Welcome to

Advanced Textiles EXPO®

ORGANIZED BY ATA



Designing and Manufacturing Advanced Medical Textiles: Lessons learned from Bally Ribbon Mills

Ted Fetterman, Vice President-Sales and Marketing – November 3, 2026

BRM
Bally Ribbon Mills



Ted's Talk

What am I going to talk about?

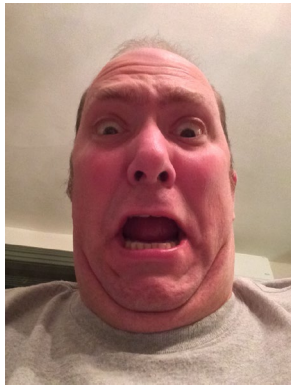
- Overview-who are we, its relevant
- Industries Served
- Medical Capabilities
- Medical Device Market
- Challenges - Medical Device Industry
- Lessons Learned



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Introduction – Ted Fetterman

Vice President – Sales and Marketing

- 31 years at Bally Ribbon Mills
- Market Strategy
- Innovations
- Business Development
- Customer Service
- R&D and Engineering

Primary Focus: working to ensure Bally Ribbon Mill's future viability

Secondary Focus: working to sustain the health of the US textile industry

ATAExpo: Headshot Plug
I need a new one

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Introduction: Bally Ribbon Mills

Weaving Company

- Family owned and operated – 4th generation at the helm
- Established in 1923
- 275 employees. 5 days/wk, 3 shifts
- 95% man-made fibers

We Are Weavers

- We design, engineer, & manufacture woven materials
- that serve as structure or substrate for components,
- in critical customer applications,
- when superior characteristics and specific properties are required.

Commercial Cut & Sew	Fire and Fall Protection
Commercial Aerospace/Aviation/Air Mobility	Industrial Equipment/Processes
NASA – Near/Deep Space exploration, habitation, economy	Medical Device Components
US DOW-Troop PPE, Equipment Soft Goods, transportation	US Military Service Ribbon



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Medical Device Industry

- This market opportunity comes with a great many challenges.
- Products for Life Support Applications
- Textiles as components
- Zero defect tolerance
- Capital Intensive
- Extreme manufacturing scale difference from traditional applications



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Medical Device Components

- Implant Structures
- Orthopedic Devices
- Woven Vascular Grafts and Arteries
- Orthopedic Webbings
- Ligature Tapes for Reconstructive Surgery
- Dental Prosthetics
- Tissue Culture Scrim



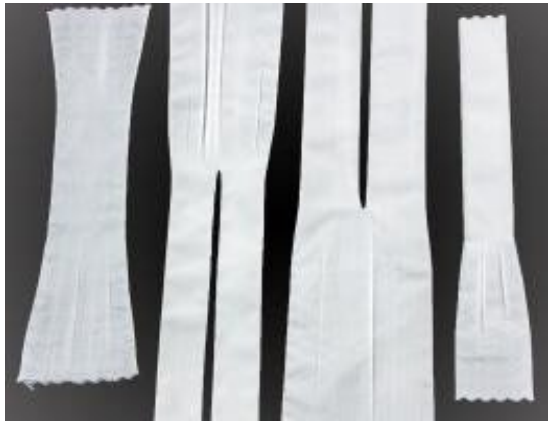
Product Properties

Woven Structures

- Dimensional stability
- Specific elongation
- Specific strength - optimized design
- Specific porosity - controlled air/liquid

Technology / Capability / Value

- Multi-weft insertions
- Tapered tubular constructions
- Bifurcate Weave
- E-WEBBINGS® - embedded conductive elements
- Ultra-fine yarns (less than 15 denier)
- Yarns approved for medical use
- US yarn supplier with dedicated facility for medical applications – secure supply chain



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Manufacturing Technology

Class 8 Medical Clean Room

- Certified 3000+ sq ft
- Shuttle looms – woven selvage
  - Cam-driven
  - Dobby Head
  - Jacquard
  - Special Bifurcate Loom
- Needle Looms
- Value-added processing
- Custom packaging



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Historical Product Benchmarks

BRM: WEAVING MEDICAL PRODUCTS - 50 YEARS

- 1960's > woven tubular structures for implant in the human body
- 1970's > designed structural webbings for orthopedic braces
- 1980's > designed woven tapes to grow human tissue
- 1990's > designed woven tapes for use medical filtration
    - ISO Certified in 1997
- 2000's > purchased weaving technology to solve technical defect in woven arterial implants
- 2008 > constructed Clean Room
- 2014 > ISO13485 Certified
- 2015 > installed multi-weft weaving technology
- 2017 > positioned for growth in the Medical industry
- 2019 > providing R&D Services as well as full production commercialization support
- 2022 > Post Covid – development – New Fibers, new equipment, new skills.

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Medical Device Market

2026 Forecast

- $605 billion
- $1 trillion by 2034 – 7%+ CAGR
- Driven by
  - AI integration
  - Remote Patient Monitoring
  - Surgical Robotics
  - Chronic disease management
  - Strong Demand - North America, Asia-Pacific



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Medical Device Market

AI embedded

- Diagnostics
- Imaging
- Remote monitoring tools
- Patient specific care
- Improvements in operational efficiencies.



Medical Device Market

Remote Patient Monitoring, RPM

- Smartwatches
- Soft-good systems-functional fabrics
- Glucose monitoring
- Patient engagement
- Reduction of hospital readmissions



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Medical Device Market

Market Drivers

- Surgical Robotics and Advanced Manufacturing
- Localized manufacturing is expected to drive innovation
- Applications
  - Cardiac
  - Orthopedic
  - Neurological



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Medical Device Market

Regulatory and Security Focus

- FDA scrutiny – process and documentation
- Software-driven
- Cyber security
- Compliance is a major hurdle.



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Medical Device Market



Market Drivers and Challenges

- High Volume
- New applications
- Aging population
- Geopolitical risks
- Supply chain regionalization
- Capital intensive investments

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Opportunities and Challenges



Medical - Devices

- Risk, regulatory controls for safety and effectiveness

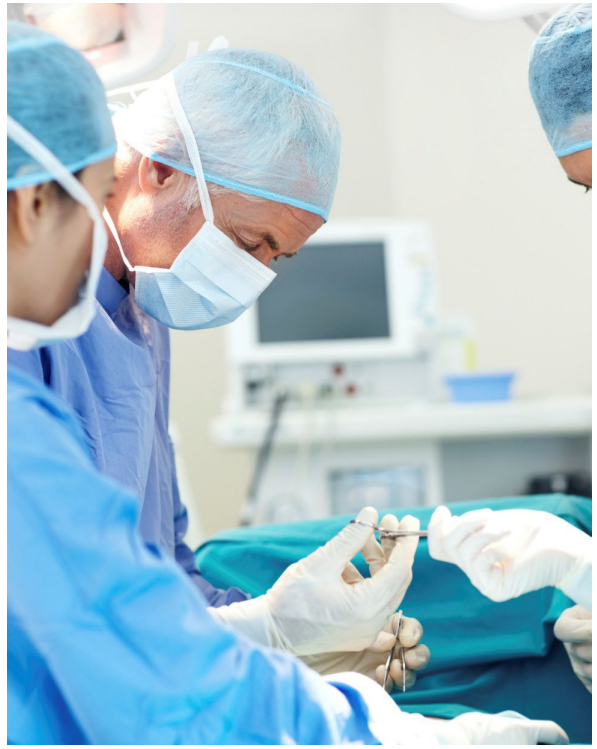
- Class 1 – low risk, general controls, bandages, prosthetics, gloves, toothbrushes
- Class 2 – moderate risk, special controls syringes, infusion pumps, surgical tools
- Class 3 – high risk, pre-market approval implantable devices, life support or sustaining

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Opportunities and Challenges

Medical - Devices

- Investment – partnerships
- Co-Investment
- Suppliers and customers
- TRL/MRL – 1-4, 4-7, 8-10
- NIH - Small business partners
- Capital is limited.
- Intellectual Property – maintain weaving technology. Give up product for application.
- Time to Market – comparatively long



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Opportunities and Challenges

Internal Control Requirements

- Robust quality controls
- Production and process controls
- Supplier flow down
- Notification of Changes – 4Ms, personnel (man), machine, materials, and method
- Material handling, storage, traceability
- Monitoring, measurement, control
- Corrective and Preventative action system
- Audit



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Opportunities



Now What?

- Innovation and Collaboration –growing market
- Supply Chain Push, Demand pull, Innovation in a Box
- Development Activities
  - Proof of Concept
  - Prototyping
  - Verification
  - Validation.
- Questions


See You Next Year In
Charm City
Baltimore
MARYLAND
Advanced Textiles
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Oct. 26–28,
2027

THANK YOU!



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See you next year!

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