



CASE STUDY: MULTI-LUMEN CO-EXTRUSION FOR MINIMALLY INVASIVE CATHETER DESIGN

Challenge

A medical device manufacturer was developing a catheter featuring a multi-lumen core for use in minimally invasive surgical procedures. The device required a complex internal architecture capable of supporting multiple functions while maintaining a low-profile design suitable for navigating intricate anatomical pathways. Key challenges included:

- Engineering a multi-lumen structure to support functional integration within a single catheter shaft
- Ensuring the device could navigate complex anatomy and avoid obstructions or interference
- Maintaining dimensional precision across a large cross-sectional profile
- Managing material performance while preserving flexibility and structural integrity

The complexity of the lumen configuration, combined with stringent fit, form, and function requirements, demanded advanced extrusion and tooling expertise.

Solution

TE Medical partnered with the customer to design and manufacture a sophisticated multi-lumen co-extrusion solution tailored to the device's clinical and mechanical demands. The solution incorporated:

- A large cross-sectional, multi-lumen profile engineered with a non-uniform centroid and center of mass to meet functional design requirements
- Tight control of fit, form, and function tolerances, ensuring consistent performance throughout the catheter shaft
- Advanced process development to address the challenges associated with TPU/Tecoflex, a material known for its demanding extrusion characteristics

By leveraging in-house engineering, simulation, and tooling capabilities, TE Medical was able to refine the design efficiently while minimizing iteration cycles, maintaining dimensional stability.

Results

The final multi-lumen catheter solution was delivered within six months, supporting the customer's development timeline and accelerating progress toward commercialization.

Despite the complexities of working with TPU/Tecoflex, TE Medical successfully overcame material processing challenges to achieve the required dimensional accuracy and performance characteristics.

The result was a high-precision, multi-lumen catheter shaft capable of supporting minimally invasive surgical procedures in complex anatomical environments.

Capabilities

This project highlights TE Medical's advanced co-extrusion and development capabilities, including:

- In-house tool design, simulation, and 3D metal printing, working together to reduce tooling iterations and shorten development timelines
- In-house material characterization testing, providing data-driven insights for simulation and problem solving
- Advanced simulation capabilities to optimize tooling design and minimize iteration
- Expertise in processing challenging materials such as TPU/Tecoflex

Conclusion

Developing multi-lumen catheter solutions for minimally invasive surgery requires a precise balance of material science, tooling innovation, and dimensional control. Through integrated engineering resources and advanced simulation capabilities, TE Medical delivered a complex co-extruded profile within an accelerated timeline.

By combining in-house design, testing, and manufacturing expertise, TE Medical continues to enable medical device manufacturers to solve complex catheter challenges and bring innovative minimally invasive technologies to market.

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