Mikrotech

A division of ASYST Technologies, LLC®

Finding new cost reductions when you thought you had run out of ideas. Micromolded plastic has grown to be an accepted choice to replace miniature machined components.

— John Whynott
Mikrotech, Division of
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Micromolding: A Cost-Effective Alternative to Micromachining

Historically micromachining has been the only option for manufacturers sourcing low to moderate quantities of miniature components. However, with advances in technology, micromolding can now offer a range of cost–effective alternatives for components that are miniature, complex and require high precision tolerances.

Advances in material science and plastic injection mold equipment now permit complex machined components to be injection molded in metal, plastic, or plastic with metal or ceramic filler. New high–performance polymers that have a combination of superior thermal properties (heat deflection temperature), strength, toughness and chemical resistance continue to enter the market, making suitable replacements for machined stainless steel, titanium, ceramic, plastic and glass. In addition, injection molding equipment specifically designed for micromolding makes it possible to achieve shot consistency and repeatability never before possible. Mikrotech brings together all of these advances in technology to provide an alternative to high cost machining.

Optimal Conversion Criteria

There are a number of advantages that can be obtained by converting over to micromolding. In addition to reducing the cost of the component or assembly other advantages include decreasing the overall size or weight, incorporating complex features, eliminating particle contamination and reducing the number of components..

What type of component makes a good fit? Table 1 identifies six variables that make a component a good candidate for conversion to micromolding.

Table 1. *Optimal Conversion Criteria*

No.	Criteria
1.	Components machined from ceramic, metal, plastic or glass
2.	1cm3 or smaller
3.	High part complexity
4.	Tight tolerance demands
5.	5,000 to 250,000 EAU
6.	Currently in production

Weighing the Costs and Benefits

So how do you justify moving from machining to micromolding? One widely used method of performing a cost and capital investment analysis is NPV (net present value) or NPW (net present worth) comparisons.

Table 2 illustrates an example of a potential cost savings project we are currently working on. The project is for a medical device manufacturer and contains two components. Both are currently being machined from stainless steel. The NPV is based on a minimum 5 year life expectancy and the required internal rate of return is 10% (IRR). The project will have an immediate outlay of $15,000 and $13,000 respectively for mold and inspection tooling and an estimated cost of $30,000 for product revalidation (both parts). Cash inflows (savings) are expected to be $75,000 and $68,000 respectively for years 1–5.

(Over)

Table 2. *Costs of Machining vs. Micromolding*

	Pivot	Washer
EAU	10,000	10,000
Machined cost stainless steel)	$10.00	$9.00
Micromolded cost (PEEK)	$2.50	$2.20
Annual savings	**$75,000**	**$68,000**
Tooling cost	$15,000	$13,000
Re-validation cost (estimate)	$30,000	$0.00
5 Year NPV	**$239,309**	**$244,274**
IRR	10%	10%

If we switch to a molded PEEK substitute at approximately $2.50 & $2.20 per component would result in a savings of $143,000 per year! The annual savings would be enough to offset any costs associated with seeking regulatory approval again.

How to Get Started

So how do you get started? Table 3 provides a simple four step process to help establish potential opportunities and allow you to make an informed decision on whether or not to convert to a micromolding component.

Evaluating material alternatives is extremely important. Engineers need to determine what properties are critical to the functionality of the component, so that an equivalent polymer replacement can be selected. Does it have to be sterilized? What method? How often? Does it have to be biocompatible?

There are a number of USP Class VI compliant polymers already on the market that are biocompatible and can be sterilized. If you are considering using a polymer that has not been biocompatibility tested, you will need to include the cost of testing in your analysis of whether or not to convert. However, keep in mind that once the polymer has been tested, it can be used for multiple products.

Table 3. *How to Get Started*

No.	Steps	Comments
1.	Identify conversion candidates	Existing component too expensive? Poor yield? Can't get the component geometry you want?
2.	Evaluate material alternatives	What material properties are important? Mechanical, Electrical, Thermal? Does it have to be sterilized? Single–use device? Implantable?
3.	Conduct cost/ benefit analysis	Does the payback offset the initial investment/ risk? What are the costs to re–test? Do I need to test the polymer for biocompatibility? Are there other products that can use the same polymer?
4.	Prototype, Validate, Produce	Will it work in my application? Verify cost savings.

Conclusion

Micromolding can be an excellent lower cost alternative to machining. It can also be a nice alternative to outsourcing offshore, eliminating the complexities associated with logistics and the potential risk of losing intellectual property.

With so much emphasis placed on product innovation and getting products to market on time sometimes it becomes difficult to implement cost reduction initiatives. Our in–house engineering team is available to help and can provide assistance to promote and accelerate your cost reduction initiatives. We can provide assistance with component design, prototyping, polymer selection, developing new polymer blends, material testing and cost justifications.

If you would like more information or have a specific project you would like to discuss please contact:

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