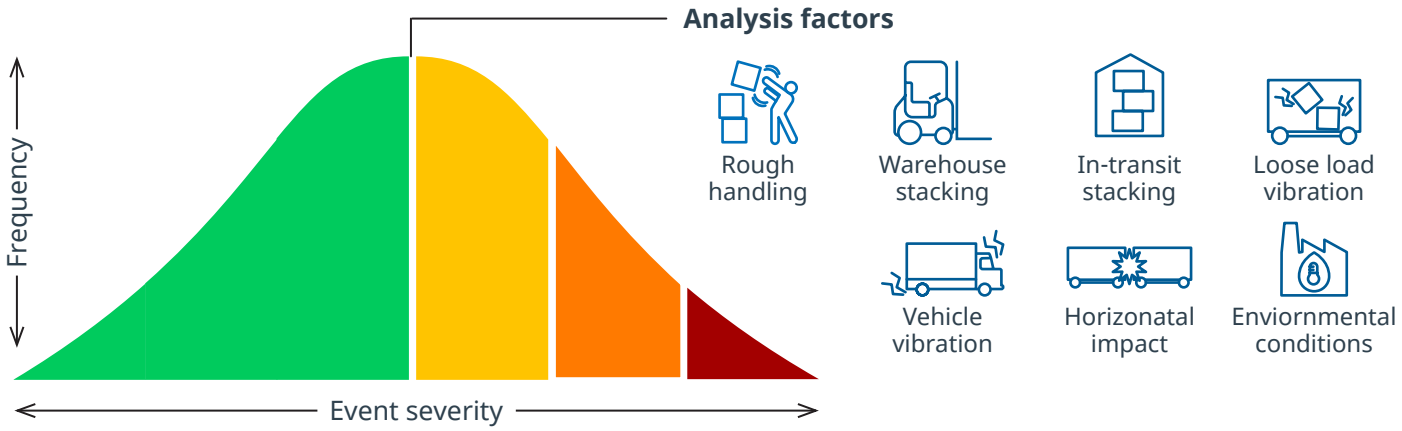
Common distribution hazards

Next, consider common distribution hazards (see Figure 2). Most of these hazards are incorporated in traditional ISTA or ASTM protocols, but the intensity levels in the protocol may not match what your product experiences in the field. Depending on your unique supply chain, material handling and mode of transport, some test parameters may need to be adjusted to receive accurate results. Also, as more products are subjected to omnichannel and ecommerce shipment, your test protocol may need to incorporate multiple methods of material handling. These could include, for example, palletized fork truck movements and clamp truck handling. Each unique wrinkle in your supply chain can add a new element or parameter to your distribution test protocol.

The final mile – packaging hazards, from the store to the consumer's home, through installation

As many test protocols start at the pallet level, most also fail to incorporate the final mile, installation or customer handling once your product leaves the store. Handling events and hazards are present all the way until your product is at its final point of use or installation (or consumed!). Potential interactions with shopping carts, vehicle loading and moving up and down stairs may all need to be considered as potential additions when fully evaluating your customized protocol.

Figure 2. Seven common distribution hazards



Conduct a fact-based review of damaged products and returns

Packaging-related damage can come in a variety of shapes and forms. Subjective in nature, damage often depends on the end customer's perception (and in some instances is dependent on the value of the product). Damages can range from cosmetic scratches to catastrophic failures and may even include "aesthetic" damage — where the product is fine but the packaging is crushed, dented or ripped (think dented cans at the grocery store). No matter which category it falls under, these are all considered "damages" and are likely to prompt a return, a credit — or no purchase at all.

If you're experiencing a sudden, or simply abnormal, spike in your warranty damage signal, a change along the supply chain may be the cause of the damage.

Conduct data-driven analyses; build the business case

Most organizations looking to make continuous improvements often follow some form of the define, measure, analyze, improve and control (DMAIC) approach. Reducing product damage within your system is no different. The first step in "defining" often includes data gathering and root-cause analysis.

Depending on what you're looking for, this process can range from a glance to a deep dive. A few critical questions include:

- What is the definition of the specific damage? (It may be relevant to define precise bounds.)
- Does the damage signal align with any significant supplier, engineering, material or supply chain changes?
- Does the damage signal originate from one specific part of the supply chain?
- What are the hard costs (for example, product replacement and shipping costs) associated with the damage?
- What are the soft costs (for example, employee time, customer ill-will or social media exposure costs) associated with the damage?

Once you've had a chance to review and analyze your data, a more thorough investigation is required to identify the root cause(s) of damage. Data analysis can help identify trends by product family, carrier, shape, size and so on. Then your findings can be used to adjust your test protocol.

Make field observations (that is, in-person assessments)

Understanding how your product is packaged and handled throughout the entire supply chain can be eye-opening because the intended means of handling may not necessarily be the actual means of handling. Evaluating this process and tying it back to your test protocol can pay huge dividends when it comes to damage prevention.

Gather and collect shipment data

ISTA and ASTM protocols encompass commonly occurring distribution hazards. You may have a gap in your process if you haven't mapped the data of your own supply chain from actual shipments. Hazards such as vibration, compression and shock impacts may be more severe (or less severe) in your own supply chain than the prescribed levels in traditional ISTA and ASTM protocols. Collecting a sampling of data from your supply chain will improve the confidence level in the distribution hazards to which you're subjecting your products. Depending on the level of data required, this can be an extensive and time-consuming process that may require outside resources.

Leverage experienced packaging engineers to help identifying gaps in your testing approach

When asking any packaging professional, virtually all agree that distribution testing proves key to mitigating risk. Manufacturers of products with a low threshold for failures tend to test more rigorously. If your organization doesn't have a packaging engineer on staff, it'd be best to seek expert advice on which protocols to apply to your specific products and supply chain. If you contact a packaging test lab or one of the small parcel shippers (UPS or FedEx) or trailer load carriers, they'll ask a few pertinent questions and offer to run a standard protocol. As omnichannel supply chains become more common, the complexity of your supply chain increases. Additionally, standard protocols may fail to adequately vet your packaging system.

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