



CASE STUDY: THIN WALL HEAT SHRINK FOR PFA CATHETERS

Challenge

A medical device manufacturer was developing a high-precision PFA catheter designed for accurate device delivery within a beating heart. The dynamic nature of cardiac motion created significant engineering challenges, requiring a solution that could maintain precision and stability in a constantly moving environment. The device required:

- Advanced navigation capabilities to maneuver within complex cardiac anatomy
- Reliable performance despite continuous motion and anatomical interference
- Miniaturization to support precise device placement
- Tight dimensional tolerances to ensure consistency and accuracy

Balancing flexibility, dimensional control, and material performance at micro-scale dimensions was critical to the catheter's success.

Solution

TE Medical partnered with the customer to engineer a thin wall heat shrink solution designed to meet the demands of cardiac-based catheter applications. Key elements of the solution included:

- Thin wall design with precise dimensional control, delivering exceptional flexibility while meeting stringent tolerance requirements
- Innovative material fusion, integrating spline structures with Pebax through tailored expansion characteristics
- Optimized electrical properties, enabling smaller device tips for enhanced procedural precision
- Co-extrusion technology, securing tubing to the substrate while maintaining tight recovered inner diameter specifications
- Application-specific crosslinking, carefully engineered to control gripping force and performance

This approach combined advanced materials science with micro-engineering precision to support next-generation catheter development.

Results

The collaboration resulted in a micro-engineering breakthrough that advanced the limits of catheter miniaturization and manufacturability. Key outcomes included:

- Achieved 0.008" recovered inner diameter (ID) with 0.004" wall thickness
- Integrated a 0.001" adhesion layer to optimize spline-to-substrate bonding
- Implemented design for manufacturability (DFM) principles to improve production yield
- Reduced point-of-use scrap, enhancing overall device reliability

By merging micro-scale precision with advanced polymer integration, the final design supported improved navigation, durability, and performance in demanding cardiac environments.

Capabilities

TE Medical's expertise in thin wall medical grade heat shrink tubing and micro-extrusion enables advanced catheter innovation through:

- Designing 0.008" recovered ID heat shrink with co-extrusion to secure tubing to substrates
- Application-specific crosslinking to precisely control gripping force
- Micro-scale dimensional control with exceptional flexibility
- Advanced material integration for spline and substrate bonding
- Improving point-of-use yield through scrap reduction and DFM implementation

Conclusion

Developing high-precision catheters for use within a beating heart requires a combination of material innovation, dimensional accuracy, and manufacturing expertise. Through advanced thin wall heat shrink technology and integrated material solutions, TE Medical enabled the customer to push the boundaries of miniaturization while maintaining performance and reliability.

By aligning micro-engineering precision with scalable manufacturing strategies, TE Medical continues to support medical device manufacturers in advancing catheter technologies that improve procedural accuracy and patient outcomes.

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08-26