

# USU Technology Highlight: LABORATORY-SCALE GAS- LIQUIDS-SOLIDS SEPARATOR FOR UASB REACTOR

*The technology is a helical lamella clarifier for separating gases, liquids, and solids in small (1-25 L) upflow anaerobic sludge blanket (UASB) bioreactors.*

## PROBLEM

A UASB reactor experiences washout of active biomass from the sludge blanket through the effluent outlet, resulting in decreased power to treat wastewater. In large reactors, biomass washout can be mitigated using inclined plate settlers, or lamella clarifiers, downstream from the sludge blanket. The narrow cylindrical shape of lab-scale reactors complicates implementation of plate settlers, and no lamella clarifier solution is commercially available for use in small reactors.

## SOLUTION

Instead of the traditional square settling plates, this lamella clarifier uses parallel plates in a helical array. The plates are bounded radially by an inner cylindrical wall and an outer cylindrical wall. The inner wall comprises a tube through which gas bubbles may rise and separate from liquid and solid particles. The clarifier may be 3D printed as a single piece and inserted directly into a lab-scale UASB reactor tank. Prototype testing has shown the design can significantly reduce biomass washout.

## BENEFITS

With adjustments to geometric parameters such as helix pitch, height, inner diameter, outer diameter, and baffle angles, a generic model can be adapted and custom-fit for use in any small cylindrical UASB reactor. Comprised of only one piece, the clarifier offers a compact plug-and-play solution much simpler to install, remove, and maintain than larger embodiments of inclined plate settlers. 3D-printing the clarifier makes it inexpensive to produce and easy to replace.

## APPLICATIONS

This clarifier is intended primarily for small-scale reactors (1-25 L). The fundamental design may also be applied to large reactors, but at much higher expense and complexity. Use of the clarifier in lab-scale reactors could aid students and lab workers in their research objectives by improving the quality of water treatment in small UASB reactors.

## CONTACT

Questions about this technology including licensing availability can be directed to:

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## DEVELOPMENT STAGE

TRL 4

## LICENSING

Available for License

## PATENT STATUS

Under Evaluation

## WEBSITE

[https://engineering.usu.edu/be/swbec/?\\_](https://engineering.usu.edu/be/swbec/?_)