# A Buyers Guide to Managing Injection Mold Program Risk

*3 Questions Buyers and Engineers Should Ask to Reduce Total Program Cost and Risk*

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### The True Cost of an Injection Mold

The final price of an injection mold project is influenced by factors such as part size, material selection, part design, and tool design. Companies should work with their supplier as a strategic partner in order to make intelligent decisions regarding these variables and achieve the best cost and quality for their finished part.


### Case Study: Tooling Transfer Saves Weeks and Dollars

Ultralife, a global industrial customer, was having trouble with their tool, so they pulled it from their molder in England and sent it to Empire. It turned out that improper gate location meant that the mold couldn't be shot.

Empire changed the tool to the U.S. standard and from 2 plates to 3 plates. While most molders would have thrown out the tool, by fixing the tool Empire was able to save Ultralife 16 weeks and $20K.

ULTRALIFE®

When the costs in injection molding quotes vary widely among suppliers, so do several variables key to managing your program risk. This paper will cover questions to ask in your due diligence to ensure the best quality, consistency, and price for your project. Here are some things you should know in order to reduce risk:

## 1. What is included in the total tool cost?

Various factors contribute to the amount you will pay for a mold. The full injection mold price includes a) the initial cost listed on the quote and b) the residual costs. Residual costs are expenses that start once a new mold is in production and occur over the life of a mold. Any inefficiency in a mold such as defective parts, slowing cycle time, and tool wear can affect residual costs. The total purchase price is influenced by:

- **Part size** – Large parts require large molds, resulting in greater material cost.
- **Part design** – Intricate part designs require elaborate mold designs, which generally increase the tool cost. Simple part designs require less complexity in the mold design, lowering the cost of the tool.
- **Material selection** – If the plastic used is volatile or corrosive, requires high mold temperatures, or contains abrasive materials such as mineral, glass or carbon fiber, the cost of the tool increases. These factors could also impact the maintenance cost of the mold.
- **Tight tolerance parts** – Parts with tight tolerances will require additional mold steps, which increases the manufacturing and tool maintenance costs.
- **Annual volume** – High-volume (think hours of production, not number of parts) projects need higher quality tools to provide reliable service, which increases the cost of the tool. A higher number of cavities is also associated with greater manufacturing costs.
- **Cycle time** – To achieve fast machine cycles, a tool needs uniform cooling throughout the cavity impression (and from cavity to cavity in multi-cavity tools). This requires well-designed tooling and higher precision build, both of which increase the tool construction cost and potentially the maintenance cost.
- **Gate location** – Proper gate location is critical to part quality, but tools that do not have gates at the side of the part require construction techniques that increase tool cost. Additionally, the use of hot manifold systems significantly increases the tool price but frequently lowers the part price and/or tool complexity.
- **Mold cooling** – The mold functions like a heat exchanger, drawing heat from the molten plastic. Uniform cooling throughout the cavity impression will yield the highest quality part and the fastest cycle time. Different cooling strategies will impact the tooling manufacturing cost.
- **Manufacturing country** – Cost and quality vary by country. Lower-cost tools usually have some challenges. Choose what makes sense based on your needs.
- **Design/Build** – A well-designed mold has low residual costs, is easy to set up and to start, has a low reject rate and a predictable and consistent cycle time, and will perform well beyond its required life expectancy. Your supplier will provide reliable quality, cost and delivery when using a properly designed, built and maintained mold. On the other hand, an unreliable tool impedes production and requires extra time and effort to repair.

Because residual costs occur over a period of time, they often remain hidden until later in the project life cycle. The best way to reduce these costs is through good tool design and maintenance.

## 2. How does my design impact manufacturability?

Complex part designs usually require more intricate molds, which increases production risks. Some common complexity factors include:

- **Cavitation** – The more cavities there are in a mold, the greater the possibility is that parts don't conform. Your supplier needs to be able to produce higher-cavitation molds with well-balanced runner systems. This provides cavity-to-cavity consistency and repeatability.
- **Critical dimensions** – Parts with critically tight tolerances need to be inspected more frequently, which leads to adjustments and increased unit prices for parts. Over-dimensioned parts should be avoided when possible.

## 3. What are your mold maintenance practices?

Your company's molds and tools are critical assets to your corporation. How your supplier maintains these tools is widely overlooked during the sourcing decision but becomes a critical aspect of a successful long-term business relationship.

The condition of the injection mold affects the quality of the plastic components produced. For example, the molding process leaves a build-up of material on the mold surfaces. This fine film can dent the tool over time and break down the sharp edges at the parting line, causing flash and other damage. It can also fill in the vents and change the molding process, yielding additional dimensional variation and lower quality parts.

Unfortunately, many molders ignore injection mold maintenance and simply wait until the mold breaks down. The resulting repairs can be expensive and can jeopardize the consistency of supply. Performing preventative maintenance consistently and correctly lowers the costs of ownership, improves production, and protects your investment.

**Working with your supplier as a strategic partner can help reduce many of the risks and costs associated with injection molding. They can help you:**

- **Optimize part design and mold design** – Molded parts are only as good as the mold in which they are made. Working with your supplier to optimize both part design and mold design can improve the longevity of the tool and the quality of the part. Sometimes simple feature changes will improve the robustness of the tool, simplifying manufacturing and ensuring consistent part quality.
- **Make the most of your tooling investment** – Achieving the "right size" for tooling budgets means optimizing the tooling investment for the type of part and volume required. Over-investing wastes money, but under-investing results in a shorter mold lifespan, supplier reliability issues and added costs. Added expenses can include reactive tool maintenance while the tool should be producing parts, as well as overall mold maintenance and repair over the life of the tool.
- **Choose the right development tools** – There are many options for making prototype parts; SLA, take-apart tools and other strategies can accelerate a project's time to market. For specific applications such as high-cavitation precision parts with complex tools, a production intent prototype mold that replicates cooling, gating and ejection strategies will lower the risks associated with production molds.

Basing a supplier selection decision largely on tool cost is short-range thinking that fails to account for costs that might accrue later. It is necessary to understand a supplier's area of expertise, experience, reputation for quality, and ability to produce the type of injection molds required for the job in order to secure the best cost and quality for your project.

**Empire Precision Plastics**
500 Lee Road
Rochester, NY 14606
585.454.4995

**Connect with us.**