Reverse Osmosis · buyer decision guide

RO Cleaning Recovery: Decide from Normalized Flow, Salt Passage and Pressure Drop

By VCYCLETECH Technical Team · 4 November 2026

After an RO clean-in-place (CIP), do not judge recovery from the first permeate-flow reading. Stabilize the train under the membrane manufacturer's restart procedure, then compare normalized permeate flow, normalized salt passage and stage or vessel pressure drop against a reliable pre-fouling and pre-cleaning baseline. Record feed temperature, conductivity or composition, pressure, recovery, valve settings, instrument condition and the exact cleaning sequence. A flow gain with worse salt passage or rising pressure drop is a different decision from a stable three-metric recovery. First exclude changed feed and measurement error; investigate remaining foulant or membrane damage before repeating chemistry. The next purchase may be a targeted cleaner, diagnostic service or no chemical at all. Use the membrane OEM's limits and normalization method for the installed elements rather than an invented universal recovery target.

TL;DR

Build a comparable before-and-after record for each RO train. Wait for a stable restart, normalize permeate flow and salt passage with the installed membrane OEM's method, and compare pressure drop at matching flow and recovery. A favorable raw production number can hide warmer feed, higher pressure or poorer rejection. If all three indicators recover and remain stable, continue monitored operation; if one diverges, verify instruments, sampling and feed changes, then identify residual deposits or element damage. Do not repeat CIP just because a single number misses a target. Give a chemical supplier the membrane model, water analysis, cleaning history and trends so any next trial addresses a demonstrated foulant and stays within OEM limits.

Choose the comparison that answers the purchase decision

A cleaning report often compares the last production hour before CIP with the first hour after restart. That convenient pair can be misleading. Feed temperature may have changed, storage tanks may have been drained or refilled, recovery may have shifted, and permeate diverted during rinsing can distort measured production. The first restart period may also include displaced cleaning solution, air, changing feed salinity and instrument settling. Record when rinse acceptance was reached and when operation became stable under the OEM's procedure. Keep the raw points, but base the recovery decision on a defined stable interval.

Find three distinct references: a healthy commissioning or recently verified clean baseline, the deterioration trend leading into CIP, and the stable post-CIP operating point. The healthy baseline tells you what the train has previously achieved under comparable conditions; the pre-CIP trend tells you which symptom cleaning was intended to address; the post-CIP point shows what actually changed. If the original commissioning feed or membrane configuration is no longer comparable, label that reference historical and establish a documented newer baseline. Never back-calculate an attractive baseline from the desired outcome.

Document membrane model, element age and arrangement, stage configuration, feed source, pretreatment, antiscalant and other chemical identities, feed and concentrate flow, permeate flow, pressures at the available stage boundaries, temperature, conductivity or measured ions, recovery and any instrument calibration. A missing stage pressure tap is a limit, not permission to invent a stage differential. Sampling points and conductivity temperature compensation must be stated. The RO application page identifies the treatment context; this guide addresses the decision after cleaning, not the selection of a cleaning recipe.



Photograph: James Grellier, Reverse osmosis desalination plant, Wikimedia Commons, 2010, CC BY-SA 3.0. Original scene unaltered; historic generic context, not a VCYCLETECH site or evidence of this cleaning outcome.

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Read three indicators together, not raw flow alone

Normalized permeate flow

Permeate production responds to feed temperature, net driving pressure, feed concentration and recovery. Normalization places readings on a more comparable basis using the membrane supplier's defined method and the train's actual measurements. A higher raw flow after CIP may simply reflect warmer water or changed pressure. Conversely, an apparently flat raw flow in colder feed can still represent meaningful improvement. Keep the chosen software or calculation version, inputs and excluded periods with the trend. Do not combine values calculated by incompatible methods without recalculation.

Normalized salt passage

Salt passage asks whether the membrane is rejecting dissolved material as expected. Compare feed and permeate sampling from the same stable interval, with the same method and units. A higher permeate conductivity can reflect a changed feed composition, a leak, an O-ring or interconnector issue, or membrane damage; it does not automatically mean the cleaner was too aggressive. Conductivity is not a complete account of every dissolved species. Verify the sample valve, meter, temperature compensation and any mixed permeate header before locating a problem in an element.

Stage or vessel pressure drop

Pressure drop through a feed channel is an independent sign of hydraulic obstruction, but it depends on flow, viscosity and instrumentation. Compare like flow and temperature conditions, and use stage-specific taps where available. A cleaner might restore some flow while a residual foulant still restricts the lead stage. A pressure-drop increase after restart could also reflect a valve state or an instrument fault. Do not infer which foulant remains from differential pressure alone; inspect pretreatment trends, spent cleaning solution, filters or an element autopsy where justified.

DuPont's FilmTec cleaning procedures distinguish normalized permeate flow, salt passage and pressure drop in evaluating cleaning. Their methods and limits apply to the specified membrane families and equipment, not automatically to every RO installation. Hydranautics' technical bulletin likewise frames normalization around its products and operating data. Check the installed OEM document before applying either method.



Editorial illustration generated with AI. Generic diagnostic scene, not a VCYCLETECH test, customer membrane or measured foulant result.

Post-CIP patterns and the first defensible decision

Comparable trend	First check	Decision boundary
Flow, salt passage and pressure drop return near the documented stable baseline	Verify sustained operation, feed and instrument consistency.	Resume monitored service under the OEM and site criteria; do not claim guaranteed membrane life.
Raw flow rises but normalized flow does not	Check temperature, pressure, recovery and the normalization inputs.	Do not credit the cleaner before the comparable trend supports it.
Flow improves but salt passage worsens	Recheck samples, feed composition, seals and membrane integrity.	Investigate rejection loss; another CIP may not repair damage.
Salt passage stable but stage pressure drop remains high	Check stage flow, valves, instruments and remaining feed-channel deposits.	Diagnose the hydraulic obstruction before choosing a second cleaner.
All metrics improve briefly and then regress	Review upstream solids, scale, biofouling and cleaning interval events.	Fix the continuing source; repeating the same CIP is not a control program.

A higher raw flow is not the whole result

Production	Normalized permeate flow Controls for changed operating conditions.
Rejection	Normalized salt passage Checks whether permeate quality changed.
Hydraulics	Stage or vessel pressure drop Checks feed-channel resistance at matched flow.

The three readings are different diagnostic signals, not a universal pass/fail score or performance claim.

If recovery is incomplete, investigate the missing signal

Start with the lowest-cost uncertainty: was the train restarted and sampled consistently? Compare calibrated pressure and conductivity instruments, temperature probes, permeate sampling valves, flowmeter range and data historian timestamps. Review recovery and valve positions, concentrate disposal, bypass, blending of permeate from other trains and any pretreatment change during downtime. A simple sampling error can create a false salt-passage shift, while a changed feed source can create a real quality shift unrelated to cleaning.

Then compare the symptom with the foulant originally suspected. A rising lead-stage pressure drop plus filter upset may point toward particulate or biological material, but neither alone identifies it. A progressive normalized-flow decline without a pressure-drop rise may prompt mineral scale or compacted fouling analysis, yet several mechanisms remain possible. Analyze deposits or cleaning returns with methods suited to the suspected mineral, organic or biological matter. The cleaner-selection guide covers choosing a chemistry after the foulant is known. Our biofouling recurrence guide covers recurring upstream biological causes rather than this post-CIP acceptance decision.

Do not turn an improvement into a causal claim about one product when the cleaning procedure, circulation, temperature, feed, recovery or pretreatment also changed. If a subsequent clean is proposed, write down the hypothesized remaining foulant, sample evidence, prior sequence, rinse quality, membrane model, material and elastomer compatibility, spent-solution observations and OEM operating envelope. A pilot or controlled train comparison may be worth more than another full-system chemical change. If salt passage suggests physical damage, prioritize integrity and element assessment; chemistry does not mend torn membrane or bad seals.

Decision sequence

1. Lock the stable restart interval
2. Normalize flow and salt passage
3. Compare pressure drop at matched flow
4. Exclude feed and measurement changes
5. Resume, diagnose or plan a bounded next trial



Editorial illustration generated with AI. Generic water-analysis context, not a VCYCLETECH cleaner compatibility test or measured recovery.

Connect the next trial to a real product identity

VCYCLETECH lists WT-260 acid detergent and WT-261 alkali detergent within its RO chemical category. Those identities are possible discussion starting points, not evidence that a grade suits this membrane, foulant or prior cleaning history. Do not infer concentration, pH window, temperature, exposure time, restoration or element life from this article. Obtain current grade technical and safety files and have the membrane OEM restrictions and site materials checked before a trial.

The trial question should be narrow: can the selected procedure remove a characterized remaining deposit without worsening salt passage or pressure drop? Keep the same normalization method, sample schedule and comparable operating window before and after. Record solution preparation, cleaning direction, circulation, soak, rinse, conductivity endpoint and waste handling only as performed and permitted by the OEM. Photograph or analyze recovered material if appropriate. If the next test instead points to upstream pretreatment, the commercial route may be process correction rather than chemical purchase. If a changed oxidant-removal or storage boundary is implicated, use the dechlorination-point verification guide to trace membrane-inlet residuals before changing chemistry.

A procurement team should ask how the product grade is identified, what documentation is current, which membranes and wetted materials are in scope, how the cleaning solution and spent waste are managed, and which site-specific metrics decide acceptance. DuPont's RO KPI discussion is a useful equipment perspective, but its general examples are not performance guarantees for this plant.

Send a decision-ready RO inquiry

Provide the technical inquiry team with the installed membrane and pressure-vessel models, feed-water analysis and seasonality, pretreatment map, normal recovery and throughput, at least one stable pre-clean trend and the stable post-clean data. Include the OEM normalization method, feed and permeate conductivities with sample locations, available stage pressures, cleaning product grades and sequence, current deposits or spent-solution analysis, elastomers, operating restrictions, location and buying timeline. State which metric failed and what decision you need: resume operation, investigate membrane integrity, review pretreatment, or test a specified remaining foulant. The answer may be no new cleaner. That protects both the membrane and the purchasing decision.

Frequently asked questions

Does higher permeate flow immediately after CIP prove the cleaner worked?

No. Compare stable normalized permeate flow, normalized salt passage and pressure drop with feed, temperature, pressure and recovery documented. A raw flow rise can reflect changed conditions.

When should the post-CIP baseline be taken?

After the membrane OEM's restart and rinse procedure reaches a stable operating interval. Record the interval and repeat trend measurements; do not select an early transient point.

Can a second CIP repair worse salt passage?

Not necessarily. Recheck feed and permeate samples, instruments, seals and membrane integrity. Physical damage or leakage is not repaired by another cleaning solution.

What does persistent pressure drop mean if normalized flow improved?

It suggests the hydraulic result is incomplete, but does not identify a foulant by itself. Check stage flow, taps, valves and deposits before selecting a second procedure.

What information should be sent for a cleaner recommendation?

Send membrane model, OEM limits, water analysis, pretreatment and foulant evidence, full cleaning history, stable normalized trends, materials, site location and the specific failed acceptance criterion.

Technical references

Accessed 4 November 2026. OEM methods apply to their specified membranes and conditions; none establishes this site's recovery.

- DuPont FilmTec cleaning procedures
- Hydranautics technical service bulletin on RO cleaning
- DuPont industrial RO performance indicators