Paper Machine Hood Exhaust Air

Dry air to exhaust from a paper machine dryer hood to carry away the evaporated water, from the supply and exhaust humidity, with the hood dew point check.

Method: Smook; Handbook for Pulp & Paper Technologists; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Water evaporated	45.000	t/h
Supply air humidity (per kg dry air) Humidity ratio of the supply air: kg of water per kg of dry air.	15.000	g/kg
Exhaust air humidity (per kg dry air) Humidity ratio of the hood exhaust: closed hoods run about 120–180 g/kg, open hoods far lower.	160.00	g/kg
Pressure in the hood (absolute) Absolute pressure, normally the local barometric pressure.	101.33	kPa

Calculated results

Parameter	Value	Unit
Dry air exhausted	310.34	t/h
Water vapour partial pressure in the exhaust	20.733	kPa
Exhaust dew point	60.839	°C

Notes for this case

- This exhaust humidity is in the closed-hood range (0.12–0.18 kg/kg, dew point 55–62 °C): little air to heat, but keep hood surfaces above the dew point.

Formula and method

$$\dot{m}_a = \frac{\dot{E}}{Y_e - Y_s}, \quad p_v = \frac{P Y_e}{0.621945 + Y_e}$$

Variables

$\dot{E}$	Water evaporated	kg/s
Y_s	Supply air humidity (per kg dry air)	kg/kg
Y_e	Exhaust air humidity (per kg dry air)	kg/kg
P	Pressure in the hood (absolute)	Pa
$\dot{m}_a$	Dry air exhausted	kg/s
p_v	Water vapour partial pressure in the exhaust	Pa
T_{dp}	Exhaust dew point	K

Method and standards

Water balance on the hood air.

Assumptions and limits

- All evaporated water leaves with the exhaust.
- Humidities are humidity ratios (kg water per kg dry air); the pressure is absolute.

References

- Smook
- Handbook for Pulp & Paper Technologists
- 3rd ed. (Angus Wilde, 2002)
- ch. 17 (drying: hood ventilation and heat recovery)

- Psychrometric humidity ratio Y = 0.621945 p_v/(P − p_v); saturation from IAPWS-IF97

Report details

Report reference	FCC-BGB0-945X (the same inputs always give the same reference)
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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/chemical/pulp-paper/paper-machine-hood-air

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.