

# Rosarito Desalination Plant — Pump Operation Scenarios Report

Field	Value
<b>Project</b>	Rosarito Desalination Plant — Seawater Intake System
<b>Client</b>	CONAGUA / AYESA S.A. de C.V.
<b>Engineer</b>	Dr. Raul Trujillo (VAG GmbH)
<b>Model</b>	ROSARITO_EPANET_Rev2.inp
<b>Date</b>	2026-02-28
<b>Software</b>	EPANET 2.2 via EPyT

## System Overview

### Topology

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SEA (H=0m) -> P_INTAKE -> J_SUCTION -> PUMP_1..5 (parallel) -> J_MANIFOLD
-> P_US -> J_RIKO_IN -> RIKO valve (GPV) -> J_RIKO_OUT
-> P_DS -> PLANT (H=18.17m)
```

### Equipment

Equipment	Specification
Pumps	5x Ruhrpumpen 35WX vertical centrifugal (4 duty + 1 standby)
Control valve	VAG RIKO DN1800 plunger valve
Configuration	N+1 redundancy, rule-based staging
Pipe material	DN2500 (intake), DN1800 (upstream/downstream)
Friction model	Darcy-Weisbach

## Steady-State Staging Scenarios

Pumps	RIKO Kv (m <sup>3</sup> /h)	Q_total (l/s)	Q_total (m <sup>3</sup> /h)	Q_pump (l/s)	H_pump (m)	H_RIKO (m)	v_DS (m/s)	hf_INTAKE (m)	hf_US (m)	hf_DS (m)
4	41,038.45	5012.2	18044	1253.1	26.14	7.50	1.970	0.029	0.094	0.345
3	38,444.21	3660.9	13179	1220.3	26.93	8.50	1.439	0.016	0.052	0.190
2	30,621.47	2218.6	7987	1109.3	29.51	11.24	0.872	0.006	0.020	0.074
1	23,179.78	1012.3	3644	1012.3	31.66	13.47	0.398	0.001	0.005	0.017

## Energy Summary

Pumps	Q/pump (l/s)	H_pump (m)	eta (%)	P_hyd (kW)	P_shaft (kW)	Motor load (%)	P_total (kW)	E_24h (kWh)
4	1253.1	26.14	88.0	329.4	374.3	83.7	1497.1	35931
3	1220.3	26.93	88.0	330.4	375.4	84.0	1126.3	27031
2	1109.3	29.51	88.0	329.1	374.0	83.7	748.0	17953
1	1012.3	31.66	88.0	322.3	366.3	81.9	366.3	8790

## Validation — Computed vs Hand-Calculated Reference

Tolerance: 5%. Reference values from Project Instructions Section 5.

### 4-pump scenario (phi=44%) — PASS

Parameter	Computed	Reference	Deviation (%)	Result
Q_total	5012.21	5016.00	0.08	OK
Q/pump	1253.05	1254.00	0.08	OK
H_pump	26.14	26.12	0.08	OK
dH_RIKO	7.50	7.51	0.09	OK

### 3-pump scenario (phi=38%) — PASS

Parameter	Computed	Reference	Deviation (%)	Result
Q_total	3660.85	3664.00	0.09	OK
Q/pump	1220.28	1221.00	0.06	OK
H_pump	26.93	26.90	0.10	OK
dH_RIKO	8.50	8.50	0.02	OK

### 2-pump scenario (phi=30%) — PASS

Parameter	Computed	Reference	Deviation (%)	Result
Q_total	2218.60	2221.00	0.11	OK
Q/pump	1109.30	1111.00	0.15	OK
H_pump	29.51	29.48	0.09	OK
dH_RIKO	11.24	11.22	0.15	OK

### 1-pump scenario (phi=22%) – PASS

Parameter	Computed	Reference	Deviation (%)	Result
Q_total	1012.32	1014.00	0.17	OK
Q/pump	1012.32	1014.00	0.17	OK
H_pump	31.66	31.63	0.11	OK
dH_RIKO	13.47	13.44	0.23	OK

**Warning:** Q\_total = 3644 m<sup>3</sup>/h < VAG Qmin (4500 m<sup>3</sup>/h) – known system characteristic for 1-pump

### 24h Extended Period Simulation – Event Log

Pump trips scheduled at: - **PUMP\_4**: trip at hour 6, restore at hour 8 - **PUMP\_3**: trip at hour 12, restore at hour 14 - **PUMP\_2**: trip at hour 18, restore at hour 20

Time	P1	P2	P3	P4	P5	Active	RIKO	Q_DS (l/s)	Q_DS (m <sup>3</sup> /h)	H_pump (m)
0:00	ON	ON	ON	ON	OFF	4	44%	5012.2	18044	26.14
6:00	ON	ON	ON	OFF	OFF	3	44%	4083.4	14700	23.48
6:00	ON	ON	ON	OFF	ON	4	38%	4300.1	15481	30.28
6:00	ON	ON	ON	OFF	ON	4	44%	5012.2	18044	26.14
8:00	ON	ON	ON	ON	ON	5	44%	5733.4	20640	28.65
8:00	ON	ON	ON	ON	OFF	4	44%	5012.2	18044	26.14
12:00	ON	ON	OFF	ON	OFF	3	44%	4083.4	14700	23.48
12:00	ON	ON	OFF	ON	ON	4	44%	5012.2	18044	26.14
14:00	ON	ON	ON	ON	ON	5	44%	5733.4	20640	28.65
14:00	ON	ON	ON	ON	OFF	4	44%	5012.2	18044	26.14
18:00	ON	OFF	ON	ON	OFF	3	44%	4083.4	14700	23.48
18:00	ON	OFF	ON	ON	ON	4	44%	5012.2	18044	26.14
20:00	ON	ON	ON	ON	ON	5	44%	5733.4	20640	28.65
20:00	ON	ON	ON	ON	OFF	4	44%	5012.2	18044	26.14
24:00	ON	ON	ON	ON	OFF	4	44%	5012.2	18044	26.14

### Notes and Warnings

1. **H\_PLANT = 18.17 m** is back-calculated from system data, not field-measured. All operating points shift if this value changes.

2. **1-pump scenario** produces  $Q_{\text{total}} < \text{VAG } Q_{\text{min}}$  (4500 m<sup>3</sup>/h). This is a known system characteristic, not a modeling error.
3. Valve headloss uses ISO 5167 Kv method:  $dH = Q^2 \times 132.15 / K_v^2$ . VAG's internal zeta values are **not** used.
4. Pump efficiency is fixed at the duty-point value for energy calculations. Actual efficiency varies with operating point.
5. EPS rule-based controls handle standby pump activation (PUMP\_5) and RIKO valve position changes automatically per Georgescu et al. (CCWI 2015).