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Precision Loop Formation in Pre-Engineered Braided Components

Executive Summary

A medical device OEM required development of a pre-formed looped braided component designed to support downstream assembly and functional integration.

The specification required a loop construct with a target length of 1” ± 0.15”, manufactured using a 16-carrier braid architecture with 61 dtex blue polyester and a defined internal structure.

The objective extended beyond braid production and focused on converting a flexible braided structure into a repeatable, dimensionally controlled component suitable for scalable manufacturing.

Through coordinated control of braid architecture, forming methodology, and dimensional verification, the programme established a repeatable process for producing precision looped textile components.

The Challenge

Producing tight dimensional tolerances in small-scale flexible braided structures presents a unique engineering challenge.

Unlike rigid components, braided assemblies remain sensitive to tension, handling, and post-processing conditions, creating potential variation in final geometry.

Key engineering challenges included:

- Achieving loop dimensional accuracy within ± 0.15”
- Managing braid compliance during loop formation
- Preventing elongation and deformation during handling
- Maintaining consistency across production batches
- Balancing formability with shape retention
- Preserving structural integrity following forming

The programme required structural and process controls that enabled the braid to maintain its intended functional geometry.

Engineering Objectives

The programme focused on:

- Developing a repeatable pre-formed loop geometry
- Maintaining dimensional accuracy within specification
- Supporting integration into downstream device assembly
- Preserving structural integrity during loop formation
- Reducing assembly variability
- Establishing scalable manufacturing conditions

Development Approach

Architecture & Form Development

Development centred on controlling final geometry through integrated design of braid structure and forming conditions.

Key technical strategies included:

- Selection of a 16-carrier architecture to balance flexibility and structural stability
- Use of fine denier polyester to support compact loop formation
- Defined internal braid construction to support geometry retention
- Alignment of structure and forming methods to define final component shape

Loop formation was treated as an engineered outcome of the structure rather than a secondary manufacturing step.

Manufacturing Process

The manufacturing route was developed to maintain consistency throughout both braid production and component formation.

Key stages included:

Braid production

- Controlled 16-carrier braiding conditions
- Regulation of yarn tension and braid angle

Component Formation

- Cutting to controlled lengths
- Formation into defined loop geometry
- Process optimisation to maintain shape stability

Inspection

- Dimensional verification against specification
- Visual inspection for structural consistency and appearance

Validation & Performance Assessment

Validation focused on confirming dimensional accuracy and structural robustness.

Assessment activities included:

- Measurement of loop dimensions across multiple samples
- Evaluation of geometry stability during handling
- Visual inspection of braid uniformity and appearance
- Verification of structural integrity following forming

Results confirmed that the required loop geometry could be achieved consistently within specification.

Process Control & Repeatability

Repeatability was established through tight control of critical variables including:

- Carrier balance and braid tension
- Controlled forming conditions
- Standardised handling procedures
- In-process dimensional inspection

These controls supported reliable batch-to-batch consistency and enabled scalable production.

Engineering Outcome

The project demonstrated that braided structures can be engineered into functional components with controlled final geometry.

Key engineering outcomes included:

- Repeatable loop formation within defined tolerances
- Improved dimensional consistency for integration
- Reduced customer assembly requirements
- Controlled small-scale component geometry
- Scalable production capability

The programme demonstrated a transition from supplying braided material to delivering engineered textile components.

Application Relevance

General Surgery

Looped textile components supporting controlled handling and assembly consistency.

Orthopaedics & Sports Medicine

Braided loop constructs used in fixation and soft tissue repair systems.

Cardiovascular & Delivery Systems

Low-profile braided loops supporting controlled positioning and deployment.

Minimally Invasive Device Platforms

Compact pre-formed textile components enabling reliable navigation and device integration.

Key Takeaways

- Precision geometry in braided systems requires integrated control of structure and process.
- Final component behaviour is influenced by both braid architecture and forming conditions.
- Dimensional control improves downstream assembly consistency.
- Pre-engineered geometries reduce manufacturing variability.
- Controlled loop formation supports scalable component production.

"The project transformed a flexible braid into a repeatable functional component through controlled geometry and process integration."

Contact Corza Medical today

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