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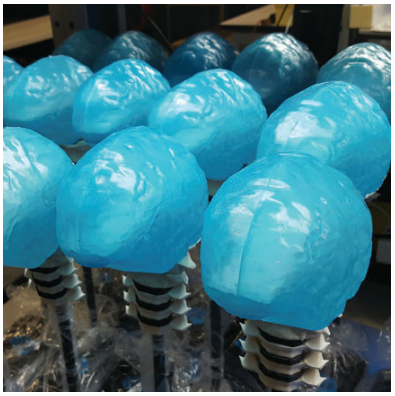

Rapid Injection Molding Case Study

3D Printing, or Rapid Prototyping as it is also called, is a very fast and-cost effective solution for testing and perfecting digital designs in the real world. Due to their ability to fabricate parts overnight without any direct labor, programming or tooling, 3D printing technologies carry many advantages over traditional technologies like injection molding for short turns and small-batch production.

Sometimes 3D printing can only go so far when developing and manufacturing products in their early stages. In those instances, Rapid Injection Molding can help take a new product to the finish line.

iLED, an American-made LED light bulb manufacturer, engineered a version that is bigger and brighter than its competition. iLED initially approached RapidMade for its 3D printing capabilities but learned that using Rapid Injection Molding could allow it to test, validate and even manufacture its light bulbs in ways that 3D Printing simply could not match.

Material Challenges

Although there are a wide range of 3D-printed plastics available to achieve many purposes, often compromises must be made. Printed nylon, for example, may be very tough and able to withstand very high temperatures, but it is also opaque with a very rough surface finish. Polyjet technology conversely has a very smooth, even glossy, finish and very fine feature detail but melts under the prolonged heat exposure produced by an ultra-bright LED.

Since iLED didn't know what the final material of the bulb should be, cutting the mold and testing multiple materials, like different grades of ABS and Polycarbonate, helped it pinpoint the final material and even helped estimate eventual mass manufacturing costs.

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Additionally, electronics products must go through rigorous UL testing to ensure consumer safety before the product can be sold in stores. Since the tested product must be made from UL-certified material and identical to the final distributed product, 3D technologies are useless in this step as they will not be cost effective for mass manufacture.

3D technologies also can produce fewer color options and inferior clarity control, and since these traits are vital to the lighting industry, traditional manufacturing is a better choice. With injection molding, one can custom blend different clear and opaque pigments with clear plastic to prototype different levels of clarity and color allowing iLED to test very specific color profiles to perfect its formula for the final product.

Finishes

As with most consumer products, finish is extremely important in lighting. A matte finish diffuses light at a very different rate than a polished one. Due to the layered nature, inherent in the 3D printing process, even the highest detail machines will have some level of surface striation. Additionally, most filament or powder technologies will have a very rough finish beyond the layer lines. To achieve custom finishes, it is extremely labor intensive, including polishing, sanding, and painting of each individual unit.

Injection molding however shoots molten plastic into a cavity which picks up the texture of that cavity. That means one only has to finish a mold once to get repetitive shots of the desired finish. And a mold can be polished and textured to prototype a variety of finishes before settling on the final one.

Volume

A light bulb is a relatively low-cost consumer goods produced in large volumes. Traditional tooling to produce those volumes inexpensively enough can take months to make and have a high upfront investment. This motivates many businesses to consider small- and medium-batch options that are more cost effective and higher quality than 3D printing to excite investors, test markets and stoke demand.

iLED could enjoy a prototyping option with relatively little upfront investment that could serve as a bridge tool to get actual product out into the marketplace. Aside from the aforementioned quality concerns, one cannot market a light bulb where the housings cost $38 to the manufacturer, as the 3D printing price would have been. Creating large volumes of parts on a 3D Printer can also take much longer than injection molding, making it harder to fill orders. Rapid Injection Molding can really provide exceptional value to early-stage manufacturers when producing runs of hundreds or thousands of parts for low cost very quickly.