Scientific Achievement:
Thermal analysis at Purdue University of the experimental thermocline tank at IISc Bangalore; simulations are performed at flow velocities below and above a flow rate that induces instability in the thermocline region to identify a stability criterion.

Significance and Impact:
It is critical to maintain a narrow thermocline region inside the tank to prevent significant losses in storage efficiency. A critical stability velocity exists inside tanks that contain low-cost filler material based on the opposing effects of viscous forces and buoyancy forces. Low velocities are stable; high velocities cause deconstruction by viscous fingering. A performance tradeoff exists in the operational velocity due to thermocline expansion by either diffusion (low velocities) or viscous deconstruction (high velocities).


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