Buyer's Guide for Voltage Management & Optimisation

Produced for **The Energy Managers Association**
with the support of

VOICE
Voltage Optimisation Industry Council for Excellence

Voltage Management & Optimisation - Buyer's Guide
Introduction

Summary

This EMA buyers guide is designed to give you some basic information and guidance on how to approach Voltage Management & Optimisation, helping you understand more about the available technologies and how best to apply them.

Voltage Optimisation Industry Council for Excellence (VOICE)

Based on feedback from their members, the EMA called upon the Voltage Optimisation manufacturers in the UK to form a self-governing body and work together to establish a Code of Conduct and Standard for the industry.

This Buyers Guide was written by Andrew Hawley; a Fellow of the Energy Managers Association and the founder of VOICE - a totally independent association whose members are manufacturers of Voltage Management Equipment in the UK. Andrew is an independent specialist who has had experience of working with most of the available technologies and ensures that the group remains focused on its Mission and Vision Statements.

Updates & enquiries

VOICE is planning a suite of industry guidelines. If you are a UK based manufacturer of Voltage Optimisation Equipment and would like to get involved or for further information, please get in touch via **info@voice-vostandards.com** or call **0844 585 3043.**

Where to start
Assess the potential for savings

Check your voltage

Take some readings around your building and ensure your site does have a higher voltage than necessary so that it can be reduced.

Check your electrical loads

Not all loads are 'voltage dependent'. This means that not all loads use less energy when the voltage is lowered.

Old Equipment

Some sites may have older equipment that operates on a grid voltage of 415/240V +/- 6%. This will need to be identified before dropping the voltage to it.

Available Technology
Choosing the right equipment

Fixed % Reduction

A fixed reduction Voltage Optimiser will reduce your existing voltage by a fixed percentage.

Variable Voltage Stabilisers

Stabilisers will maintain an agreed voltage within your building, within a certain percentage.

Combined (integrated Transformer)

MV/LV transformer with Voltage Management or Optimisation technology housed integrally.

Choose Your Supplier
Making the right choice

Which company?

This document does not suggest or promote any single supplier or technology. It does however recommend that you choose a supplier that is a member of the VOICE group.

VOICE membership

Companies that are part VOICE are able to use the VOICE logo. By ensuring your supplier is a member of VOICE, your supplier will operate within the agreed Standards and Code of Practice.

Voltage Management & Optimisation – Q & A
Questions for Project Managers

How easy is it to install a Voltage Optimiser?
The installation of a Voltage Optimiser requires thorough planning and co-ordination. The process itself is (relatively) straight forward but you should only use qualified and experienced companies and suppliers. Any work that involves electricity is highly dangerous and should only be carried out by a qualified electrician.

What is the typical supply voltage in the UK?
This varies widely (which is why a site survey is so desirable) but typically, although the official nominal supply voltage is 230V, the actual voltage fluctuates around an average of 242V.

Why is my grid voltage higher than it needs to be?
From 1995, the statutory specification for grid voltage within the UK was 400v/230v +10/-6%. Whilst the technology can be used in both 3phase and 1phase environments, this means that single phase voltage in the UK can be as low as 216V to as high as 253v. This means that in the UK, equipment designed for use in the European market place is often used at a higher voltage than the equipment was made for. As a result the equipment may consume more energy than necessary.

How long does installation take ?
Each site has specific requirements and so each individual installation should be looked at separately. Most works will be completed prior to switch over to limit equipment downtime.

Will my building(s) have power during the installation and/or switchover period ?
It is possible to use 'portable' generators to maintain power to your building during the implementation of any device that sits in series with your incoming power supply. To do so, two short power outages would be required – the first to disconnect mains electricity and connect the generator and the second to return the site to its original state - but with the new device installed. Most if not all engineers and installers are used to working outside of normal hours, minimising disruption as far as possible. This is the more common approach and would require one, longer outage – usually done overnight.

Do I need to contact my energy supplier to switch off the supply during works ?
Normally no contact would be required and where required the installer will normally deal with the energy supplier arrangements directly but you should ensure any costs are included within your ROI calculations.

Voltage Management & Optimisation – Q & A

Questions for Buyers

Can I take Voltage Readings myself?

The connection of voltage logging equipment is highly dangerous and should only be undertaken by an appropriately qualified electrician. Three pin plug type loggers can provide basic voltage information but three phase logging is more reliable when calculating savings.

How will the Voltage Optimiser be rated/sized?

The ratings of your Voltage Optimiser will be based on your maximum demand, the rating of your incomer and any future allowance for expansion that you need. The Optimiser will not usually be rated higher than your existing incoming supply although there may be reasons for doing so to account for planned increases in demand for example.

Does the equipment require a By-Pass Switch?

The equipment should have the ability to be isolated for maintenance or shutdown works and so we always recommend the fitting of a bypass switch. Some models now incorporate internal bypass systems but these should not be confused with a full 'wrap around' solution which would effectively allow you to replace an Optimiser without further long outages. Even in cases where such an option is taken, it is not always the case that in doing so, an outage would be required – you should check with your supplier.

How does reducing the voltage save power?

Generally, the mains supply voltage in the UK is greater than necessary. For many types of electrical equipment if the voltage is reduced the current drops. Power consumption is the product of voltage and current, so as voltage is reduced the power falls.

Why do quotations state different savings?

The savings achieved are determined by incoming voltage, duty cycle and the electrical appliances that are to be 'optimised'. For that reason, the predicted savings need careful calculation following a full site survey. The impact of reducing the voltage will not change from one manufacturer to another - but the technology used can achieve varying results. Ultimately, the quality of the initial site survey will impact the quoted potential savings – great care needs to be taken that your suppliers survey process is suitably detailed.

Do Voltage Optimisers improve Power Factor & Harmonics?

Voltage Optimisers (unless fitted with this specific option) will generally only reduce the site (or partial site) voltages. Any improvement in Power Factor or harmonics is a by-product of the reduced voltage and current. Where 'harmonic traps' are marketed, inspection of any harmonic survey reports will demonstrate the issue. If you have issues with harmonics, then you will need to carry out a harmonics survey.

Does the voltage Optimiser replace the site transformer?

Most commonly, Voltage Regulators or Optimiser run in series with your existing MV transformer although combined transformers are now being brought to market that do combine regulation/optimisation.

Will VO produce savings on all my electrical equipment?

The simply answer is no – this is the primary reason for the site survey. Savings will vary significantly from one appliance to another. VOICE intends to release a full schedule of expected savings over the coming weeks.

Voltage Management & Optimisation – Q & A

Questions for Buyers

Of the three types of Voltage Optimisers that are available, which offers the best savings?
An Optimiser can only set the conditions for the loads to make the savings so every site is different. An Optimiser that has the ability to more closely control voltage should offer better results but this may come at a premium.

Why would we select a fixed reduction unit over others available in the marketplace?
As suggested above, commercially, a fixed unit may be more viable and being a single component - it could be perceived as being less likely to require service.

Which is the best Optimiser?
There is no question that the closer control you have over voltage, the better results you will achieve - maximising your return on investment. Often however, for physical or financial reasons - your choice is limited to a particular type of unit.

What is the average savings by voltage reduction?
Each individual site will have unique characteristics and a variety of plant and equipment, however, in our experience savings of up to 25% can be achieved but only in very precise circumstances (high voltage/old light fittings), more commonly the savings are between 5% and 13%.

What types of load are better suited for energy savings by voltage reduction?
Most loads benefit from voltage reduction as the un-reduced voltage is higher than the optimum design voltage of the equipment. As an example resistive loads and fluorescent lighting generally show the highest savings.

Will the installation of a Voltage Optimiser or Regulator have any negative effect on any of my electrical equipment?
No. In fact operation of electrical equipment with a reduced and regulated voltage will generally increase service life of the equipment.

Why do we need to have a site survey and voltage logging to establish possible savings and carbon reduction?
In order to accurately establish site suitability and energy saving potential a detailed survey and electrical logging are required.

A site survey will help you to understand the load types that exist on the site and the specific way in which they are applied. Without this basic level of detail any report could be inaccurate and potentially cause operational problems.

What is the lifetime of a voltage Optimiser?
As with any product, the lifetime depends upon its use and treatment over time. However, provided the equipment is maintained and operated in accordance with the manufacturer instructions it will give indefinite service life.

How will any savings guarantees be affected by changes to my building(s) ?
Many suppliers offer savings guarantees – you need to agree in advance who will calculate the savings at the end of the agreed term and how this will be done. Ideally, you should specify this at the point of order and agree how any changes within your buildings will impact the guarantee.

Voltage Management & Optimisation – Q & A
Questions for Engineers

Why do some site surveys include phase current as well as voltage ?
The correct way to rate any 3 phase electrical equipment is amps/phase. It's logical therefore to measure the current per phase.

Are variable transformers less reliable ?
The use of variable transformers to control voltage has been around for many decades. Whilst the use of a single component unit could be seen as less likely to require service, there is a compromise here as the savings achieved could be reduced.

By asking all the questions in this document and checking that the supplier responses are generally in line with this buyers guide, you will be guided to the best technology choice.

Why would I use a Stabiliser or Regulator rather than a 'fixed' Voltage Optimiser ?
Regulators are designed to maintain the supply at the optimum voltage and achieve this dynamically whereas many other products on the market simply give a fixed reduction in Voltage or offer the same levels of savings or protection from supply variations. A fixed-ratio voltage reduction may cause problems if the supply voltage reduces significantly, whilst Regulators may be able to automatically compensate for this. In many cases Regulators can secure increased voltage reduction and thus enhance the savings.

What is the difference between a fixed ratio Optimiser and a Stabiliser ?
A fixed unit reduces the voltage by a fixed percentage. A stabiliser reduces voltage to a preset value using either solid state or electro-mechanical technology.

Can voltage regulation be used for voltage reduction purposes ?
Voltage regulation or stabilisation can offer advantages over fixed or switched tap voltage reduction equipment not least of which being its ability to maintain the supply that can be adjusted to give optimum voltage within a close tolerance.

What is the voltage range equipment can accept ?
All electrical equipment sold in the EC needs to be capable of working with a supply voltage anywhere between 207 and 253V (230V ± 10%). Operating at a fixed, reduced, voltage of 220V (or even 216V for maximum saving) is therefore operationally realistic but most opt for a compromise of around 220v at the far point of a site.

What happens if a Voltage Optimiser is overloaded ?
Just like any electrical appliance, the capacity of the equipment should not be exceeded and protection to ensure this should be added (where not already provided) as part of any new installation. Be sure that any initial site surveys and three phase logging allows you to calculate the required capacity and allows for any future expansion.

Can a customer set the output voltage per their requirements ?
As technology advances the adjustment of a Voltage Stabiliser is becoming increasingly accessible. In some cases, cloud based software could allow output voltages to be adjusted but this should only be done by fully trained and authorised personnel.

Voltage Management & Optimisation – Q & A
Questions for Project Managers

How is VO installed ?
Voltage optimisation units are normally installed at the mains supply intake point of a building, fitted between the electricity meter and the distribution panel / consumer unit.

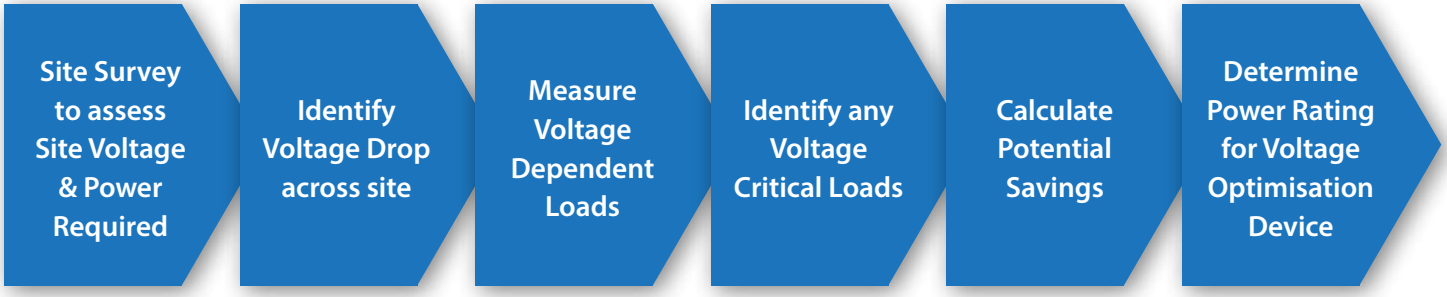
If space is restricted at the mains supply intake point, then commercial voltage Optimisers can be located away from the building intake point and fed via additional cable runs of a suitable size and rating conforming to BS7671:2008.

Voltage optimisation must be installed by a competent qualified electrician complying with BS7671:2008 (if in the UK) and all current amendments. If voltage optimisation is being installed outside the UK all relevant electrical standards for the country of install must be adhered to.

As with any major electrical installation, thorough planning and preparation is required to ensure a successful installation.

What process should be used to identify the potential savings that can be achieved ?
Individual VOICE members will have their own specific procedures, but these should follow a basic process very similar to that described below. It is of critical importance that each of these steps are followed at some stage.

Basic Savings Assessment & ROI Project Planner



What happens on shutdown night ?
In most cases, all the preparation work will have been done well before your chosen 'changeover' day. Generally speaking, the buildings most likely to deliver the best savings are likely to be in excess of 5 – 10 years old. For that reason, consideration needs to be given to any issues that may arise as a result of a full power shutdown. Mains breakers/isolators should have been tested regularly but a plan needs to be in place to handle any unexpected technical issues that may arise on the night. For that reason, it is recommended that a full team is either on site or on call and notified well in advance of the shutdown to minimise the associated risks.

Give consideration to having your own electricians and refrigeration engineers on site or on call (if applicable). Also consider the appointment of an independent project manager to oversee the entire process. This will add an additional level of protection for you and ensure that your installation goes as smoothly as possible.

This guide is designed to give you the best chance of securing the maximum benefit from any Voltage Optimisation installation. If you have any further questions, please get in touch with the EMA team, contact VOICE directly on 0844 585 3043 or refer to their website www.voice-vostandards.com

Serving Energy Management Professionals

Goals
Driving Purpose of establishment

The Industry
Raise Energy Management as an issue in the Boardrooms of Industry & offices of government.

The Professionals
Improve the standing of those working in the Energy Management Industry.

The Career
Establish a career path to encourage interest in the Energy Management Industry

Accomplishments
Successes in first year of EMA

Leading Industry
Becoming recognised by government as the VOICE of the energy management industry.

Energy Management Qualifications
Building the basis of qualifications for Energy Managers with the completion of Level 1 & 2 standard.

Training Delivery
Training Provision in EMA approved courses for non-energy specialists.

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