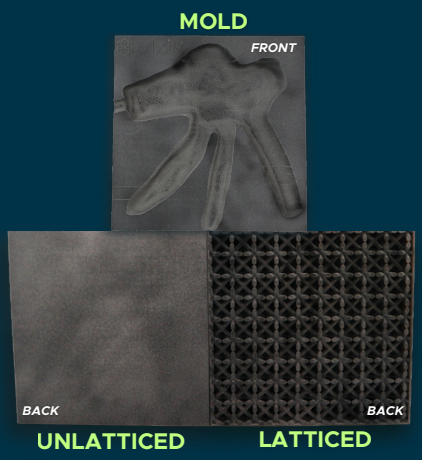
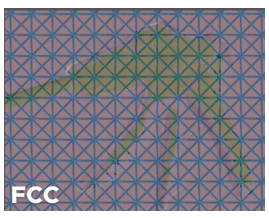
Laparoscopic Tool Mold Case Study

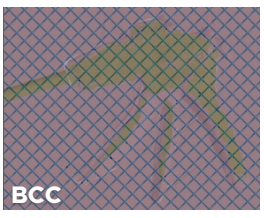
Applicable Industries: Industrial, Medical

Overview

Laparoscopic tool molds are typically produced from Delrin using subtractive machining, resulting in solid, high-stiffness components used to shape minimally invasive surgical tools. This case study shows how Vixiv AI optimized a laparoscopic tool mold, achieving significant weight reduction and performance improvements while maintaining structural integrity.







CHALLENGE

Traditional molds are heavy, expensive, and slow to machine. Engineers and companies need a faster, lighter, more flexible solution.

The Objective: Reduce the mold's weight and manufacturing time while maintaining mechanical stiffness.

OPTIMIZATION WITH VIXIV AI

INPUTS

- **Optimization goal**: 400 lbf (static loading)
- **Material**: HP HR PA12
- **Printer**: HP MJF 5200
- **Shell thickness**: 0.036in (1mm)
- **Zero thickness direction**: None

KEY RESULTS

- Up to **77.92%** mass reduction
- 21 designs ready in **4 minutes**
- **Passed** 400 lbf compression test
- Multi-lattice optimization (**FCC, BCC, Fluorite**)

21 Designs Generated

IMPACT

Using Vixiv AI, the optimized mold delivered substantial engineering and production advantages: a 77.92% weight reduction, no machining requirements, and maintaining stiffness and load capacity. Two designs (1 FCC, 1 BCC) were tested and both passed, demonstrating that lightweight lattice structures can match the performance of traditionally machined Delrin molds. The result is faster iteration, lower material usage, and greater design flexibility.