# 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.

**Method:** IAPWS R7-97(2012) IF97; first law heat balance

## Input parameters

Unit system: SI

| Parameter | Value | Unit |
|---|---|---|
| Number of soot blowers | 12.000 | |
| Steam flow of one blower while blowing<br>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)<br>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 |
| $\mathrm{state}$ | saturated or superheated steam | – |
| $T_s$ | steam temperature (superheated) | K |
| $T_{fw}$ | feedwater temperature | K |

| | | |
|---|---|---|
| $p_{fw}$ | boiler (feedwater) pressure, absolute | Pa |
| $\eta_1$ | 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.

### References

- IAPWS R7-97(2012) IF97
- first law heat balance

## Report details

| | |
|---|---|
| Report reference | FCC-P6RH-H8G5 (the same inputs always give the same reference) |
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| Calculator | Soot Blowing Steam Consumption and Cost |
| Method last reviewed | 10 November 2026 |
| Software release | FireCAD Calc, release of 17 November 2026 |
| 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/boilers/soot-blowing-steam

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.