Fan and Blower Performance — Report

Calculation summary | PlantCalcKit v1.0

DOCUMENT

Plant / project	**Example Plant**
Equipment tag / system	**FAN-01**
Calculation / document no.	**CALC-FB-001**
Revision	**0**
Prepared by	**Your name**
Checked by	**—**
Date	**07-Nov-2026**
Calculation basis	Total efficiency basis · pressure measured as fan total pressure · power measured as motor input power · air density: calculate from conditions · flow control in service: outlet damper. Definitions aligned with the publicly documented AMCA 210 / AMCA 205 / ISO 5801 fan performance terms; fan laws as in AMCA 99 and ASHRAE practice; moist-air density as an ideal-gas mixture; flow control by a fan-curve model (see the Guide)
Status	✓ **Inputs OK** · ℹ️ **9 default value(s) in use: barometric pressure, motor efficiency at full load, motor constant-loss share, drive efficiency, air pressure after the change, shut-off pressure of the fan, fixed part of the system pressure, inlet vane efficiency loss at 50 % flow, VSD efficiency**

KEY INPUTS

Input	Unit	Value used
Airflow at the fan inlet (actual conditions)	m³/h	60,000
Fan pressure rise (measured)	Pa	3,000
Fan outlet area	m²	0.800
Static pressure at the fan inlet (gauge)	Pa	-500
Air temperature at the fan inlet	°C	35.0
Relative humidity	%	60
Site altitude above sea level	m	200
Barometric pressure (absolute)	kPa a	98.95
Measured power (motor input or shaft, as chosen)	kW	66.0
Motor rated shaft output	kW	75.0
Motor efficiency at full load	%	94.0
Drive efficiency (coupling or belts)	%	100.0
Electricity price	per kWh	0.1000

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RESULTS

Result	Unit	Value
Fan efficiency (basis chosen)	%	79.6
Fan total efficiency	%	79.6
Fan static efficiency	%	73.3
Fan shaft power	kW	62.1
Motor electrical input	kW	66.0
Motor loading	% of rated	82.8
Motor efficiency at this load	%	94.1
Overall efficiency, electrical input to air power	%	74.9
Specific fan power (electrical)	kW per m³/s	3.96
Fan total pressure	Pa	3,000
Fan static pressure	Pa	2,762
Air density at the fan inlet	kg/m³	1.099
Lowest-energy method	–	VSD
Energy saved by the lowest-energy method	MWh/yr	218
Cost saved by the lowest-energy method	USD/yr	21,783
Saving as % of the energy now used	%	46.2

FLOW CONTROL COMPARISON

Operating point	Unit	Flow, % of test flow	Hours per year	Outlet damper (in service)	Inlet vane	VSD
Test point (100 % flow) — electrical power	kW	100	—	66.0	66.0	68.0
Operating point 1	h/yr	100	1,200	66.0	66.0	68.0
Operating point 2	h/yr	80	3,000	60.9	44.8	37.2
Operating point 3	h/yr	60	2,800	56.2	28.7	18.5
Operating point 4	h/yr	40	1,000	51.7	17.6	8.4
Annual electricity use	MWh/yr			471	312	253
Annual electricity cost	USD/yr			47,121	31,163	25,338
Energy saved against the method in service	MWh/yr			0	+160	+218
Cost saved against the method in service	USD/yr			0	+15,958	+21,783

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FAN LAWS AND DENSITY CORRECTION — PERFORMANCE AFTER THE CHANGE

Result	Unit	Value
Speed ratio (new ÷ test)	–	0.946
Diameter ratio (new ÷ test)	–	1.000
Air density after the change	kg/m³	1.204
Airflow after the change	m³/h	56,757
Fan total pressure after the change	Pa	2,942
Fan shaft power after the change	kW	57.6
Motor electrical input after the change	kW	61.2
Motor loading after the change	% of rated	76.8
Impeller tip speed after the change	m/s	73.3

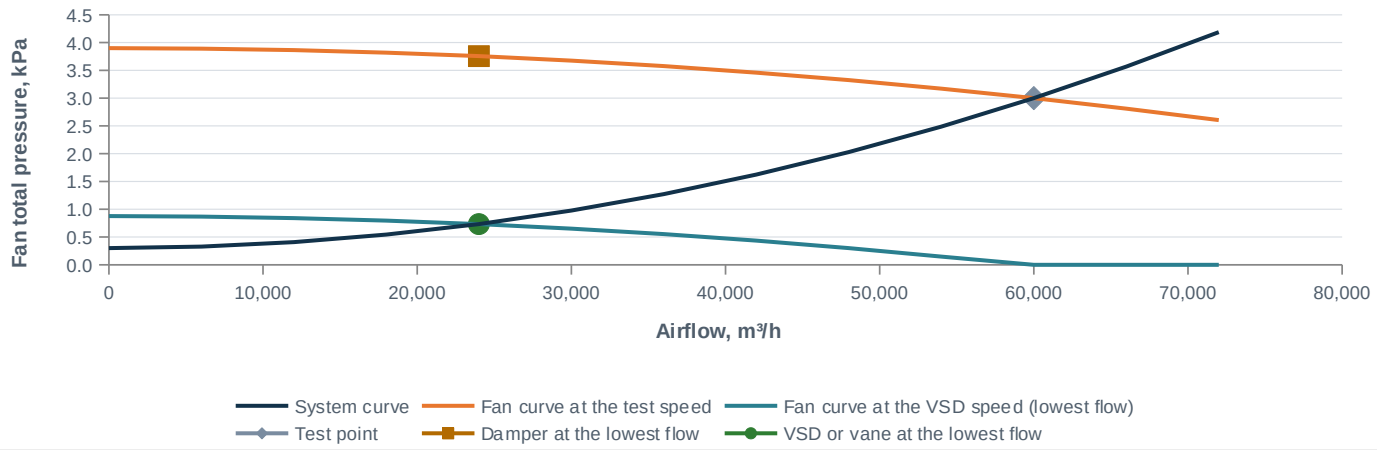
FINDINGS AND RECOMMENDATIONS

◆ **Opportunity**

Changing from outlet damper to variable speed (vsd) control would cut the electricity use by 46.2 % (218 MWh/yr, about 21,783 USD/yr) at the operating profile entered. Check the vane or inverter data before deciding.

CHARTS

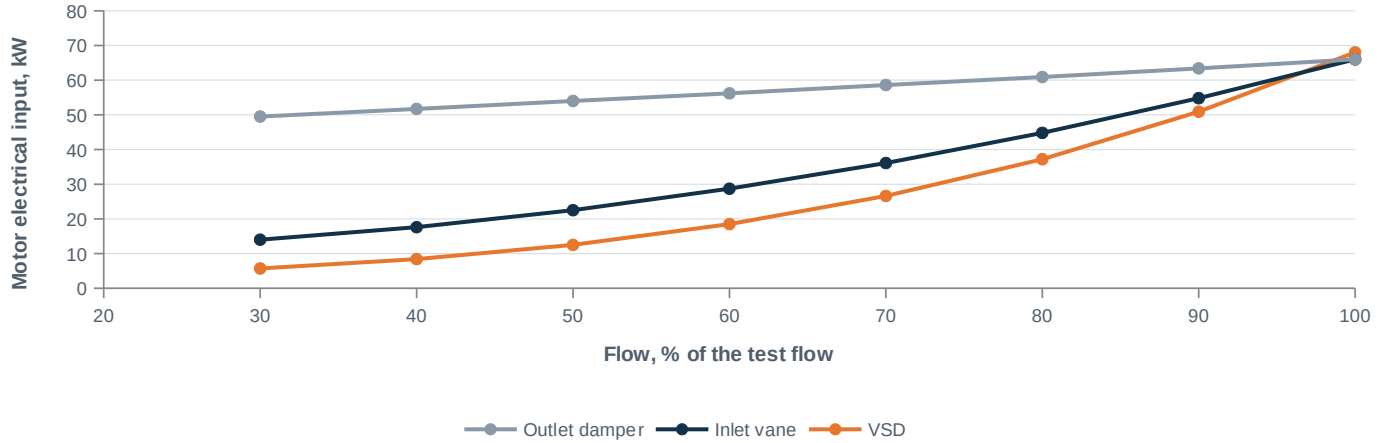
System curve and fan curves — operating points



Observations — system curve and fan curves

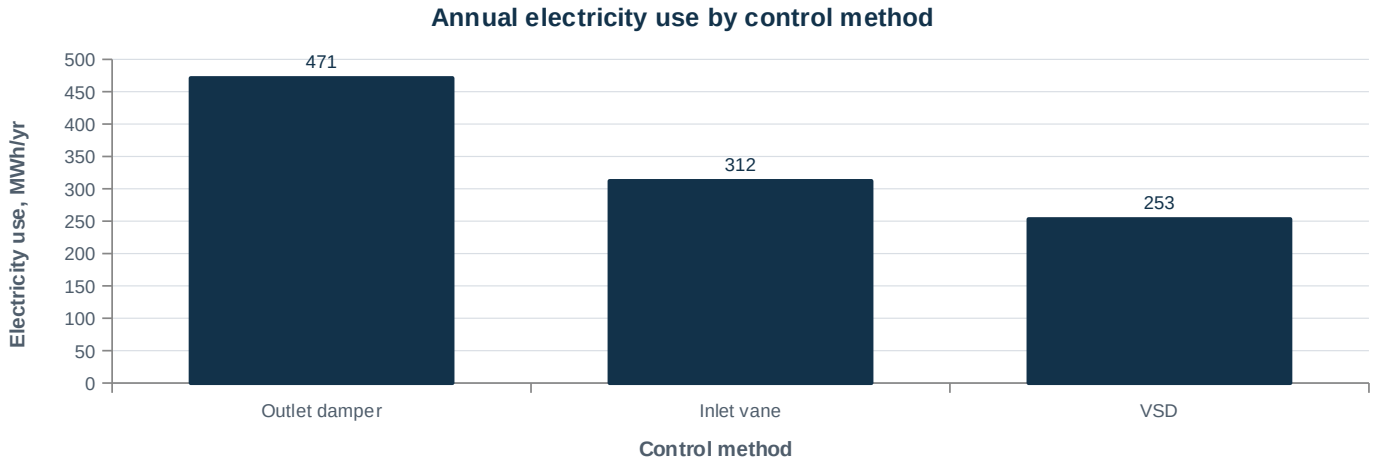
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Motor input power versus flow



Observations — power versus flow

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Observations — annual electricity use

[Write your observations here]

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