

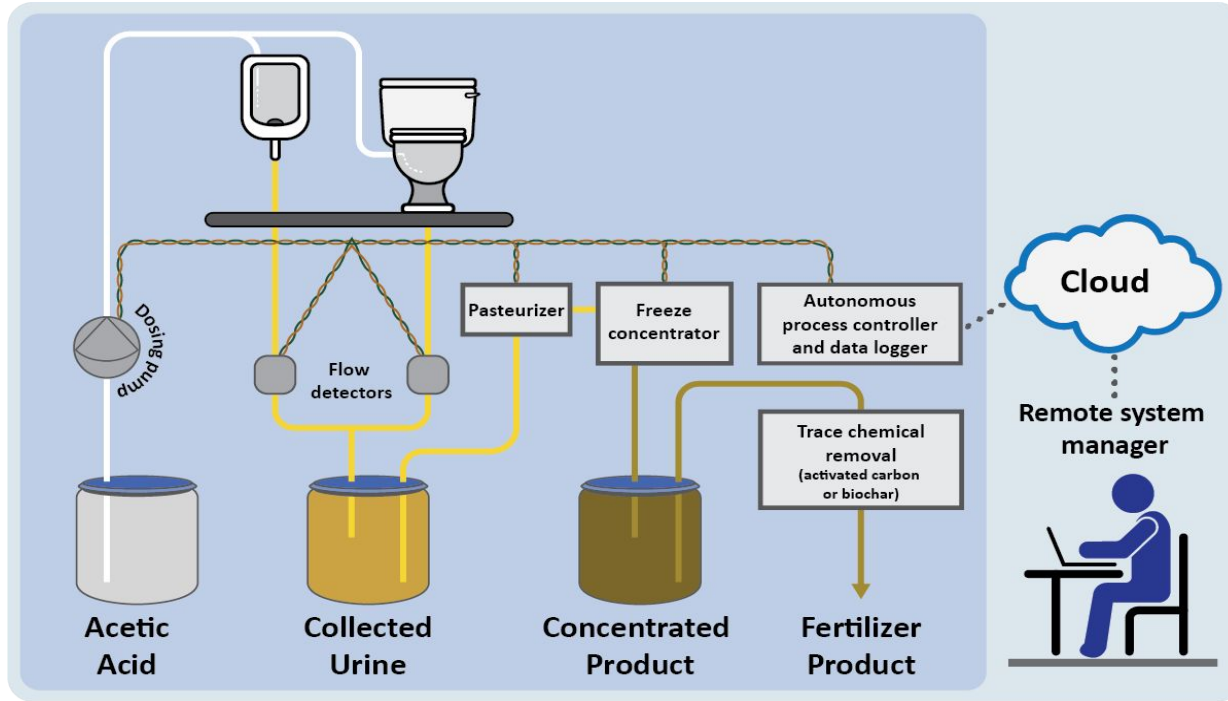
RICH
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Building-scale urine processing with freeze concentration

Phosphorus in Europe Research Meeting

June 2, 2021

Building-scale urine treatment system



- Acidification
- Pasteurization
- Concentration
- Charcoal filtration

Reverse Osmosis

- 5x concentration
- Prone to fouling
- Loss of N through membrane
- Energy use: 5 Wh/L?

Freeze Concentration

Heat pump transfers heat back and forth between two alternating chambers to freeze/thaw across low ΔT

- 10x concentration
- Energy use: 7-9 Wh/L?
(COP 10-14?)
 - Thermal resistance
 - Mechanical inefficiency

