What is Voltage Optimisation?

Voltage optimisation is a technique employed to ensure that all energy delivered into a premise is cleaned, regulated, and optimised to not exceed a certain level. This often includes assessments for any energy-using equipment held within the building to see how the use of power could be streamlined to save both energy, and money. This two-pronged approach will not only extend the lifetime of any electrical equipment involved, but will reduce emissions and expenditure. Voltage management, power-optimisation, and the cleaning of energy can produce dramatic results.

Voltage optimisation is a transformer-based technology that comes in a multitude of forms. All work to control or optimise incoming grid voltage to return an energy saving. At its most simple – voltage optimisation is a form of voltage management that is specifically designed with the aim to reduce energy consumption.

How does voltage optimisation save energy?

The electricity supplied from the National Grid can be at much higher voltage than is necessary for most homes or businesses. This is mostly down to ageing electricity distribution networks, as-well as electricity suppliers being required by law to all buildings within pre-set parameters.

Voltage optimisation is a general term – but will often include some form of reduction in excessively high voltage levels through regulating power supply.

How does voltage optimisation work?

An agreement was reached in 1988 to create a shared common voltage level throughout Europe, based upon a 230V/400V system. This agreement became known as Voltage Harmonisation and didn't come into effect until 1995.

The first stage of voltage harmonisation decreed that a supply voltage of 230v was to be used, but with allowances of deviation in the range of -6% and +10%. If your mental maths is a little rusty – this means that grid voltages could range from 216 to 253V. This remains the official standard to this day.

It has since been proposed that a second stage should be introduced, with the voltage remaining the same but a wider breadth of tolerance. Proposed tolerance limits are -10% and +10%, meaning grid voltages between 207 and 253V.

The European Union introduced the Low Voltage Directive (LVD) in 2006 to try and simplify the market for electrical goods. The directive would go on to regulate the operating voltage of electrical equipment within the EU – any goods that meet the terms of this directive would be able to operate on harmonised voltages and will show the CE mark.

However, the CE mark doesn't necessarily mean that the device operates efficiently or to an appropriate lifespan – just that that it operates safely. There are those that believe voltage optimisation exploits CE mark regulations and the LVD rather than offering any uniquely special savings. You are free to make your own mind up about this…

As voltage can be described almost as a pressure, the increased voltage will have adverse effects when it comes to the lifespan of an electrical product. Running an electrical appliance at higher voltages than necessary will shorten the potential lifespan. By optimising the voltages supplied to these devices will allow for regulation towards EU levels, protecting the device and delivering savings.

What are the voltages I should know?

Traditional	**European**	**Harmonised**
240Vac	220Vac	230Vac +10% to -6%
415Vac	380Vac	400Vac +10% to -6%

Voltage Level	**Code**	**Voltage Rating**
Low Voltage	LV	up to 1000V
Medium Voltage	MV	1000V to 35kV
High Voltage	HV	35kV to 230kV
Extra High Voltage	–	above 230kV

Realistically, you will never need to know any of these voltages of by heart. Electricity is usually generated at high voltages and then transformed along the UK distribution network down to the single and three-phase voltages you can connect to. Voltage is often generated at a higher level than is needed due to losses from throughout the distribution system to point of consumption.

The European electrical AC voltages are separated based upon voltage, and classified accordingly. These are High Voltage (HV), Medium Voltage (MV), and Low Voltage (LV). These can be seen on the table to the left.

Further to this – Western European supply voltages were harmonised to 230Vac single phase and 400Vac three phase in 1995. (The details of this can be found within the table to the right). One of the main reasons why voltage optimisation is so successful in generating savings for UK businesses is that there is such a wide variety in voltage levels.

Who is this important for?

If you think that you operate a business that receives electricity at a far higher voltage than you require it – then this information is invaluable to you. This problem is widespread throughout the UK, with the numbers of businesses who could benefit from this technique in the thousands.

The best thing about using this technique is that it's not just you who will benefit from it – but others too. You will benefit from the extended lifetime of your electronic equipment and lower monthly costs, while the rest of the world will benefit from lower emissions and electricity usage.

What to bear in mind…

Voltage optimisation is something that should be left to experts. With most sustainability tips and tricks, they are easily implemented after a little research – not in this case. Any companies offering voltage optimisation are trained specialists with a huge amount of expertise and specialist equipment.

This isn't something that will take *immediate* effect after deciding to take the plunge. Companies will need to survey your site before deciding on an implementation plan. After all, businesses are like snowflakes – there are no

two completely identical. What works for one business may be completely unnecessary at yours, just because your competitors make huge savings does not mean you should automatically assume you will too.
If you are a domestic customer – this doesn't mean you are excluded from the conversation entirely. The potential for return on investment is just so much higher for business customers that they absolutely should be the main focus of this article.

The pros and cons of voltage optimisation

Pros	**Cons**
Lower monthly bills and lower carbon emissions from streamlined energy consumption.	Initial cost can be very high – research should be undertaken to determine if it is worth it long-term.
Quite often will pay for itself within 2-years time.	During set-up or maintenance related to voltage optimisation, you may find your power supply disrupted.
Tried and tested method – voltage optimisation has been implemented for over 100 years.	
Normal energy savings by appliance are as follows: -14% on chillers, -15% on some types of lighting, -4% on direct motors, -16% on all appliances.	
Can be installed at distribution level or the low-voltage incomer.	