



The Enercon Energy System

Understanding what you are selling is the most important step in a successful career with Enercon. This section is completely devoted to understanding Enercon's unique system based approach to reducing customer electricity costs. If you comprehend the concepts taught here, you will have taken the first step in developing your flourishing Enercon business. That step, when followed by proper understanding and growth, will help you in continuing a very satisfying and economically triumphant career with Enercon.

The first rule it is imperative to comprehend is that Enercon offers no magical equipment to perform electrical consumption reduction. Everything we do follows basic electrical laws and concepts that anyone, properly educated, can duplicate. What makes us distinctive is our treatment of these concepts, which are based upon decades of electrical engineering experience in the field. Enercon offers a system for reducing the costs of operation of the electrical equipment and systems your customer already owns. These cost reductions actually pay for the cost of the Enercon system, allowing the customer to pay for the system with a portion of the money they are currently spending on their electric bills. Therefore, our approach is not an equipment approach, but rather a financial one. We give our customer the opportunity to reduce their future costs and save money by redirecting revenue they already allocate to electricity.

The Basics

Electric bills have been a cause of complaint for business owners and their managers since the electric company sent out the first one. Everyone, especially business owners, want to spend less for utilities. Our business concept is based on the idea of doing just that, reducing electric bills for facility owners.

Key Fact

Electric bills must be paid every month.

Initially, before you can sell this system, you must comprehend: Enercon's system allows diverting money normally paid to the electric company, into a set of facility improvements that reduce operating costs, as well as improve operations and reliability. Whether your customer chooses to buy our system or not, they are still spending this money anyway like clockwork with the electric company. So the most important idea in understanding Enercon's system is that it is not technical decision at all, rather a financial one. You are giving your customer an option as to how they spend their money. They can reduce what they pay to the electric company by rerouting some of that money into a system that will reduce their electric usage, pay for itself, and leave revenues remaining in their operating budget.



There is a whole list of accompanying improvements that occur from what we do for our customers. Candidly, even if our method didn't compensate for itself from the electrical savings, these side benefits alone would be a great incentive for investing in our products.

So let's look at the other benefits, (side effects), gained by a customer installing an Enercon system:

- Motors run cooler
- Light bulbs and ballasts run cooler
- Transformers, panels, switchgear, breakers, starters, controls and wiring run cooler.
- SCRs, diode arrays, switching transistors and microprocessors all run cooler.
- Switching power supplies are more stable.
- Process and production controls are more accurate and reliable.
- Air conditioning and refrigeration are more effective and reliable.
- In-house and outside maintenance and labor costs are reduced.
- Equipment repair and maintenance costs decrease.
- Light bulb and ballast replacement costs decrease.
- Costs of production are decreased.
- "Downtime" is reduced.
- PC screens flicker less.
- Computer data is safer and more secure.
- Computer operations are more reliable and stable.
- Lights flicker less.
- Circuit breakers trip less.
- PLC's and other automated controls malfunction less.



- Improved Power Factor

These benefits are resulting from the decrease of heat, friction, and harmonic imbalances in the facility's electrical distribution system. Improved power factor also helps with the creation of these positive side effects.

Any business owner or executive should love to receive all these operating improvements, especially if they were gained at no additional cost to their current budget. That is the primary benefit of the Enercon system.

Key Fact

An Enercon system has only positive side effects.

The "side effects" of an Enercon system have genuine value. However, rather than attempt the difficult job of accurately determining this fiscal value, we use the much simpler method of calculating the electric bill savings. This means we don't need to rationalize the purchase of an Enercon system on these side effects; the savings on the electric bill will do that itself. However, don't forget the positive benefits from the system, for they are worthy of discussion.

Key Fact

Customers will be apprehensive about the effects our work will have on their equipment procedures and dependability.

This point will come up quickly in the opening sales contacts. "Downtime" is a dirty word to all business managers. They will be prone to believing that our electrical work will cause problems, not answers. Most likely they will begin with thinking if what we say we can do is valid, their electricians would have already considered it. For this reason we need to be assertive in addressing this issue early in our sales presentation. The demonstration is an especially competent way to manage this early opposition. When done properly, your demonstration will show that there is no change in operation or use of the motor. Have your potential customers put their hands on the demonstrating motor, ask them to listen and watch the amp meter. Dare your audience to see, hear or feel any variation in the motor operation after you connect the PhaseSaver. They should not see, hear or feel any change. That is because our treatment will have no adverse effects on the operation of that motor. If this is properly explained here it will not become a major issue or objection later.

You would be wise to discuss the positive side effects of an Enercon system in with your technical explanations of what we do. These "extra benefits" alone are well worth the cost of an Enercon system.

What Enercon does is scrutinize your electrical distribution system and find ways of phasing in passive technology that will reduce your kilowatt consumption from 5% to 15%, or more. We do



this by applying our skills to dramatically improve the operating efficiency of your distribution system, reduce your maintenance and replacement costs, and increase the reliability of your production process.

The Whole Facility

The next most important element of an Enercon system is to address the entire facility as one project. Our work builds upon the concept of creating small savings all throughout a plant's many different types of loads, and then adding them together to get a very noticeable savings total.

Enercon continues to focus on the electrical distribution system itself instead of the way many vendors focus on the loads of the facility by offering ever higher efficiency

A/C units, refrigeration and chiller systems, as well as electric motors and lighting systems, Even though each of these options offered by other vendors can save the facility money, they are costly and short sighted at best. Even after these options are incorporated, Enercon can still find great areas of savings not yet touched. Our view is that our customers know best what equipment to install to meet their needs, and that our work should focus on the electrical system correction work that will deliver just the right power to all of their loads.

Because we focus on making power corrections in the electrical system itself, it does not matter if they have an energy management system or high efficiency equipment. Enercon's work can be overlaid on any pre-existing work and still find desirable savings.

Important exception: If you find pre-existing power factor correction devices at individual loads or sub panels contact Enercon staff for advice. This situation may not be suitable for correction by Enercon products.

It is important that your customer understands this distinction, that your work is not aimed at the individual loads in their buildings. In fact it has nothing to do with the operation and reliability of these loads. Motor and equipment loads receive the same or improved voltage, electrical waveform, and current supply after our work is performed as they did before.

Key Fact

Enercon corrects the electrical system, not the loads.

Initially in your surveys you will be taking nameplate data from individual pieces of equipment to help determine the electrical loading and the type of that electrical loading throughout the buildings branch circuits. As you grow in your business we strongly advise you to learn how to take electrical readings of power factor, as well as gather information about the layout of the electrical system panels and transformers. All this information is used to determine the recommendations within a specific Enercon project proposal.



Enercon's Non Technical Approach

Really, the least important, and what should be the least emphasized element of an Enercon electrical efficiency system are the various technologies (Enercon products) that might be installed.

As easy as that may sound, many affiliates have struggled with this issue. If our affiliates are struggling with it, so must their customers be as well. So, just what makes an Enercon system so special if it is not the products?

First, an Enercon system is a unique financial proposition. We go into an operating business to find and look at the many different points where electrical effectiveness can be improved, and then accept the inclusive responsibility for executing our work. We have even arranged a third party insured savings program or assurance system for all of our projects.

Second, our customers do not have to make any changes in the way they operate their business for our system. There is no employee training or participation in the operation of our system. An Enercon system is an invisible way to lower their electricity costs, since there is no cycling on or off of their equipment with harmful impact on their business operations.

Third, everything in the customer's facility will operate better when we leave than when we came, because our concentration is on reducing the wattage drawn throughout the total electrical distribution system; as well as on completing indicated electrical system improvements which assure exactly that. Improved production times at reduced KWH consumption on the electric bill are added to less maintenance, fewer repairs and replacements, and less downtime as a result of our system.

What makes an Enercon system so special is that it is a truly matchless chance for a business owner or manager to enjoy better operations and lowered electricity costs, all from a one-time project that pays for itself from its savings, and is fully guaranteed.

Contrasting Approaches

Another way to consider the singular value of an Enercon system is to balance our approach to that of other electrical conservation measures. Some examples of which are:

1. Lighting Retrofits

The typical approach for gaining efficiency with facility lighting is to remove old existing fixtures, and replace them with new ones.

Another tactic is to replace the old ballasts and lamps with newer more energy efficient ones which are suitable with the old fixture. Enercon can create even more energy



savings by taking this approach and blending it in with our work. Our affiliates can do this retrofitting and still apply our passive energy saving products to the finished work for additional savings and profits to the customer.

2. Motor Replacements

A common recommendation will be to replace older electric motors with new high efficiency motors. Under the Enercon system, this is not recommended. When an older fully loaded motor is replaced with a new energy efficient one with a lighter load, there is usually a very small wattage (under 5%) reduction. The facility owner will expect a higher savings (more like 15%) because the comparisons will be with fully loaded motors.

However, most motors are operated under lightly loaded situations. When a new high efficiency motor is mechanically under-loaded it will run at a poor power factor, and demand similar wattages as the old motor did. This is a common scenario, hardly ever discussed by the manufacturers of high efficiency motors.

Enercon's approach is to leave the older motor in place and correct the wasted power it may demand from the electrical system, upstream of the motor itself. This lowers the cost added to the electric bill by that motor, but does so in a way that provides positive side effects without touching the motor itself; therefore resulting in less cost to the customer.

3. VFD Motor Retrofits

Variable frequency drives are inserted ahead of the motor for one of two reasons. One being the process powered by the motor benefits from possessing a variable power source, and a VFD permits an existing motor to run at a controllable, variable speed. The second time the addition of a VFD for energy conservation measures is considered is when the process being powered will not be unfavorably affected by varying motor speed. An extensive discussion of VFD's would be impossible here, but a couple of major points need mentioning. First, adding a VFD to an existing motor causes voltage waveform distortions, which increase the heat in the motor windings and insulation. This increases disintegration of the motor and reduces lifespan. "Drive Duty" motors are principally designed to endure the demands created by a VFD power source. However, using these requires the purchase of a new motor in addition to the VFD. Secondly, a VFD is a high power electronics device with much shorter service intervals than the original motor. This means maintenance cycles and long-term costs to both the motor and the VFD are increased. Enercon's approach is to use rugged power correction devices whose lifespan is measured in decades, not in months or years. All of our work improves facility power quality which adds to apparatus intransigence while lengthening maintenance cycle times.



4. Energy Management Systems

An additional way of reducing electrical utilization and demand costs is to switch off the operation of major loads with the use of programmable systems. Air conditioning is the most common application of this technology. The purpose here is to keep all or most of the units from running at the same time. This type of control has little effect on KWH consumption, but it does noticeably reduce KW (or KVA) demand charges. Production related loads, such as chiller pumps, vacuum pumps, exhaust blowers, or air compressors can all be treated with the same control strategies and can benefit from the same KW Demand reductions. However, when a computer makes the decisions as to when to use or not use production and A/C equipment, then human comfort, production requirements, unplanned events, or any other fuzzy event that cannot be programmed in are ignored by the system.

Typically, companies who adopt these load cycling management systems soon tire of the arbitrary switching of the loads and either dramatically reduce the aggressiveness of the original system or disconnect it entirely. Since these systems are really elaborate on site computer systems, they demand a high price in employee training, employee oversight and operation, and ongoing maintenance of the system. Electronic controls for cycling of loads are not added by Enercon. Our system inertly works in the background without need of employee involvement, maintenance, programming or oversight for decades into the future.

The above alternative approaches to an Enercon system all illustrate an attention-grabbing set of features not shared with an Enercon system.

They are active, requiring employee or management involvements.

- Require employee training.
- They are not durable, thereby decreasing existing system reliability.
- Reduce facility power quality or reliability.
- Introduce readily evident negative side effects.
- Require major replacements of controls or equipment.
- Are very disruptive at installation, or operation, or both.



While we will not do a complete discussion on techniques considered to be rival to the Enercon system, we will compare a few other approaches to energy conservation with our own. Looking below you can see the main features of an Enercon system:

- Is passive, not involving the cycling of loads.
- Requires no employee involvement or training.
- Is durable, with a maintenance free expected life of over twenty years.
- Improves the reliability and power quality of the entire facility.
- Have exclusively positive side effects.
- Includes an assurance guarantee for promised savings.

An Enercon System only includes methods meeting these requirements. Today's Enercon system is truly a many-sided approach to facility electrical improvements. The techniques you will be implementing in your projects will include:

- Canceling reactive current demands by inductive motors.
- Adjusting power consumption demanded by different lighting systems.
- Reducing the power consumption demanded by A/C and refrigeration systems.
- Applying minor reconstruction and replacements to make lighting more efficient.
- Identifying minor electrical maintenance work to reduce system losses.

Before moving on with further discussions, please refresh yourself with the following important fact:

Key Fact

A system of verified electrical engineering and contracting methods are applied by Enercon to a customer's facility, aimed at saving modest amounts of electrical power and costs. Together, these methods, when applied as a turnkey system can create remarkable total electrical savings with a very fast payback.

Energy conservation in a cost effective and constructive manner is our goal, not selling "products". Ours is a financial sale. The "products" applied to our projects are among the least of the values offered by an Enercon system. While we could not achieve the results without these "products", they are only the tools used to achieve the goals of energy conservation in a cost



effective and constructive manner. The really extraordinary value is that we do all this work at one time; we combine all of the savings from the pieces of work completed into one considerable total savings. We then contract to do the installation and provide an assurance of the contracted savings.

Enercon's system is not founded on "products", but on knowledge and responsibility to our customers.

Go out from your training and increase your knowledge through experience and application.

The Foundations of an Enercon System

The following section discusses the specific measures implemented in an Enercon system, both the product solutions and the electrical work solutions. However, there are also three key theoretical foundations on which all the work we do is based.

1. Reducing current lowers wattage heat losses in a distribution system.
2. Adjusting voltage to certain types of loads reduces wattage consumption.
3. Adjusting the electrical system itself saves wattage.

1. Reducing Current to Lower Wattage Heat losses

Facility electrical distribution systems are composed of a collection of individual bits & pieces; wire, bus bars, switches, circuit breakers, motor starters, transformers, nuts and bolts, screws and washers, plugs or receptacles, and of course, the electrical loads themselves. These components conduct the current being demanded by the loads in the building and all of them emit heat. By reducing the current draw through all these electrical components, we reduce the wattage being emitted as heat.

Key Fact

Buildings lose up to 20% of their electric costs as emitted heat.

Actually some buildings, with incredibly bad wiring and high harmonic problems can lose more than 20% as emitted heat. In these buildings an Enercon system can make a huge difference in reducing the total electric bill. Even in newer buildings, with an electrical system in great condition, an Enercon system will create substantial savings. One of the keys in predicting the savings potential is in identifying the complexity of the electrical system. The more complex the system is, the greater the potential becomes for savings using the Enercon system.



Everything but the Wire

For years, your customer's technical and electrical staff has asserted that "line losses" in their facility were negligible, in the 1% to 3% range. How then could Enercon claim to save them 5% to 15% or even more? This is a powerful objection, and a correct one at that.

Line losses in a building are around 1% to 3% of the total building load. So if Enercon were in the business of reducing line losses, we would all be out of business. So where does

Enercon pick up the additional savings that we project?

Key Fact

Most building losses are from everything but the wires.

Key Fact

"Distribution system losses" and "line losses" are not the same.

Terminology here is very important! When you say, "line losses" you are referring to the losses directly attributed to the length of wire only. When you say "distribution system losses" you are including every single piece of electrical gear in the entire building, from the incoming transformer to the eventual load. That's a tremendous difference from just the wire.

Let's Talk About Segmentation.

As Enercon has studied our own projects, we have come to understand that the wire in the building usually has very little impact on the savings we create. As stated above, the savings potential of a building is really a function of every component in the electrical distribution system, not just the wire. Having this mindset, let's look at a new way of evaluating a building for savings potential... "segments."

Key Fact

A conducting wire always has a fastener at each end.

A "segment" of distribution system is made up of a length of wire cable (or metal bus bar) with a mechanical termination (fastener) at both ends. As an example, the wire leaving the main transformer and carrying the power to the end of the bus bar on the main service cabinet is a "segment", as is the wire leaving a motor starter and carrying power to the motor terminal. One of the main determining factors in the savings gained from an Enercon system in any facility is the number of segments between the incoming revenue meter and the typical loads in the building. The more segments in the system, the higher the savings. The fewer the segments, the lower the savings.

Key Fact

More segments = more savings. Less segments = less savings.



In all electrical systems, the wattage heating losses are an effect of current and resistance. If you increase either value, the wattage heating losses increase. Wire itself has a fairly low electrical resistance. Even very long sections of wire have a little total resistance. So wattage losses from wire are typically quite small; however, when wire is cut and placed into a mechanical fastener, (slipped into a hole in a metal block and then clamped down with a bolt), significant resistance is added to the electrical circuit. Each such mechanical fastener can add from 5 to 50 times the resistance of the wire itself.

Even very well-designed systems with properly tightened fasteners will add dramatic resistance values to the circuit's total resistance. Loosely connected or poorly maintained electrical systems will further aggravate this condition.

- Fasteners are not the only component to add resistance to a building's electrical system.
- Listed below are other components of an electrical distribution system that create segments.
- Disconnect switches
- Bus bars
- Fuse blocks
- Circuit breakers
- Heat coils in protective systems
- Motor starters
- Distribution transformers
- Isolation transformers
- Line reactors
- Solid state switching systems
- Lighting ballast

There are undoubtedly other conductive pieces that you will find in the facilities that you inspect, but these are the most common ones. Every one of the above items emits wattage as heat losses, often as much as hundreds or even thousands of feet of wire.

A distribution system segment is composed of a length of wire, with a mechanical termination (or fastener) on each of the ends, or another such piece of connected conductive equipment.

Here is a simple representation of a distribution system segment.

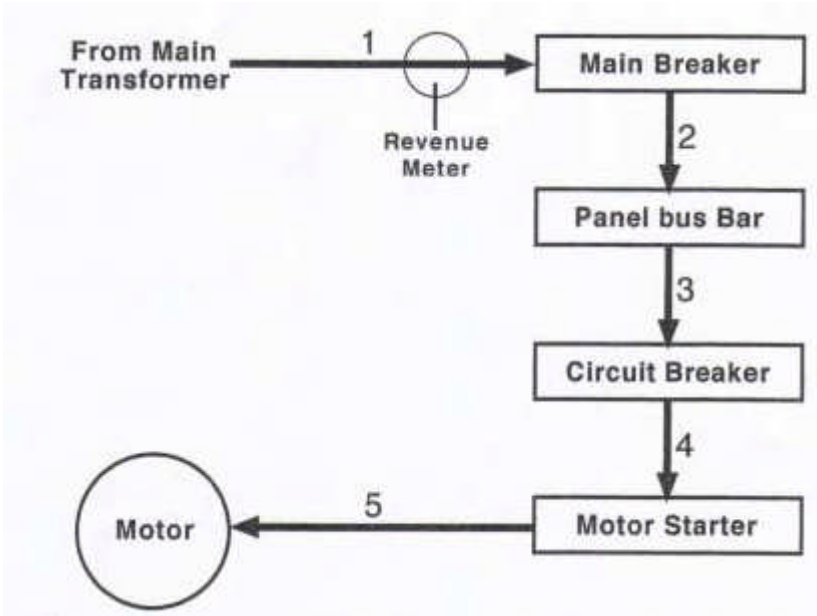
A simple segment is one length of wire providing power to a motor from a motor starter.

Here is one length of wire providing power between the main transformer and the distribution panel bus bar.



The typical number of segments in the electrical distribution system calculated into an Enercon system is between 4 and 6, coming to an average of 5. Facilities having an average number of 5 segments will easily show the calculated savings of an Enercon prepared proposal. Fewer than 5 segments will generate a lower savings proposal while more than 5 will generate a higher savings proposal.

To see a common building with 5 segments in the distribution system from the revenue meter to the typical load, let's look at the following diagram.





This is 5 segments of the typical electrical distribution system. As you can see, it will be rare to have a system that has less than 5 segments between the meter and the load. Also note that 2 of these segments are hidden inside the electrical panel itself. The first one is between the main breaker and the panel bus bar, and the second is between the bus bar and the individual circuit breaker.

In the above example, it is of little importance what distance the wire might be between the electrical components. The total resistance of this circuit is primarily in the several mechanical terminations, in the breakers, bus bar motor starter, and motor terminals...not the wire. So, regardless of the length of the wire involved, full projected savings of the Enercon system will be achieved here with the application of a properly sized PhaseSaver to cancel the reactive current demanded by the motor.

Consider All the Losses

Combinations of all facility factors are studied, in performing the needed estimation of total wattage heat losses before Enercon designs an energy efficient system. When designing an Enercon system a clear understanding of the past interconnecting factors concerning the current designation and distribution of loads, along with measurement of key points and key loads in the system and exactly how the load is used are all necessary.

Generally, approximately 20% is the loss amount on the entire facility's electrical distribution demand. Even higher losses can be shown on heating and distribution when facilities have old, very complex, poorly designed or a disproportionately high percentage of non-linear equipment loads. Identifying and reducing wattage losses through heat dissipation through out the electrical distribution system is an extensive part of every Enercon system. Often Enercon can accomplish this by knowledgeably canceling the effects of reactive current and harmonic current.

2. Adjusting Voltage to Reduce Wattage Consumption

What voltage to supply to which load for what reason and to achieve what result is one of the most puzzling areas of facility operation. Despite the ingrained idea of many facility maintenance and engineering personnel, there is usually a great deal more variance possible in operating voltages and load conditions than those specified on the manufacturer's nameplate, especially with regard to lowering the voltage.

Gas discharge lighting is the most common load type suitable for supply voltage adjustments. Enercon will consider this load as candidate for supply voltage adjustment based electrical efficiency improvements.



Voltage and Gas Discharge Lighting

Gas discharge lighting systems include all fluorescent and high intensity discharge lighting. Reducing the power consumption demanded by the lights is done by Enercon through application of one of our energy saving lighting controls by creating a modest reduction in the supply voltage; reduction is engaged by timer following a prescribed startup period at full power. Voltage reduction, (normally in the 10% to 25% range), is combined with intelligent selection of bulbs for relamping the voltage reduced fixtures.

Questions relating to the effects of voltage reduction on lamps and fixture life as well as light output are often generated from this energy saving approach. Understanding lamps, fixtures and our treatments is important for you, so you may answer any client questions.

Lamp and Fixture Life

Lamps or ballasts will last longer when there is less heat. To lower the heat on any electrical device, we make it draw less current at a lowered voltage. Actual improvement in how long the lamp or ballast lasts vary from brand to brand. Enercon products will make lamps and ballasts last longer despite technical publications warning against using external voltage reducers on gas discharge lights. While drastic voltage reduction (50% or more) on gas discharge lighting is bad, Enercon lighting voltage controllers are installed with fixed voltage drops of 15% or 20% or adjustable voltage drops less than 50%. This way we will not harm the lamps but extend their operating life while saving a great deal of energy. This way, Enercon fulfills its promise to never recommending power treatments into a facility that harms equipment or causes negative side effects.

Additionally all Affiliates must test the recommended lighting treatment before they order and install it in any facility. This advance testing is used to discover any problems prior to actual installation; again helping to protect our clients from any accidental mistakes.

Key Fact

Modest voltage drops to lights (<30%) extend lamp and ballast life and operation.

Ballast manufacturers are notoriously conservative in making operating recommendations for their products, while having little or no concern about the operating cost of these recommendations.

Light Output

In gas discharge light fixtures, equipped with new lamps, lowering wattage power does not equal a proportionally equal drop in lumens. Light level output when lowering wattage power will vary from a minor amount to one half of the wattage power saved depending on type, age and condition of the fixture. It is important to evaluate fixtures and lamps replacing all old lamps



and/or worn out ballasts at time of installation of Enercon lighting controllers. With modest voltage reductions and relamping the finished lighted circuit will be as bright as or brighter than with the previously installed old bulbs and no savings products.

Full spectrum lamps should whenever possible be used when you re-lamp, this will produce an improved lighting environment after treatment than previously existed. While, Enercon treatment has the potential of “dimming” the lights, you should read on before deciding if this is an undesirable effect.

Key Fact

Lights get dim over time

As lamps age the lumens are reduced or in other words, the older the lamp the dimmer the light. When the majority of lamps are midway through their lifespan they produce approximately 60 to 80% of starting light. By the final hours of illumination a mere 40 to 60% of starting light will be produced. No matter the age of the lamp or the lumens produced, they draw the identical amount of energy.

Installation of an Enercon lighting controller should be accompanied by replacement of old lamps. This will upgrade general lumen levels and save energy at the same time. Using full spectrum lamps instead of standard lamps will give 30% more useable light. See Chapter 11 – Additional Profit Source for a full spectrum lamp discussion.

Overall lumen levels will improve with Enercon lighting controllers. Now, having said that, it is important to know initial lumen levels will initially drop 15 to 20% of their untreated output when controllers are set at. However, during the last 50% of their lifespan, lamps with Enercon controllers will have 10 to 25% greater lumens than untreated lamps. Thus, Enercon treated lamps have extended life spans with greater lumen levels overall.

Invest In Lighting to Gain Light

Investing in new lamps by your customer at the time of installing an Enercon system will usually give them better lighting now and positively give improved lumens over a greater time period. Sowing or investing a minimum amount of lumens now will result in higher lumen harvesting for a greater length of time. Reduced costs result not only from the saved energy, but also from less lamp replacements and thus also reduced maintenance costs.

When you install our Enercon controllers and put in new 20,000 + hour lamps, the life of the lamp will be expanded 20% to 30%. This means extending the lamp life from 20,000 hours to either 24,000 or 26,000 hours.



Extended lamp life goes hand in hand with extended light output under the Enercon system. The light output normally associated with 10,000 hours, is what will be produced when it reaches 12,000 to 14,000 hours, losing output at a much slower rate than lamps not Enercon treated.

So, while your customer may have to invest or sow a little light loss now, they reap the yield of overall higher light levels with longer lasting bulbs.

Additional harvests of light can be reaped by investing in full spectrum lighting, which adds 30% to the useable light levels. When this is added to the Enercon light controller system, maintaining same or better light levels from the beginning of the project is possible. As the lamps age, they maintain the same reduced heat degradation as the standard lamps did. This means, they remain brighter, longer for better life and light output, an even better return for your customer's investment.

New or Old Lamps Cost the Same to Operate

The electricity which fluorescent or HID lamps consume remains the same no matter whether they are new or old. However, they may only be putting out half the original light output when they are 2-years-old compared to when they were new.

The Enercon lighting controller instantly reduces the electrical consumption by 20% to 30%. This savings remains constant for the life of the current lamp and all subsequent lamps replaced for decades into the future; your customer receives a tremendous return on investment.

Waveform Modification of lighting Products

There are three practical ways for Enercon to reduce the voltage applied thru its lighting controllers. They all affect the sine wave of the supply voltage but in different ways.

1. Lux Lighting Controller

The Lux Lighting Controller modifies the waveform by "shaving" off the top portion of the wave thereby not allowing full waveform creation. This method works with every ballast type and saves energy but is not adjustable in the amounts of energy saved as it comes preset from the factory.

2. Lux Electronic Controller

The next type of waveform modification to be offered chops the trailing edge of the voltage waveform to reduce energy consumption. By allowing the waveform to be totally and completely created before, the intensity, spectrum and light output are left undisturbed. The lamp puts out its full light and spectrum before the waveform is chopped. The light level is kept higher than with either of the two other methods because, after chopping off the wave, there is phosphorescence of the gas discharge lamp. This



enables you to take greater reductions in energy before you begin to noticeably affect the light levels. This product has been tested with various ballast types and appears to work well with them all. Currently it is in the beta testing stage at the time of this printing and will be fully released into production very shortly.

3. The Lux Phase Controller

The Lux Phase Controller combines the other two technologies. It not only modifies the waveform by “shaving” off the top portion of the wave and by chopping off the trailing edge.

Voltage Reduction and Electric Motors

The impact of supply voltage on the operation of electric motors is another misunderstood area of electrical operations. Some people believe the motor nameplate ratings must always be observed, others say actively varying the voltage to a motor, based on load conditions, is an acceptable practice.

The truth lies somewhere in the middle of these two extreme views. This is because, under certain conditions motors operate with no problems when supply voltage is outside the normal 10% of manufacturer’s nameplate recommendations. But, there can be extreme voltage variations created by the on-line voltage reduction systems.

Extreme voltage variations are generally too drastic causing more harm than good. As with lighting, a little voltage variation can be a good thing, but don’t get too much.

Motors-Heavily or Lightly Loaded

Motors are either lightly or heavily loaded. If a motor is working only to a small portion of its rated capacity it is a lightly loaded motor while a heavily loaded motor is working close to full capacity. A company prefers a heavily loaded motor. Lightly loaded motors waste more electricity than heavily loaded motors. We will call lightly loaded a motor with a running power factor of less than 0.70 and a modest starting torque. We will call heavily loaded motors ones with higher power factors or heavy start up torque requirements. The effects of supply voltage reductions are very different on these two types of electric motors. Of course here we are referring to AC motors.

1. Heavily Loaded Motors

Most motors face two entirely separate operating loads: starting loads, and running loads.

Some face extremely heavy mechanical loads when they initially start up. High inertia shaft driven equipment can cause a motor to demand as much as 10 times its normal running current as they are starting to rotate. They require every last bit of rotational



power to accelerate through the needed starting of the attached equipment. Sometimes such high start up load motors will settle into seemingly under loaded condition after the initial mechanical inertia is overcome, and the attached equipment is at full rotation.

However this condition does not necessarily ensure that the motor is a candidate for supply voltage reduction at this time. If the heavy load of the motor is subject to being cycled on and off, with the motor facing the unloading and re-loading of the heavy shaft load, this motor is definitely not a candidate for voltage reduction. Reducing the voltage to a cyclically loaded motor creates moments when the motor's magnetic flux is drastically reduced. When the heavy load is reapplied to the motor, it must suddenly take up the load and drive it to full rotation. Without the benefit of the full magnetic field flux this will lead to early motor failure and increased energy consumption.

There are several devices on the market that purport to save electrical cost by actively controlling the supply voltage to motors by sensing the motor load in real time. The concept is fundamentally flawed as they are always lagging somewhat behind the actual loaded condition of the motor. This leads to premature bearing wear and failure. Enercon does not make or sell such devices.

2. Lightly Loaded Motors

When dealing with lightly loaded motors, each must be considered a customized application. Motor testing must be done for every motor considered for treatment.

Applying these voltage control devices to lightly loaded motors can be very effective. When electrical testing of a motor start up cycle and the motor's running power factor prove that the motor is truly lightly loaded, then supply voltage reduction can easily create significant voltage savings, and cause little or no negative side effects.

Active and Reactive Power

Two types of electrical power are required to operate all motors, whether they are lightly or heavily loaded. The first type of power is "Active" power. This is the power consumed to rotate the armature to create the work being done. The second power, "Re-active" power, is the power borrowed from the electric company to cause the rotation of the magnetic field in the motor. Re-active power is needed or else the magnetic field would not rotate and the armature would not turn, resulting in no work being done. This re-active power is not consumed however; it is just borrowed and returned to the electric company. Reactive power is not paid for directly, however, there are two ways you pay for its affects. You pay for reactive power in power factor penalties and increased amperage draw caused by the interference of the re-active power to the flow of the active power.



A power factor penalty, based on the percentage of active power provided versus the re-active power provided, is charged by most electric companies. Higher penalties are charged for higher amounts of reactive power provided. Enercon installs several products to eliminate the need for the electric company to provide your customer with re-active power.

Increased wattage heat losses throughout the entire electrical distribution system of the facility are caused by re-active power. We reduce the amount of the active power needed to do the work by eliminating the effects of the re-active power. Thus, the electric bill is reduced since the consumption of watts through the revenue meter is decreased.

Installing capacitors at the main inlet to your customer's facility will do two things. It will make the electric company happy since the effect of the re-active current in the facility is reduced. This reduces the effect of the re-active current in the lines to the facility, benefiting the electric company. It will also have the electric company drop the power factor penalty charge from the customer's bill. Nothing, however, is being done for the facility itself, other than having gotten rid of the power factor penalty. The re-active current is still causing the same problems within the facility itself.

You can cancel re-active current. Eliminating the effect of the re-active power through out the plant, reducing KW consumption, thereby reducing your customer's electric bill, is done when Enercon's products are installed properly at the loads.

Harmonic (Distortion) Current

Another load segment that is growing rapidly in today's business is nonlinear equipment. The voltage and current sine waves arrive at different times to the loads and are thus called out of phase. The sine waves arriving at different times do not overlap as is usual in inductive motors. Harmonic imbalance or distortion is also a way of referring to the out of phase condition.

Computers, office equipment, UPS systems, induction heating, HID lighting, DC drives, PLC's and other equipment used by today's high technology facilities is demanding of harmonic current. Current drawn at frequencies well above the electric company's normal electrical supply frequency is called harmonic current. The high-tech equipment, which is more and more in demand, is responsible for requiring harmonic current in a facility's electrical distribution system.

The harmonic power consumed by nonlinear loads and the harmonic current demands are referred to as harmonics. These non-linear loads being dissipated as heat loss in the distribution system are responsible for as much as 30% of the electric bill. This is because up to 80% of the electrical load in businesses is composed of these harmonic loads. The Enercon system looks at treating the absolute amount of harmonic current needed by the circuits and the total electrical distribution system.



The kW consumption of the facility is reduced when the wattage heat loss is reduced. This is accomplished when harmonic imbalance effects are canceled out. The correct product treatments are determined by site measurements taken by a qualified field staff person.

Correct product treatments include Enercon's Harmonic-Saver or PowerSaver. Proper use of these products requires more than the basic training received in class and through the manual. There will be additional information available by experience and knowledge.

Adjust the Power Supplied to Lighting

Enercon products to reduce watt consumption, re-lamp with new lamps, or retrofit with newer technology for gas discharge lighting combined will save your customer from 15% to over 50%. Several different lighting products are used to attain energy reduction. These are discussed in detail in the Enercon Products.

Reducing the Power Demands of Refrigeration and A/C

Reducing the energy demands of refrigeration and air conditioning systems can be done with three different available tools. First you can apply reactive current cancellation with the PhaseSaver to motor loads. Secondly, you can introduce Artikool synthetic lubricant additive into the compressor unit. These two units can reduce wattage consumption upwards of 10% to 25%. Motor treatment here is the same as any inductive A/C motor, with the same savings results. More information on Artikool and other products can be found in Enercon Products. The third product is the AC Power Miser, which reduces wattage consumption.

The Components of an Enercon System

A true Enercon system's components are not corporeal items, or goods. They are the total complex of ideas, products, and work, which we bring together to design solutions to our customer's needs for lowered electrical consumption. In other words, while we use our merchandise to create solutions, there is much more. We must also employ skilful electrical labor and adjustments, discovering separable loads and occasionally connect other equipment like lighting retrofits.

By now you have become appreciative of how, the Enercon system is not just the effortless treatment of one-size fits all off-the-shelf products. It is a rigorous approach to the entire facility's electrical distribution system for enhanced effectiveness and dependability. It is your expertise, combined with ours, bringing a full spectrum of Enercon savings measures to bear as a one-time complete ready to go project for your customers.

Receiving real electrical savings by attacking the uneconomical in an existing business, without having to remove and replace the key electrical loads, is a real and an unusual service. It takes intense and committed work founded upon a vast fund of amassed knowledge and skill.



The Enercon system enables you to bring all of these to each of your customers, one facility at a time every time. Your responsibility is to convey all of these

With Enercon, you can deliver each of these elements to all of your customers, one project at a time, with every project you undertake. Your job is to communicate each of these essentials to your clients so they can truly comprehend the remarkable value that they will be getting by approving an Enercon system for their facility. If you do a great job conveying this, then subsequently present this program in an effectual manner, then every job you undertake will be a triumphant one.

No, the Enercon system is not about products. It is a financial decision of your customers about you, your business and theirs, working together with Enercon.

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