NYS Center of Excellence in Healthy Water Solutions

Request for Proposals (RFP-20260420) | Projects from Clarkson and ESF Faculty

Moby Filters: From Lab to Market Testing

1. Category of Funding: Concept Commercialization / Implementation

2. Ideal Funding Start and End Date: August 1, 2026 to Feb 1, 2027

3. Project Title: Moby Filters: From Lab to Market Testing

4. Clarkson / ESF Team Members:

Stefan Grimberg, Principal Investigator, Professor, Civil & Environmental Engineering, Clarkson University, grimberg@clarkson.edu

5. External Partners:

Moby Filters, Inc. (Yoni Ronn, Founder & CEO, yoni@mobyfilter.com)

6. Water Research Area: Emerging and Traditional Contaminants (microplastics / micro- and nano-plastics)

7. Additional Funding Sources:

This work is supported in part by an additional active award, the J.M.K. Innovation Prize.

8. Prior CoE Project Outcomes:

Under a prior NYS CoE reserve award, Moby built its first integrated filtration system in the lab as designed. The team is now building the second iteration, which this proposal advances toward market testing.

Abstract

Moby Filters is a water technology company developing a modular, closed-loop filtration system designed to capture and reuse micro- and nano-plastics (MNPs) generated by businesses that wash or manufacture textiles, before those particles enter wastewater streams and affect environmental and human health. Future project phases will explore expanding the system's application to additional pollutant types, including dyes, PFAS, sulfates, and chlorides, and to sectors such as potable water treatment, bottled beverages, cosmetics, and data center cooling water.

The system integrates dual step techniques, embedded sensors, and self-cleaning automation to enable real-time particle capture across a wide size range at high volumetric flow rates. In doing so, Moby Filters aims to help facilities reduce operational costs, including sewage utility bills by up to 30%, through the reduction of pollutants discharged to the municipal system and through on-site water reuse.

Co-benefits include the diversion of process-associated toxins from receiving waterways, recovery and reuse of captured particulate material, reduced energy consumption when compared to other treatment solutions, and direct cost savings for commercial and industrial operators.

Existing commercial technologies are inadequate for this application: they are limited by submicron filtration incapability, insufficient flow throughput, susceptibility to fouling, or excessive maintenance burden under industrial conditions.

EPA researchers define microplastics (MPs) as plastic particles ranging in size from 5 millimeters (mm), about the size of a pencil eraser, down to 1 nanometer (nm). Moby's technology is retrofittable, low-energy, and validated to achieve 99.9% capture efficiency at 10 μm while maintaining a volumetric flow rate of 1.2 gal/s, a combined performance benchmark 10x faster than any comparable commercial system. One of the project's main goals is to maintain the same flow rate of 1.2 gal/s while capturing particles ≥0.5 μm, with a future goal of achieving 0.1 μm.

Spun out of Columbia University's Lamont-Doherty Earth Observatory, Moby Filters has developed a dual-stage filtration system targeting particles down to the nanoscale. Stage A Primary employs a modular architecture for bulk capture of particles in the 80 to 240 μm range, with each unit designed for scalability and ease of installation across varying facility configurations. Stage B Secondary utilizes a nanostructured filtration method with optimized pore geometry and channel spacing, targeting particles down to 0.1 μm. The goal of this project is to advance Stage B capture to ≥0.5 μm while maintaining the validated flow rate of ≥1.2 gal/s; full design performance of 0.1 μm represents the longer-term target beyond this grant period. Experimental data from lab testing (Fig. 5) shows the system reduces particle counts across all size classes from 2 μm to over 100 μm, with captured material visible across both stages (Fig. 4). Flow rate testing across valve configurations (Fig. 6) confirms the system sustains 1.2 gal/s under operational conditions, validating performance at the scale required for commercial laundry and textile facilities.

Moby is currently operating active pilots at a commercial laundromat in Harlem and soon at Columbia Residential, with additional deployments underway across the country. These pilot sites are generating real-world performance data under varying influent conditions and facility configurations, and are advancing the company's understanding of discharge impact, system durability, and operator requirements at commercial scale. The integration of both filtration stages into a single pre-commercial unit, completed under the prior CoE award, marks the critical milestone from which this proposal builds. The next phase of work requires dedicated engineering resources to refine the system for manufacturing, reach sub-micron capture rate while eliminating the flow rate trade off, validate performance across pilot sites analytically, and produce the technical documentation needed to engage contract manufacturers.

Project Team

Stefan Grimberg is a research professor in the Department of Civil and Environmental Engineering at Clarkson University with over 30 years experience in environmental engineering focusing on wastewater treatment research. He has maintained an active research program in nutrient recovery and anaerobic digestion of wastewater and agricultural media. Dr. Grimberg is also the co-director of the NY Center of Excellence in Healthy Water Solutions promoting industry/academic collaborations for economic development.

Yoni Ronn is the CEO and Founder of Moby Filters, a Techstars-backed startup tackling microplastic pollution. He previously managed a NOAA-funded research program at Columbia University's Lamont-Doherty Earth Observatory, where he also established the Microplastic Laundrolab. With a background in fashion, textiles, media, and the built environment, he is a 2026 gener8tor + NOAA grantee, 2025 Newlab Founder Fellow and a 2023 J.M.K. Innovation Prize awardee and holds a master's degree from Columbia University. Ronn will serve as the project's co-Principal Investigator (co-PI), managing day-to-day project execution, overseeing system integration and pilot operations across the New York sites, and coordinating the project team.

Thomas van Haren has been consulting Moby since March 2026. Thomas most recently led a biomaterials scale-up, where he served as COO. In that capacity, he was responsible for go-to-market strategy for two innovative bio-material products, and support the scale-up of a mycelium-based alt protein. In addition, he acquired, operated, and sold a production business in the mushroom sector. The funds will be used to extend his consulting services to support Moby to refine the GTM strategy and achieve critical milestones in final development.

Orkan Telhan is a product engineering and design leader with a PhD in Design and Computation from the Massachusetts Institute of Technology. He served as Chief Information and Data Officer at Ecovative, where he led data systems and intelligence for biomaterials manufacturing. Previously he co-founded Biorealize, serving as its Chief Technology and Design Officer, where he led the development of biofabrication hardware products from laboratory prototypes to commercial products. He was Associate Professor of Emerging Design Practices at the University of Pennsylvania's Stuart Weitzman School of Design from 2010 to 2023. His expertise spans hardware-software integration, product engineering, and the transition of complex lab-scale systems into manufacturable commercial products. Grant funds will support his engineering consulting services to lead the commercial prototype development.

Project Goals

The primary goal of this project is to transition Moby Filters' integrated two-stage filtration system from a validated pre-commercial prototype into a commercially manufacturable product, and to scale active New York pilots toward broad deployment. Stage A (Primary) employs a staged overflow-safe architecture for bulk capture of particles in the 80 to 240 µm range. The system must maintain a volumetric flow rate of ≥1.2 gal/s and a particle capture efficiency of ≥99.9%, thresholds currently achieved at 10µm. A key engineering objective of this project is to advance the system's filtration capacity toward sub-micron particle capture by project completion.

Textile wastewater contains microplastics across a broad size distribution, from particles up to 5 mm down to the nanometer scale. Effective capture requires a staged approach: bulk removal of larger particles in Stage A Primary (80 to 240 µm) reduces fouling load and protects Stage B Secondary, which targets the finer sub-micron fraction down to 0.1 µm. Removing larger particles first is a prerequisite for achieving nanoscale capture efficiency without sacrificing flow rate. Current research needs center on

advancing Stage B Secondary to reliably capture particles below 1 μm while maintaining the system's validated flow rate of ≥1.2 gal/s, a trade-off that remains the key engineering challenge of this project. In parallel, there is a need to quantify the economic benefit of the integrated system through structured measurement of reductions in organic loading (BOD/COD) and solids discharged to the municipal sewer system, as industrial facilities operating under pretreatment programs are charged based on those parameters. Establishing these discharge reduction metrics is essential to demonstrating tangible cost savings for operators and supporting the system's commercial case.

Embedded sensors monitor flow rate, ΔP, and particle accumulation in real time, feeding a machine learning layer that automates filter regeneration cycles and optimizes performance across varying influent conditions. This hardware-software integration reduces manual intervention, extends filter service life, and enables remote monitoring across multiple deployment sites.

Industrial facilities operating generally within discharge permits, which specify the allowable organic and solids loading through pretreatment programs. In order to quantify the economic impact of the filter system the project will quantify the system's net impact on facility discharge through analytical testing of suspended solids (TSS) and organic loading (BOD/COD) reduction, and will expand applicability to textile manufacturing clients through chlorides and sulfates analysis.

Grant funds will support engineering and project management consultants, technical supplies and equipment, and analytical services.

Existing Technology

Moby is developing and validating a high-flow, low-energy filtration system designed to capture and reuse micro- and nanoplastics, along with associated contaminants from textile washing and manufacturing. The system integrates two patent-pending filtration stages engineered for continuous operation at industrial scale. Together these technologies cover modular architecture, self-cleaning mechanisms, and particle recovery. The system also incorporates real-time data monitoring and automated control modules for performance optimization, predictive maintenance, and remote system management.

The dual-stage system (Fig. 1) has been validated to achieve 99.9% capture efficiency at 10 μm while maintaining a flow rate of 1.2 gal/s (Figs. 2, 6), a best-in-class benchmark for this filtration specification. Particle size distribution data confirm measurable reduction in particle counts across the full size range from 2 μm to over 100 μm (Fig. 5), and captured material from both stages is shown in Fig. 4. The first integrated system was built and tested in the lab (Fig. 3), and this proposal funds the transition of that system into a product tested in real operating environments.

The system maintains continuous flow through brief automated cleaning cycles synchronized with washer or facility discharge. Embedded sensors monitor flow, capture efficiency, and differential pressure in real time, enabling predictive maintenance and advanced performance analytics. Building on this validated foundation, the work funded by this grant will advance hardware-software integration, conduct structured analytical testing across active pilot sites, validate methods for textile industry clients, and compile the full technical scale-up package required for contract manufacturer engagement. The full scope is detailed in the Scope of Work table below.



Figure 1. Patent pending - Moby Filters dual-stage advanced nanofiltration system. Stage A Primary modular micro filter (left) and Stage B Secondary nano filter assembly (right).



Figure 2. Key performance specifications: 99.9% capture efficiency at 10 µm, 1.2 gal/s flow rate, hardware-software integration with real-time monitoring, and low-energy operation enabling water and particle reuse.


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Figure 3. Complete integrated dual-stage system with full electronics assembly during laboratory testing.


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Figure 4. Captured micro- and nanoplastics. Full-system capture sample (left) and Stage A Primary captured material at ~200 µm (right)

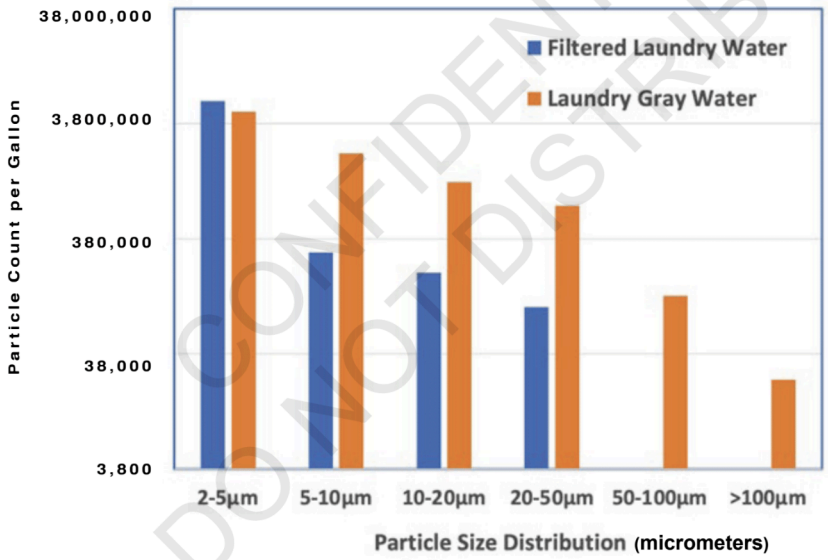


Figure 5. Distribution of PET Particles from 84" × 84" Fleece Blanket

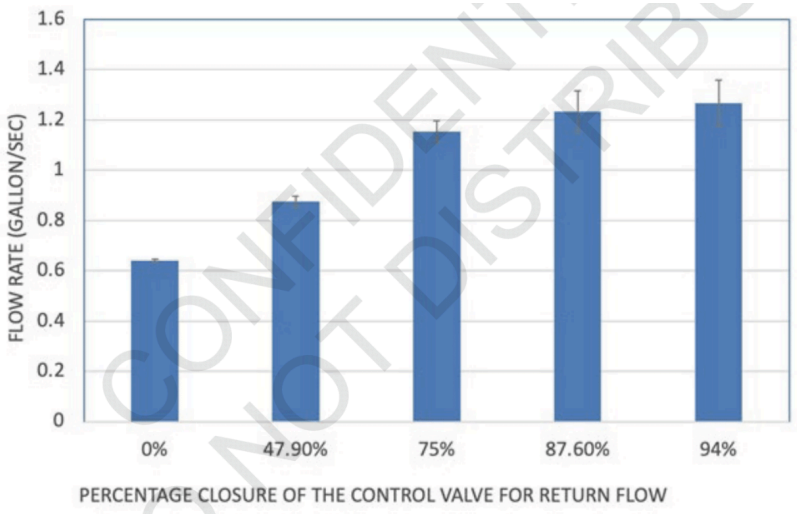


Figure 6. Best-in-class flow rate at 10 µm: 1.2 gal/sec.

Scope of Work

Tasks / Objectives	Deliverables	# of Key Hire Days
1. Product Engineering and Commercial Prototype Development Transition the integrated Stage A Primary (80 to 240 µm) and Stage B Secondary system from validated prototype to commercially manufacturable product. Refine design for manufacturing, finalize materials specifications and component sourcing, and advance hardware-software integration including embedded flow, ΔP, and particle accumulation sensors with automated regeneration logic. Maintain performance thresholds of ≥1.2 gal/s volumetric flow and ≥99.9% capture efficiency at ≥ 0.5 µm.	Commercial-ready design package (CAD assemblies, materials specifications, BOM); refined sensor and automation architecture; engineering validation reports against flow and capture targets	**45 days**
2. Project Coordination and Commercialization Pathway Coordinate engineering, analytical, and pilot workstreams across the project team. Refine go-to-market strategy, define manufacturing and supply chain pathway, and oversee progression of active New York pilots, including the Harlem commercial laundromat and Columbia University housing sites, toward commercial deployment.	Project management plan and milestone tracking; commercialization pathway and manufacturing assessment; refined go-to-market strategy; pilot operations reports	**40 days**
3. Comprehensive Wastewater Analytical Testing and System Benchmarking Quantify the net impact of the integrated system on facility discharge through structured sampling and laboratory analysis conducted with the PI's research team, measuring suspended solids (TSS) reduction and organic loading (COD/BOD) reduction across pilot sites on a per-sample basis. Evaluate system performance from the hardware perspective, benchmarking capture efficiency, energy use, and machine uptime, establishing the performance baseline for future automated operation in which the system adjusts its own throughput based on real-time monitoring.	Analytical testing protocol and sampling schedule; laboratory results quantifying TSS and COD/BOD reduction; discharge impact summary report; hardware performance benchmark report (efficiency, energy use, uptime)	**20 days**

Tasks / Objectives	Deliverables	# of Key Hire Days
4. Textile Industry Client Feasibility Develop and validate analytical methods for chlorides and sulfates in textile manufacturing wastewater to assess system applicability for textile industry clients and expand the addressable use cases of the technology.	Chlorides and sulfates analytical methods; feasibility assessment for textile manufacturing applications	**7 days**
5. Technical Documentation and Scale-Up Package Compile design files, performance data, materials specifications, and manufacturing tolerances into a technical package suitable for contract manufacturer engagement and CoE grant reporting.	Technical scale-up package (CAD files, performance summary, manufacturing specifications); final progress report to CoE	**10 days**
TOTAL	**5 workstreams**	**122 days**

Project Impacts

Social / Environmental Impacts

Urban waterways like the Hudson carry significant microplastic contamination driven by textile sources. Studies of urban rivers across the US and Europe consistently find fibers as the dominant microplastic type, with concentrations spiking downstream of wastewater treatment plant outfalls (McCormick et al., 2014; Tibbetts et al., 2018). The Hudson River watershed alone discharges an estimated 300 million anthropogenic microfibers into the Atlantic Ocean per day (Miller et al., 2017), and textile fibers account for up to 70% of microplastics detected in wastewater globally (Hossain et al., 2025).

New York's wastewater infrastructure is not designed to capture these particles at scale. During high rain events, untreated sewage enters through combined sewer overflows and carries pollutants directly into surrounding waterways, while particles captured in wastewater sludge re-enter ecosystems when biosolids are exported upstate for use as agricultural fertilizer.

The burden of this pollution is not evenly distributed. Frontline communities experience greater exposure to the pollutants and often have fewer resources to detect it or advocate for protective policy.

By capturing pollutants at the source, before discharge to the municipal system, Moby's filters divert micro- and nano-plastics from waterways, sludge, and landfills. Captured material is reclaimed through Moby's closed-loop approach rather than discarded, and source capture reduces the burden on downstream treatment infrastructure while protecting the communities most exposed.

Business / Economic Impacts and Commercialization

The system provides commercial and industrial operators an opportunity to lower operating costs, reducing sewage utility bills by up to 30% through reduced pollutant discharge (EPA approved pre-treatment programs) and on-site water reuse. In New York City alone, over 3,000 businesses discharge significant laundry-related wastewater, translating to a $1.5 billion addressable market in the US.

Our commercialization strategy targets key polluting industries in regions with increasing regulatory and consumer pressures as well as established pretreatment programs.

Our target customer is any facility where a significant portion of wastewater comes from washing or manufacturing, mainly across sectors including hospitality, textile manufacturers, laundering services, healthcare, and maritime, but can also include future applications and pollutants in cosmetics, potable water, bottled water, and other sectors.

The project supports between two and four New York jobs, advances a commercializable product engineered and piloted in New York, and produces the technical scale-up package required for future contract manufacturer engagement. The proposal's $100,000 match from Moby Filters, a New York industry partner, directly reflects the private-sector commitment the CoE's review criteria identify as evidence of economic development potential.

Expected Scientific Outcomes

The project is expected to deliver: (1) a commercial-ready integrated design validated against performance thresholds of ≥1.2 gal/s volumetric flow and ≥99.9% capture efficiency; (2) capture efficiency reaching ≥0.5 μm by project completion by project completion; (3) quantified reduction of suspended solids (TSS) and organic loading (COD and BOD) in facility discharge across active pilot sites,

measured through structured sampling and laboratory analysis with the PI's research team; (4) validated analytical methods for chlorides and sulfates in textile manufacturing wastewater, informing the system's expanded applicability to additional pollutant types including dyes and PFAS in future project phases; and (5) engineering data from the embedded flow, ΔP, and particle accumulation sensors that informs automated regeneration logic and performance optimization across varying influent conditions.

Expected Economic Development Outcomes

This project directly supports economic development in New York State. Moby Filters is a New York company, and the work funded here will mainly support between two and four New York jobs while helping local businesses lower their operating costs. The company's active New York pilots, including a commercial laundromat in Harlem as well as Columbia Residential, give local commercial and industrial operators a direct path to reduce operational costs.

The project also taps into New York State's legacy manufacturing potential. By keeping the system's R&D in New York, the project builds in-state capacity in water technology.

By transitioning the integrated two-stage system from a validated prototype into a commercially manufacturable product within New York, the project advances a clear commercialization pathway with in-state job creation, technology transfer potential, and measurable benefit to New York businesses and waterways.

Match Contribution

Moby Filters' matching contribution of $100,000 is sourced from the JMK Innovation Prize, a multi-year award providing $50,000 annually for three years plus $25,000 in technical reimbursement ($175,000 total). Allowable expenditures charged against the JMK award, personnel, legal, supplies, and operational costs, constitute documented cost-share. Moby Filters' total documented match meets the $100,000 requirement and reflects strong financial commitment to the proposed work.

Budget Breakdown

Project Award Amount	Moby Match Contribution	Total Project Amount
$100,000	**$100,000**	**$200,000**

Cost Categories

Category	Amount
Contractors (engineering and project management consultants)	**$70,000**
Supplies, Materials & Equipment	**$15,000**
Analytical Testing provided by Clarkson (35 samples at $200/sample)	**7,000**
Other	**$8,000**
TOTAL	**$100,000**

References

Hossain, M.I., Zhang, Y., Haque, A.N.M.A., Naebe, M. (2025). Fibrous Microplastics Release from Textile Production Phases: A Brief Review of Current Challenges and Applied Research Directions. *Materials*, 18(11), 2513. https://pmc.ncbi.nlm.nih.gov/articles/PMC12156283/

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