


Applications & Cases

Power factor correction

October 2005

Power factor correction on site



PROFIL	POLECAP
<p>PoleCaps are a new type of capacitor for power factor correction. Their rugged construction makes them ideal for direct mounting on poles or pylons.</p>	
	<p>Voltages: 400 V, 440 V, 525 V Frequencies: 50 to 60 Hz Reactive power range: 0.5 to 30 kvar</p>

Recent years have repeatedly seen spectacular power outages that paralyzed major cities and even entire regions. Grid overload can be prevented by using power factor correction (PFC) equipment in the immediate vicinity of loads. Power quality improves at the same time. PoleCaps are the right tool for this purpose.

Who doesn't remember the great blackout of August 14, 2003? Large areas of the northeastern United States and parts of Canada were without electricity on that day. The outage affected 50 million people and caused billions of dollars of damage.

Incidents with serious consequences like these lead to ever louder demands on power companies: consumers insist on stable grids with a reliable supply of energy and high power quality. For this purpose, power capacitors have been used for many years for power factor correction in industrial power distribution, in UPS systems, in wind parks and drive systems. PFC equipment of appropriate design reduces the share of reactive current in the entire grid, simultaneously reducing power consumption and voltage drops, and stabilizing the power supply. Lower energy costs are a further benefit.

Outdoor use

To obtain the same effect in rural areas with mainly domestic or agricultural loads or in regions with little commercial or industrial activity, considerable capital expenditure would be needed to expand the distribution network. An alternative is to install PFC capacitors close to the source of reactive current - in this case by mounting them right on the masts of the overhead power lines.

Because of their exposed position, power capacitors used for this purpose must satisfy several requirements. They must be

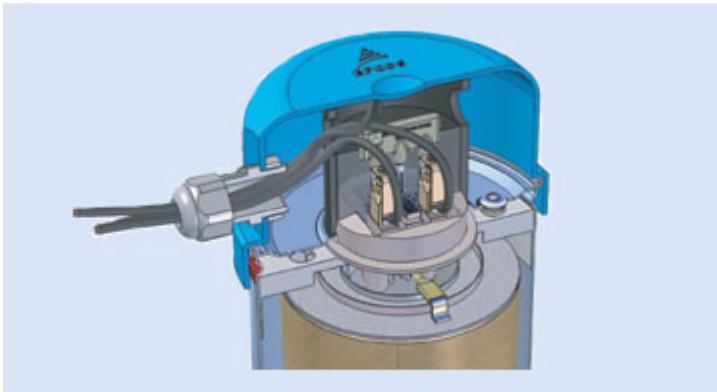
- watertight
- dustproof

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- impact-resistant
- resistant to weathering and UV light
- of high dielectric strength
- resistant to high temperatures caused by sunlight
- capable of remote operational monitoring

EPCOS power capacitors of the new PoleCap series satisfy these requirements and are therefore very suitable for outdoor use. Based on proven metalized plastic film technology, PoleCaps are a logical development of the PhiCap and PhaseCap® series. A section through a PoleCap is shown in → 1.

1 | Section through a PoleCap



1 Prefitted cables and a discharge resistor reduce installation costs.

However, it would be wrong to use PoleCaps outdoors only. Thanks to their high impermeability, they are also suitable wherever high levels of dust or moisture can impair operation of conventional capacitors - such as in cement works and sawmills. Here PoleCaps can be used either inside or outside a switch cabinet. Further advantages are their compact design and low weight.

PoleCaps can be directly mounted on a power mast in the open air. They are supplied with connecting cables already fitted, leading to considerable savings in time and thus cost. In addition, the M12 threaded stud permits fast and simple mounting.

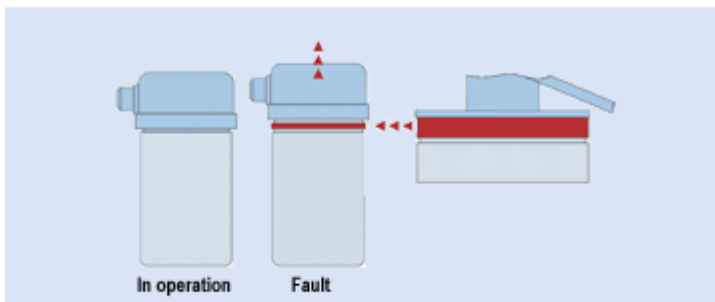
The new capacitors also offer a host of safety features.

- All live parts are protected; cable connections are shock-hazard-protected to IP 54
- Integrated overpressure disconnecter
- Self-healing design
- Dry technology thanks to gas impregnation
- Pre-mounted discharge module on ceramic basis

Capacitors mounted on masts must permit operational monitoring from the ground. So PoleCaps are equipped with a red strip that becomes visible as soon as the overpressure disconnecter has triggered in response to a malfunction → 2.

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2 | Overpressure disconnector for malfunctions

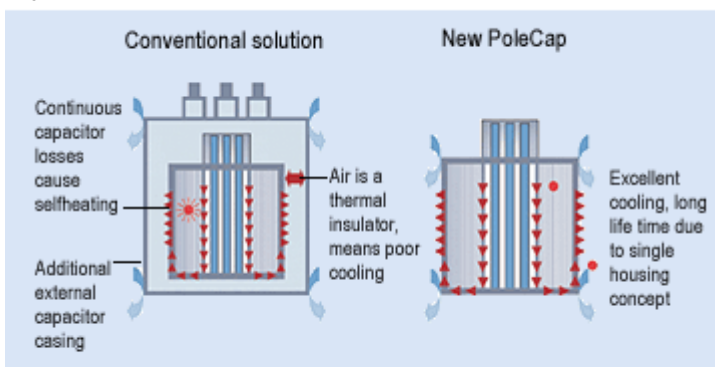


- 2 A marking ring under the capacitor lid makes a triggered overpressure disconnector visible from a distance.

Superior thermal response

But what makes PoleCaps unique is their thermal response. The conventional solution for capacitors designed for outdoor use or mast mounting is to fit an additional protective casing. Capacitor losses lead to selfheating that heats up the space between inner can and outer casing. This accumulated heat then surrounds the capacitor, which is heated up already, like an electric blanket. Insufficient cooling then makes premature aging of the capacitor inevitable.

3 | Conventional solution versus PoleCap



- 3 Capacitors with an extra casing (left) for external mounting suffer from a build-up of heat that shortens their operating life.

PoleCaps, on the other hand, are designed to prevent this extra heat reservoir from forming → 3. Tests have shown that PoleCaps with their single-can design operate at a significantly lower temperature than conventional capacitors with additional steel casings. The PoleCap uses convection alone for inner cooling. This property gives it a longer operating life and higher reliability.

In order to accurately compare the thermal behavior of two capacitors with and without additional protective casings, tests were carried out in Malaysia under extremely harsh climatic conditions. A voltage of 440 V was applied to both capacitors, which were exposed to direct sunlight. Evaluation of the temperatures measured with thermistors shows that the can and core temperatures of the capacitor with the extra casing are significantly higher than for the PoleCap.

The PoleCap without extra casing attains a hot-spot temperature 7 °C lower than in conventional solutions. This is a significant advantage, as experience shows that a temperature reduction of this size roughly doubles the operating life of the capacitor.

India opts for PoleCaps

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Jaipur Vidyut Vitran Nigam Ltd. (Jaipur, Rajasthan, India) was one of the first power companies worldwide to opt for PoleCaps. In future, capacitors with an overall rating of 37250 kvar will help stabilize the electricity grid in that region, reduce losses and considerably improve power quality.