Langelier and Ryznar Index (LSI, RSI) of Water

Langelier saturation index and Ryznar stability index of cooling, boiler feed or process water from pH, temperature, TDS, calcium hardness and alkalinity.

Method: Langelier (1936); J. AWWA 28; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Measured pH of the water	8.0000	
Water temperature	25.000	°C
Total dissolved solids	500.00	mg/L
Calcium hardness as $CaCO_3$	250.00	mg/L
Total (M) alkalinity as $CaCO_3$	100.00	mg/L

Calculated results

Parameter	Value	Unit
Saturation pH (calcium carbonate)	7.5602	
Langelier saturation index	0.43976	
Ryznar stability index	7.1205	
Factor A (dissolved solids)	0.16990	
Factor B (temperature)	2.0883	
Factor C (calcium)	1.9979	
Factor D (alkalinity)	2.0000	

Notes for this case

- LSI above zero: the water tends to deposit calcium carbonate scale.
- RSI above about 7: in common reading, a corrosive water.
- Both indices describe the tendency only; inhibitors, temperature at the heat transfer surface and flow change what really happens.

Formula and method

$$pH_s = (9.3 + A + B) - (C + D)$$

$$A = \frac{\log_{10}\mathrm{TDS} - 1}{10}, \quad B = -13.12\log_{10}(t + 273) + 34.55$$

$$C = \log_{10}\mathrm{Ca} - 0.4, \quad D = \log_{10}\mathrm{Alk}$$

$$LSI = pH - pH_s, \quad RSI = 2\,pH_s - pH$$

Variables

pH	Measured pH of the water	-
T	Water temperature	K
TDS	Total dissolved solids	kg/m³
Ca	Calcium hardness as $CaCO_3$	kg/m³
Alk	Total (M) alkalinity as $CaCO_3$	kg/m³
pH_s	Saturation pH (calcium carbonate)	-
LSI	Langelier saturation index	-

RSI	Ryznar stability index	-
A	Factor A (dissolved solids)	-
B	Factor B (temperature)	-
C	Factor C (calcium)	-
D	Factor D (alkalinity)	-

Method and standards

The saturation pH pHs is the pH at which the water would be just saturated with calcium carbonate. The working form above, with TDS, calcium hardness and total alkalinity in mg/L (the last two as $CaCO_3$) and temperature t in °C, is the one used in water-treatment practice for Langelier's equilibrium. Ryznar's index weights the same pHs to separate scaling from corrosive waters more clearly.

Assumptions and limits

- 0–100 °C; the working form is approximate at high TDS (above about 10 000 mg/L), and a note appears there.
- A note gives the common reading of the RSI bands.
- An index of tendency only; inhibitors and flow decide what happens.

References

• Langelier (1936)
• J. AWWA 28
• Ryznar (1944)
• J. AWWA 36
• Standard Methods 2330 (calcium carbonate saturation)

Report details

Report reference	FCC-0NER-2G9K (the same inputs always give the same reference)
Generated	17 November 2026, 19:50 UTC
Calculator	Langelier and Ryznar Index (LSI, RSI) of Water
Method last reviewed	12 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/boilers-power-plant/water-treatment/langelier-ryznar-index

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.