Oxygen Scavenger Dose (Sodium Sulphite, Hydrazine)

Sodium sulphite or hydrazine dose for boiler feedwater from the dissolved oxygen, feed flow and excess residual, from the reaction stoichiometry.

Method: Reaction stoichiometry (2 Na2SO3 + O2 → 2 Na2SO4; N2H4 + O2 → N2 + 2 H2O); IUPAC 2013 atomic weights

Input parameters

Unit system: SI

Parameter	Value	Unit
Feedwater flow	10,000	kg/h
Dissolved oxygen in the feedwater	7.0000	ppm
Scavenger	Sodium sulphite (Na_2SO_3)	
Excess dose kept above the oxygen demand A feedwater concentration, set by your water-treatment programme. Sulphite is controlled as a residual in the boiler water, which the feedwater excess builds up to through the cycles of concentration less blowdown.	20.000	ppm
Active content of the product as dosed	100.00	%

Calculated results

Parameter	Value	Unit
Dose in the feedwater (active)	75.145	ppm
Active chemical feed	0.75145	kg/h
Product feed as supplied	0.75145	kg/h
Stoichiometric ratio, kg chemical per kg O_2	7.8778	kg/kg

Notes for this case

- Sulphite decomposes in high-pressure boilers to SO_2 and H_2S, which pass to the steam: check the pressure limit of your treatment programme and do not overdose.
- The excess is a feedwater concentration. A boiler-water residual is reached by concentration over the cycles, less what blowdown removes; set the feedwater excess from the residual your programme specifies.
- Treating several ppm of oxygen chemically is costly and adds dissolved solids: a deaerator or feed tank heating removes most of it first.

Formula and method

$$r_{sulphite} = \frac{2\,M_{Na_2SO_3}}{M_{O_2}} \qquad r_{hydrazine} = \frac{M_{N_2H_4}}{M_{O_2}}$$

$$D = O_2\,r + e \qquad \dot{m}_c = \dot{m}_{fw}\,D \qquad \dot{m}_p = \frac{\dot{m}_c}{w}$$

Variables

$\dot{m}_{fw}$	feedwater flow	kg/s
O_2	dissolved oxygen, mass fraction	–
chem	sodium sulphite or hydrazine	–
e	excess dose above the oxygen demand	–
w	active content of the product	–
D	dose in the feedwater	–
$\dot{m}_c$	active chemical feed	kg/s
$\dot{m}_p$	product feed	kg/s

r	stoichiometric ratio	kg/kg
M	molar masses from IUPAC atomic weights	kg/kmol

Method and standards

Stoichiometry of the scavenging reactions with molar masses from IUPAC 2013 atomic weights.

Assumptions and limits

- Complete reaction; oxygen measured where the dose is injected.
- The excess is a feedwater concentration. The boiler-water residual that programmes control depends on the cycles of concentration and blowdown, which are not modelled here.
- Sulphite decomposes in high-pressure boilers; there is no pressure input, so the page always reminds you of this for sulphite.

References

• Reaction stoichiometry (2 Na2SO3 + O2 → 2 Na2SO4; N2H4 + O2 → N2 + 2 H2O)
• IUPAC 2013 atomic weights

Report details

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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/oxygen-scavenger-dose

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.