innovation works
CASE STUDY

A Sound Investment: Using Acoustic AI to Crack the Code on Plastic Recycling



Engineer and entrepreneur **Georgia Crowther** has built a career solving complex problems across aerospace, advanced manufacturing, and robotics. From developing urban bikeshare technology and designing wheels for NASA's VIPER lunar rover to pioneering large-format bioplastic 3D printing, her work revealed a systemic failure in how we handle engineered materials. While advanced manufacturers struggle to source high-quality recycled materials, enormous volumes of valuable plastic are routinely dumped into landfills. Crowther saw a stark disconnect between the value of these highly engineered plastics and the failing infrastructure designed to recover them.

Reclamation Factory was founded in 2024 to reengineer the economics of material recovery. Early field tests revealed a critical flaw in the industry's legacy approach to sorting plastics. Nearly all material sorting technologies relied on visual or hyperspectral imaging, which routinely failed to identify black plastics, highly pigmented resins, and shredded materials. These limitations made high-quality recycling expensive and reinforced the long-held belief that advanced recycling only worked at massive scales.

Rather than refining an inadequate solution, Crowther and her team abandoned traditional optics entirely. They pivoted to a new method of material classification based on acoustic resonance. Acoustic AI is Reclamation Factory's patent-pending technology that analyzes how materials sound rather than how they look, identifying plastic resins and additives regardless of color, size, or shape. By accurately classifying shredded, crushed, and remelted plastics that conventional systems routinely miss, Acoustic AI unlocks new waste streams, produces higher-quality recycled materials, and makes intelligent recycling infrastructure practical at virtually any scale.

Challenge

Reclamation Factory sought to automate recycling processes that have changed little over the decades, moving beyond traditional machinery that merely shifts bulk waste. The true challenge was engineering a system capable of generating real-time process data to instantly automate sorting workflows, elevate material quality, and maintain a historical record of every batch.

Data from early prototypes quickly proved that visual sorting technology was a dead end for modern automation. Legacy optical cameras proved completely unreliable at identifying complex, dark, or shredded plastics, letting contaminants slip through and ruining entire batches. This failure went far deeper than misidentified trash. Without precise, instant material recognition at the hardware level, the system could not generate the real time process data required to automate sorting workflows or maintain the strict quality standards required by industrial end users.

Project Details

Company:
The Reclamation Factory

Year Founded:
2024

Founder:
Georgia Crowther

Programs Participated In (Year):
Robotics Factory Accelerate Program (2024)
Robotics Factory Scale Program (2025)



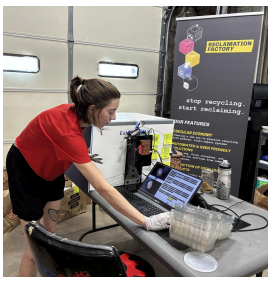


The Robotics Factory network was incredibly important for us. One of our program mentors is now an active company advisor."

--Georgia Crowther
Founder & CEO, Reclamation Factory

Solution

The 2024 Robotics Factory Accelerate program helped Crowther and her team transform an ambitious vision into an actionable business plan. Armed with that strategic focus, Reclamation Factory transitioned into the 2025 Robotics Factory Scale program. Using the Scale Shop resources, the company rapidly prototyped and automated its recycling platform with hands-on support from the Robotics Factory team. Led by electromechanical engineer **Andrew Katon**, Robotics Factory assisted with digital controls, provided circuit design guidance, and helped fabricate custom components using the fiber metal laser cutter, enabling Reclamation Factory to iterate quickly while generating the high-quality process data needed to advance its technology.



A defining moment occurred during the 2025 PGH Lab 10.0 pilot with the City of Pittsburgh. Testing against real municipal waste streams revealed that conventional optical systems consistently failed to identify black plastics, clamshell containers, pill bottles, and other difficult materials, contaminating recycled feedstocks. Encouraged by Robotics Factory advisors and external mentors, Crowther and her team abandoned optics to explore whether plastics could be identified by sound instead of sight.

By analyzing how different materials respond to physical impact, Reclamation Factory began building machine learning models to capture these unique acoustic profiles. Unlike visual or near-infrared systems, Acoustic AI is unaffected by color, shape, or surface appearance, allowing it to accurately classify plastics that have been shredded, crushed, or heavily pigmented. The results were striking. Trained on challenging black e-waste plastics, Acoustic AI achieved over 96 percent classification precision, proving that accurate, low-cost material recovery can finally break free from fragile and expensive optical systems.

With active pilots underway in high-demand sectors like e-waste, black plastics, and automotive recycling, the company plans to integrate its sensor suite directly into existing industrial conveyance systems. By owning this critical sensing layer, Reclamation Factory aims to unlock unprecedented automation and precise material recovery across the entire industry without requiring massive, cost prohibitive processing facilities.

Reclamation Factory's rapid evolution has been fueled by Pittsburgh's collaborative innovation ecosystem. Through the Robotics Factory programs, a PGH Lab pilot with the City of Pittsburgh, and research partnerships with Carnegie Mellon University, Crowther leveraged technical expertise, customer validation, and real-world datasets to rapidly refine the company's technology. Today, Reclamation Factory continues to build on those relationships to advance hyperlocal plastics recycling and pioneer next-generation sensing technology.

Innovation Works and the Robotics Factory

Innovation Works is one of the most active early-stage investors in the country and the most active in Pennsylvania. Since its inception of the seed fund in 1999, Innovation Works has invested in over 800 companies that have gone on to raise $3.74 billion in follow-on funding. Innovation Works is part of the Ben Franklin Technology Partners network, which has catalyzed economic growth over the last 30 years by providing access to capital and networks that help foster innovation and technology-based economic development in Pennsylvania. The Robotics Factory is an array of robotics programs led by Innovation Works and the Pittsburgh Robotics Network. Learn more at **innovationworks.org** and **roboticsfactory.org**.