Compressed Air Leakage by Pressure Decay Test

Leakage of a compressed air system as free air delivery from the pressure drop over time with compressors off, the share of compressor output and the yearly cost.

Method: Pressure-decay leak test

Input parameters

Unit system: SI

Parameter	Value	Unit
System volume (receivers and pipework)	10.000	m³
Start pressure (absolute)	800.00	kPa
End pressure (absolute)	650.00	kPa
Time for the drop	120.00	s
Atmospheric pressure	101.33	kPa
Compressor capacity (FAD)	30.000	m³/min
Specific power (kW per m³/min of FAD)	6.5000	
Pressurised hours per year	6,000.0	h
Electricity price (per kWh)	0.10000	

Calculated results

Parameter	Value	Unit
Leakage as free air	7.4019	m³/min
Leakage share of compressor output	24.673	%
Power wasted	48.113	kW
Energy wasted per year	288.68	MWh
Cost per year	28,868	

Notes for this case

• Isothermal pressure decay: Q_L = V(p₁ − p₂)/(p₀t). Leaks fall as pressure drops, so start near working pressure and keep the drop moderate. Typical plants lose 20–30 % of compressor output to leaks; under 10 % is good practice.

Formula and method

$$Q_L = \frac{V(p_1 - p_2)}{p_0 t}, \quad P_L = SP \cdot Q_L$$

Variables

V	System volume (receivers and pipework)	m³
p_1	Start pressure (absolute)	Pa
p_2	End pressure (absolute)	Pa
t	Time for the drop	s
p_0	Atmospheric pressure	Pa
Q_c	Compressor capacity (FAD)	m³/s
SP	Specific power (kW per m³/min of FAD)	-
h	Pressurised hours per year	s
c_e	Electricity price (per kWh)	-
Q_L	Leakage as free air	m³/s

Q_L/Q_c	Leakage share of compressor output	-
P_L	Power wasted	W
E	Energy wasted per year	J
C	Cost per year	-

Method and standards

Leak test.

Assumptions and limits

- Isothermal; constant leak orifices over the test.

References

Pressure-decay leak test

Report details

Report reference	FCC-QW5F-BCXJ (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/mechanical/compressors/compressed-air-leak-pressure-decay

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.