Technology Snapshot

LA-UR-24-22790
Published March 25th 2024

LOS ALAMOS NATIONAL LABORATORY
Richard P. Feynman Center for Innovation

Remotely Operated Ultrasonic Separation

Continuous Removal of Particles in Industrial Manufacturing Processes

Partnership Opportunities

We are seeking a partner with an interest in furthering the development of the technology into an application/product for industrial manufacturing sectors.
This technology is available for a:

- ☑ Cooperative Agreement
- ☑ License
- ☑ Tech Assistance
- ☐ Start-up

Technology Readiness Level 5

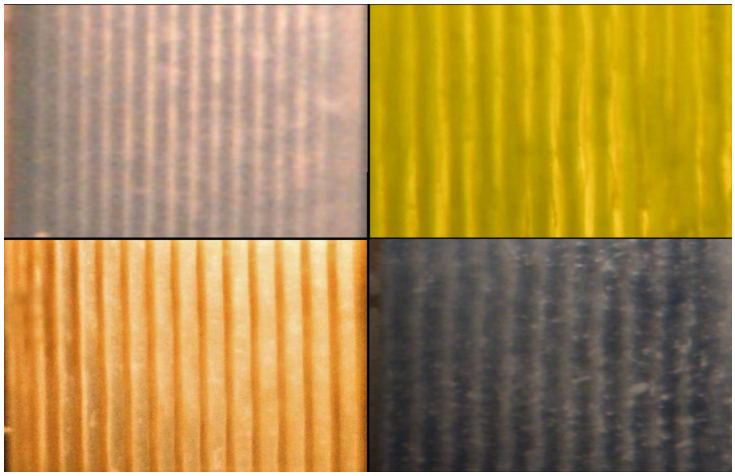
Technology Validated in Relevant Environment

Contact

BDE Name: Marc Witkowski

Email: witk@lanl.gov

Phone: 1-505-551-2384



Overview

No more clogged filters!

UltraSep is being developed for industrial manufacturers fed up with choked filters and their sluggish dewatering rates. Los Alamos is creating a membrane-free solution with a much lower footprint than gravity settling. Unlike membrane filtration, our technology provides steady-state dewatering without maintenance disruptions. Remote, automated operation also reduces dose accrual in personnel while freeing them up for other tasks.

UltraSep employs a silent standing wave that continuously traps and concentrates micron-sized particles in solutions. Particles flowing upward into the standing wave are stopped and moved laterally to nearby nodes. This creates vertical regions of clarified liquid that flows up and out the top of the chamber. Particles concentrate at the nodes and form fast-settling aggregates that break free and settle to the bottom of the chamber where they are continuously removed.

Advantages

- Low footprint
- > 99.9% metal removal in filtrate
- High water removal (up to 95% of bulk water)
- GUI provides operator complete control of process including pH adjustment
- Ultrasonics startup with automatic pump coordination is actuated at the GUI by the click of a button

NNSA National Nuclear Security Administration

Technology Description

Separations exist in all industrial manufacturing sectors and are heavily reliant on well-established technologies such as membrane filtration and energy intensive centrifugation. However, these conventional technologies come with issues that make them impractical or unsatisfactory for many applications including production-critical nuclear processes, beverage production and potentially pharmaceuticals processes. Ultrasonic filtration is a membrane-free technology shown to dewater micron-sized solid precipitates at a steady rate without the maintenance needed by membrane filtration processes.

Market Applications

- Currently applicable for solids dewatering processes operating at the liter per hour scale
- UltraSep can be stand-alone or integrated into an existing process for solids removal
- Designed to be used by technicians and engineers responsible for processes involving solids dewatering on a continuous or daily basis
- Users of UltraSep will gain the benefits that come from continuous, steady-state operation occupying a smaller footprint than gravity settling with complete remote operation
- Food and beverage
- Production-critical nuclear processes (especially those housed in confined glovebox spaces)
- Pharmaceutical

Next Steps

Initial baseline tests for application in production-critical nuclear processes (especially those housed in confined glovebox spaces) with actinide surrogates and uranium hydroxide completed. As well as tests underway or planned for various precipitates of actinide and lanthanide metals.

Selected Publications

Coons, J.E., D.M. Kalb, T.Dale, and B.L. Maronne, Getting to low-cost algal biofuels: A monograph on conventional and cutting-edge harvesting and extraction technologies, Algal Research 6 (2014) 250-270.

Coons, J.E., A. Roman, K. Campbell, and K. Erickson, Membrane-free Removal of Cerium and Zirconium Hydroxide Precipitates by Continuous Ultrasonic Filtration, in review for presentation at the WM2024 Conference, Phoenix AZ.

IP Information

U.S. Pat. No. 10,428,324, “Acoustic Manipulation of Fluids Based on Eigenfrequency”, granted October 1, 2019 (S133320.001)

U.S. Pat. No. 11,395,982, “Ultra Low Power Acoustic Separation”, granted July 26, 2022 (S133490.001)

PATENT PENDING, “Ultrasonic Separation with PH Control”, filed September 19, 2023 (S167554.000)

National Nuclear Security Administration