

ADVISORY NOTE

A service to A.G. Coombs Group Clients



Optimise Power Quality and Reduce Costs with Voltage Regulation

Electricity supplied at voltages that exceed the rated design of an electrical device can result in increased energy consumption and costs, and significantly shorten equipment lifespans.

Voltage Regulators are a well-established but underutilised technology that can significantly reduce power consumption in buildings as well as improve equipment performance and longevity.

Why Optimise Electrical Supply Voltage?

The statutory electricity supply range for Australian voltage levels for households and commercial buildings is 230V (Single-Phase supply) and 400V (3-Phase supply) with a maximum deviation of +10% / -6%. That means that electricity suppliers are required to provide a voltage level that is between 216V and 253V or 376V and 440V respectively.

On average buildings are supplied at 247V / 430V.

Most electrical equipment manufactured for the Australian market is designed to work most efficiently at the mid-range of 230V or 400V.

Voltage Regulators - Available Technology

Voltage optimisation equipment operates to limit voltage variation to a narrowly defined band. There are 2 options available:

- Hard wired solutions such as Constant Voltage Transformers (CVT) can produce a constant voltage output of +/- 3% irrespective of the incoming voltage. These are a set and forget device that need to be disassembled if adjustment is required.
- Electronic Voltage Regulators provide real-time correction by injection of secondary voltage waves in antiphase to reduce supply voltage to the desired level. These are a more intelligent device with an interactive key pad screen to enable monitoring and adjustment.

Benefits of Optimised Supply Voltage

A Voltage Optimisation device effectively acts as a filter for power supply into a building's electrical system. The potential for energy savings is a key benefit, this is achieved by the reduction of the voltage and thereby energy consumed. Additionally, the site's power factor may also improve in the order of 5-10%. This could have a direct affect on reducing the electrical supply charges depending on the tariff arrangement. The reduced energy consumption will also assist in improving the facility's NABERS Energy or Green Star Performance rating.

The extent of energy usage improvements that can be achieved will be influenced by the type of equipment operating in the building and its occupancy - usage profile.

Typical energy cost reductions in a commercial building can range from 8 to 12% and the Simple Pay Back for voltage optimisation can be as short as 2-3 years.

In addition to the commercial advantages there are a number of technical benefits that a voltage optimisation system can provide:

Reduction of Harmonics: This is achieved as part of the voltage transformation process and is particularly effective in systems where voltage imbalances are present. Harmonics are common in building electrical systems and cause damage to sensitive electrical and electronic equipment.

Elimination of Voltage Transients: Also known as Voltage Spikes, transients are typically generated by the switching of large loads, i.e. motors and electrical drives, or lightning. These can have damaging effects on electronic equipment and are becoming a more common issue due to increased distributed generation arrangements, such as on-site power generation systems e.g. solar power, tri-generation etc.

Phase Balancing: Voltage optimisation can help balance the power supply through each leg of a 3-phase electrical supply. This will significantly improve the efficiency of 3 phase equipment, reduce their noise and vibration output, as well as extend equipment life.

Is Voltage Optimisation for My Building?

To determine whether Voltage Optimisation is a feasible option to reduce energy cost and increase efficiency and longevity of the installed electrical equipment the operational requirements of the building and its main energy consuming elements must be well understood. The type of electrical loads and equipment efficiencies directly influence the savings that can be achieved. As voltage optimisation equipment is sized to the maximum electrical demand, the site's load profile will provide an indication on Return-On-Investment. A consistent load profile close to maximum demand provides highest returns.

Other important considerations relate to potential limitations associated with the existing electrical installation such as the age and condition of the switchboard and the extent of spare capacity and space availability in the switchboard. These aspects must be properly considered prior to the design and installation of a Voltage Optimisation System.

For guidance on the above contact:

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