Atomising Steam Consumption and Heat Loss

Steam used by steam-atomised oil burners from the oil flow and steam-to-oil ratio, with the heat it carries up the stack as a share of the fuel heat.

Method: IAPWS R7-97(2012) IF97; first law of thermodynamics

Input parameters

Unit system: SI

Parameter	Value	Unit
Oil firing rate	1,000.0	kg/h
Atomising steam per kg of oil From the burner maker's data sheet for your burner and load.	0.30000	kg/kg
Atomising steam pressure (absolute, saturated)	8.0000	bar
Feedwater temperature (to value the steam)	105.00	°C
Gross calorific value of the oil	43,000	kJ/kg

Calculated results

Parameter	Value	Unit
Atomising steam	300.00	kg/h
Heat in the atomising steam	193.97	kW
Heat lost with it, share of fuel heat	1.6239	%

Formula and method

$$\dot{m}_s = r\,\dot{m}_o \qquad \dot{Q} = \dot{m}_s\,(h_g - h_{fw}) \qquad L = \frac{\dot{Q}}{\dot{m}_o \cdot GCV}$$

Variables

$\dot{m}_o$	oil firing rate	kg/s
r	atomising steam per kg of oil	kg/kg
p_s	atomising steam pressure, absolute	Pa
T_{fw}	feedwater temperature	K
GCV	gross calorific value of the oil	J/kg
$\dot{m}_s$	atomising steam	kg/s
$\dot{Q}$	heat in the atomising steam	W
L	loss as a share of fuel heat	–
h_g	saturated steam enthalpy (IF97)	J/kg
h_{fw}	feedwater enthalpy (IF97)	J/kg

Method and standards

Steam valued at the heat added from feedwater to saturated steam, with FireCAD's IAPWS-IF97; all of it is taken as lost with the flue gas. This is a simple upper estimate: strictly the stack carries the vapour at stack temperature and its low partial pressure, which differs from h_g by a few per cent. Feedwater enthalpy is taken at the atomising pressure, or just above its own saturation pressure when the feedwater is hotter than steam boils at that pressure.

Assumptions and limits

- Saturated atomising steam; ratio from the burner maker.

References

- IAPWS R7-97(2012) IF97
- first law of thermodynamics

Report details

Report reference	FCC-5HV8-X521 (the same inputs always give the same reference)
Generated	17 November 2026, 19:35 UTC
Calculator	Atomising Steam Consumption and Heat Loss
Method last reviewed	11 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/combustion/atomising-steam

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.