# AetherFibe: Keratin Textiles ♻ Deep Innovation Dossier

# 1. Product Vision & Value Proposition

The future of sustainable luxury is 'AetherFibe': a revolutionary textile fiber derived entirely from upcycled keratin protein, offering superior hand-feel, natural lightweight structure, and complete biodegradability.

Vision: To establish AetherFibe as the premium standard for responsible material innovation, replacing petroleum-based synthetics in performance and fashion markets globally.

Unique Selling Points:

Circular Sourcing: Diverting millions of tons of feather waste from landfills annually, transforming a cost center into a sustainable resource.

High-Performance Biodegradability: Offering the durability and resilience of performance synthetics (like nylon or polyester) but degrading naturally at end-of-life, eliminating persistent textile microplastics.

Superior Tactile Experience: The natural protein structure of keratin provides an exceptionally soft, breathable, and luxurious drape desirable in high-end apparel and technical gear.

# 1. Consumer & Market Impact

AetherFibe targets rapid adoption across three core user profiles, maximizing early market penetration and ethical brand alignment.

Primary Persona 1: The Luxury Eco-Brand Director (B2B)

Pain Point: Difficulty sourcing materials that meet stringent corporate sustainability goals without sacrificing quality or performance necessary for premium pricing.

Testimonial: “Finally, a truly circular material we can integrate across our entire supply chain. This validates our environmental commitments without compromising the integrity of our design.”

Primary Persona 2: The Performance Apparel Designer (B2B)

Pain Point: The need for lightweight, moisture-wicking materials that offer technical functionality but are inherently less damaging than current synthetic mainstays.

Testimonial: “The innate structure of keratin provides breathability and resilience that feels engineered by nature. This allows us to innovate performance wear with a clean conscience.”

Primary Persona 3 (Non-Obvious): Waste Management & Agricultural Stakeholders (B2B/Gov)

Pain Point: Handling the massive, costly, and environmentally challenging waste stream generated by the poultry industry.

Testimonial: “This transforms a major liability—feather disposal—into a commercially viable feedstock. It’s a systemic solution for agricultural waste management.”

# 1. Feasibility Assessment

Technological Readiness Level (TRL) Assessment:

TRL 5: Component and/or breadboard validation in a relevant environment.

Explanation: Keratin extraction and dissolution into a spinnable polymer solution have been demonstrated in laboratory settings (TRL 3-4). However, scaling the process (bio-polymerization/wet-spinning) to consistently produce commercial-grade fiber properties (tensile strength, uniform diameter) in a pilot plant environment is ongoing.

Next Stage (TRL 6): System prototype demonstration in a relevant operational environment (e.g., testing fiber durability and batch consistency in a small-scale textile mill).

Business Readiness Level (BRL) Assessment (KTH Innovation):

BRL 3: Defined idea, market size estimate, and competitive landscape analysis completed.

Explanation: The core value proposition (waste-to-fiber) and primary target markets (luxury, performance, and circular economy brands) are clear and quantified. However, the commercial viability relies heavily on validating the cost structure of the upcycling process against traditional fiber production (e.g., pricing strategy and supply chain logistics).

Next Stage (BRL 4): First draft of the business plan, initial key partners identified, and preliminary pricing model verified based on pilot scale production costs.

# 1. Prototyping & Testing Roadmap

Phase 1: MVP Development (0–9 Months)

Develop Keratin-Polymer Formulation V1.0 optimized for tensile strength and stability.

Construct and stabilize pilot-scale wet-spinning apparatus to produce 1–5 kg batches of continuous AetherFibe yarn.

Initiate textile characterization: testing dye affinity, shrinkage, and mechanical properties against industry benchmarks (e.g., Tencel/Lyocell).

Phase 2: Targeted Field Trials & Iteration (9–18 Months)

Partner with 3-5 'Lighthouse Brands' (high-visibility, eco-conscious designers) for small-batch garment trials.

Gather qualitative feedback on fiber hand-feel, wash durability, and consumer reception.

Parallel Business Model Validation: Test cost structures and optimal fiber yield from various feather sources to confirm profit margins.

Phase 3: Commercial Pilot & Refinement (18–24 Months)

Scale production to 100 kg/month capacity, focusing on process efficiency and material sourcing resilience.

Finalize technical specifications (e.g., denier, filament count) and secure third-party certifications (e.g., Cradle to Cradle, USDA BioPreferred).

# 1. Strategic Launch & Market Integration

Strategic Launch: AetherFibe will employ a high-leverage partnership model, framing the material as an exclusive ingredient brand.

Strategic Partnerships: Secure exclusivity contracts with major poultry processors for stable feedstock supply. Form R&D agreements with leading textile innovation hubs (e.g., Fashion for Good) and established chemical firms for processing scale-up.

Distribution Channels (B2B Focus): Direct supply to premium and performance apparel manufacturers (B2B Ingredient Branding), emphasizing traceability and circularity claims.

Pilot Incentives: Offer launch partners reduced material costs and co-marketing opportunities, showcasing the material's origin story from waste stream to finished product, leveraging consumer desire for supply chain transparency.

Macrotrend Alignment: AetherFibe is perfectly positioned within the Circular Economy transition and the global imperative to reduce reliance on petroleum-based synthetic polymers. It supports the next generation of sustainable manufacturing, ensuring waste streams become valuable, scalable inputs—the inevitable future of material science.

# Next Step

Secure seed funding to transition from TRL 5 (Lab Validation) to TRL 6 (Pilot Plant Demonstration) and initiate formal partnership negotiations with a major poultry waste handler for consistent, high-volume feedstock access.