Soot Blowing Steam Consumption and Cost

Steam used by soot blowers per day from the number of blowers, flow, blowing time and cycles, with the heat and fuel it costs.

Input parameters

Unit system: SI

Parameter	Value	Unit
Number of soot blowers	12.000	
Steam flow of one blower while blowing From the soot blower maker's data sheet.	5,400.0	kg/h
Blowing time of one blower per cycle	90.000	s
Cycles per day	3.0000	
Steam pressure at the blowers (absolute)	45.000	bar
Steam condition	Superheated at the temperature below	
Steam temperature (superheated only)	400.00	°C
Feedwater temperature	140.00	°C
Boiler (feedwater) pressure (absolute) The feedwater enthalpy is taken at the boiler pressure. If the blowers take steam through a reducing valve, enter the boiler pressure here; the valve keeps the steam enthalpy unchanged.	45.000	bar
Boiler efficiency (on GCV)	80.000	%
Gross calorific value of the fuel, as fired	18,600	kJ/kg
Fuel price per tonne (your currency)	6,000.0	

Calculated results

Parameter	Value	Unit
Steam used per day	4.8600	t
Fuel to raise it, per day	0.85366	t
Fuel cost per day (your currency)	5,121.9	
Heat in the steam per day	12.702	GJ

Formula and method

$$m_s = n\,\dot{m}_b\,t_b\,N_c \qquad Q_d = m_s\,(h_s - h_{fw}) \qquad m_f = \frac{Q_d}{\eta_1\,GCV} \qquad C_d = m_f\,c_f$$

Variables

n	number of soot blowers	–
$\dot{m}_b$	steam flow of one blower while blowing	kg/s
t_b	blowing time of one blower per cycle	s
N_c	cycles per day	–
p	steam pressure at the blowers, absolute	Pa
state	saturated or superheated steam	–
T_s	steam temperature (superheated)	K
T_{fw}	feedwater temperature	K

p_{fw}	boiler (feedwater) pressure, absolute	Pa
η_1	boiler efficiency on GCV	–
GCV	gross calorific value	J/kg
c_f	fuel price per tonne, your currency	–
m_s	steam used per day	kg
m_f	fuel to raise it, per day	kg
C_d	fuel cost per day, your currency	–
Q_d	heat in the steam per day	J
h_s	steam enthalpy	J/kg
h_{fw}	feedwater enthalpy	J/kg

Method and standards

Daily steam from the blower data; heat to raise it from feedwater with FireCAD's IAPWS-IF97 enthalpies; fuel from the boiler efficiency on GCV. The cost uses the fuel price per tonne you enter (mass in tonnes).

Assumptions and limits

- Steam taken from the boiler's own output; the cost covers fuel only, not water, treatment or wear.
- The steam enthalpy is taken at the blower pressure and temperature (a reducing valve keeps it unchanged); the feedwater enthalpy at the boiler pressure.

Report details

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Release checks	4 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/boiler-auxiliaries/soot-blowing-steam

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.