Night Purge Ventilation Cooling Energy

Cooling delivered by night-time ventilation of a building from the air flow, indoor and outdoor temperatures and hours, against the fan energy used.

Method: Sensible heat removal by ventilation; CIBSE Guide A; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Purge air flow	10,800	m³/h
Mean indoor (exhaust) temperature	25.000	°C
Mean outdoor temperature at night	17.000	°C
Heat removal effectiveness	70.000	%
Purge hours per night	8.0000	h
Specific fan power	1.0000	kJ/m³
Atmospheric pressure	101.33	kPa

Calculated results

Parameter	Value	Unit
Mean cooling power	20.562	kW
Cooling per night	164.49	kWh
Fan energy per night	24.000	kWh
Cooling per unit of fan energy	6.8539	

Notes for this case

• Q = ε·ρ·V̇·c_p·(T_i − T_o); ε covers how closely exhaust air approaches the mean indoor temperature. Exposed thermal mass (concrete soffits) is needed to store the coolth for the next day.

Formula and method

$$\dot{Q}_c = \varepsilon \rho \dot{V} c_p (T_i - T_o), \quad E_f = SFP \cdot \dot{V} \cdot t$$

Variables

$\dot{V}$	Purge air flow	m³/s
T_i	Mean indoor (exhaust) temperature	K
T_o	Mean outdoor temperature at night	K
ε	Heat removal effectiveness	-
t	Purge hours per night	s
SFP	Specific fan power	J/m³
p	Atmospheric pressure	Pa
$\dot{Q}_c$	Mean cooling power	W
E_c	Cooling per night	J
E_f	Fan energy per night	J
E_c/E_f	Cooling per unit of fan energy	-

Method and standards

Night purge.

Assumptions and limits

- Mean temperatures over the purge period.

References

Sensible heat removal by ventilation, CIBSE Guide A, Environmental Design (CIBSE)

Report details

Report reference	FCC-DX51-KVHE (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/hvac/loads/night-purge-cooling

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.