Kraft Mill Chemical Make-Up: Saltcake or Caustic for Soda Losses

Make-up Na_2SO_4 (saltcake) or NaOH needed to replace sodium lost from the kraft liquor cycle, from the soda loss per tonne of pulp expressed as Na_2O (Smook ch. 10).

Method: Smook; Handbook for Pulp & Paper Technologists; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Soda loss per ADt (as Na_2O)	12.000	kg/t
Pulp production (air-dry)	1,000.0	t/d
Share made up as saltcake (rest as NaOH)	50.000	%

Calculated results

Parameter	Value	Unit
Sodium to replace (as Na_2O)	12.000	t/d
Saltcake (Na_2SO_4)	13.750	t/d
Caustic (NaOH)	7.7440	t/d
Sulphur brought in by the saltcake	3.1036	t/d

Notes for this case

- Saltcake also adds sulphur: balance it against the sulfidity target; modern mills with low losses often make up with caustic.
- Saltcake is only partly reduced in the recovery boiler: the sodium is all recovered, but less sulphur than shown ends up as Na_2S.

Formula and method

$$n = \frac{L_{Na_2O} P}{M_{Na_2O}}, \quad \dot{m}_{Na_2SO_4} = f_s n M_{Na_2SO_4}, \quad \dot{m}_{NaOH} = 2(1 - f_s) n M_{NaOH}$$

Variables

L_{Na_2O}	Soda loss per ADt (as Na_2O)	kg/kg
P	Pulp production (air-dry)	kg/s
f_s	Share made up as saltcake (rest as NaOH)	-
$\dot{m}_{Na_2O}$	Sodium to replace (as Na_2O)	kg/s
$\dot{m}_{Na_2SO_4}$	Saltcake (Na_2SO_4)	kg/s
$\dot{m}_{NaOH}$	Caustic (NaOH)	kg/s
$\dot{m}_S$	Sulphur brought in by the saltcake	kg/s

Method and standards

Sodium balance.

Assumptions and limits

- Make-up equals losses.
- The sulphur shown is what the saltcake brings in. Saltcake is only partly reduced in the recovery boiler, so the sulphur made available as Na_2S is less; the sodium balance is unaffected.

References

- Smook
- Handbook for Pulp & Paper Technologists
- 3rd ed. (Angus Wilde, 2002)

- ch. 10 (chemical make-up of soda losses)
- Stoichiometry: Na_2SO_4 and 2 NaOH per Na_2O; IUPAC masses

Report details

Report reference	FCC-QSPZ-RXHD (the same inputs always give the same reference)
Generated	17 November 2026, 19:49 UTC
Calculator	Kraft Mill Chemical Make-Up: Saltcake or Caustic for Soda Losses
Method last reviewed	13 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	2 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/chemical/pulp-paper/saltcake-makeup-soda-loss

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.