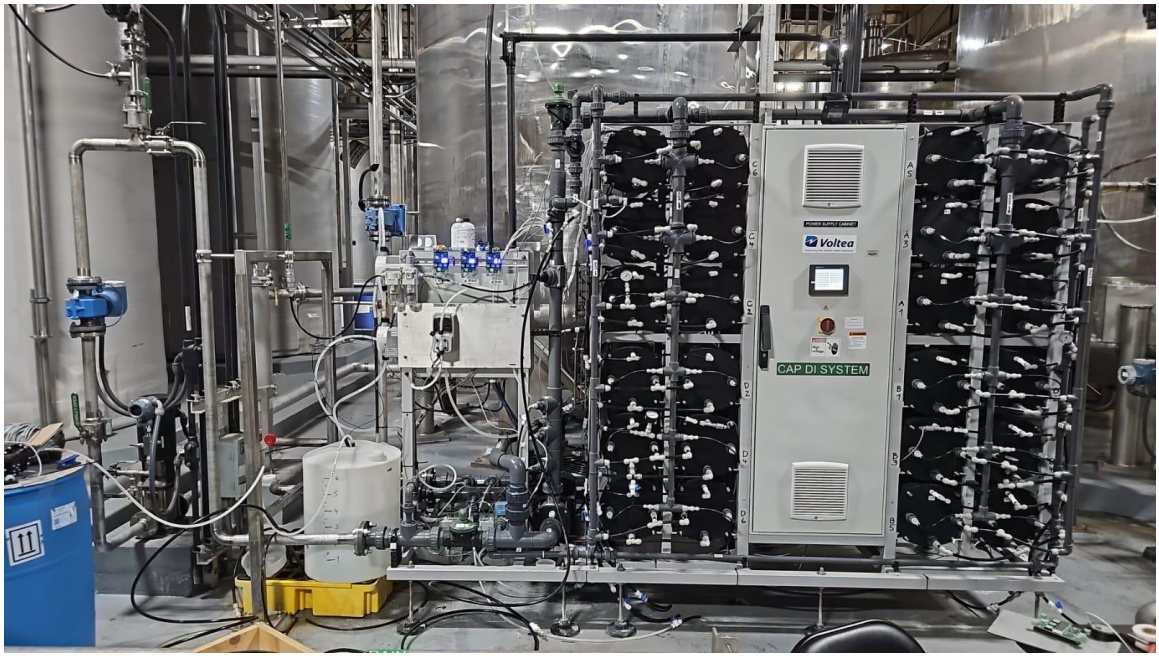
Case Study: Recovering 2-Stage RO Concentrate with IS-24 at PepsiCo Oakland



The Voltea IS-24 CapDI system at PepsiCo's Oakland plant.

At a glance

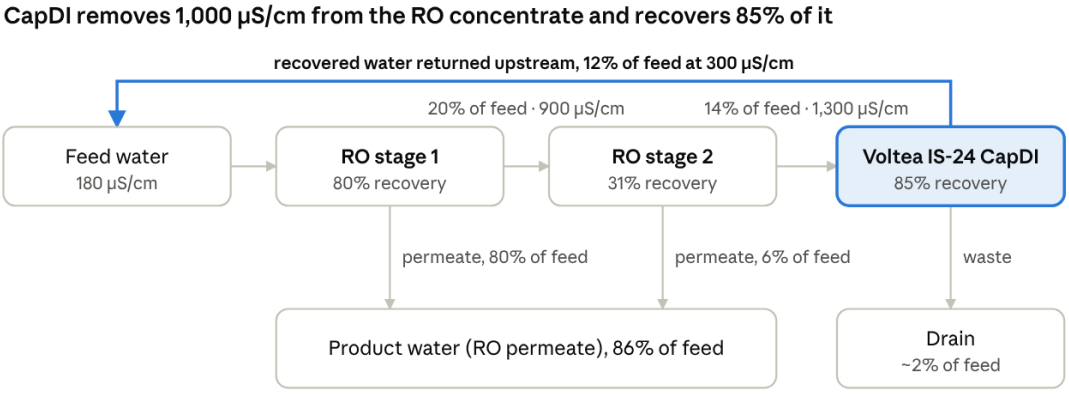
At PepsiCo's Oakland plant, a Voltea IS-24 capacitive deionization (CapDI) system treats the concentrate from a 2-stage reverse osmosis (RO) line, as the last resource for recovering water. It lifts total water use from about 86% with RO alone to about 98%, and cuts the water sent to drain by 85%.

Process metric	2-stage RO alone	RO + CapDI
Total water use	86%	98%
Water to drain	14%	2%
Drain per 1,000 gal of feed	138 gal	21 gal
Concentrate EC leaving the RO	~1,300 µS/cm	reduced by 1,000 µS/cm in the CapDI

Customer: PepsiCo, Oakland, CA · **Process:** 2-stage RO, 180 µS/cm feed · **Final recovery stage:** Voltea IS-24 CapDI (24 modules)

The process

The Oakland line runs two RO stages in series. Stage 1 concentrate feeds stage 2, and the stage 2 concentrate — the most saline stream in the plant — goes to the IS-24 instead of straight to drain.



Oakland water treatment line · 2-stage RO with CapDI as the last stage

The CapDI removes salts from that concentrate and returns the recovered water upstream. Only its small waste stream leaves the line, so CapDI recovery is the lever that sets how much of the plant's water is lost.

Water balance

With a 180 µS/cm RO feed, 80% recovery on stage 1 and about 31% on stage 2, the concentrate reaching the CapDI is about 14% of the feed at 1,300 µS/cm. The CapDI takes 1,000 µS/cm out of that stream, returning water at about 300 µS/cm, and recovers 85% of it, leaving about 2% of the line's water to drain. Figures are per 1,000 gallons of RO feed.

Stage	Feed (gal)	Feed EC (µS/cm)	Recovery	Recovered (gal)	Product EC (µS/cm)	Concentrate / waste (gal)	Concentrate / waste EC (µS/cm)
RO stage 1	1,000	180	80%	800	—	200	900
RO stage 2	200	900	31%	62	—	138	1,300
CapDI (IS-24)	138	1,300	85%	118	300	21	~7,000
Whole line	**1,000**	**180**	**97.9%**	**979**	—	**21**	—

Impact on the process

Placing the CapDI after the second RO stage changes what the plant loses, what it discharges and how the RO line can be run.



The Voltea IS-24 CapDI system at PepsiCo's Process Hall

- **More water from the same feed:** recovering 85% of the RO concentrate adds about 12 points of water use on top of the RO line's 86%.
- **Less discharge:** water sent to drain drops from about 14% of feed to about 2%, shrinking the plant's wastewater volume by 85%.
- **Built for RO concentrate:** the IS-24 accepts feed water up to about 2,500 µS/cm, so it treats the ~1,300 µS/cm stage 2 concentrate directly and removes about 1,000 µS/cm from it, returning water at about 300 µS/cm.
- **Follows the RO line:** feed flow is variable from 22 to 44 GPM (sweet spot about 36 GPM), so the CapDI can track changes in RO output and concentrate salinity.
- **Fits RO operations:** 3-phase cleaning uses the same caustic, acid and POAA chemicals as the RO system, and runs automatically overnight in about 6 hours.
- **Deliberate waste stream:** a sweet spot of about 2% to waste keeps ions and additives moving out of the line, so they do not build up in the recycled water.

Measured performance

Plant data logged at 19:33 on 4 December 2024 confirm the balance: the RO line used 91% of the water and rejected 9% to the CapDI, which recovered 7.5% — leaving 1.5% to drain and 98.5% total water use.

That 580-second CapDI cycle produced 190 gallons of recovered water from 229 gallons of RO concentrate, an 83.1% recovery.

Cycle phase	Duration (s)	Flow (LPM)	Waste (gal)	Recovered (gal)
Pre-pure	30	40	5	—
Pure	360	120	—	190
Shunt waste	40	40	7	—
Waste	150	40	26	—
Full cycle	**580**	—	**39**	**190**

Why it matters

For a plant running multi-stage RO, the last 14% of concentrate is the hardest water to save and the main source of discharge. Oakland shows a CapDI final stage can recover most of it.

- **Water security:** near-complete use of incoming water, about 98%, reduces dependence on municipal supply.
- **Lower discharge cost and load:** roughly 21 gallons to drain per 1,000 gallons of feed, instead of 138.
- **No change to the RO line:** the CapDI sits on the concentrate outlet and shares the RO's cleaning chemicals.
- **Room to push RO harder:** because the CapDI handles high-EC concentrate, RO recovery is no longer the limit on total plant water use.
