# Cold-End Metal Temperature vs Acid Dew Point

Metal temperature at the cold end of an economiser or air heater from the gas and water or air temperatures and film coefficients, and its margin to the acid dew point.

**Method:** Thin-wall metal temperature from two film coefficients

## Input parameters

Unit system: SI

| Parameter | Value | Unit |
|---|---|---|
| Flue gas temperature at the cold end | 150.00 | °C |
| Water or air temperature at the cold end | 105.00 | °C |
| Gas-side film coefficient | 60.000 | W/(m²·K) |
| Water- or air-side film coefficient | 3,000.0 | W/(m²·K) |
| Acid dew point of the flue gas<br>From the acid dew point calculator. | 125.00 | °C |

## Calculated results

| Parameter | Value | Unit |
|---|---|---|
| Metal temperature at the cold end | 105.88 | °C |
| Margin above the acid dew point | -19.118 | K |

**Notes for this case**

- The metal is below the acid dew point: sulphuric acid condenses and corrodes the cold end. Raise the feedwater or air temperature (steam coil air heater, bypass).

## Formula and method

$$T_m = \frac{h_g T_g + h_c T_c}{h_g + h_c} \qquad \Delta T = T_m - T_{adp}$$

### Variables

| | | |
|---|---|---|
| $T_g$ | gas temperature at the cold end | K |
| $T_c$ | water or air temperature at the cold end | K |
| $h_g$ | gas-side coefficient | W/(m²·K) |
| $h_c$ | water- or air-side coefficient | W/(m²·K) |
| $T_{adp}$ | acid dew point | K |
| $T_m$ | metal temperature | K |
| $\Delta T$ | margin above the acid dew point | K |

### Method and standards

Steady heat balance across a thin wall: the metal temperature divides the gas-to-coolant difference in proportion to the film resistances (wall and fouling resistance neglected).

### Assumptions and limits

- Thin clean wall; local temperatures at the cold end.
- Both coefficients must be on the same area. For finned tubes or a large outside-to-inside diameter ratio, refer the gas-side coefficient to the coolant-side area (h_g × A_g/A_c, with fin efficiency) before entering it; otherwise the metal temperature is misstated.

### References

- Thin-wall metal temperature from two film coefficients

## Report details

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|---|---|
| Report reference | FCC-PHBJ-QKGX (the same inputs always give the same reference) |
| Generated | 17 November 2026, 19:36 UTC |
| Calculator | Cold-End Metal Temperature vs Acid Dew Point |
| Method last reviewed | 11 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/furnace-heating-surfaces/minimum-metal-temperature

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.