Tube Leak Detection from the Make-Up Balance

Unaccounted water loss from make-up less blowdown, known vents and unreturned process steam: a tube leak signal as a share of steam.

Method: Water mass balance over the steam–water circuit

Input parameters

Unit system: SI

Parameter	Value	Unit
Make-up water	6.0000	t/h
Blowdown	1.5000	t/h
Process steam not returned	3.5000	t/h
Known vents, drains and sampling	0.30000	t/h
Steam generated	60.000	t/h

Calculated results

Parameter	Value	Unit
Unaccounted loss	0.70000	t/h
Unaccounted loss share of steam	1.1667	%

Notes for this case

- A rising unaccounted loss with steady load is the earliest sign of a tube leak; check acoustic leak detection and furnace draught.

Formula and method

$$\dot{m}_u = \dot{m}_{mu} - \dot{m}_{bd} - \dot{m}_p - \dot{m}_k, \quad s = \frac{\dot{m}_u}{\dot{m}_s}$$

Variables

$\dot{m}_{mu}$	Make-up water	kg/s
$\dot{m}_{bd}$	Blowdown	kg/s
$\dot{m}_p$	Process steam not returned	kg/s
$\dot{m}_k$	Known vents, drains and sampling	kg/s
$\dot{m}_s$	Steam generated	kg/s
$\dot{m}_u$	Unaccounted loss	kg/s
$\dot{m}_u/\dot{m}_s$	Unaccounted loss share of steam	-

Method and standards

Water mass balance over the steam–water circuit: with a steady inventory, the make-up replaces every water loss, so what is left after the known losses is unaccounted (a leak or a meter error).

Assumptions and limits

- Steady inventory.
- All known losses must be in the inputs: put deaerator vent, soot-blowing and atomising steam, flash and trap losses on the return in the known vents.
- No significance threshold is applied: meter errors are often several per cent of the make-up, so trend the value at steady load rather than judge one reading.

References

- Water mass balance over the steam–water circuit

Report details

Report reference	FCC-KVY2-ZSW6 (the same inputs always give the same reference)
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Release checks	2 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/plant-performance/tube-leak-makeup-balance

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.