Ash Generation Rate (Bottom Ash and Fly Ash)

Bottom ash and fly ash produced by a boiler from the firing rate, ash content and unburned carbon in the residue, per hour and per year.

Method: Mass balance on fuel ash; ASME PTC 4-2013 (residue and unburned carbon)

Input parameters

Unit system: SI

Parameter	Value	Unit
Fuel firing rate	50,000	kg/h
Ash in the fuel, as fired	35.000	%
Carbon in the residue (unburned carbon)	2.0000	%
Share of the residue leaving as fly ash Set by the firing system: pulverised coal about 80 %, stokers and grates much less, fluidised beds in between. Use the boiler maker's split.	80.000	%
Operating hours per year	8,000.0	h

Calculated results

Parameter	Value	Unit
Total residue (ash plus unburned carbon)	17.857	t/h
Fly ash	14.286	t/h
Bottom ash	3.5714	t/h
Residue per year	142,857	t
Unburned carbon in the residue	357.14	kg/h

Formula and method

$$\dot{m}_r = \frac{\dot{m}_f A}{1 - c_r} \qquad \dot{m}_{fa} = x_f \dot{m}_r \qquad \dot{m}_{ba} = (1 - x_f)\,\dot{m}_r \qquad \dot{m}_c = c_r \dot{m}_r \qquad m_r = \dot{m}_r t_{op}$$

Variables

$\dot{m}_f$	fuel firing rate	kg/s
A	ash in the fuel as fired	–
c_r	carbon in the residue	–
x_f	share of the residue leaving as fly ash	–
t_{op}	operating hours per year	s
$\dot{m}_r$	total residue	kg/s
$\dot{m}_{fa}$	fly ash	kg/s
$\dot{m}_{ba}$	bottom ash	kg/s
m_r	residue per year	kg
$\dot{m}_c$	unburned carbon in the residue	kg/s

Method and standards

Mass balance on the incombustible matter: all the fuel ash leaves as residue together with the unburned carbon, as in the residue terms of ASME PTC 4-2013.

Assumptions and limits

- Ash content as fired; limestone or sorbent added for desulphurisation adds to the residue (see the limestone calculator).
- One carbon content for all residue streams; fly ash and bottom ash usually differ.
- The fly-ash share splits the residue including its carbon, so with one carbon content it equals the split of the fuel ash.

- The ash content must be on the as-fired basis of the firing rate; an air-dried or dry-basis ash with an as-fired rate overstates the residue.

References

- Mass balance on fuel ash; ASME PTC 4-2013 (residue and unburned carbon)

Report details

Report reference	FCC-696V-6GXF (the same inputs always give the same reference)
Generated	17 November 2026, 19:36 UTC
Calculator	Ash Generation Rate (Bottom Ash and Fly Ash)
Method last reviewed	10 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/fuel-ash-handling/ash-generation-rate

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.