



Novel Treatment Process Makes Fertilizer from Human Waste

Excess nitrogen and phosphorus in surface waters cause harmful algae blooms, and in densely populated watersheds, human urine and feces in this nutrient pollution. Many wastewater plants are at capacity and struggle to meet tightening nutrient removal regulations, prompting them to pass on the cost of related sewer upgrades, in the form of connection and usage fees, to building developers.

When blackwater, including water, urine, feces, and toilet paper, is collected as a separate stream and fully treated onsite, new buildings can dramatically reduce their environmental impact. This option increases climate resilience, saves energy, and produces a natural fertilizer product. Blackwater separation allows new buildings to greatly reduce sewer connection and usage fees, especially when paired with onsite systems that recycle greywater for non-potable reuse, which are buildings and water-scarce regions.

Brightwater Tools (a Vermont-based start-up company supported by the U.S. National Science Foundation) has developed a treatment process to manage digested blackwater onsite,

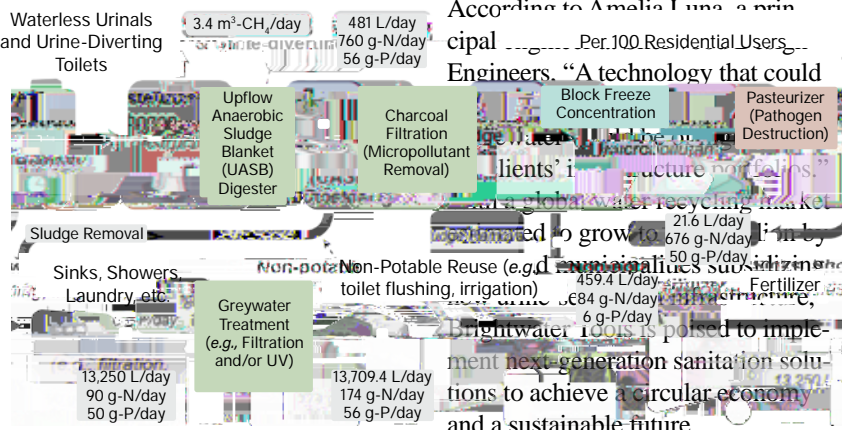
using automated block freeze concentration, pasteurization, and activated

Blackwater separation is achieved collect all toilet waste using 83% less water than conventional toilets. The diverted blackwater is pre-processed

product that is collected and distributed by Brightwater Tools through a is recombined with the building's greywater for light treatment and non-potable reuse to achieve circular onsite wastewater treatment.

Wastewater management companies have expressed that water reuse and nutrient recovery are fundamental to the creation and implementation of sustainable water infrastructure.

According to Amelia Luna, a principal engineer at Brightwater Tools, "A technology that could



▲ Brightwater Tools' innovative equipment presents an integrated system for nutrient recovery and non-potable water production from residential wastewater. In this flowchart, g-N/day and g-P/day stand for grams of nitrogen or phosphorus per day, respectively.

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