# Falling-Rate Drying Time (Linear Rate)

Drying time in the falling-rate period when the rate falls linearly from the critical moisture to zero at equilibrium moisture.

## Input parameters

Unit system: SI

| Parameter | Value | Unit |
|---|---|---|
| Dry solids | 500.00 | kg |
| Drying surface | 25.000 | m² |
| Critical moisture (dry basis) | 0.30000 | kg/kg |
| Final moisture (dry basis) | 0.050000 | kg/kg |
| Equilibrium moisture (dry basis) | 0.020000 | kg/kg |
| Constant drying rate | 1.8000 | kg/(m²·h) |

## Calculated results

| Parameter | Value | Unit |
|---|---|---|
| Falling-rate drying time | 6.9490 | h |
| Rate at the end | 0.19286 | kg/(m²·h) |

## Formula and method

$$t_f = \frac{m_s(X_c - X^*)}{AN_c} \ln \frac{X_c - X^*}{X_2 - X^*}$$

### Variables

| | | |
|---|---|---|
| $m_s$ | Dry solids | kg |
| $A$ | Drying surface | m² |
| $X_c$ | Critical moisture (dry basis) | kg/kg |
| $X_2$ | Final moisture (dry basis) | kg/kg |
| $X^*$ | Equilibrium moisture (dry basis) | kg/kg |
| $N_c$ | Constant drying rate | kg/(m²·s) |
| $t_f$ | Falling-rate drying time | s |
| $N_2$ | Rate at the end | kg/(m²·s) |

### Method and standards

Integration of a rate linear in free moisture.

### Assumptions and limits

- Linear falling rate.

## Report details

| | |
|---|---|
| Report reference | FCC-DSVY-MKFM (the same inputs always give the same reference) |
| Generated | 23 November 2026, 17:34 UTC |
| Calculator | Falling-Rate Drying Time (Linear Rate) |
| Method last reviewed | 13 November 2026 |
| Software release | FireCAD Calc, release of 22 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/chemical/drying/falling-rate-drying-time

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.