# Pressure Decay after a Firing Trip (Stored Energy)

Time for drum pressure to fall between two values after firing stops while steam is drawn, from water and steel stored energy (IF97).

**Method:** Energy balance of saturated water and steel between two saturation states (IAPWS-IF97)

## Input parameters

Unit system: SI

| Parameter | Value | Unit |
|---|---|---|
| Water in drum, risers and downcomers | 40.000 | t |
| Steel in contact with the water | 150.00 | t |
| Steel specific heat | 0.50000 | kJ/(kg·K) |
| Pressure at the trip (absolute) | 46.000 | bar |
| Pressure reached (absolute) | 36.000 | bar |
| Steam still drawn | 30.000 | t/h |

## Calculated results

| Parameter | Value | Unit |
|---|---|---|
| Stored energy released | 3,943.3 | MJ |
| Steam made from stored energy | 2.2599 | t |
| Time to fall to $p_2$ | 4.5198 | min |

**Notes for this case**

- Flash steam is taken at the lower pressure's latent heat (conservative); heat still stored in refractory and the setting adds a little time.

## Formula and method

$$E = M_w[h_f(p_1) - h_f(p_2)] + M_m c_m[T_s(p_1) - T_s(p_2)], \quad t = \frac{E}{h_{fg}(p_2)\,\dot{m}_s}$$

### Variables

| | | |
|---|---|---|
| $M_w$ | Water in drum, risers and downcomers | kg |
| $M_m$ | Steel in contact with the water | kg |
| $c_m$ | Steel specific heat | J/(kg·K) |
| $p_1$ | Pressure at the trip (absolute) | Pa |
| $p_2$ | Pressure reached (absolute) | Pa |
| $\dot{m}_s$ | Steam still drawn | kg/s |
| $E$ | Stored energy released | J |
| $M_s$ | Steam made from stored energy | kg |
| $t$ | Time to fall to $p_2$ | s |

### Method and standards

A lumped energy balance between two saturation states with IAPWS-IF97: the heat given up by the saturated water and the steel as the saturation temperature falls from $T_s(p_1)$ to $T_s(p_2)$ makes steam at the latent heat of the lower pressure $p_2$. The time follows from a constant steam draw. Holding the water mass constant and using $h_{fg}(p_2)$, the largest latent heat in the range, gives slightly less steam and so a slightly shorter, conservative time than a step-by-step balance in which the water inventory falls as it flashes.

### Assumptions and limits

- Saturated, well-mixed water; constant steam draw; no firing and no feedwater during the decay.
- Water mass held constant; a warning appears when the steam made exceeds 20 % of the water, when drum level may trip the

boiler first.

### References

- Energy balance of saturated water and steel between two saturation states (IAPWS-IF97)

## Report details

| | |
|---|---|
| Report reference | FCC-4PEQ-NZ6C (the same inputs always give the same reference) |
| Generated | 17 November 2026, 19:36 UTC |
| Calculator | Pressure Decay after a Firing Trip (Stored Energy) |
| Method last reviewed | 13 November 2026 |
| Software release | FireCAD Calc, release of 17 November 2026 |
| 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/boilers/boiler-pressure-decay-trip

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.