Power Factor Improvement: kVA Demand and Charge Saving

Reduction in maximum kVA demand and in the monthly demand charge from improving power factor, with the capacitor kvar needed and the payback.

Method: S = P/cos φ; Q_c = P(tan φ₁ − tan φ₂)

Input parameters

Unit system: SI

Parameter	Value	Unit
Maximum demand (active)	800.00	kW
Present power factor	82.000	%
Target power factor	97.000	%
Demand charge per kVA per month	350.00	
Capacitor bank cost per kvar	1,200.0	

Calculated results

Parameter	Value	Unit
Present kVA demand	975.61	kVA
kVA demand at the target	824.74	kVA
Capacitor needed	357.90	kvar
Demand charge saved per year	633,643	
Payback (months)	8.1336	

Notes for this case

- Add any power factor incentive or penalty in your tariff; watch for harmonics before adding capacitors.

Formula and method

$$S = \frac{P}{\cos\varphi}, \quad Q_c = P(\tan\varphi_1 - \tan\varphi_2), \quad \Delta C = 12(S_1 - S_2)c_d$$

Variables

P	Maximum demand (active)	W
$\cos\varphi_1$	Present power factor	-
$\cos\varphi_2$	Target power factor	-
c_d	Demand charge per kVA per month	-
c_c	Capacitor bank cost per kvar	-
S_1	Present kVA demand	VA
S_2	kVA demand at the target	VA
Q_c	Capacitor needed	var
ΔC	Demand charge saved per year	-
t_{pb}	Payback (months)	-

Method and standards

Power triangle.

Assumptions and limits

- Same active demand.

References

- S = P/cos φ; Q_c = P(tan φ₁ − tan φ₂)

Report details

Report reference	FCC-27TP-PS9N (the same inputs always give the same reference)
Generated	17 November 2026, 19:45 UTC
Calculator	Power Factor Improvement: kVA Demand and Charge Saving
Method last reviewed	12 November 2026
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/environmental/carbon-energy/capacitor-kva-demand-saving

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.