Thin-Layer Drying Curve Fit (Page Model) and Drying Time

Page model constants from two moisture readings during thin-layer drying, and the time to reach a target moisture, for grain, fruit, tea and other products.

Method: Page thin-layer drying model

Input parameters

Unit system: SI

Parameter	Value	Unit
Initial moisture (dry basis)	30.000	%
Equilibrium moisture (dry basis)	6.0000	%
Time of the first reading	30.000	min
Moisture at the first reading	22.000	%
Time of the second reading	120.00	min
Moisture at the second reading	14.000	%
Target moisture	12.000	%

Calculated results

Parameter	Value	Unit
Page exponent	0.71902	
Page rate constant (time in hours)	0.66742	
Moisture ratio at the target	25.000	%
Time to reach the target	2.7639	h

Notes for this case

• Page's empirical model MR = exp(−k tⁿ) fits most thin-layer drying curves of grains, fruits and leaves, with the moisture ratio MR = (M − M_e)/(M₀ − M_e). Two readings fix k and n: n = ln(ln MR₁/ln MR₂)/ln(t₁/t₂). The fitted curve then gives the time to any target moisture at the same air conditions. Use readings spread over the run; fits from more points (least squares) are more reliable.

Formula and method

$$MR = \frac{M - M_e}{M_0 - M_e} = e^{-kt^n}, \quad n = \frac{\ln(\ln MR_1 / \ln MR_2)}{\ln(t_1/t_2)}, \quad t = \left(\frac{-\ln MR}{k}\right)^{1/n}$$

Variables

M_0	Initial moisture (dry basis)	-
M_e	Equilibrium moisture (dry basis)	-
t_1	Time of the first reading	s
M_1	Moisture at the first reading	-
t_2	Time of the second reading	s
M_2	Moisture at the second reading	-
M_t	Target moisture	-
n	Page exponent	-
k	Page rate constant (time in hours)	-
MR_t	Moisture ratio at the target	-
t_t	Time to reach the target	s

Method and standards

Page model.

Assumptions and limits

- Same air temperature, humidity and velocity as the readings.

References

Page thin-layer drying model

Report details

Report reference	FCC-9VXG-7VD4 (the same inputs always give the same reference)
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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/chemical/drying/thin-layer-drying-page-model

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.