XCENTRIC
MOLD & ENGINEERING

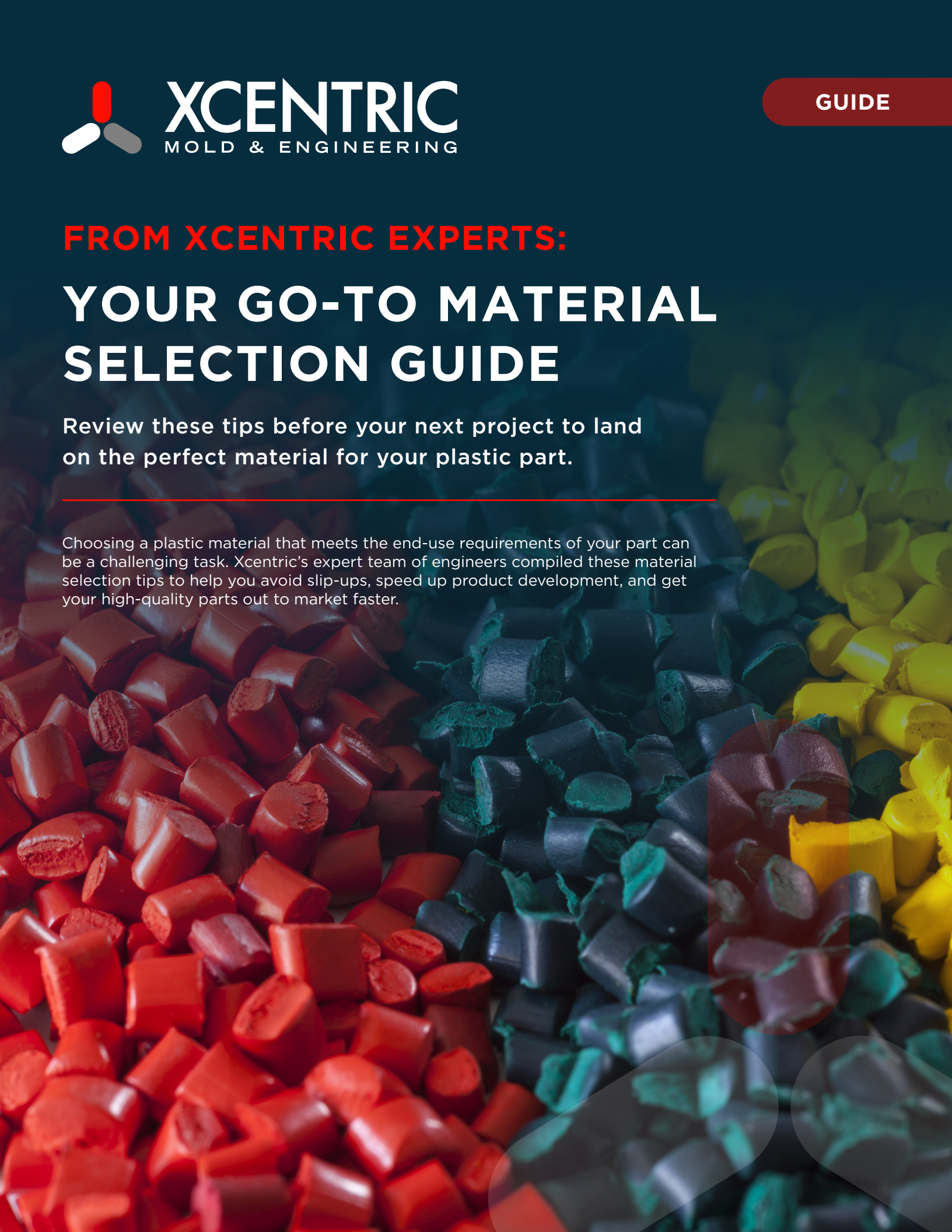
GUIDE

FROM XCENTRIC EXPERTS:

YOUR GO-TO MATERIAL SELECTION GUIDE

Review these tips before your next project to land on the perfect material for your plastic part.

Choosing a plastic material that meets the end-use requirements of your part can be a challenging task. Xcentric's expert team of engineers compiled these material selection tips to help you avoid slip-ups, speed up product development, and get your high-quality parts out to market faster.



5 COMMON MISTAKES IN PLASTIC MATERIAL SELECTION

1	Not finalizing the material source, grade selection, and any required material testing prior to cutting the tool or setting project timelines (not accounting for material shrink).
2	Not defining application requirements; end-use, end users, operating conditions, environmental exposure, and regulatory requirements.
3	Failing to consider molecular compatibility when painting or bonding parts of dissimilar materials via adhesion, welding, or over-molding.
4	Neglecting aesthetics, which affects material selection, filler composition, and finishing requirements.
5	Underestimating the relationship between—and volatility of—the various factors influencing the materials market, such as oil prices, conflicts, pandemics, labor shortages, and natural disasters. These affect the cost and availability of raw materials.

Click **here** for a list of guides that will help you optimize your designs for manufacturability, cost, and time to market.

TRUE MATERIAL STORIES FROM XCENTRIC EXPERTS

WHEN MATERIAL SELECTION GOES WRONG

> **A customer selected an alternative to the material specified on the part drawing without approval from the OEM because the material call-out was not available due to a material shortage. Those parts failed during testing and the OEM discovered the material was not the one they had approved. Because of this, the tool had to be re-cut to account for the difference in shrinkage. The customer had to cover the cost of recutting the tool and producing replacement parts, and the late notice to the material supplier added to the material lead time, causing the project timeline to be extended significantly.**

AND WHEN IT'S DONE RIGHT

> **We once had a client who had no direction from their customer on the material. However, they took time to understand the product's end-use requirements before moving forward with tooling. Once the material was identified, it was tested to ensure it would withstand the environmental conditions the product would be put through. Only after material testing was completed did the customer approve tool cutting. This allowed the tooling team to account for the correct shrink, in turn allowing us to produce quality parts and keep the project on time, and on budget.**

MATERIAL PROPERTIES CHECKLIST

Use the following checklist to identify all the properties a plastic should have to meet your next part's application needs:

THERMAL	Maximum and minimum operating temperatures and duration sustained, impact under given temperature, thermal expansion, and contraction needs.	
CHEMICAL	Exposure to chemicals, moisture, humidity, steam, submersion, paint, glue, solvents, vapors, plasticizers, and petroleum-based chemicals.	
MOLDABILITY	Suitability of plastic's melt and flow characteristics to your part's mold dimensions.	
MECHANICAL	Impact, tensile and flexural strength, rigidity, load bearing limit, wear stress, dimensional stability, and projected part life.	
RADIATION	Resistance to and dissipation factor when exposed to electromagnetic waves.	
ELECTRICAL	Is it an insulator, conductive, anti-static or static dissipative?	
BIOCOMPATIBILITY	Will the material cause adverse biological responses when in direct or indirect contact with tissue?	
AESTHETICS	Color, opacity, translucency, texture, and surface finish.	
REGULATORY REQUIREMENTS	What certifications, federal laws or quality standards do the material need to meet? This is especially important for medical equipment and automotive parts.	

6 MOST POPULAR INJECTION MOLDING PLASTICS

1	NYLON	Cost-strength ratio, temperature, chemical, abrasion resistance
2	POLYPROPYLENE	Cost-strength ratio
3	ABS	Impact resistance, toughness, rigidity
4	PC ABS	Impact resistance, toughness, rigidity, UV light color stability
5	POLYCARBONATE	Strength, optical clarity, purity
6	POLYETHYLENE	Lubricity, processability, chemical resistance

Click **here** to explore all the plastics Xcentric has in stock for your injection molding projects.

5 UNUSUAL BUT EXCEPTIONAL PLASTICS YOU SHOULD KNOW ABOUT

Silicone

- Biologically inert; it can be used inside the human body with no adverse reaction.
- Commonly used in the medical industry for various applications.

Polyamides/Nylons (PA)—PA6, PA66, PA666, PA10, PA11, PA12

- Highly versatile material in terms of use. Properties depend on type and processing.
- Applications range from textiles like nylon stockings to the intake manifold of an automotive engine.
- It can be used to replace metal components to reduce part weight.
- It achieves high strength when filled with glass fiber.

Polycarbonate (PC)

- Incredibly high impact, heat, and UV resistant.
- Has excellent optical clarity.
- Can be used in bullet proof glass, safety glasses, automotive interiors, outdoor appliances, etc.

Poly (1,1,2,2 Tetrafluoroethylene) or TEFLON

- High strength and toughness.
- Has good flexibility at temperatures of 194°F or higher.
- Has a melting point of 600°F.
- Low water absorption, anti-adhesion ability, low friction.
- Can be used in performance-demanding applications such as bullet-proof vests, gaskets and seals, anti-stick cookware, anti-friction devices, and medical device coating due to its chemical and corrosion resistance.

Liquid crystal polymer (LCP)

- Exhibits a highly ordered structure in both melt and solid states.
- LCP can replace such materials as ceramics, metals, composites, and other plastics due to its strength at extremely high temperatures and resistance to all chemicals, weathering, radiation, and burning.
- LCPs have heat deflection temperatures up to 610°F at 264 psi when reinforced with glass fiber.
- Contains a high melt flow and can be molded into large, thick-walled parts as well as thin-walled components.
- Used in applications that require resistance to high temperatures and chemicals.

STEP-BY-STEP GUIDE TO PICKING THE BEST MATERIAL FOR YOUR NEEDS

YOUR DESIGN

Inventor/designer shows Xcentric their design.

DEFINE APPLICATION REQUIREMENTS

Xcentric collaborates with inventor/designer to determine end-use needs.

CONSULTATION WITH MOLDING PARTNER

Xcentric helps them weigh plastic options based on shrinkage and warp. Xcentric can help them adapt material (and source, if required).

MATERIAL SELECTION

Material is formally selected.

MOLD TRIAL AND SAMPLING

Mold cut and trialed, samples tested to identify issues.

PRODUCTION

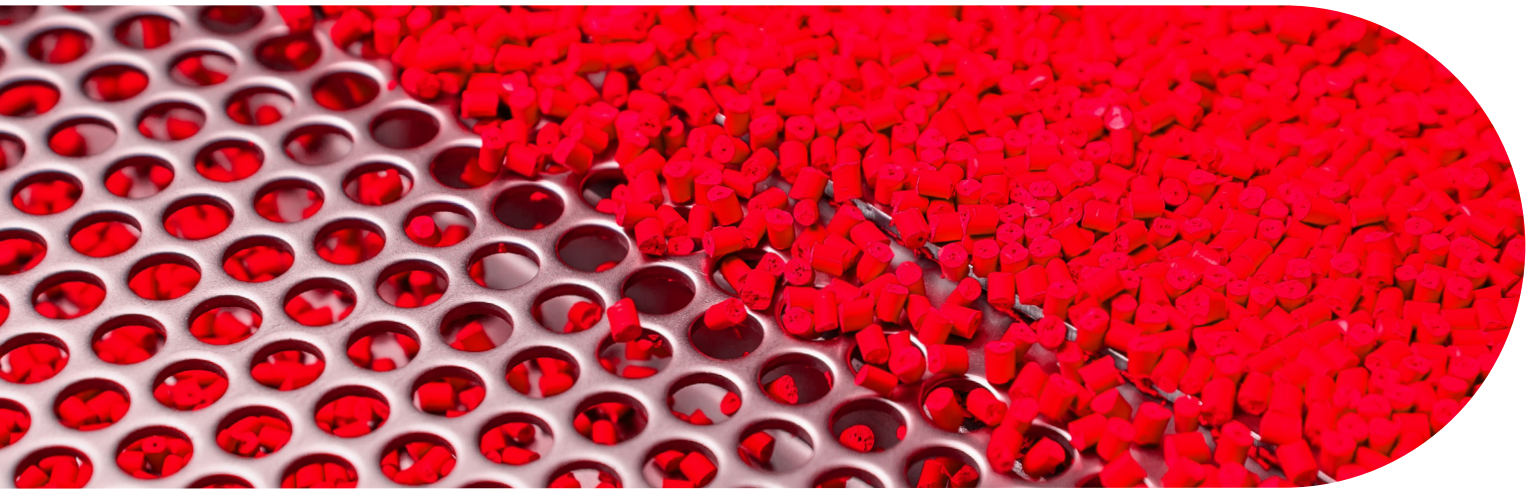
Material and mold are approved, and production begins.

NOTE: Customers who purchase materials themselves often formally select it BEFORE their consultation with the molding partner, while others who require Xcentric's help to guide them may prefer consulting us first before making a formal selection.

QUESTIONS YOUR MOLDER WILL ASK ABOUT MATERIALS

1. Who will supply the material?
2. If you supply the material, when would it be available to us?
3. What's the end-use of the final product?
4. What wear and tear will it undergo? For example, does it need UV protection, sterilization, or impact resistance?
5. What's your material cost budget?
6. What's your timeline for material procurement?
7. What color/finish do you need the part or product to be/have?
8. How many material options are you willing to accept? What are they?
9. What are the regulations that will affect your material choice?

Read our eBook Designing for Manufacturability to learn how to optimize your part design from concept through to production. Click **here** to download.



ABOUT XCENTRIC MOLD & ENGINEERING

Founded in 1996, Xcentric Mold & Engineering is an innovator of on demand digital manufacturing and continues to lead advances in injection molding and rapid prototyping. We know what it takes to deliver a high-quality product on time and on budget.

Ready to experience our engineer-centricity, quality, and speed for your injection molded part? Send us a project!

GET A QUOTE	TALK TO AN EXPERT: SALES@XCENTRICMOLD.COM

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