

Applications & Cases

HomeCaps for residential PFC

January 2006

Power factor correction in Peru



Photo: Getty Images

PROFILE	HOMECAP
<p>HomeCap is a complete ready-to-connect capacitor for power factor correction in residential applications. The self-healing capacitor is insulated with a shrink-sleeve and features internal grounding and an overpressure disconnection device.</p>	
Dielectric:	Polypropylene film (extra thick)
Rated voltage:	400 V (application voltage 127 to 400 V)
Capacitance:	5 to 33 μ F
Reactive power:	0.25 to 1.66 kvar
Frequency:	50/60 Hz
Diameter:	40 mm
Height:	70 to 105 mm



Power factor correction (PFC) has found widespread use in commercial applications, both within industrial facilities, office complexes and in the power distribution grid in close proximity to commercial clients. A new application developed by Peruvian electricity distributor Edelnor shows that correcting the power factor at the household level benefits utilities and users alike.

Deregulation and restructuring of the energy market and steadily falling electricity prices in Peru have put enormous pressure on the margins of the utilities. In order to improve the efficiency of the electrical system and create further capacity, Peruvian authorities began to implement incentives for power factor correction. Under these, electricity

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distributors must achieve minimum power factors or face penalties. At Edelnor, initial efforts to improve the power factor began with banks of medium-voltage capacitors installed in the high-voltage and medium-voltage transformer substations. Once Edelnor attained the required power factor and the demand for electricity continued to grow, "further investments in power factor correction for the distribution network began showing diminishing returns," recalls Carlos Arroyo, managing director of quality and service at Edelnor. "Therefore, we started to explore the benefits of deploying PFC in the low-voltage distribution networks as close to the consumer as possible." Edelnor's expectations that the reduction of energy losses here would eclipse the benefits achieved thus far in the high-voltage transport grid were soon confirmed in a pilot project in 2001 with the installation of 4800 kvar in 26 000 households in Infantas in northern Lima. The networks analyzed were those connected to 250 kVA, 10:0.22 transformers.

Compact and safe

Theoretically, nothing stood in the way of commercial rollout of residential PFC in the entire service area of Edelnor. In practice, Edelnor needed a standardized capacitor that would be suited for installation in confines of the metering cabinet. "We were looking for a manufacturer able to provide a capacitor of the smallest possible diameter that could be quickly installed and safely operated in a residential environment where access cannot be controlled," said Arroyo. EPCOS engineers soon developed a PFC capacitor prototype with the desired diameter complete with all the factory-mounted accessories. Based on the design of the PhiCap capacitor, the HomeCap capacitor had several safety features: a PVC shrink sleeve for the aluminum can, a top case to cover the terminals, and a strong cable with double insulation. It also featured an internal safety device to avoid the risk of fire or explosion. All Edelnor had to do was connect it to the AC power line inside the metering cabinet. Installation is simple enough for any technician and requires no special training.

Today, the HomeCap is being deployed for residential customers throughout the Edelnor distribution network. With a capacitance of 20 μF and a rated voltage of 400 V, HomeCap achieves a power factor correction of 0.365 kvar in the 220 V distribution network. By the end of 2004, Edelnor had installed approximately 37 000 kvar for 114 000 residential customers, including those in the pilot project. By the end of 2005, the electricity distributor expects an additional 32 000 kvar for 90 000 further customers.

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CUSTOMER PROFILE | EDELNOR

CARLOS ARROYO
Managing director of quality and service at Edelnor. He oversaw deployment of the most profitable project for Edelnor.



Edelnor S.A.A. is a distributor of electricity serving Peru. It is part of the Endesa Group from Spain, which is primarily engaged in the generation, transmission and distribution of electricity in Chile, Argentina, Brazil, Colombia and Peru. Edelnor serves a 2440 square kilometer region north of the Peruvian capital city of Lima, includes the provinces Constitucional del Callao and Norte Chico as well as the Department of Lima to the north. Edelnor purchases its electricity from the power generation companies and operates some small hydroelectric power plants for remote communities.



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HomeCap installation in the meter cabinet.
The capacitor has UL approval for safe operation in residential applications.

Rapid return on investment

HomeCap pays for itself in a very short time. For every kvar installed, Edelnor saves 280 kWh or approximately US\$ 13, after taking into account the electricity purchased from the power generator. Altogether Edelnor will save around 19 300 MWh per annum, meaning a costs saving of close to US\$ 900 000. Says Arroyo, "residential PFC is now considered the most profitable project in Edelnor". And because HomeCap has a life expectancy of around 15 years, Edelnor and its customers can look forward to reaping the full financial benefits for many years.

The advantages of residential PFC go far beyond the actual cost savings. Because PFC actually saves energy, Edelnor is able to postpone investments to increase its power system and expand grid capacity. Moreover, PFC at all network levels helps to considerably improve the voltage profile in the network. Certainly, residential PFC based on the HomeCap is a model for countries and regions with large proportions of overhead lines, as is the case in many South American countries. Of course, each distribution company must evaluate its own needs based on the characteristics of its network. "We are sure that electricity distribution companies will now consider deploying residential PFC wherever the network topography offers the potential. Now, other utilities in Peru are using PFC in low-voltage networks," commented Arroyo.

For Edelnor, advancements such as residential PFC will be of highest priority in the 21st century if they want to efficiently deliver the service quality levels demanded by customers. "We need to develop innovations and new products in order to compete in the electricity market," concludes Arroyo.

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OVERVIEW

WORLD CHAMPION IN PFC

EPCOS is the world market leader in capacitors for power factor correction. They cover reactive powers from 0.5 to 56 kvar at operating voltages from 230 to 800 V. EPCOS also offers a wide range of accessories for PFC, such as discharge resistors, current-compensated chokes, and automatic controllers with various monitoring and safety functions. The latest development is PhaseMod, a family of ready-to-connect system units for PFC that yield cost savings of up to 50% against conventional systems.

