AMICI ENTERPRISES, LLC.

Maximum Power Transfer Solution (MPTS®)

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Big Power Benefits from Small Changes

by Alex Wenger

AC induction electrical devices are ubiquitous in factories, offices and retail space throughout the United States and other developed and developing nations. They consume more than 50% of the energy used in industry and commerce. These devices run our air conditioners, elevators and escalators, chillers and air handlers, conveyors and a panoply of other industrial, commercial and retail applications.

Reducing the current requirements of induction motors by minimizing their reactive power consumption can result in significant savings in electric power bills. Many electric power suppliers incorporate demand charges in their tariffs. In large industrial settings these demand charges can amount to 30% of the total electric power charges or more. Other electric power suppliers measure the power factor at the point where power consumption is measured, the connection point to the customers' premises. If the measured power factor is below a specific value defined in the power companies' tariff, extra charges are levied against the customers' bill. Since it takes additional fuel, generating capacity, and transmission/distribution capacity, in the end rate payers pay for this reactive power, which does no useful work.

Maximum Power Transfer Solution (MPTS) solves these problems. Users save money, reduce CO_2 emissions and extend the useful life and MTBF of connected devices. The MPTS is an industrial scale device that uses a patented technique to match the impedance of a 3 phase electric power source and a 3 phase electric power load. The line impedance conditions are sampled and evaluated at a rate of 20,000 times a second. Adjustments to the impedance on the 3 phase power lines are made to optimize the impedance matching.

When the MPTS is used to perform power conditioning for induction motors, the current drawn from the power distribution network is typically reduced by 30%. This is due to a reduction in the flow of reactive current. It is manifested as an improvement in THD (Total Harmonic Distortion) and power factor in the power distribution network. Electric power company demand charges and/or power factor charges are reduced. The reduction of THD can result in significant improvement in the performance of inductive motors.

Induction motors produce undesirable harmonic currents in the power lines connected to them. These harmonic currents can cause non-linearities in the motor torque curve and they will also cause additional heating of the motor. The MPTS will reduce the harmonic

currents, which waste power and reduce mechanical performance. One recent engineering paper estimates that the effects of harmonic currents alone can increase the operating temperature of an induction motor by 4º to 6 º Celsius.

Reducing I^2R losses due to harmonic current flow in an induction motor will reduce the power losses and operating temperature of the motor for a given amount of motive power output.

It is obvious that you can save money operating an induction motor by reducing electrical losses thus reducing the input power needed to run the motor. What is not obvious is the large cost savings that occur due to a small reduction in motor operating temperature.

The Arrhenius equation relates chemical reaction rates to temperature. It has long been used to estimate the effects of temperature on the reliability of electrical and electronic equipment because it accounts for temperature dependent processes like rates of corrosion, chemical degradation, etc. Simply stated, the Arrhenius equation says that for every 10º C increase in operating temperature of a device, the functional life of the device will be cut by 50%. A reduction in temperature of 10º C, will double the operating life of a device. By reducing the operating temperature of the induction motors that we use in industry by a few degrees Celsius, we could extend the life of these motors and improve the reliability of the manufacturing production activities that are dependent on them. To be specific, a reduction of 4º C in the operating temperature of an induction motor would extend the average operating life of an induction motor by 32%!

What would a 32% improvement in operating life mean to a medium size business? The savings that come from extending the life of a 60 hp induction motor is de minimis when compared to the cost of a lost day of production due to a motor failure. Imagine a company with a factory of 120 people, whose average annual revenue per employee was $110K per annum. A motor failure that shuts down the entire production line for a single shift would cost $60K in lost productivity, assuming a 220 day work year.

Can we reduce the operating temperature of a 60 hp induction motor by 4º C? From the datasheet of a typical induction motor we can learn that the temperature rise at 100% load is 80º Celsius, efficiency is 92.6% at full load, power factor at full load is 0.84, operating voltage is 415VAC, and operating current is 80.5A.

When MPTS is not present, total losses are approximately 4.28 kW, resulting in a temperature rise of 80º C. The implicit thermal resistance of the motor to the ambient environment is 0.0187º C per Watt.

In a recent study of a typical operating environment for 25kW and 50kW motors, the THD on the power lines was measured at 9.2%. This exceeds the recommended maximum THD levels specified in IEEE Std. 519-1992 by 84%. The losses due to the 3rd and 5th harmonics of the power line frequency constituted 10.1% of the total losses. Assuming a similar response in our 60kW motor, we can infer a loss due to harmonics of 432 Watts.

The reduced losses result in an operating temperature reduction of 8º Celsius for the 60 hp induction motor in this example. This results in a substantial improvement in the motor's operational reliability… longer MTBF.

Another non-obvious benefit of reducing the operating temperatures of devices attached to MPTS is that reducing the heat generated by those devices also reduces the air-conditioning (AC) load for the facility, thus reducing the power needed to meet cooling objectives.

FEATURES & BENEFITS COMPARISON	AUTOMATIC POWER FACTOR CORRECTION	HARMONIC FILTER/POWER CONDITIONING	UPS AND BATTERY BACK-UP SYSTEMS	VARIABLE FREQUENCY DRIVES	MPTS MAXPOWER TRANSFER SOLUTION
Reduces Power Consumption by 20% to 40%					X
Improves Power Factor	X	X		X	X
Improves Power Quality					X
Reduces Carbon Footprint				X	X
Decreases Amperes, (KVA, KVAr, KVAh, and KVArh)					X
Decreases Total Harmonic Distortion (THD)		X			X
Does NOT Interrupt Power to the Load When Off					X
Increases Useful Life of Connected Equipment					X
Decreases Capital Costs					X
Decreases Service, Repair and Maintenance Costs					X
Increases Facility Wiring Capacity Due to Reduced Current					X
Adds Load or Capacitance or Harmonics to the System	X	X	X	X	
Requires Programming and Significant Maintenance	X		X		
No Parasitic Load					X
Works on Balanced or Unbalanced Load Conditions		X			X
Decreases Downtime Costs Related to Electrical Power Issues					X
Electronic Solution - Consumes Less than 100w					X
Standard Models and Capacities			X	X	X
Can be moved to different Applications or Loads					X
Stabilizes Voltage					X
Reduces Switching Gear and Facility Wiring Heat		X			X

Harmonic Currents Are Bad For Your Motors

by Alex Wenger

Approximately one half of the electric power used in industrial and commercial enterprises is used to power electric motors. The preponderance of these motors are large multi-horsepower 3 phase induction motors. These motors produce the mechanical power that drives escalators, elevators, chillers, air handlers, and many other applications.

Harmonic currents flowing into electric motors can be harmful because they can result in significant increase in motor temperatures. In fact, the rule of thumb for determining when harmonics are excessive, requires harmonic power to be less than 4%.

In most areas, the electric power Utilities deliver near sinusoidal power to end users. (That is not true for some countries.) The largest sources of harmonic currents come from installed equipment in your facility and nearby facilities if you share a common power feed.

If you have variable frequency drives, UPS systems for your computers, desktop computers and servers, induction heating equipment, arc welding equipment, or any other high power electronic equipment, your equipment is generating harmonics to some degree. Every power supply that has rectifier diodes to convert AC power to DC power for amplifiers, microprocessors, LEDs, etc. produces harmonics because of the non-linear characteristics of the rectifier transfer function. Thyristor based lighting dimmer's produce very high harmonic currents.

Rectifiers are not the only sources of harmonics. Induction motors and other magnetic devices produce harmonics due to non-linearities in the magnetic core used to make those devices. Harmonics produce no useful motive power in electric motors. All of the harmonic currents are converted into heat. When there is a significant amount of heat, electric motor operating reliability and useful life are reduced.

The Arrhenius equation says that for every 10^{o} C increase in operating temperature of a device, the useful life of the device will be reduced by 50%. When the harmonic power exceeds 4%, the heat effects of the harmonic currents begin to have a significant impact on the useful life of the electric motor.

The MPTS significantly reduces harmonics. In one particular case study, during a period of 4 months, the reduction in harmonics produced by the MPTS ranged from 6.2% to 8.0%. Before connecting the MPTS, the THD (Total Harmonic Distortion) varied between

9.0%.to 10.7%. Over the 4 month evaluation period, the THD in the power coming from the MPTS varied from 2.2% to 2.7%, well below the 4% threshold.

When electric motors run cooler their useful life is extended and cooling loads in your facility are decreased because less heat needs to be removed from the space being cooled.

How Electric Power Quality Effect Your Business?

by: Adil Khan, President TransPower Company

What is Poor Quality Electricity & Why Does it Occur?

Any deviation from normal voltage and current can be thought of as a power quality issue. Power quality issues can be due to high-speed events known as voltage impulses, electrical surges, spikes, transients, frequencies variations, presence of unwanted frequencies, wave shape faults, total power loss, noise, unbalanced load conditions, electromagnetic fields, electrostatic fields, electromotive voltages, electromagnetic interference, resonance, harmonic distortion, inductance, capacitance, improper grounding and neutral connections.

Power quality can also be thought of as the load's ability to function properly

What are the Symptoms of the Poor Quality Electrical Power?

- Devices Overheat
- Periodic Malfunctions
- Shorter MTBF
- Requires More Maintenance
- Reduced Useful Life

What Causes Poor Quality Electrical Power?

Most electric power quality issues are generated by electric devices in buildings. Non-linear loads are the major cause of quality issues. Following are some of the loads that cause power quality problems:

Arc Furnaces	Personal Computers
Battery Chargers	Photocopiers
Compressor Motors	Switch-mode Power Supplies (SMPS)
Factory Equipment	UPS Battery Back-up Systems
Fluorescent Lamps	Variable Frequency Drives (VFDs)
HVAC, AHUs, FCUs	Variable Speed Motors and Drives
Laser Printers & Fax Machines	Welding Machines

Single-phase non-linear loads are prevalent in modern office buildings. Three-phase, non-linear loads are widespread in commercial office buildings, factories and government facilities.

Does Electric Power Quality Affect Electricity Bills?

It is important to understand that not only does poor quality electricity have a negative effect on equipment connected to the network, it is also has an effect on electricity bills.

Power quality has a direct impact on electrical consumption and electrical demand. Poor quality electricity increases the Amps required by an electrical network. Good quality electricity reduces the Amps required for an electrical network.

The two items that show up most often on electricity bills are KW and KWh
In some cases KVA Charges and KVAr Charges are shown. Some Power Companies charge penalties for low Power Factor performance.

When Amps decrease (KVA, KVAr and Peak KW) charges decrease

When KVA and KVAr decrease, electricity charges decrease

The increase or decrease in Amperes is determined by the Power Quality.

Poor Power Quality increases the Amperes required. ***Good Power Quality decreases*** the Amperes required.

How MPTS Works

by Alex Wenger

COOL, CLEAN CONDITIONED POWER™

The Maximum Power Transfer Solutions (MPTS) are next generation power quality products that decrease the electrical demand, total electrical power generation (KVA), and carbon footprint, without replacing inefficient electrical and mechanical equipment in facility.

The MPTS is patented in 28 countries and is a UL approved solution.

MPTS is unique and innovative. It is an industry changing technology. The MPTS precisely senses the supply input and demand output, matches the impedance parameters, adjust the resonance of the resulting network loop, synchronizes and optimizes the output. This occurs at very high speeds in the device eliminating nearly all the wasted electrical power in the system. This significantly reduces total electrical consumption and enhances the electrical efficiency of the network to near unity (1).

Maximum Power Transfer Theorem (Jacobi's Law - 1840) focuses on increasing total electrical efficiency by decreasing losses using impedance matching.

When losses decrease, the phase angle is zero (0) and the Power Factor approaches unity (1).

When phase angle is zero (0) as a result of Impedance matching

KVA = KW and KVAH = KWH

When current decreases, power consumption will decrease

MPTS dynamically matches, optimizes and reduces the KVA requirements of connected loads which also decreases losses in an electrical network.

MPTS compliments and/or replaces capacitors, automatic Power Factor correction systems (APFCs), harmonics filters, power conditioners, voltage stabilizers and surge protectors providing the next generation in power quality.

MPTS FEATURES AND BENEFITS:

1. COMPETITION: There are no products that directly compete with MPTS. Some power solution providers offer some MPTS features but none have a fully integrated system equivalent to MPTS. No one competes for price either.
2. CUSTOMER REFERENCES: Several MPTS customers are reference customers.

3. INSTALLATION HISTORY: The first MPTS systems were installed in 2010. Most installations have been made during the last 3 years.
4. LEAD TIME: Standard MPTS units are usually delivered from inventory. Increased demand may create a 12 to 16 week lead time, especially for custom orders.
5. LEASE FINANCING: Lease financing is available to qualified customers.
6. MPTS BENEFITS**:**
   A. Avoids Overload conditions and hot spots in panels and equipment.
   B. Annual Return: For every $200,000 investment the annual return is $100K to $150K.
   C. Decreases Current and Electrical Demand (20 to 40%) of inductive loads
   D. Decreases I^2R losses, KVAr and Harmonics
   E. Decreases total current requirements for the facility
   F. Delays replacement of mechanical equipment
   G. Typically extends useful life of connected inductive equipment by 20%
   H. Minimizes and solves several electrical power issues in the electrical networks
   I. Typically reduces service, repair, and maintenance costs by 25%.
7. LOW MAINTENANCE COSTS**:** Routine annual inspections should be conducted. The only moving parts are small inexpensive fans that cost less than $100 to replace.
8. NO INTERRUPTION: MPTS is "Fail Safe" - no interruption to the connected load whether the MPTS is ON, OFF or down for maintenance
9. PATENTED: MPTS is patented in 28 countries. First Patent issued 12/2012.
10. SCALEABLE: MPTS technology scales up and down and operates at the same efficiency from 20 %t to 100 % of rated capacity.
11. STANDARD MPTS SIZES:
    A. 100 Amp/480/3 phase,
    B. 225 Amp/480/3 phase and
    C. 400 - 450 Amp/480/3 phase.
    D. 600 Amp/480/3 phase

    The 225 Amp and 400 - 450 Amp models comprise about 80 % of sales. Custom orders are available for other size/capacity requirements.

Stealthy Power Transients Can Do Substantial Damage

by Alex Wenger

Modern commercial and industrial environments can have an eclectic mix of devices that are powered from the AC power mains. A typical commercial working environment may have desktop computers, servers and routers, while also including elevators, chillers, air handlers and high power lighting. Industrial environments may have everything found in the commercial environment plus arc welders, induction furnaces, large mixers, extruders, etc.

The power coming into your facility my not be benign. Lightning is one of the leading causes of impulsive transients. To cause damage, lightning strikes do not need to make a direct hit on the power lines coming into a facility. Lightning currents traveling through metal structures or the ground can induce currents onto the power lines coming into your office or factory.

Powerful magnetic fields created by the very high current flowing from a lightning strike can cause considerable damage. Power company transmission system switching is another source of external impulse transients. Unless specialized monitoring and suppression equipment is in place, the first indication of trouble may be blue smoke coming from a mission critical device. Significant impulse transients can come from internal sources as well. When high power electric motors stop they produce impulse transients due to collapsing magnetic fields within the device. Industrial equipment such as induction furnaces and arc welders also produce these types of transients.

The ballasts for high intensity lighting that are suited to lighting a warehouse or a parking lot, also produce similar spikes on internal power lines. Depending on where these devices are connected in the internal power distribution network, their effects on other equipment may be more or less severe.

The MPTS has high energy transient suppressors on each of the 3 input phases to earth ground. Each phase can withstand repeated transient impulses of up to 20,000 amperes at 1,600 volts. The surge protectors are compliant with specifications UL 1449 Edition 3 in 20kA mode and ANSI/IEEE C62.41.2 Cat. A, Cat. B, & Cat. C. Any devices connected to the MPTS are protected by the action of the transient suppressors provided the earth ground connection to the MPTS has a suitably low impedance, as defined in the TransPower MPTS installation manual.

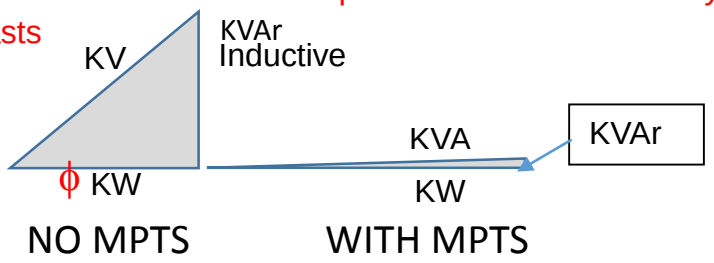
POWER FACTOR ANALOGY

By Alex Wenger

Like input voltage and input current, Power Factor is an operating parameter of every device that consumes AC power. It is important in commercial and industrial applications of AC electricity but has a relatively minor role in residential applications. Low Power Factor in commercial and industrial applications can significantly increase the cost of electric power for an office building or manufacturing facility. The MPTS controls the Power Factor in facilities that consume large amounts of 3 phase AC power at either 208VAC or 480VAC.

Power Factor Improvement Using MPTS

Electronic and dynamic solution KVAr is significantly decreased, Harmonics THD is reduced. No increase in harmonics. No parasitical load on the system. Minimal maintenance, MPTS lasts more than 10 years



To properly describe the effects of Power Factor in AC circuits, complex equations and number notation need to be used. However, since few people are comfortable with this form of mathematics, we present an analogy to explain Power Factor.

Imagine a rowboat with room for eight oarsmen. Furthermore, imagine that the rowboat is entered in a race with other identical rowboats. The course of the race is defined by a starting line, a finish line, and well-marked lanes for each boat. If the oarsmen apply the same amount of force on both sides of the rowboat, the boat will go straight ahead and not out of its lane. The race is started. Each of the boats, keeps within its lane as they head toward the finish line. All of the energy expended by the oarsmen is applied to making the rowboats race to the finish line. By analogy, this corresponds to a Power Factor value of 1.00. No energy is wasted getting the rowboats to the finish line. It is the ideal situation.

In the real world, things are often not ideal. In the case of supplying AC electrical power, we often come across cases where the Power Factor is 0.70 or even lower. Low Power Factors result in wasted energy, which is converted to heat that damages the electrical equipment and increases charges from the local electric power company.

Now imagine we have modified one of the row boats to have two additional oarsmen sitting side by side in the center of the rowboat. Suppose the race has begun and that the center oarsman on the left side (port) uses his oar in a strange way. He dips the oar into the water as far away from the boat as he can and he pulls the oar directly toward the side of the rowboat. Furthermore, the oarsman on the right (starboard) side does not even put his oar into the water. The effect would be two fold. None of the energy used by the center port side oarsman would go toward moving the rowboat toward the finish line. Worse, the energy input would move the rowboat into the next lane, resulting in certain disqualification! This corresponds, loosely, to a low Power Factor environment.

Clearly, we have a way to mitigate the problem caused by the port side oarsman, by using the available starboard side oarsman. The starboard side oarsman could use his oar to produce a thrust that exactly equal to and opposite to the force generated by the port side oarsman. If the port side oarsman makes a change in the direction that he moves his paddle, the starboard side oarsman, makes a compensating change to maintain the balance of forces on the rowboat, allowing it to go on a straight course to the finish line of the race. This corresponds, loosely, to what the electronics of the MPTS does in correcting the electrical Power Factor from say 0.70 to 0.95 or better. This seemingly small change in Power Factor can extend the useful life of electrical equipment and reduce power consumption between 20% and 40%.

Up Your NegaWatts

by Robert S. Block, Managing Partner

The U.S. Environment Protection Agency (EPA) has been directed, by President Obama, to develop regulations to reduce greenhouse gas emissions in the U.S. The EPA expects the reductions to yield important health, economic and environmental benefits in the U.S. and world-wide.

In pursuit of this goal, the EPA and other federal agencies have developed Social Cost of Carbon (SC-CO_2) estimates to assess the economic benefits of rulemakings that reduce carbon dioxide (CO_2) emissions. When government agencies prepare to issue regulations implementing the laws enacted by Congress, or promulgated by Presidential order, they are required to justify proposed regulations by assessing their cost and benefits to the economy and society. The SC-CO_2 approach is typically used in the benefits part of the cost-benefit analysis. For a regulation that decreases emissions, the SC-CO_2 represents the damage avoided--or the benefit of the regulation--for marginal reductions of CO_2.

The required supporting technical documentation (PDF, 21 pp, 1 MB) are not yet complete because current computer models do not capture all of the important physical, ecological, and economic impacts of rising levels of CO_2 in the atmosphere. According to the EPA, "Nonetheless, these estimates and the discussion of their limitations in the supporting technical documentation represent the best available information about the social benefits of CO_2 reductions to inform benefit-cost analysis."

The EPA is, "Exploring approaches to further understand the benefits of CO_2 reductions that complement the analysis conducted with the SC-CO_2. While the SC-CO_2 is a useful metric to assess marginal changes in CO_2 emissions in the context of cost-benefit analysis, bottom-up approaches, such as the Climate Change Impacts and Risks Analysis (CIRA) project, may offer additional insights about the impact of significant global action." CIRA is a peer-reviewed study comparing impacts in a future with significant global action on climate change to a future in which current greenhouse gas emissions continue to rise.

In 2015, EPA released a report, "Climate Change in the United States: Benefits of Global Action", estimated the physical and monetary benefits to the U.S. of reducing global greenhouse gas emissions. Although no specific mitigation policies were analyzed, the report concludes that global action on climate change will, "Significantly benefit Americans by saving lives and avoiding costly damages across the U.S. economy."

Research Underlying EPA Economic Modeling of Climate Policies:

Climate Economic Modeling

EPA uses a variety of economic models and analytical tools when conducting climate economic analyses of climate legislation or policy. These models help researchers estimate the future effects of proposed policies on energy production, the economy, emissions of CO_2, and land use trends in agriculture and forestry.

Air Quality and Climate Modeling

EPA is creating decision support tools to evaluate policy options for both air quality and climate change.

International Emissions Projections for Non CO_2 Gases

EPA conducts studies of projected global emissions of the methane, nitrous oxide, and fluorinated greenhouse gases which account for about 30 percent of human-caused warming. Projected emissions studies for the non-CO_2 gases provide a benchmark that can be used to measure the potential environmental and economic impact of proposed climate policies across all relevant gases.

International Mitigation Technologies to Reduce Emissions of Non CO_2 Gases

Numerous technologies are available to reduce emissions of methane, nitrous oxide, and fluorinated greenhouse gases. EPA develops reports that evaluate the costs of various technologies to reduce non-CO_2 greenhouse gas emissions. These reports also provide cumulative marginal abatement cost curves which are used by researchers to represent mitigation costs in their models."

AMICIMPTS Effects on Greenhouse Gasses

The MPTS reductions in electric current by 20% to 40% eliminate the need for the generation of these conserved Watts, ("NegaWatts"). Therefore, MPTS reduces CO_2 and other Greenhouse emissions in direct proportion to the NegaWatts saved.

FREQUENTLY ASKED QUESTIONS

1. **How does TransPower's MPTS work?**
   The MPTS (Maximum Power Transfer Solution) is a patented device, which conditions power by matching the load impedance to the electrical power supply. The complex conjugate impedance is applied to the power line to accomplish impedance matching, pursuant to Jacobi's Law.

   Typically:

   (1) Reactive power requirements are reduced, (i.e. KW = KVA).
   (2) Real power requirements are reduced.
   (3) Harmonics and IM (intermodulation) products are reduced, resulting in decreased THD (total harmonic distortion).
   (4) Power factor is raised to approximately 0.95.
   (5) Electrical current requirements are reduced.
   (6) Line voltage is stabilized.

2. **Does the MPTS work on 3 phase power circuits?**
   Yes, the MPTS is design to operate in high power commercial and industrial environments where 3 phase power is used.

3. **If inductive loads constantly vary over time. Will the MPTS still be able to improve my power performance?**
   The MPTS is ideally suited to handle these types of constantly varying loads. It samples lines conditions at 20 KHz and responds rapidly to varying load conditions.

4. **If the ON/OFF switch on the MPTS is accidentally switched off, will the loads be disconnected?**
   The MPTS is designed to allow an uninterrupted flow of power to the connected loads, regardless of the position of the ON/OFF switch.

5. **How does MPTS increase the useful life of connected equipment?**
   By reducing current flow and power losses, the MPTS reduces the operating temperature of connected equipment.

   The Arrhenius equation says that for every 10^{o} C decrease in operating temperature, the useful life of equipment is doubled.

6. **What happens if a 3 phase load becomes unbalanced?**
   The MPTS manages each phase of the 3 phase load independently. Impedance is matched separately for each phase.

7. **What is the dynamic range of the MPTS?**
   The MPTS has a wide but finite electrical dynamic range. It is designed to operate from 100% of its rated load down to a low of 10% of its rated load. When the total connected load goes below 10% the MPTS will not do anything because the current level is too low.

8. **Can the MPTS reduce my demand peaks?**
   Demand peaks are automatically reduced because reactive load current is virtually eliminated.

9. **What Line Frequencies, Voltages and Current does MPTS support?**
   MPTS works with 50 & 60 Hz Line Frequencies, 208 V and 480 V, 3 phase and is available in 100 Amp, 225 Amp and 450 Amp sizes. A 600 Amp MPTS is available as a custom order.

10. **Does MPTS require substantial maintenance?**
    No. The only moving parts in the MPTS are the exhaust fans. There are filters on the air input ports that need to be cleaned periodically based upon how dusty the MPTS operating environment is.

11. **Do I need in-house expertise to operate the MPTS correctly?**
    No. After installation and commissioning, there is nothing more to do except to clean the filters periodically.

12. **What operating environmental conditions are required for the MPTS?**
    The operating temperature range for the MPTS is -10^0 C to $+ 50^0$ C (14^0 F to 122^0 F).

    The operating humidity range is 20% RH to 95% RH, noncondensing.

13. **Does the MPTS include surge protection?**
    Yes, the MPTS has a robust surge protection sub-system that exceeds the requirements of UL standard 1449 Edition 3.

14. **Where and how should the MPTS be installed?**

    MPTS units can be installed where the electricity enters the building. In large facilities multiple MPTS units are installed behind electric power sub-panels. In general, the closer to the load that the MPTS is installed, the better.

15. **Can it be used where the 480V has been stepped down to 277, 240, 208, and 120?**

The MPTS is a 3 Phase technology. The input/output is based on a Y + Neutral connection. The preferred voltages in the U.S. are 480 V and 208 V. MPTS is not a 120 V technology.

16. Where would you install it to handle motors at 480v and 277 V, and 120 V lighting and power needs?

See question 14 for part of the answer to this question. If the MPTS is connected to a 3-phase 480V power source, MPTS controlled 277V can be derived by connecting between any of the 3 phases of the MPTS output and the neutral. Similarly, if a 208V 3-phase power source is connected to an MPTS, the output from any phase to neutral will deliver MPTS controlled 120V.

17. Please provide installation information, such as electrical engineering drawing for a typical installation.

See the Installation Manual for these details.

18. Do you partner with an electrical contractor or try to get engineers to spec?

Since any Master Electrician can install an MPTS, we provide installation instruction for customers who have their own resources or an approved supplier. If requested, TransPower will perform the installation. Installation charges are not included in system pricing.

19. How do you commission it?

The Installation Manual has the details regarding the commissioning process.

20. How do you size it a prospective installation?

Sizing the requirements for a location simply requires the addition of all the current (AMPS) required by the connected loads and then making sure that the total AMPS does not exceed 80% of the MPTS nameplate capacity.

21. What is the pricing on various models?

Pricing is based on the AMPS capacity of the MPTS. The domestic (U.S.) price is $150/AMP. The international price is $165/AMPS. There are 4 MPTS sizes: 100 Amps, 225 AMPS, 400-450 AMPS and 600 AMPS. Custom sizes are also available

22. Energy savings are quantified in KVA rather than KW, Why?

The answer to this question relates to how utilities charge for their service. Sometimes KVA and KW are treated the same and sometimes they are not. KVA always includes reactive power and KW does not.

23. Do you have a scaled down demo that can be used in a sale presentation?

Yes, we do have a single phase 120 V demo version. We also have video of a standard size MPTS.

KEY MESSAGE POINTS

Amici MPTS provides industrial, commercial and government organizations with cool, clean, conditioned power that reduces total power consumption by 20% to 40%.

1. **MPTS (Maximum Power Transfer Solutions) creates cool, cleaned, conditioned electricity** that is fully used by the load (an electrical component or portion of a circuit that consumes electric power), without wasting any electrical power. It is the most efficient use of electrical power for inductive loads (such as transformers and motors that require electricity to operate).
2. **Cool, Clean, Conditioned Power is important for** three primary reasons: (1) It reduces total electrical power consumption by 20% to 40%; (2) It increases the useful life of connected devices by up to 20%; (3) It reduces peak demand and thereby reduces the cost of electric power from the grid (an interconnected network for delivering electricity from suppliers/utilities to consumers).
3. **Cool, Clean, Conditioned Power is achieved and maintained** by the patented Maximum Power Transfer Solutions (MPTS) Technology. It keeps electricity cool, clean and conditioned by activating a dynamic, integrated response to instantaneous changes in electricity flow.
4. MPTS **Key Features and Benefits** include:
    a) The avoidance of overload conditions and hot spots in panels and equipment;
    b) Reduces total electrical power and current consumption
    c) Decreases inductive load demand by 20% to 40%;
    d) Decreases in I^2R, kVAr and harmonics losses;
    e) Does not introduce a parasitic load on the electrical network;
    f) Reduction of electrical demand, total electrical power generation (kVA) and carbon footprint without the need to replace installed equipment;
    g) Improves power factor; impedance matching, total harmonic distortion, and delivers voltage stabilization to a level greater than installed correction equipment; and, results in the reduction of total electrical power requirements
    h) Requires very little service (the only moving parts are cooling fans)
    i) Provides a dynamic integrated solution that performs all Power Quality Management Tasks In virtual real-time (sample rate 20,000 samples/sec.)
5. **MPTS Financial Benefits** are significant – typically each $200,000 investment in MPTS equipment returns $100,000 to $200,000 a year in cost savings.

Customer Quotes

"Every ampere of current we decrease translates into reduction of heat and this is very important to us, MPTS helps us accomplish this." – Brian, Certified Energy Manager, U.S. Air Force NORAD at Cheyenne Mountain

"Improved power quality in buildings is very critical to protect electrical and mechanical equipment and this is the reason we use MPTS." - Andrew Olsen Resource Energy Manager U.S. General Services Administration

"When server room temperature increases we have to shut down the servers. MPTS on our HVAC chillers helps us ensure reliable cooling and protects our compressors from power surges and spikes." - George Gielow Chief Operating Officer Aurora Mental Health Centers Colorado

"We were able to fund four roof-top air conditioning chillers with the savings from MPTS." - Daniel Dawson, Chief Financial Officer Aurora Mental Health Centers, Colorado. (303) 617-2345

"We would recommend the MPTS energy solution to any and all customers that have inductive or capacitive loads in their buildings, such as air conditioners, compressors, pumps, air-handlers, ballasted lighting, electric motors, or any other loads that create induction or capacitance. I cannot think of a building that would not have these devices serving them." - Tony Gancer Vice President and Chief Engineer International Aid Services Worldwide (815) 354-3998

"It is unusual today to find product that dramatically out-performs the promises stated by the company promoting it. A refreshing change of pace in the corporate world!" – Tony, Chief Engineer New United Inc. Electrical Contractors Streamwood, Illinois (815) 354-3998

Customer References

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Management Bios

Robert S. Block, Managing Partner

Mr. Block has extensive experience in the design and development of ERP computer software, communication systems, energy systems, education and entertainment, including pioneering roles in the commercial airline industry, commercial and pay television, and cellular telephone operating companies.

Don E. Scott, Managing Partner

Mr. Scott began his career with Arthur Andersen in 1980. He became Partner in 1991. His Andersen, Mr. Scott worked in a variety of industries, with both domestic and international public and private companies. He also provided a vast array of tax, business and financial advice to high-net-worth families.

Joshua Macciello, Managing Partner

Mr. Macciello began his career on the New York Stock Exchange in 1994 where he quickly learned the ins-and-outs of money management. He spent two years on the exchange floor before moving to Los Angeles to begin a career on the business side of the entertainment industry.

Management Bios

Alex Wenger, Chief Technical Officer

Alex, studied Electrical Engineering at Illinois Institute of Technology. He is currently the Managing Member of GoGeo, LLC a company dedicated to developing alternative energy technologies. GoGeo is currently concentrating on geothermal technology for heating, cooling and electric power generation.

Adil Khan,

Adil is the Founder, President and CEO of **Trans*Power* Company**. Adil is currently focusing on energy savings solutions for businesses and property managers. **Trans*Power* Company** is applying internationally accessible **"technology and products" to business requirements thereby creating greater** value, lowering costs, and increasing customer satisfaction