

# MATERIAL SELECTION MATTERS

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## MATERIAL SELECTION CAN BE AN INTRICATE MAZE

There are a myriad of options to choose from, and the material choices for your package need to fit together, not only to meet the demands and requirements of the packaging contents, but also to provide the stability and compatibility for your package to function in harmony.

Oh yes, the packaging also needs to look good, reflect your brand, and come in on budget. A piece of cake, right?

Not quite. As a brand owner, if you are not taking a critical look at the materials you select, you are putting your brand and company at risk. The wrong selections can be detrimental. Choose the wrong material and it can impact your entire supply chain, resulting in product delays and higher costs in addition to potentially compromising shelf life and the function of your package. The packaging might look great, but if the packaging leaks or the pump doesn't work correctly, the consumer is unlikely to purchase your product again. The wrong material selection impedes your ability to deliver products, plain and simple.

In this paper, we'll examine **four key considerations** for material selection in primary packaging, specifically custom rigid packaging components. We'll offer suggestions to consider based on TricorBraun's more than 100 years of experience working with brands to deliver packaging that solves problems, meets commercial and operational needs and improves the bottom line.

## KEY CONSIDERATION #1: STABILITY AND COMPATIBILITY

If you are familiar with Maslow's hierarchy of needs, you'll recall that air, food and water are the most important needs for human survival and should be met first. Without these requirements, the human body cannot function properly and will ultimately fail. Apply that to packaging and product stability and compatibility are the most important needs. Stability and compatibility of the product with package are the foundation. Priority one. Without meeting these requirements, your package will not deliver on its intended purpose and ultimately fail.

The most common drivers of packaging **stability** are barrier-related:

- Oxygen
- Moisture
- Light transmission

Making the appropriate material choices can extend the product's shelf life by controlling the atmosphere inside the bottle.

For instance, if your product is affected by oxygen transmission you might consider a PET resin instead of HDPE; it has better oxygen barrier properties. We suggest the opposite for products affected by moisture transmission; HDPE is a better moisture barrier than PET. For products where HDPE is not an option but moisture is still a concern—for example, with hydroscopic products like protein powders—we recommend drying agents, such as desiccants to control the atmosphere inside the bottle.

### Controlling Light Transmission

Controlling light transmission is a common consideration for wine, beer, pharmaceuticals, hydrogen peroxide and products with all natural colors. Pick up a wine or beer bottle and you'll notice the beverage is typically packaged in green or amber glass versus a clear flint glass. Ever notice that hydrogen peroxide is always in a brown bottle? That's intentional to temper light transmission. In pharmaceuticals, the sensitivity of the product can require specific control of the pigment load. Standard color loading for a white extrusion blow molded bottle is approximately four percent. A light sensitive product may require higher loading or other additives to increase opacity thus mitigating further light transmission.



All natural colors have a tendency to degrade quickly. In cases where improper material selection has been made to protect the product from light, a consumer may see discoloration, which may give them the impression the product is “bad.” To prevent this, UV inhibitors instead of opaque pigments is a good option so the consumer can still “see” the product on the shelf.

Consider this example: I worked on a project packaging and labeling radioactive materials used to treat cancer. The product has an approximate 24-hour shelf life, but if packed in lead, shelf life increased to approximately 48 hours – which is absolutely critical when the product air shipped throughout the U.S. It’s an extreme case, but it clearly demonstrates how the appropriate material selection can have a significant impact on shelf life.

### Common Drivers

The most common drivers of packaging **compatibility** are:

- Formulation
- Resin Selection
- Filling/Processing

Regarding formulation, there is 1) the formulation impact on the primary package and the 2) formulation impact on the packaging system. Let’s consider the primary package. Oils and oil-based products tend to want to escape from the package so with food and beverage products, PET is quite often used. HDPE can be used, but, specialized tooling considerations may be required for mold split and processing. Additionally, products with solvents can wreak havoc on the package (paneling and permeating are common issues) so fluorination, co-extruded PET or multiwall HDPE could be more appropriate material choices.

Looking at the formulation impact on the packaging system, high viscosity products in personal care (e.g. toothpaste) may require a package with “squeezeability” so LDPE may be chosen over HDPE. For product formulations with particulates that use pumps (e.g. face scrubs), which pump to use is important to test. In some cases, it can be a challenge for the packaging to maintain pump priming, which can be extremely frustrating for consumers. Additionally, if you are using trigger sprayers or other systems that require priming, it may be more important to consider the spring or other functional components that come into contact with the product via delivery. At times, it may be necessary for these components to be outside the product path to eliminate contact with the formulation.





## Resin Requirements

In some cases, our clients may have approved resins, or specific resin requirements for their product and brand based on work they've already done. Sometimes the resin requirement is specific (Exxon Mobile PP resin grade XYZ) and sometimes it's general, such as "Food Grade" for food and beverage products or "Antistatic" for electronics. In food or pharmaceuticals, the resin used may have compliance requirements, i.e. a DMF or drug master file with the FDA. Masterbatch requirements often mean there are specific vendors who are approved to premix or compound the resin for manufacturing. At TricorBraun we've worked with hundreds of these types of needs and can advise clients on a material selection path that incorporates specific requirements. Make sure your packaging partner can do the same.



Filling and processing is the final compatibility driver. The packaging filling process—whether it be hot fill, retort or even cryogenic—can have an impact on material choices because they generate specific environmental conditions (in some cases, extreme conditions) on the package. (For example, specific grades of PET are required for hot fill applications.) Understanding this information early in the development process is critical so that production delays and higher costs are not incurred by going down the wrong path.



## KEY CONSIDERATION #2: OPERATIONAL REQUIREMENTS

There are four common categories of operational requirements:

- Distribution Testing
- Unique Test Protocols
- Manufacturer Certifications
- Cost/Current Capabilities



With distribution testing, if your package requires UN certification or is required to pass ISTA testing, those need to be considered early in the material selection process. Will distribution testing drive material choice in all cases? No, but in many instances the plastic grade will come into play, so it's always better to consider upfront.



Triumph Pharmaceutical  
SmartMouth



Envirocon Technologies  
Lemi Shine

Having worked closely with clients on hundreds of custom packaging solutions, there have been many times at TricorBraun where we needed to incorporate specific test protocols in the qualification process – protocols that went well beyond the standard UN or ISTA certifications. [SmartMouth](#) or [Lemi Shine](#) are examples of where we needed to consider slight design tweaks to maintain the primary material selections that had already passed stability and compatibility requirements.

## Let's Talk Operational Needs First

If manufacturer facility locations, processing platforms, compliance requirements or certifications are critical to your brand, it's best to acknowledge those up front in the process. These requirements can limit the manufacturers who can process the materials chosen for your product packaging. For example, an extruded HDPE bottle versus an extruded HDPE bottle from a Global Food Safety Initiative (GFSI)- or Good Manufacturing Practice (GMP)- certified manufacturing plant are not the same thing.

When we refer to cost/current capabilities as an operational requirement category, we're speaking to filling platforms. As a brand owner, if you hope to optimize your product's shelf life via a different package or packaging material - i.e. move from a bottle and trigger spray to a Bag-on-Valve (BOV) aerosol format - there could be an enormous cost if your current filling location is not set up for that package format.

## KEY CONSIDERATION #3: COMMERCIAL GOODS

Let's examine four considerations:

- Target Cost of Goods
- Timeline
- Brand Requirements
- Visual Appeal

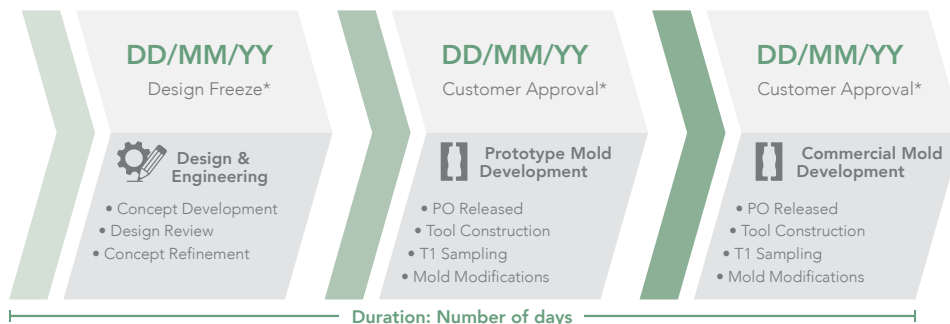
There can be a lot of ground to cover when it comes to cost of goods, so we'll cover the basic considerations. First, dollars per pound of different resins can impact material choice; dollars per pound of resin A may make more sense compared to dollars per pound of resin B. Shipping empty bottles versus shipping closures impact

cost because the empty bottles take up much more space than closures. Second, identifying the proximity of manufacturers to fillers is something to think about in regard to cost. Third, cavitation drives unit prices, so even if a PET bottle is more expensive pound for pound, if the cavitation is higher than HDPE, that could change your cost calculations. Finally, if the packaging components are complex and require assembly, the vendor's capability or lack thereof to automate this process, could impact both material and design selection.

## It's Never too Early to Think about Timelines

Example GANTT Chart  
Component Timeline

### Injection Blow Molded (IBM) and Injection Stretch Blow Molded (ISBM)



Early. Early. Early. That's when you should think about timelines in relation to your required product launch date. Pending the process and design complexity, the timeline to commercialization may change, so you need to think about how these factors may impact your timeline. For example, an Injection Molded (IM) component typically takes longer to commercialize than an Extrusion Blow Molded (EBM) component, so if you need a cap and a bottle the IM component would be the timeline driver.

There is a lot to deliberate when it comes to choosing the right packaging materials; it truly can be a tricky maze. The same can be said for balancing your brand requirements with your product's stability and compatibility needs. For example, your brand's DNA or positioning statement may encourage the use of certain materials that could negatively impact the product's shelf life. Stability and compatibility trump all other considerations; it's still the foundation, it's still priority one. But will an ugly yet stable package help you sell product?

We don't deny the importance of a product's visual appeal or shelf impact. It's the First Moment of Truth. It's those precious few seconds after a shopper first encounters your product on the shelf that you have the best chance of converting a browser into a buyer. If you can get the shopper to pick up the product, the shopper is 10x more likely to purchase the product.





Take for example, the development of a new, custom, single-serve beverage. From a product compatibility standpoint, the best material might be glass. But as a brand owner you need to consider, whether or not a Pressure Sensitive (PS) label on glass is going to allow you to have the shelf impact you're looking for. It's a constant balancing act between meeting the stability and compatibility requirements without compromising the visual appeal or decorating possibilities.

## KEY CONSIDERATION #4: CONSUMER EXPERIENCE

Understanding consumer behavior and the impact lifestyle trends have on packaging preferences is absolutely essential; we can't overstate it. Consumers crave convenience. We're multi-tasking, we are pressed for time, and we're always on the go. We want products that allow for easy and fast dispensing, and more and more, we crave portability. So while a lightweight, transparent PET bottle with a CT closure might protect the product and meet the consumer's at-home vitamin consumption requirements, this packaging style may not be portable or convenient.

Similarly, brand owners must constantly balance the consumer's functional goals and package preferences with material selection. For instance, a brand owner responsible for a dish soap package might seek a recycled, highly-squeezable package. There are multiple ways to incorporate PCR and to lightweight a package, but we need to be sure we are not compromising the product's shelf life by removing important barrier properties.

### Finding a Path Through the Material Maze

There are a multitude of material selection options for your brand packaging and making the right decisions is critical. Do you have a knowledgeable partner who knows the ins and outs of packaging material selection to help you find a viable route through this maze?

An expert packaging provider can provide you with the expertise to help you navigate the maze, define the right packaging components, mitigate risk, ensure on-time commercialization and balance your brand requirements with the product stability needs. Identifying and selecting the right packaging materials keeping these considerations in mind can help you win on the shelf and help consumers win at home.



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