



Three Reasons Why Some Of The Best Ideas Never Make It To Market

Beat The Odds With A Time-Tested Approach

A White Paper Report

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Introduction

You've done your research. You've performed cost analysis. You've grilled your focus groups. You *know* you have a great product concept. Now, you just need to turn the concept into reality.

But bringing a design concept to physical life can be a daunting process. Labor, materials and timing are just a few of the things you need to consider. How much you consider each one will depend upon your individual product.

One thing, however, is certain. Whether your product is an innovative medical device or highly sensitive computer equipment, you'll need custom plastic enclosures that are durable, cost-effective, superior quality and aesthetically appealing. In today's competitive age, how do you do this economically? Simple. Through high-quality thermoforming.

Thermoforming offers close tolerances, tight specifications and sharp detail. For its flexibility in tooling and engineering and fast set-up and production of custom plastic enclosures—especially prototypes and large parts in quantities from dozens to thousands—thermoforming is commonly selected over injection molding.

The key to thermoforming, though, is planning. Too often the manufacturing of thermoformed plastic enclosures is rushed or mismanaged, which can lead to unnecessary delays, clumsy product launches (if the product even makes it that far), added costs, and wasted time—time that you could have used to develop other profitable products. Don't let this happen.

In this white paper report, you'll learn three reasons why some of the best product concepts never make it to market: problems and challenges in (1) design, (2) development and (3) delivery phases of custom-made plastic enclosures. You'll read practical advice, questions you need to ask, and things you need to look for when choosing a thermoforming company. You'll also see "ThermoFab Thought Notes" interspersed throughout the text with ThermoFab's own experiences and recommendations in these three critical areas. Finally, you'll learn more about ThermoFab's approach to design, development and delivery.

“Design, in the end, is about creating better things for people.
Along the way, it can generate better profits as well.”

---Bruce Nussbaum, Editorial Page Editor, *Business Week*

Reason #1: Design Failure

Your product’s plastic enclosure affects its look and feel. In fact, the plastic enclosure will influence how people interact with your product. Do you want your plastic enclosure to be modern and sharp? Engaging, yet professional? Intuitive in how it functions? Devoting plenty of time to the design phase is essential if you want to bring to life the product you’ve been envisioning.

Below are challenges often encountered during this phase that can hang up a project...or kill it altogether. The strategies that follow will help you stay on track.

Challenge:

You don’t have any concept renderings, or you have only industrial sketches. You need assistance with turning your concept into reality.

Strategy:

Having a mental vision of your product concept is not enough. And while industrial sketches are great at developing your product on paper, Computer Aided Design (CAD) files are critical to the successful manufacturing of your product. You can opt to outsource this to a design engineer; however, quality thermoforming companies should be able to create 3D files of your concept in-house.

Challenge:

Your CAD files are in ProE (Pro Engineer), and you’re not sure the thermoforming company you’ve selected can work with them.

Strategy:

Make sure the thermoforming company you choose can support your CAD files. A quality company should be able to work with, at the very least, ProE and SolidWorks.

(!) ThermoFab Thought Notes

ThermoFab uses SolidWorks as its design software. ThermoFab hears from its engineers that SolidWorks is easier to deal with than ProE. Despite this, it still accepts ProE files because it wants to make things as simple as possible for its customers. ThermoFab can also read into Parasolid and STEP files, among others.

Challenge

You're still working out the fit, feel and function of your product concept.

Strategy:

Make sure you solidify this. Ask yourself the following questions and make sure you have detailed, specific answers:

- How is this product going to be used?
- Is it agency approved (UL/ETL)? If not, what steps must you take for approval?
- How should the product feel (e.g. how heavy should it be)? For example, if someone has a product, such as a hand-held device, he knows how he wants the product to feel in his hand.
- Are there different components to your product, and, if yes, how do they fit with one another?
- What do the product components do? For example, do the components come off on the left side or right side?
- What's the wall thickness of these components?
- Which side of the components or parts will be tooled?
- What sort of details, such as undercuts, are you envisioning for your product?
- Are there any standard industry ratings that your product must have, such as fire retardant ratings? If yes, make sure you have the correct up-to-date specs and information. (This information will dictate the materials needed in the development phase.)
- What colors, gloss and textures do you want? Do parts need to be textured or custom colored? Is there any type of silk screening for logos or icons to identify connectors? Will the product's name be molded in or applied as a silk screen? Does the thermoforming company have controls in place to ensure that the colors, gloss and textures are consistent?

(!) ThermoFab Thought Notes

ThermoFab creates a standard texture chip that it keeps one on file and gives one to clients—it's the exact texture with sample number, including the gloss range. By monitoring the gloss and texture, ThermoFab products will have a consistent look from batch-to-batch, year-to-year. Having these controls in place provides superior plastic enclosures every time.

A quality thermoforming company should be able to help you answer many of these questions. ThermoFab asks to be involved sooner rather than later so it can educate customers on their options. This saves everyone time and money. In fact, ThermoFab believes the best time to have a thermoforming company get involved is when the customer is ready to put a design into the computer—taking it from industrial design (sketches or foam bottles) to product design. This is especially true if the company has in-house design capabilities.

(!) ThermoFab Thought Notes

Generally, the biggest problem ThermoFab sees from outside designers is that the designs don't incorporate drafts to remove the part from the tool. It's important to design features appropriately to accommodate.

Challenge:

You're not sure how to assess the quality of the thermoforming company you're considering.

Strategy:

As with any new partner you're going to work with, it's important that you do some background checking. Here are some questions you should ask thermoforming companies:

- Do they have in-house design?
- Do they have in-house tooling?
- Do they have in-house painting?
- Do they have any quality guarantees?
- Do they have an estimate of the time it takes from 3D files to product delivery?
- Do they handle low-volume runs?

Challenge

You're unsure of which materials to use for your product.

Strategy

When you make decisions about materials, you're straddling the design and development phases. It's something you should be investigating during the design stage, and it's something that you'll need to sign off on early in the development phase. Good thermoforming companies should be able to educate you on your

options and guide you in making the smartest choices in terms of economics and practicality.

(!) ThermoFab Thought Notes

Keep this rule of thumb in mind: **design for manufacturability**. If you outsource the design, make sure the designer understands thermoforming. ThermoFab works with designers to make sure he or she “gets” the process. Remember, once your design hits manufacturing, the major decisions have already been made.

Almost all quality improvement comes via simplification of design, manufacturing... layout, processes and procedures.”

--Tom Peters, management consultant and trainer

Reason #2: Development Demons

According to the United States Census Bureau, “New orders for manufactured goods in November [2006]—up two of the last three months—increased \$3.4 billion, or 0.9 percent, to \$394.3 billion.”

But how many of those dollars have been wasted due to problems during the development and manufacturing phase? In order for manufacturing to go smoothly, “big” decisions need to be made up front about things like tooling, materials and pressure forming vs. thermoforming.

Challenge:

You’re still not sure that thermoforming is the best option; you’re still considering injection molding.

Strategy:

It’s important that you’re comfortable in your decision, whichever direction it goes. There are, however, many distinct economic and practical benefits to using thermoforming over injection molding, including its flexibility in tooling and engineering and its fast set-up and production of custom plastic enclosures.

Advantages of Thermoforming compared to Injection Molding:

- Injection-molded quality
- Short lead time
- Speedy tooling build cycle
- Ideal for small batch production
- Extensive choice of patterns, finishes and textures
- Ability to produce thin-walled parts
- Excellent part volume/quality ratio
- Ability to form large parts (48" x 96")

Challenge:

You've opted for thermoforming because of all its benefits, but now you have to make a decision between pressure forming and vacuum forming. Where should you begin?

Strategy:

First, it's important to understand the whole process. The application chooses whether you do vacuum forming (often used for more internal components) or pressure forming (which emulates injections because of the detail that can be on the parts).

Pressure Forming:

Pressure forming involves forcing a hot plastic sheet against a mold by introducing compressed air to the sheet's outer side. Pressure-formed parts compare favorably to injection-molded parts. For smaller volume runs, pressure forming offers injection-molded quality and details. The pressure applied (up to 100 pounds per square inch) is approximately five times higher than with vacuum forming, which makes it possible to obtain highly detailed parts and textured finishes.

Pressure forming uses air pressure to achieve an unparalleled level of detail on the mold side and a higher quality finish that leads to sharp edges, undercuts, and other close tolerance details. The result? You receive a product with the look and feel of an injection or structural foam molded part.

Vacuum Forming:

The vacuum forming process, perfect for larger parts, involves the automatic draping of a heat-softened plastic sheet over a female or male mold.

Vacuum forming and pressure forming both evacuate the sealed air space between the heated plastic and mold. Given the simplicity of the process and the

tooling required, it is perfect for prototyping production parts and for production runs of up to 10,000 units per year.

Challenge:

You're still unsure of the right materials to use for your plastic enclosures.

Strategy:

Here are some points to consider:

- What's the application? Outside applications will need different capabilities—such as UV stability and temperature resistance—than inside applications.
- Are you considering polycarbonates? If yes, keep in mind that polycarbonates are difficult to thermoform and injection mold because it cools too fast.
- The materials used for injection molding can be used for thermoforming, but it doesn't work the other way around. More options exist with thermoforming.

Challenge:

Tooling seems like a complicated process—how can you make sure everything runs smoothly?

Strategy:

Tooling *is* important. And it can complicate manufacturing if poor decisions are made. Make sure your thermoforming company closely monitors the tooling process. For example, ThermoFab maintains maximum control over the entire tooling process to eliminate the risks of timeline mishaps, misinterpretation of your concept, and other potentially expensive problems.

Successful Tooling Requires:

- A skilled craftsperson who considers the plastic, shrink and aluminum tooling necessary to create the desired parts from your 3D files.
- A talented team of engineers and designers to move the project along seamlessly and with precision and to keep everyone on track for a quality outcome.
- Thorough inspection of every tool by a demanding team of tooling and engineering professionals.
- The ability to make necessary changes and refinements quickly so your project stays on deadline and your product performs as intended.

(!) ThermoFab Thought Notes

In terms of tooling materials, wood is four-letter word. It really can't hold up to pressure and heat. Remember, the goal is to build a tool that lasts the length of the project, is expandable, and can be changed with a new 3D file—for years to come—and can come in dozens or thousands.

Tooling Pitfalls to Avoid:

- Wooden tools
- Cast tools (alloy shrinkage during solidification causes dimensional errors)
- Creating tooling without 3D files
- Poor Fit
- Lack of documentation
- Lack of standards—paint, texture and gloss

Challenge:

How do you determine the correlation between volume and tooling?

Strategy:

Volume determines the material used to make the tool. If you're buying 10,000 pieces, the tool material will be different from what would be used in a 500-piece order. Competitive thermoforming companies can offer cost-effective tooling for lower volumes.

(!) ThermoFab Thought Notes

ThermoFab highly recommends aluminum tooling because the tools last. ThermoFab can run tens of thousands of parts on aluminum tooling. It can easily modify aluminum tools and can CNC in details or add aluminum inserts to update revisions as a product design evolves.

Remember, when selecting your manufacturer, choose a company that's interested in developing a long-term relationship with you—a company that wants to see you succeed in your business ventures.

“Give your clients the earliest delivery consistent with quality—
whatever the inconvenience to us.”

---Arthur C. Nielsen, Founder Nielsen ratings company

Reason #3: Delivery Delays

Delivery involves more than simply shipping your products to customers or retailers. It involves things such as inventory management, scheduling, quality controls and knowing what materials need to be in stock from quarter to quarter in order to manufacture your custom plastic enclosure.

Challenge:

In today’s competitive world, turnaround time is critical. But thermoforming seems like such an involved, precise process—how can there be any guarantees?

Strategy:

Well, it’s true that not all thermoforming companies have them—or can follow-through on short turnaround promises. So, how can you ensure that you have *your* product on time? Plan. And be sure to research the thermoforming company you use so that you’re confident it can deliver on whatever schedule it promises.

Challenge:

Your product needs myriad raw materials—what’s the most cost-effective way to deal with this?

Strategy:

Knowing when to place orders for materials or what materials to keep in stock may seem like a challenge. Be sure the thermoforming company has clear guidelines on how it handles this.

ThermoFab uses a 45-day rolling forecast as part of its “Dock to Stock” program. This reduces duplicate work and delivers high quality assembled plastic enclosure product lines—when customers need it. This reduces inventory on the customer’s end *and* meets the customer’s internal production and sales requirements.

A 45-day rolling forecast involves planning materials so the client can push and pull the schedule all year long. A lack of planning for raw materials can slow down other phases. Remember, it’s not the cost; it’s the planning that matters in the long run.

(!) ThermoFab Thought Notes

ThermoFab is a UL-Approved Plastic Fabricator and has passed all stringent requirements for this internationally recognized seal of Quality, Safety and Professional Manufacturing.

Challenge:

Stories exist about inspections being the source of delivery delays. What are some ways to diminish this possibility?

Strategy:

Smart thermoforming companies conduct inspections during every phase of manufacturing. If there are any issues, they can be dealt with at this stage rather than at the end when the whole product line might be affected.

(!) ThermoFab Thought Notes

ThermoFab performs inspections every step of the way using stringent quality controls. Operating inspections in the WIP cycle are conducted at each station a customer's part travels through. ThermoFab then offers a final inspection to ensure the product looks and performs exactly as the customer intended.

Challenge:

Won't processes, such as electromagnetic interference (EMI) shielding, need to be done elsewhere, thus tacking on time to the delivery schedule?

Strategy:

It depends on the thermoforming company—some companies, like ThermoFab, handle things like EMI shielding in-house, which reduces the time to market.

“ThermoFab is always looking at our drawings to make recommendations on manufacturability, their lead times are shorter and their pricing is where I would expect. I am confident in their ability to make the parts—their level of quality is superior.”
---Julie Watson, Senior Buyer

ThermoFab’s Time-Tested Approach: Perfection In Design, Development & Delivery

High Quality. Fast Turnaround. One-Stop Shopping.

The ThermoFab Way

With over 30 years experience, ThermoFab knows what’s required to take a client’s design files and transform them into a product that people want to buy. ThermoFab works closely with its clients through every stage of the process to ensure the client receives the expertise needed for product success.

Design Made Simple...And Done Right

ThermoFab’s team of experts works closely with product designers to review clients’ designs and provide the tooling needed to ensure manufacturability. Its experienced in-house manufacturing staff then takes the lead to produce custom plastic enclosures exactly to clients’ specifications.

ThermoFab’s Design Assessment team looks at client CAD files to see how it can best produce the design while keeping the quality and exceptional details the client needs. ThermoFab only provides proposals after it does the following:

- Complete a thorough Design Assessment
- Discuss approach with client
- Review timelines and milestones
- Determine the necessity of any secondary operations

If the client is not working with a designer, ThermoFab can help find someone who will meet the client’s needs and exceed all expectations for quality and innovation.

Development: ThermoFab Manufacturing Makes A World of Difference

As a lean manufacturing organization, ThermoFab follows the Theory of Constraints (TOC) business management philosophy called Drum-Buffer-Rope (DBR), which was developed by Dr. Eli Goldratt, author of *The Goal: It's Not Luck, Critical Chain, and Necessary But Not Sufficient*.

DBR controls the flow of materials through the plant so that products are produced according to market demand with a minimum of manufacturing lead-time, inventory and operating expenses.

Drum, Buffer, Rope Definitions

Drum—Constraints or bottlenecks in the process. This is what is being managed to ensure a smooth flow.

Buffer—A protection against Murphy. This is the time provided for parts to reach the protected area. The protected areas are the Drum, the due dates and the assemblies of constraint parts with non-constraint parts.

Rope—A schedule for releasing raw materials to the floor. The Rope is derived according to the Drum and Buffers; its mission is to ensure the proper subordination of the non-constraints.

The DBR technique enables companies to maximize a Capacity Constraint Resource and use time buffers to create schedules that help deliver products on time.

Delivery: On Schedule=Satisfaction

ThermoFab's proprietary approach and continuous investment in the process (as described above) provides proven benefits that only it can deliver including:

- Fastest time to market—from design to delivery in 4-6 weeks
- Exceptional level of detail—from temperature-controlled cavities to action in the tool.
- Flexible volumes—from dozens to thousands.

ThermoFab works with clients to create a yearly blanket order with monthly releases based on a 45-day rolling forecast. This push-pull system with a 45-day window for planning deliveries offers clients extensive flexibility—allowing for market changes and growth within product lines.

Finally, ThermoFab has several processes to move clients' products along and bring the products to market quickly and successfully, such as custom assembly, custom painting, custom finishing and EMI shielding.

To find out how ThermoFab can bring your product concept to life through seamless design, development and delivery contact us by emailing engineering@thermofab.com, visiting our website www.thermofab.com, or calling 888-494-9777.



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Source Information:

United States Census Bureau: Manufacturing, Mining, and Construction Statistics
<http://www.census.gov/indicator/www/m3/>