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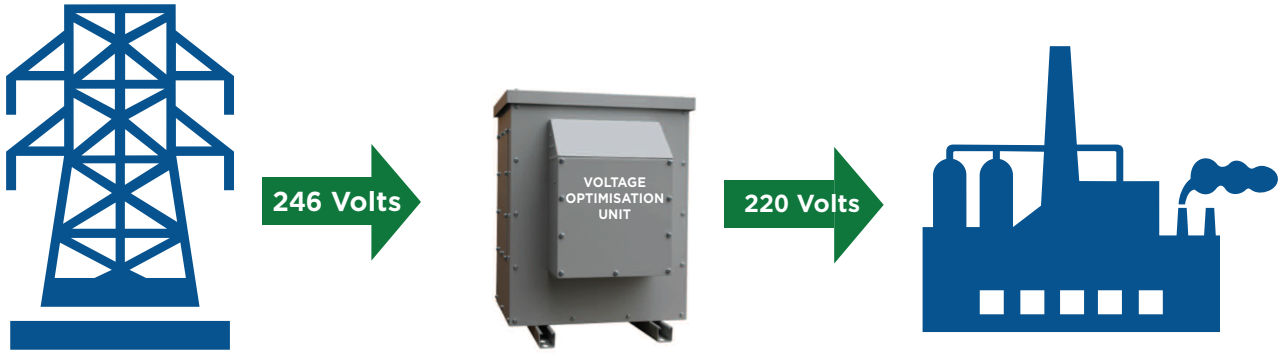
Energy Management

AN OVERVIEW TO

Voltage Optimisation



Reducing energy consumption is key to cutting bills, lowering carbon emissions and reducing exposure to fluctuating energy prices.

About voltage optimisation

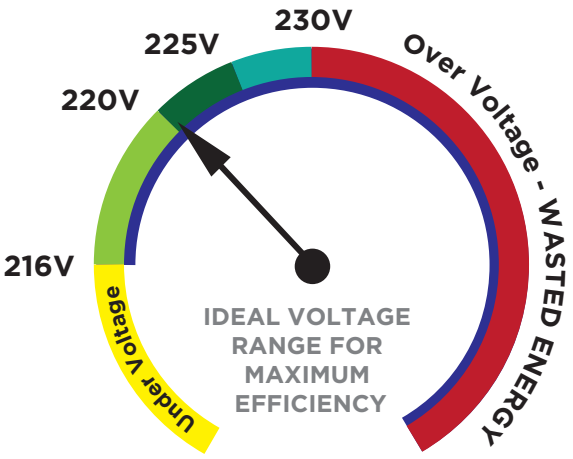
Voltage optimisation is the reduction and stabilisation of incoming electricity supply voltage to a level that the equipment in a building requires.

Historically, the supply voltage in Ireland and the UK has been set at 240VAC +/- 6%, effectively giving a supply voltage spread of 226VAC to 254VAC. For three-phase supplies the voltage was 415VAC +/- 6%, the spread being from 390 V to 440V.

All generation, distribution and transmission equipment has been set up to deliver this voltage, within this tolerance.

European Harmonisation (EN 50160:2007) has seen the supply voltage standardised across the EU at 230VAC +/-10%, giving a supply voltage range of 207V to 253V. For three-phase supplies the voltage is 400VAC +10% -6%, the spread being from 360VAC to 440VAC.

Ireland and the UK have yet to fully harmonise, with the current supply voltage limits set at 230VAC +10% -6% (Electricity Safety, Quality and Continuity Regulations, 2002) giving a supply voltage spread of 216V to 253V For three-phase is 400VAC +10% -6% giving a spread between 376VAC and 440VAC.



The historical supply voltage in mainland Europe was set at a nominal 220VAC. As this voltage is still within the harmonised voltage tolerance range, no real change has been made to the European electrical equipment either. Most equipment for use within the European market, including Ireland and the UK, has been manufactured to operate optimally at 220V, with the result that equipment used within Ireland and the UK is operating overvoltage.

- Running equipment overvoltage can result in excessive losses in the form of heat, which in turn can reduce the life cycle of the equipment.
- Running equipment at its optimum voltage can therefore reduce losses, reduce energy consumption, reduce CO_2 emissions and ultimately reduce energy costs.

207V Electrical equipment will operate adequately even at this level.	**216-220V** The ideal voltage to maximise equipment efficiency.	**242V** The average level at which voltage is supplied in Ireland and the UK.	**253V** The maximum level that electricity should be supplied.

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Voltage can be reduced by numerous methods

- Adjusting the tapings of the transformer, where the transformer is client owned. The primary advantage of this method is that it is inexpensive to implement. Most transformers are supplied with various tap settings which can be adjusted to raise or lower the voltage as required. A power shutdown is required to adjust the settings. The main disadvantage is that the tap settings are preset and fluctuations in input voltage may result in lower than permitted output voltages.

- Using voltage regulation equipment, such as Digren Energy's Linear Optimisers will:

    1. Automatically adjust output voltage to maintain a preset level irrespective of fluctuations in the input voltage.

    2. Reduce energy costs

    3. Reduce carbon emissions and improving the useful life of operating equipment in a building.

    4. Certain models can also help balance phase voltages.

    5. Will partially filter out harmonics and transients.

It is claimed by proponents of voltage optimisation that energy savings of up to 25% can be achieved by optimising the voltage level to 220V by minimising the losses within the equipment. The actual level of energy savings is highly dependent on the type of equipment installed. Variable speed inverter drives, high frequency lighting and switch mode power supplies for example, will not provide as great a savings due to the fact that the voltage fed to load is generated electronically and is therefore not as reliant on the supply voltage.

Temperature controlled heating also offers lower energy savings as the heater consumes the same amount of energy, albeit across a greater length of time. Where installed, voltage optimisation techniques have been shown to achieve average energy savings of 13% over a 5 year period.

Principles of Voltage Optimisation

Like all good ideas Voltage Optimisation is very simple and can be easily demonstrated using Ohms Law_P=IV, where P= Power, I= Current (amps) and
V= voltage.

If you run a light bulb at 240v and it draws 1A then the power that is drawn from the supply is 240W (240v x 1A)

Using Voltage Optimisation, we reduce that voltage to 220v. Therefore the power drawn is now 220W (220v x 1A)

You can now see that by reducing the voltage by 20V you have reduced the power consumption by over 8%.

In reality, if you were to reduce the voltage, you also reduce the current which means bigger savings.

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The Latest Technology in Voltage Optimisation

Digren Energy uses the latest Voltage Optimisation technology. With techniques such as the unique automatic bypass function, you can rest assured that your electricity supply will run smoothly at all times. If the unit detects any problems it will automatically switch back to the mains supply - and will safely return to the energy saving mode once the mains supply has stabilised.

Applications

Our optimisation units are designed for use in nearly all premises including: industrial, commercial, small businesses and even residential. Wherever there is an electrical supply, there is a potential for savings. Therefore the applications are endless.

That said we only generally recommend the installation of voltage optimization units if the return on investment (ROI) is sub three years.

Specification For Typical Optimisers

Digren Energy Optimisers are built to your individual requirements, so we can cater for any input voltage. These are available as single or three phase.

Single phase units from 60A up to 400A and larger on request.

Three phase units from 100A to 4kA and larger on request.

Input	420V 3 phase 50Hz
Output	adjustable from 380-400V ±0.5%
Ambient	-10°C to 30°C
Impedance	<5%
Ingress Protection	IP43
Typical Efficiency	>99.5%
Output	Continuously monitored and automatically adjusted
Standard Equipment	Automatic overload bypass* Status Indication Digital power display meter Multi gland plate for easy installation

*Automatic bypass standard is rated at a maximum of 2 x optimiser load rating. Higher ratings are available at extra cost.

Optional Equipment	Wired/wireless comms Audible bypass alarm Installation Castors
Extended Range	Wider input voltage range between 350V and 480V Higher IP ratings

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