

Power Efficient Systems Ltd (PES) is one of the leading manufacturers and supplier of Energy Saving systems for industrial and commercial clients within the UK, our approach to energy reduction at a plants source or on individual circuits using a number proven technologies combined is quite unique within the UK and is proving to be a solid and cost effective route to reduce energy costs and carbon emissions in an ever increasing energy conscious environment.

Our EnergyAce Voltage Optimisation power savers are built around proprietary patented technology for controlling the voltage supplied to the load.

This document focuses on the patented technology used in our EnergyAce Voltage Optimisation power savers.

The concept of reducing energy consumption by controlling the voltage goes way back to the 1950s and many systems have been introduced over the years which can be placed into two main categories:

- Autotransformer
- Phase controller

However, both systems have considerable disadvantages as detailed below.

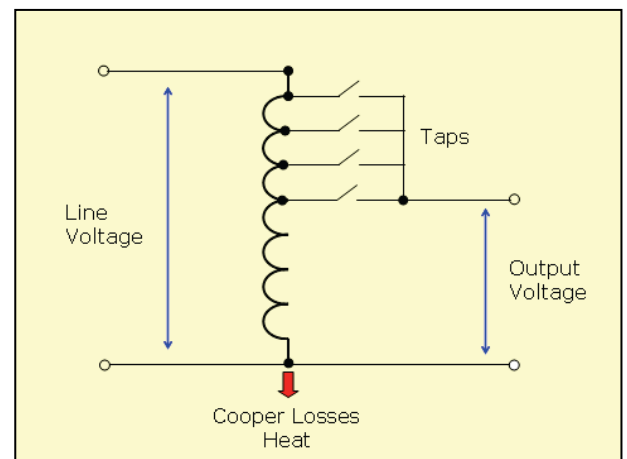
Autotransformer

An autotransformer is a transformer that has one winding, a portion of which is common to both the primary and the secondary circuits.

Multi-taps or mechanical control can be used to adjust the winding ratio to control the output voltage.

An Autotransformer will provide a sinusoidal output voltage to the load, however they have a number of disadvantages:

- **Large Physical Size** and weight due to high copper & steel content which can make it an expensive solution.
- **High Installation Costs** in small switchrooms and areas with little space to spare.
- **High kw/h Losses** due to the high copper content in its design, typical copper losses in a transformer can be around 3% -5% which also leads to special considerations for heat dissipation which in some applications is not suitable for installations in commercial indoor applications such as retail and office type environments, etc.
- **Poor Control**, mechanical control or multi-tap systems can be unreliable and will not provide dynamic control of the output voltage.

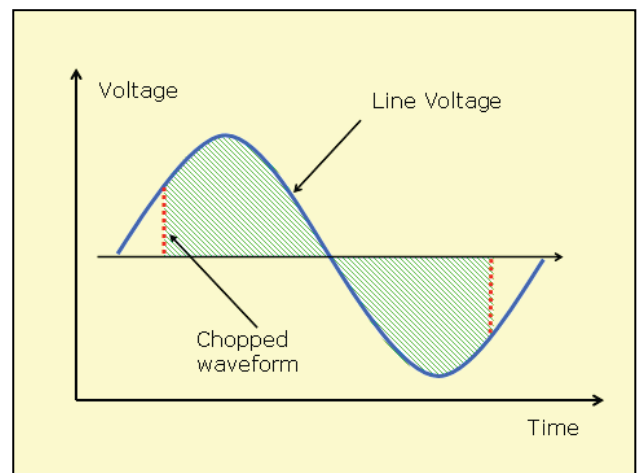


Phase Controller (“Wave Chopper”)

Phase controllers use electronics to control RMS voltage by chopping part of each voltage cycle. These electronic devices are typically lighter and more compact than autotransformers although waveform chopping can produce undesirable effects in the form of harmonic distortion that can affect sensitive electronic systems and plant.

The disadvantage of phase control systems are as detailed below:

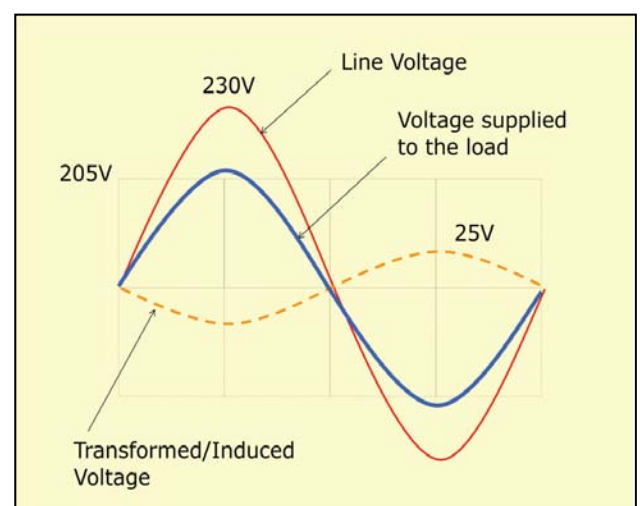
- **Increased Harmonic Distortion** and system losses which can create electromagnetic interference of control equipment, computers and communications systems.
- **Non Compliance** with EMC requirements, many phase controllers fail to comply with EMC requirements.
- **Waveform Alteration**, altering a sinusoidal waveform increases Current Crest Factor (for sinusoidal waveform the CCF = 1.41), some lamp manufactures void their warranties when CCF is higher than 1.70.
- **Waveform Chopping** increases the “zero-crossing” time interval which can create visible flicker.
- **Life Expectancy** of plant and systems is notably reduced in the presence of one or more of the effects above.



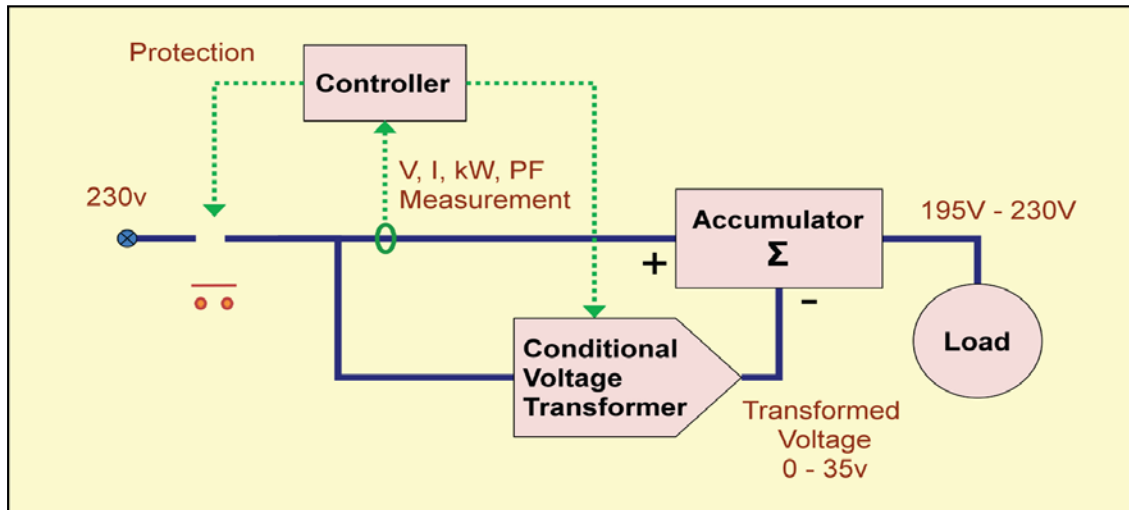
Solution - EnergyAce Power Optimiser

Unlike autotransformers and phase controllers, PES EnergyAce Voltage Optimisation is built around a proven proprietary technology that reduces only the “unnecessary energy” by transforming only part of the voltage that is to be reduced in the output while supplying the correct voltage to the load.

This unique transformer topology technology Induces a Negative Voltage (INV) vector to the line voltage, this summation of the line voltage and induced voltage creates the desired and stable result of a reduced voltage at the output.



This design technology results in a pure SINUSOIDAL output voltage and allows for the EnergyAce to be manufactured as a highly efficient and compact device.



The main advantages of the technology used in EnergyAce are as detailed below:

- **Pure Waveform**, all EnergyAce systems supply a SINUSOIDAL voltage waveform to the load
- **No Distortion** or harmonics, all EnergyAce systems are THD/EMI free and in most cases reduce the degree of distortion on the electrical supply.
- **Voltage Stabilisation** of the system voltage to the load, this allows for increased financial savings and greater control of the voltage
- **Seamless Bypass** in the event of low system volts, this technology allows for a seamless bypass to ensure damage to plant is not incurred in the event of temporary low line voltage.
- **Increased Savings** through low loss technology, only a small part of the voltage is transformed (EnergyAce up to 20V on 230V network, EnergyAce Light up to 35V on 230V network) ensuring the system losses remain very low.
- **Compact Design**, the technology allows for installation in the smallest of areas
- **Increased Life Expectancy** of plant and associated systems
- **Communication**, remote programming & two way digital communication for integration with BMS solutions
- **Real-time and astronomic clock** for the efficient control of outside lighting as an example.
- **Manual bypass** is included as standard within the EnergyAce design

