

KVAR® Energy Controller (EC)

- It is a Desired & a Simple Solution for...
RISING ENERGY COSTS
- Everyone wants to lower their energy bills
- The U.S. Government is mandated to cut energy costs
- All businesses and residences are looking to cut costs

The Need for the KVAR® EC

- Planetary distress is our new reality
- Energy efficiency is a commitment worth making
- Help meet planetary requirements and reap the financial savings
- Reduce carbon emissions & do our part to go **GREEN**
- You can empower other people to work

10 - 25% Electricity Savings: What else can be done to save this much \$ with under a 3 year ROI?

- **Installing new thermo pane windows, adding insulation or wrapping buildings with Tyvek make huge differences but offer a slow ROI**
- **HVAC systems have greatly improved their efficiency but are expensive to replace**
- **New fluorescent and HID lighting has only slightly decreased kWh & they are costly**
- **High efficiency motors are available but not widely used and they are extremely expensive**

The Problem

- Up to 25% or more of billable electricity is unusable
- **Electric AC motors use more than half of all electricity**
- **Electricity Costs: 1960's .019/kwh**
1970's energy crisis .044/kwh 2008 .10+ /kwh
- Most AC induction motors operates at 80% efficiency under a full load ... the efficiency drops dramatically at lower loads
- NASA research proved that substantial savings could be made on the running costs of AC induction motors

NASA TESTING

AVO

To: DE-TPO/C. Griffin
From: IM-WEL/J. Weeks

Subject: Response to TTA-K517. (KVAR Electrical Optimization System)

Attached for your disposition are the results of our test on the KVAR Electrical Optimization System. Approval of test format was received by Gregory Taylor of KVAR energy Savings, Inc. on 11/19/96. The test was performed at the prototype shop (building M7-581) on a 10 H.P. compressor motor on 11/22/96. Both initial and final values were recorded from a Drantz Power Monitor PP1 (NASA Tag #1382136) while connected to the distribution panel DPA-C2 (see attached diagram). The KVAR switch settings were determined by a KVAR representative. All values pertinent to motor efficiency have been recorded on the attached electric motor performance evaluation form. As shown on this form, the real power draw by this motor decreased from 5.63 kw to 5.14 kw after optimization. This corresponds to a power reduction of 8.7%.


John Weeks



cc:
IM-WEL/J. Heuser
IM-WEL/R. Batman
IM-WEL/L. Jones
IM-WEL/J. O'Malley

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The Continual Dilemma

The adequacy of North America's electricity system will decline unless changes are made soon...

... demand for electricity is expected to increase over the next ten years by 19 % in the U.S., but confirmed power capacity will increase by only 6 %

- NERC (North American Electric Reliability Council) -

"Over \$16 billion dollars of electricity is unusable energy, but billable in the US."

- U.S. Dept. of Energy -

How are the Utility Companies & the Environment Benefited?

- **Enhancement of the capacity of the existing electrical systems**
- **Supply power to more customers without the generation or acquisition of additional power**
- **Reduces capital expenditures by leveraging the existing infrastructure**
- **Keeps utility costs down**
- **Less fossil fuel being used to generate power**
- **Less dependency on foreign oil**

The Unique Energy Savings with KVAR®

- The patented diagnostic device & methodology determines to an exact science how much capacitance is required to optimize each inductive load to unity
- Optimizing is precisely accomplished on each inductive load in minutes
- There are over 100 pre-engineered customized systems assembled from modular components based on sizing results from a Qualified Electrician or HVAC Technician
- Installation is fast, simple and sized to the specific unit
- Power savings are immediate and average up to 25%
- Return on investment is rapid

KVAR® EC

- Innovative, Unique & Patented*
- U.S. Manufactured
- NASA tested and used
- U.S. Government certified & LEEDS Certified
- UL Listed, CSA Approved & CE Compliant
- Cleaner & Greener / RoHs Certified
- Reduces the amount of non-productive current in your existing electrical system, resulting in a significant reduction in power consumption costs
- 5 year warranty – 25 year life expectancy
- Thousands of installations worldwide



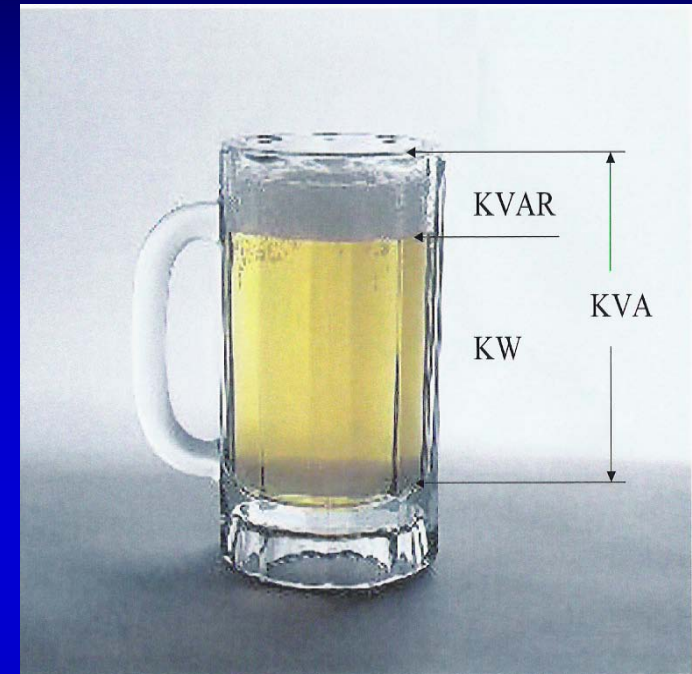
* Methodology & Apparatus

How Does the KVAR® EC Work?

- The KVAR® EC stores the reactive power to create the electromagnetic field (EMF) around the inductive windings of a motor
- As motors operate, reactive power is “pulled” and “pushed” to and from the KVAR® EC by the motor at 60 cycles per second
- The KVAR® EC stores & releases to motors what they need to function more efficiently
- When motors start, they need power to run (*voltage* and *amperage*)
- Power needed heats up and strains the wiring and motors (*watts*)
- The KVAR® EC fine tunes the motors & eliminates the $I^2 R$ Loss
- Electricity reclaimed and recycled by the KVAR® EC would normally be pushed back through the power distribution lines
- The KVAR® EC reclaims, stores, recycles and supplies power to inductive loads

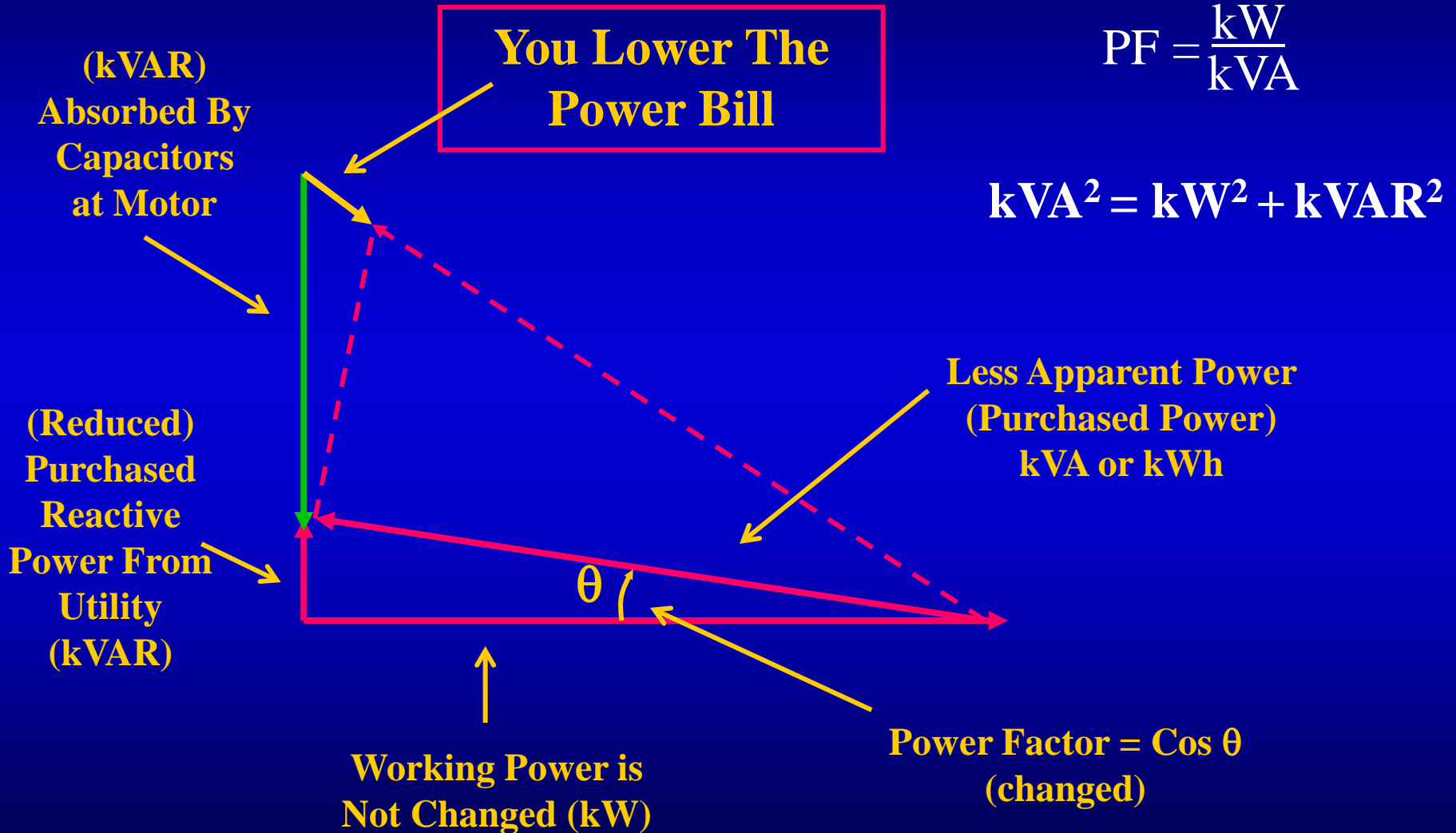
Beer or Cream Soda Analogy: Foam vs. Liquid

- Foam is wasteful because it doesn't quench your thirst
- This foam is represented by kVAR (kilovolt – ampere - reactance)
- The total contents of your mug is kVA. This is the total of kW (the beer) and kVAR (the foam).
- As your kVAR (foam) approaches zero, your Power Factor approaches 100% & the amperage & wattage is reduced
- Power Factor should always be optimized in a slightly lag position
- Power Factor (P.F.) is the ratio of Working Power to Apparent Power $P.F. = \frac{kW}{kVA}$



**kVAR (foam) is
absorbed by
the KVAR® EC**

Power Triangle



Other Benefits

- The KVAR® EC improves the efficiency of the electrical system & increases the kW & amperage capacity
- Maintains quality voltage levels in your system with less voltage drops especially long runs of cable
- Reduces the harmful effects from the EMF's
- Less power system losses in your distribution system
- Reduces the heat and premature failure of motors and other inductive equipment
- Motors run cooler, more efficient & increases life expectancy
- Interrupter for maximum 10K amp fault currents; 2000 Joules fault current surge protection
- Increase starting torque
- Reduces maintenance costs

What is Power Factor?

- Power Factor involves the relationship between two types of power:

Working Power and Reactive Power

- Most loads in electrical distribution systems are inductive
- Inductive loads require two kinds of current:
 - **Working Power** – performs actual work of creating heat, light, motion, etc.
 - **Reactive Power** – sustains the electromagnetic field
- PF measures how effectively electrical power is being used.

Electric Equipment and their PF

Equipment	PF %
Lightly loaded induction motor	.20
Loaded induction motor	@ .80
Neon/ Fluorescent lighting	@ .30 - .70
Incandescent lamps	1 (unity)
All types of resistance heating devices (e.g. toaster, space heater, hot water element, stove)	1

Causes of Low Power Factor

- Inductive loads are usually the major portion of the power consumed in Commercial Buildings & Industrial Complexes – **80% or more**
- Types of Inductive loads (Reactive Power)
 - Transformers
 - Motors
 - Compressors
 - Fluorescent lighting with T-12 ballasts
 - Older style high intensity discharge lighting (HID)
- **Lightly loaded motors are wasteful and result in low power factor**
- **Larger loads with longer run times = more savings**

Power Factor Correction

- A 20th Century technology
- Installed on the line side near the main service
- Designed to reduce or eliminate PF penalty
- Capacitors only work from where they are installed back to the source of power
- Main purpose is to clean up the electric company's "dirty power" and **save the electric company money**

Power Factor Optimization

- A 21st Century technology
- Installed on the demand side, close to the equipment
- Reduces amperage & kWh to the "cash register"
- **Saves the customer money**

Why You Should Optimize Power Factor?

- Reducing Amperage & kW usage directly reflects to dollar savings
- All electrical components are purposely oversized by at least 125% - NEC (National Electrical Code)
- Eliminate the primary power factor surcharge penalty
 - Utilities usually charge customers an additional fee (up to 25% more) when their power factor is less than 0.90 (PFC equipment)
 - Avoid this additional fee by determining the capacitance needed to optimize each motor to unity by properly sizing and installing the KVAR® EC system

Optimizing Motors to Unity

2 Types of Installations with the KVAR® EC

- **Panel mount** – accumulation of smaller inductive loads
 - Single phase panel mount
 - Three phase panel mount
- **Equipment mount** – larger individual inductive loads

How long is the Payback time?

Depends on:

- **Age of equipment**
- **Percentage of PF optimization**
- **kW per hour charged**
- **Panel mount or equipment mount**
- **Amount of equipment and labor needed for correction**

Why the delay to Market?

- Oil, gas and electricity was inexpensive
- Power companies were against the technology
- No formal marketing program
- Inventor had tragic family matters



1/3 HP motor
120 volts
4.78 amps
without the
KVAR® EC

www.KVAR.US



1/3 HP motor
120 volts
1.35 amps with
the KVAR® EC

4.78 Initial amps
- 1.35 Opti amps
3.43 Amp drop
71.8 % diff.

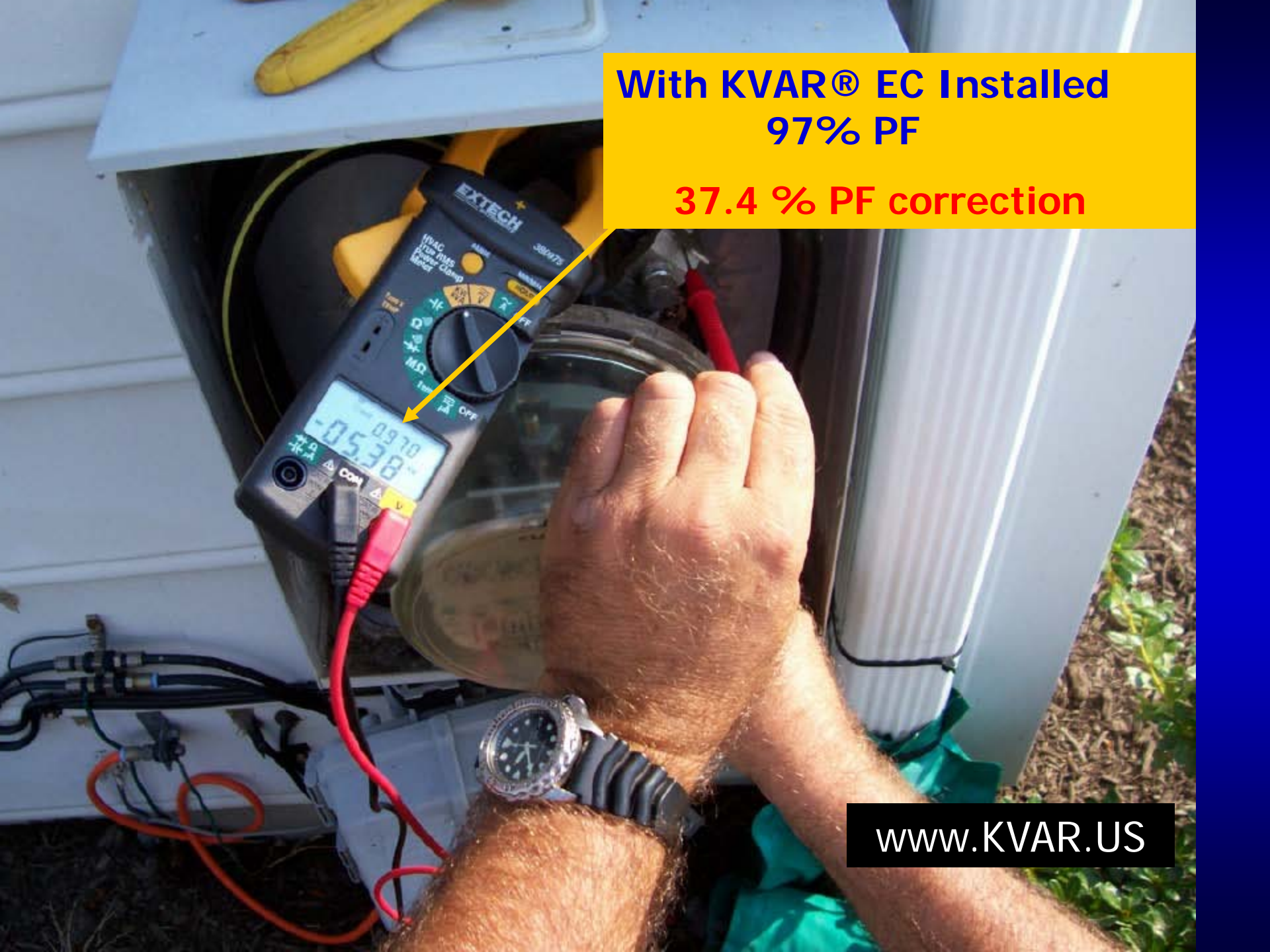
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Residential Meter
59.6% Power Factor



**With KVAR® EC Installed
97% PF**

37.4 % PF correction



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Residence

KVAR® EC

PU-1200

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Electric Meter Information

Meter Number 22ST33

Current Meter Reading, Jan 29 (actual)	015839
Last Meter Reading, Dec 28 (actual)	014727
Total KWHs Used	1112

Your Next Scheduled Meter Reading Is Feb 27, 2007

Electric Delivery Charges

Current charges for 32 days - Winter Rates in Effect - Residential Heating

For Account 2101 3369 9996, the class average annual price to compare is 10.03 cents per kWh
Delivery Charges:

Customer Charge		\$	3.64
Distribution Charge: First 1000 kWh X \$0.031873		\$	31.87
Last 112 kWh X \$0.012531		\$	1.40
Deferred Cost Recovery 1112 kWh X \$0.003710		\$	4.13
Environmental Surcharge		\$	0.16
Administrative Credit 1112 kWh X \$0.001390-		\$	1.55-
Universal Service Program		\$	0.37
MD Franchise Tax 1112 kWh X \$0.000620		\$	0.69
Total Electric Delivery Charges		\$	40.71

Supply Charges:

Standard Offer Service&Transmission First 1000 kWh X \$0.097567		\$	97.56
Last 112 kWh X \$0.097567		\$	10.93
Procurement Cost Adjustment 1112 kWh X \$0.003554		\$	3.95
Total Electric Supply Charges		\$	112.44

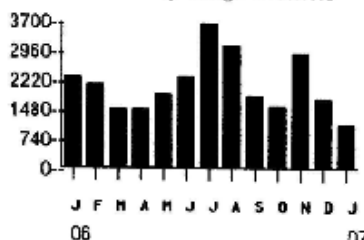
Total Electric Charges		\$	153.16
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Your Electric Energy Comparison

Daily Averages:

	Jan 06	Jan 07
Temp:	40°	40°
KWH:	72.2	34.8

Monthly Usage in KWHs



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Residence

Jan 06 72.2 kWh

Jan 07 34.8 kWh

Diff. 37.4 kWh

51.8% savings on bill

Same average outside temperature of 40° F

Not typical results



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**Residential or Light Commercial
Single Phase Panel Mount**



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SUMMER HAPPENS WITH BEER
Natural
Kaiser Brewery

TOWARD SILVER WATERMELON

Visit www.busch.com

Reach-in air cooled refrigeration cases
5 ton compressors

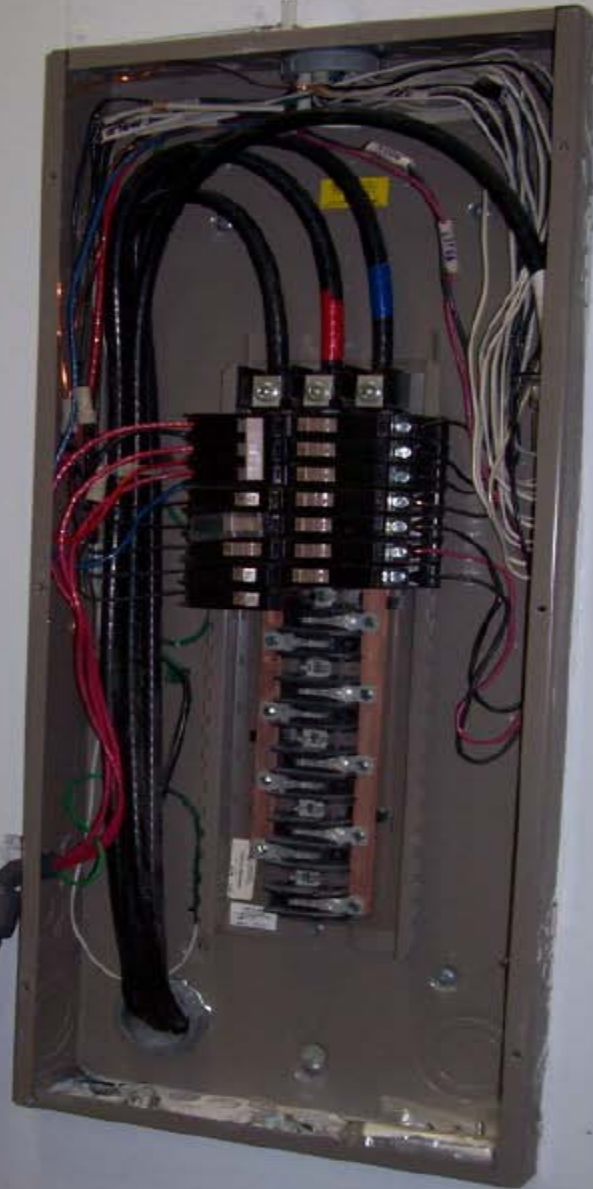
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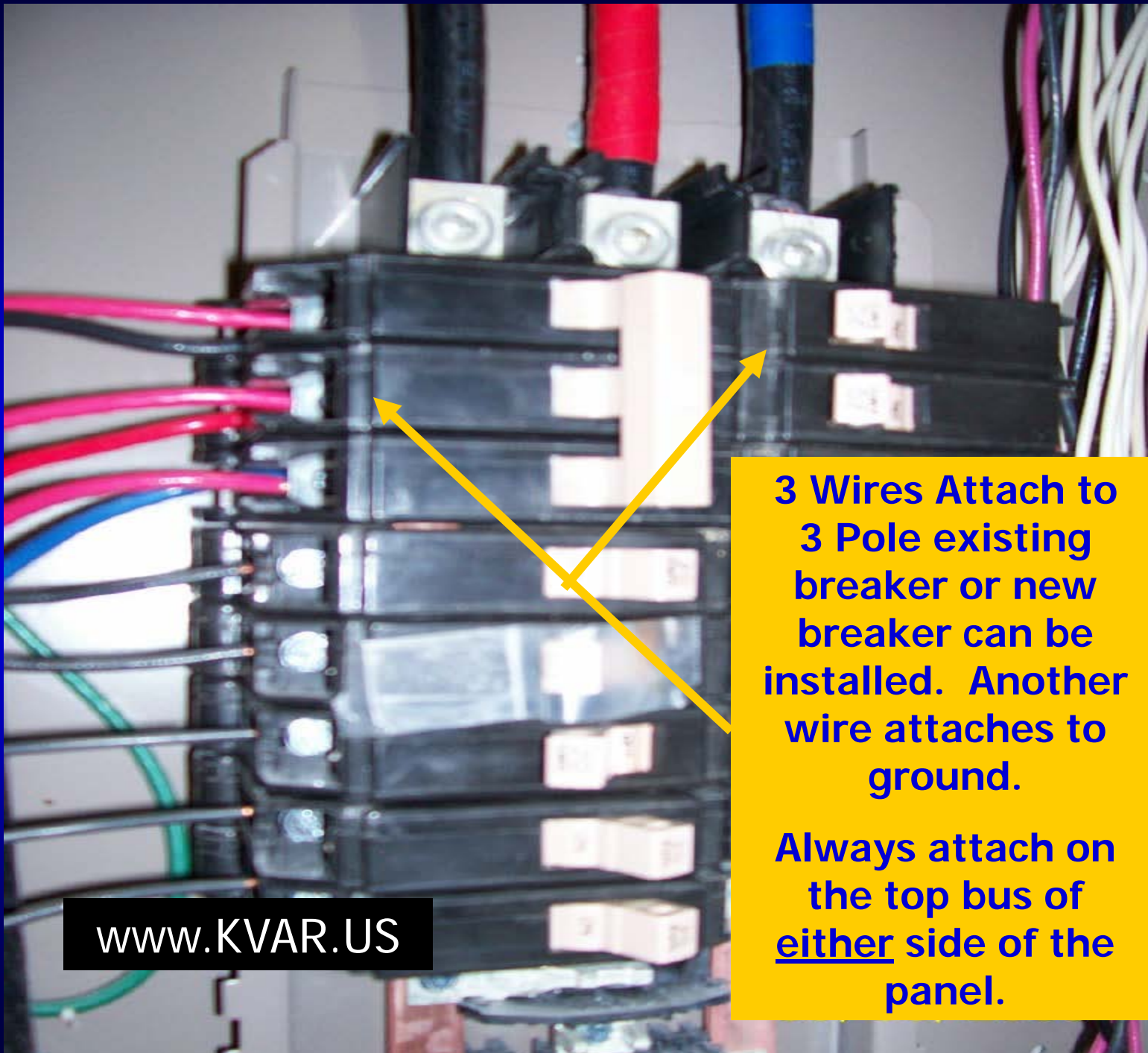


More Reach-in Cooler cases

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**3 phase panel
mount was found
to be most cost
effective to
optimize the
motors with the
fastest ROI**





3 Wires Attach to 3 Pole existing breaker or new breaker can be installed. Another wire attaches to ground.

Always attach on the top bus of either side of the panel.

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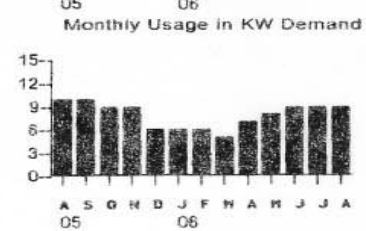
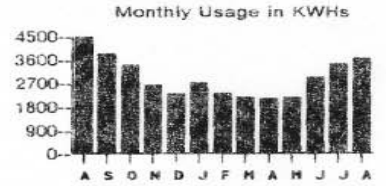
The 3 Phase KVAR®
EC has built in
overload protection
on each phase and
uses a standard
cartridge fuse



Your Electric Energy Comparison

Daily Averages:

	Aug 05	Aug 06
Temp:	80°	79°
KWH:	160.1	125.8



1. The information on this bill is based on the meter data received from your utility. If you have a meter that is not working properly, the information on this bill may not be accurate. If you believe there is a problem with your meter, please contact your utility.

30.1% Reduction in Cost

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Delivery Charges:

Customer Charge		\$	7.00
Distribution Charge: First	500 kWh X \$0.023700	\$	11.85
Last	475 kWh X \$0.023705	\$	11.28
Total Electric Delivery Charges		\$	30.11

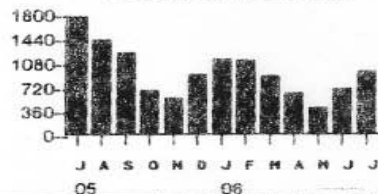
Total Electric Charges **\$ 30.11**

Your Electric Energy Comparison

Daily Averages:

	Jul 05	Jul 06
Temp:	77°	77°
KWH:	52.4	33.8

Monthly Usage in KWHs



Electric Supply Summary - Washington Gas

Supplier Account
Current Charges for 29 days - Residential Service
975 KWHs Used

Billing Period:
from: Jun 26, 2006
to: Jul 25, 2006

Previous Balance Last Bill	\$	74.97
Payment Jul 05, Thank You	\$	74.97-



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35.5% Reduction in Cost

**Total of 32.8% reduction
for all 2 Strip Center Units**

Toll Brothers

America's Luxury Home Builder™

July, 2008

Dear Preferred Partner:

From time to time we see glimmers of hope in our current economy. Like everyone else Toll has been focused on reducing costs and trying to save money anywhere applicable. Toll recently came across a very interesting product in which we would like to share with all of our employees and preferred partners and vendors. Toll has negotiated a reduced price for an energy savings product in which we hope you all benefit from.

Toll strongly believes in this energy savings product and hopes that everyone will benefit in saving hundreds if not thousands of dollars. This product will also provide as a surge protector and reduce greenhouse pollution which helps the environment.

This program has never been offered before and may never be offered again. You've worked hard for Toll Brothers and now we hope we can help you and your employees take advantage of this fantastic opportunity.

If you are interested in this energy saving product please contact Phil McCullem at 561-248-6397.

Best regards,



Zvi Barzilay
President & Chief Operating Officer

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Appoquinimink School District, DE

2005/2006 Monthly Comparison by School

Appoquinimink School District, De

Avg Daily Temp			Silver Lake	Meredith	K center	MHS	Redding	Brick	Townsend	Cedar	District Office	Olive
Jul-05	77	Daily KW Average	3135	4803	632	7455	2835	2375	2023	3102	686	2655
Jul-06		Daily KW Average	2223	2971	466	5422	1183	1137				1260
% +/-			-29.091%	-35.455%	-26.266%	-27.270%	-58.272%	-52.128%	-100.000%	-100.000%	-100.000%	-52.542%

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8 out of 10 Schools Total = 38% savings

February 22, 2007

Middletown Transcript

Appoquinimink School District saves big on energy costs

By Shauna McVey
Staff Reporter
shauna.mcvey@doverpost.com

It was announced at the Feb. 11 meeting of the Appoquinimink School Board of Education that the Appoquinimink School District saved more than \$100,000 in the last year in energy costs.

Bob Hershey, buildings and facilities supervisor, said the district saved \$161,870.

He said the savings are due to the district's Energy Manager Andy Walton, digital heating, ventilation, air conditioning controls, the efforts of the staff inside schools and **KVAR units**, which operate in eight of the 10 schools.

The KVAR units are designed to recycle reactive power, which reduces the amount on energy that needs to be purchased from a power company.

The systems are automated and can be controlled through computers by Walton, who is a heating, ventilation, air conditioning specialist working with the district.

"That's just one portion of how we're cutting down on our kilowatt consumption," Hershey said. "I think there's still a lot of room for growth and we're looking to save a lot of money."

He said the district is working to get students and staff at the schools to conserve energy in other ways by turning off lights and not operating unnecessary equipment.

On average, schools in the district reduced their energy usage nearly 16 percent for January 2007, compared to January 2006.

In addition, Hershey presented Dennis Scott, chief custodian at Olive B. Loss Elementary School, with the Annual Energy Conservation Award for his efforts in cutting energy usage at OBL by 33 percent in 2006 as compared to the energy usage in 2005.

Refrigeration Warehouse



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**Relay used with
KVAR® EC to
save customer
additional money**

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Optimizing of
refrigeration
equipment is
done LIVE

3 different sizing
tools are used

US1- single phase
motors

US2 - 3 phase
motors up to 75 hp

US3 - 3 phase
motors up to 300 hp

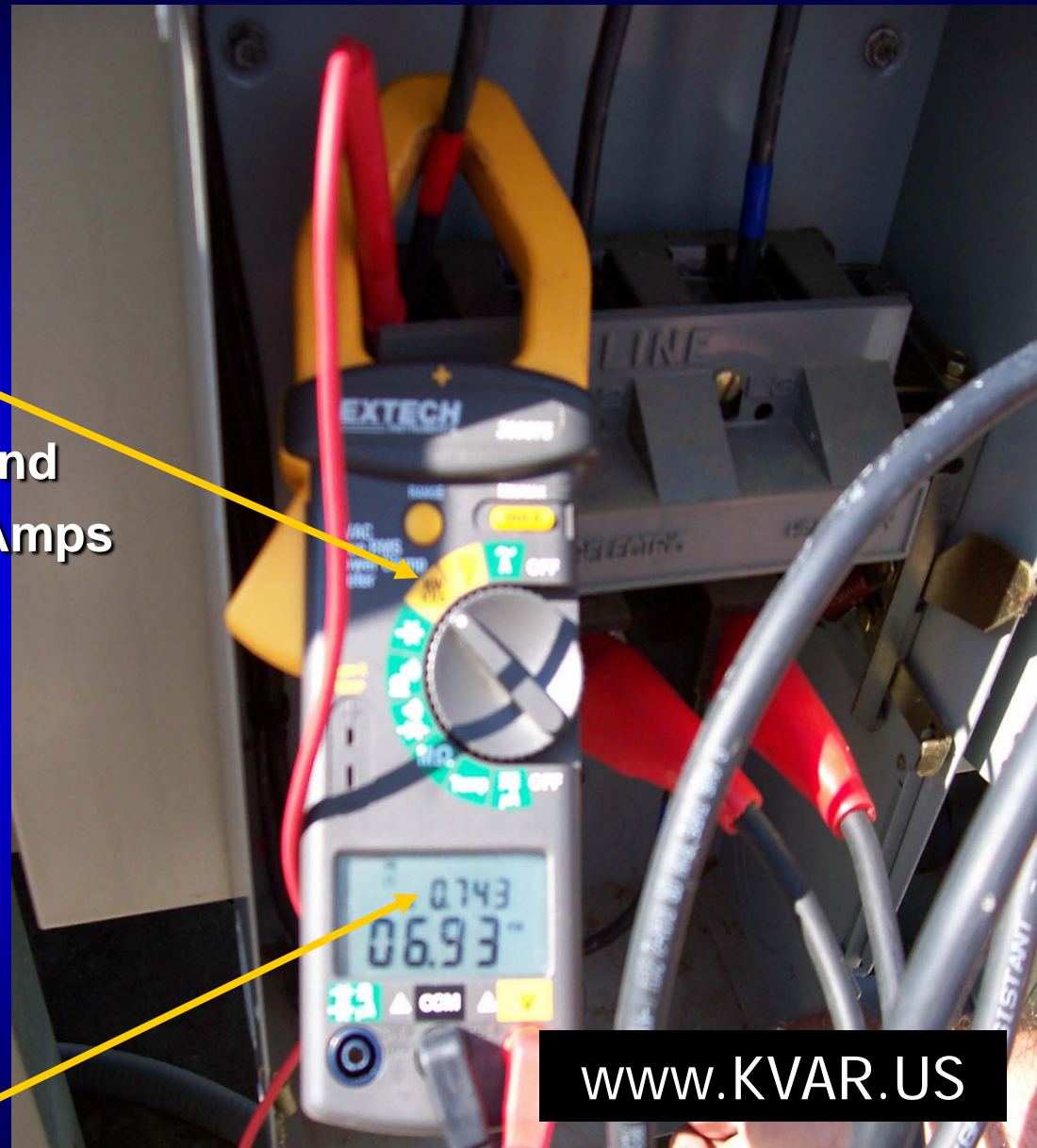
Additional sizers can
be used together for
larger motors.



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Measuring Power Factor

- Select Power Factor
- Clamp load wire
- Leads on positive and ground
- Read & record initial PF & Amps



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Initial PF = 74.3 %

Sizing

- Select switches on sizer to bring power factor as close as possible to 99.9%
- Record optimized PF and Amps
- Record Unit size, switches used, lead amps, runs hours, wire length, K/O side needed & cost per kWh

Optimized PF = 99.9%



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Initial amps

33.85

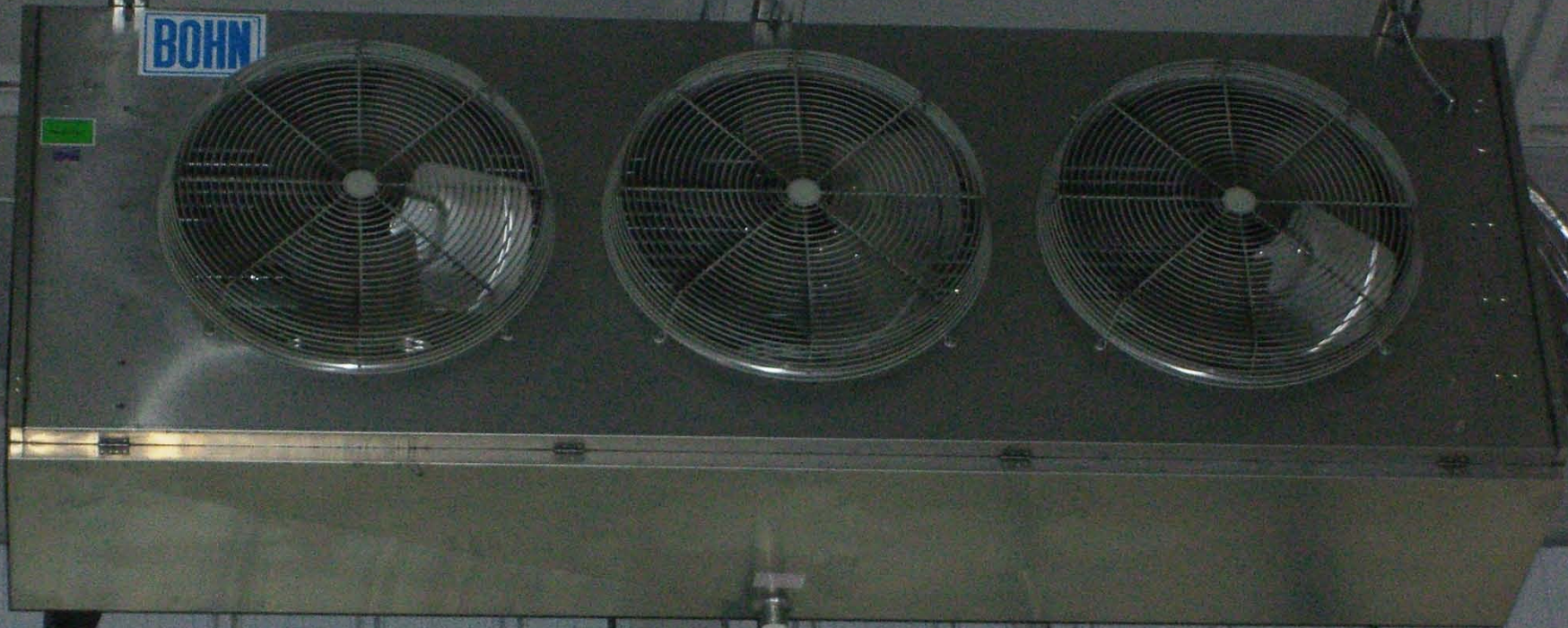


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Optimized amps 27.30
6.55 amp difference
19.35 % reduction



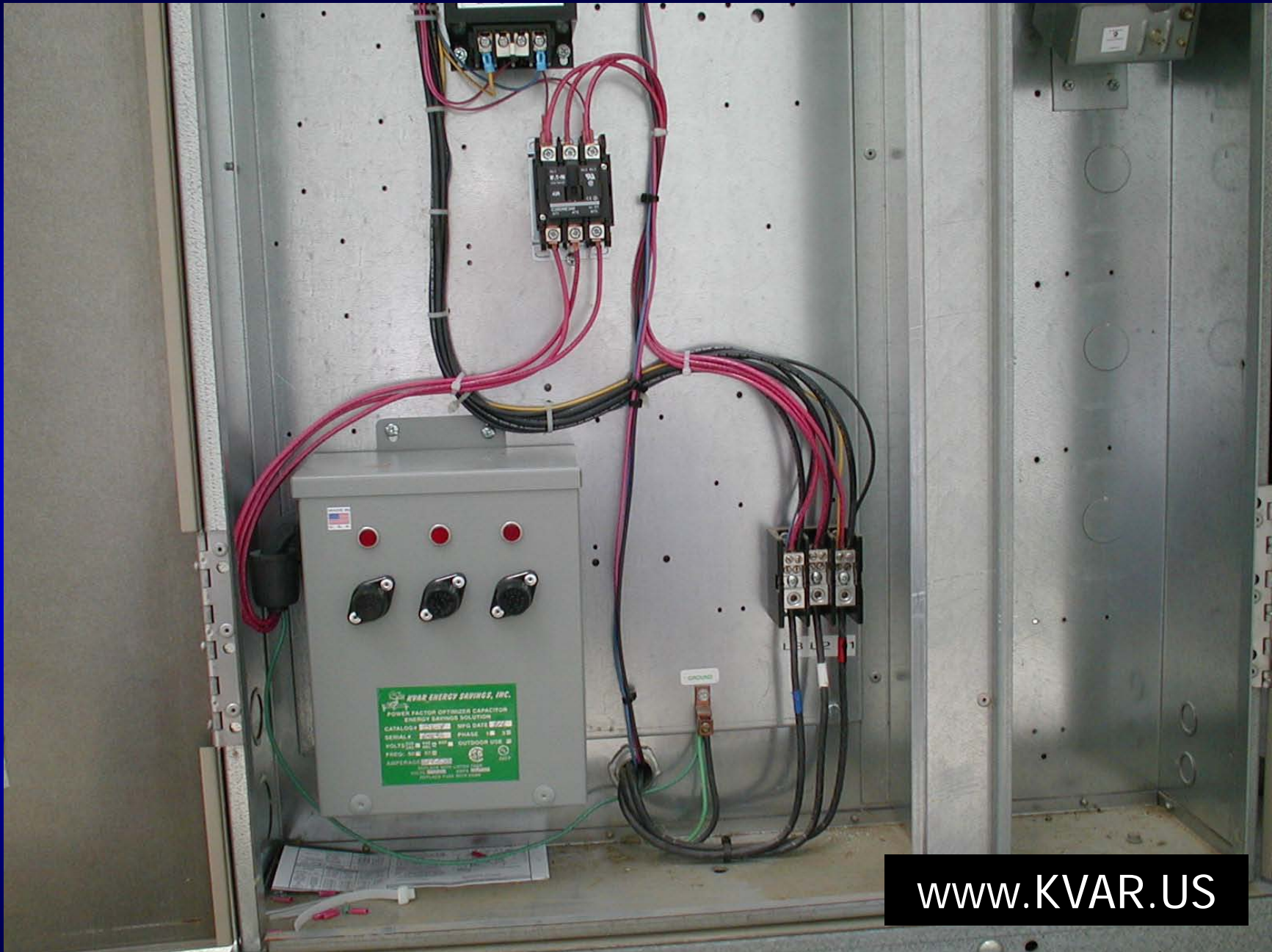
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Large evaporators inside need their own KVAR® EC at the disconnect




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**HID Lighting panel mount
with more than 50 older
style lights**

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Cooling Tower



Water Cooled Chiller

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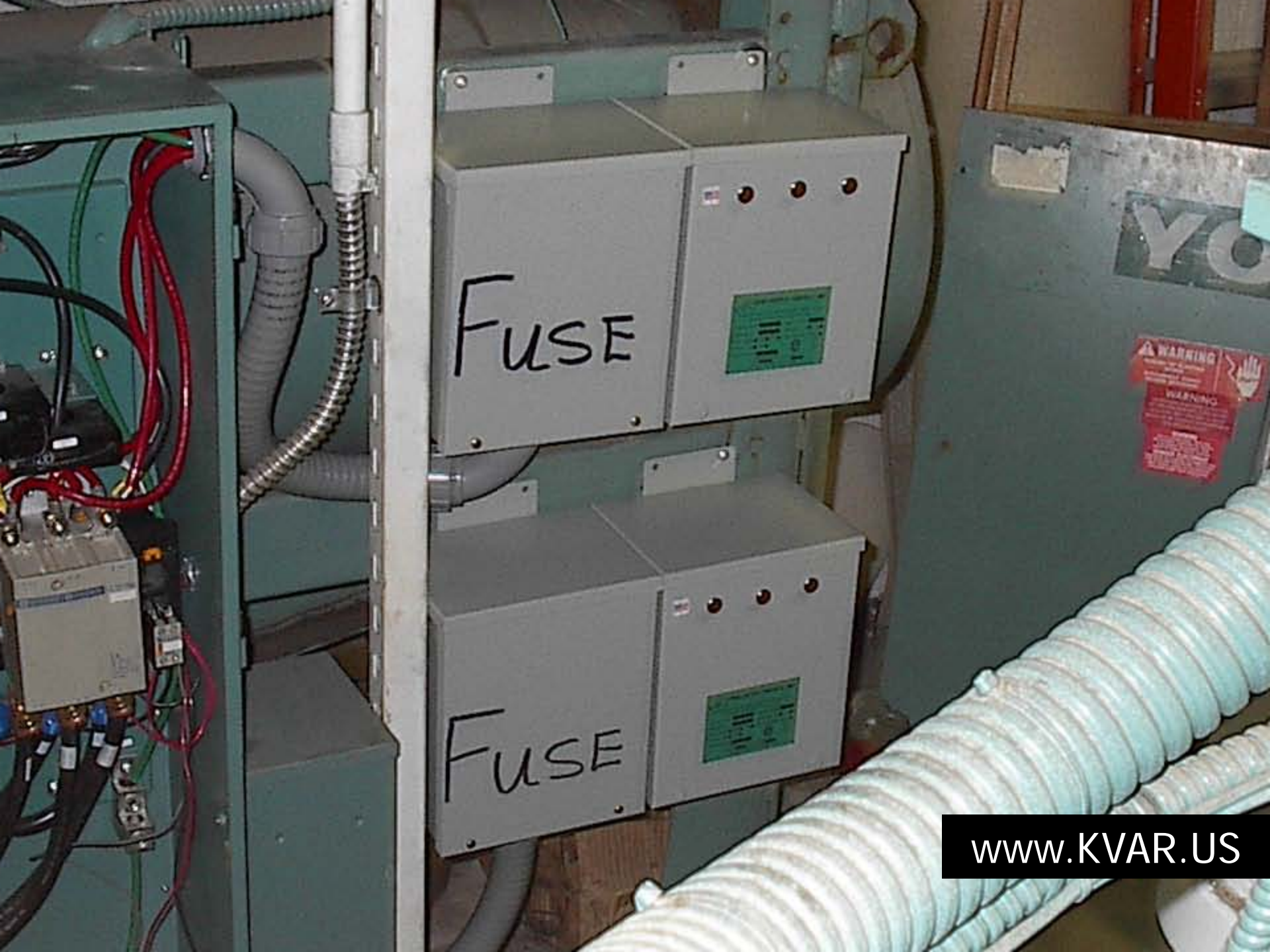






RED wiring is new
Black wiring is existing

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FUSE

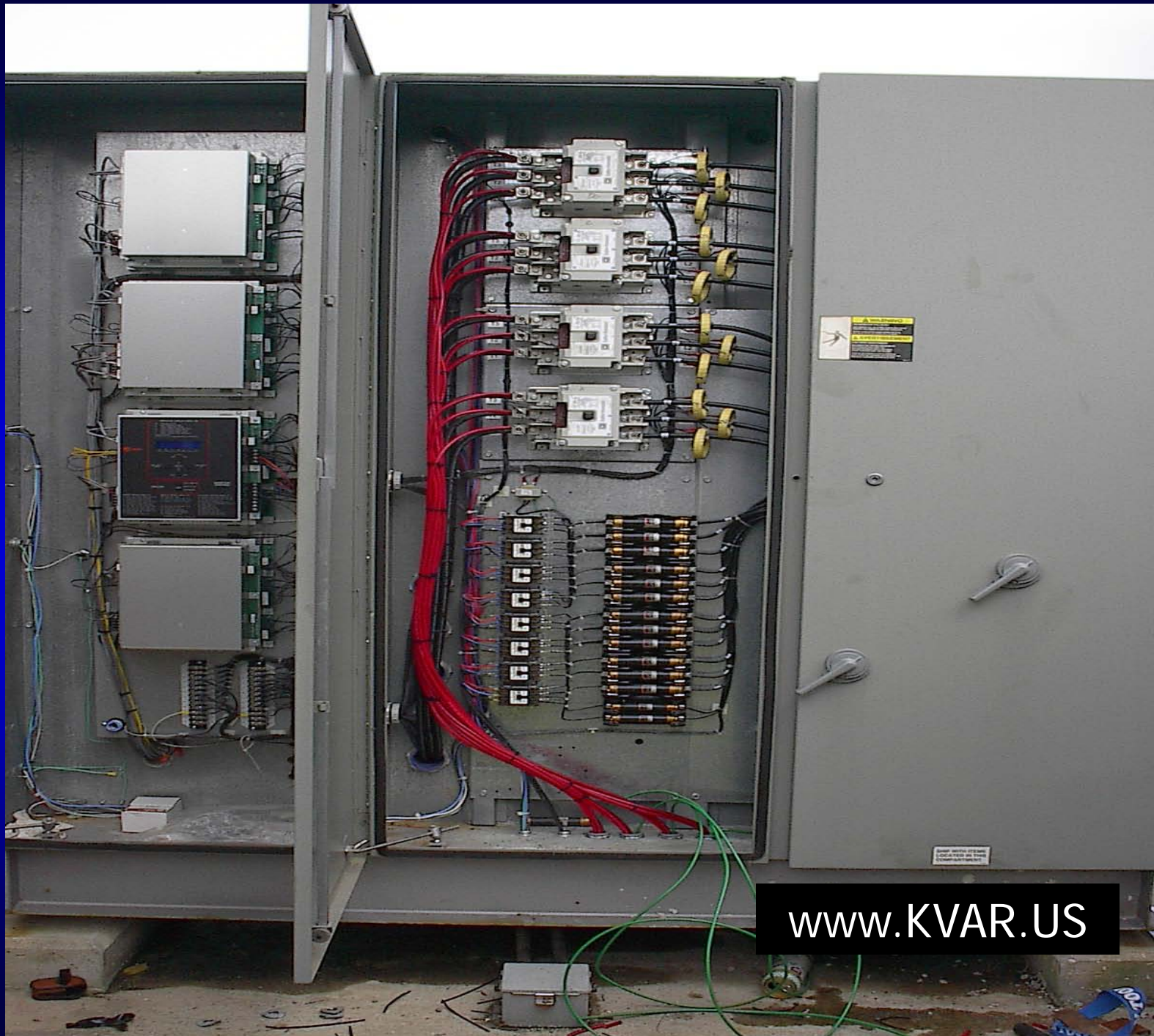
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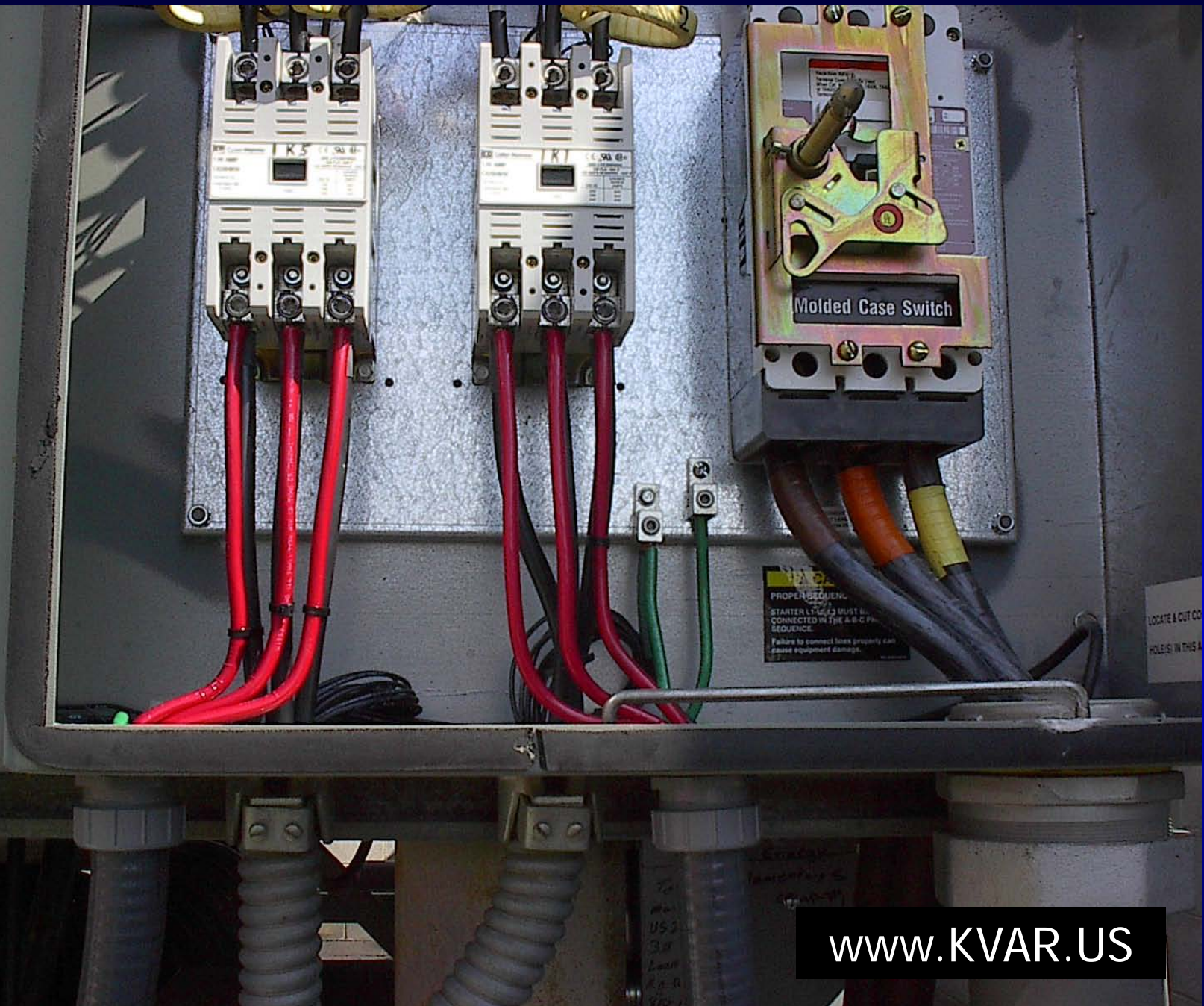
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**Drinking water treatment
plant in Florida operating
more than 15 years**

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HIGH VOLTAGE

High Service
Pump # 1

WASTE TREATMENT PLANT
WASTE PUMP NUMBER

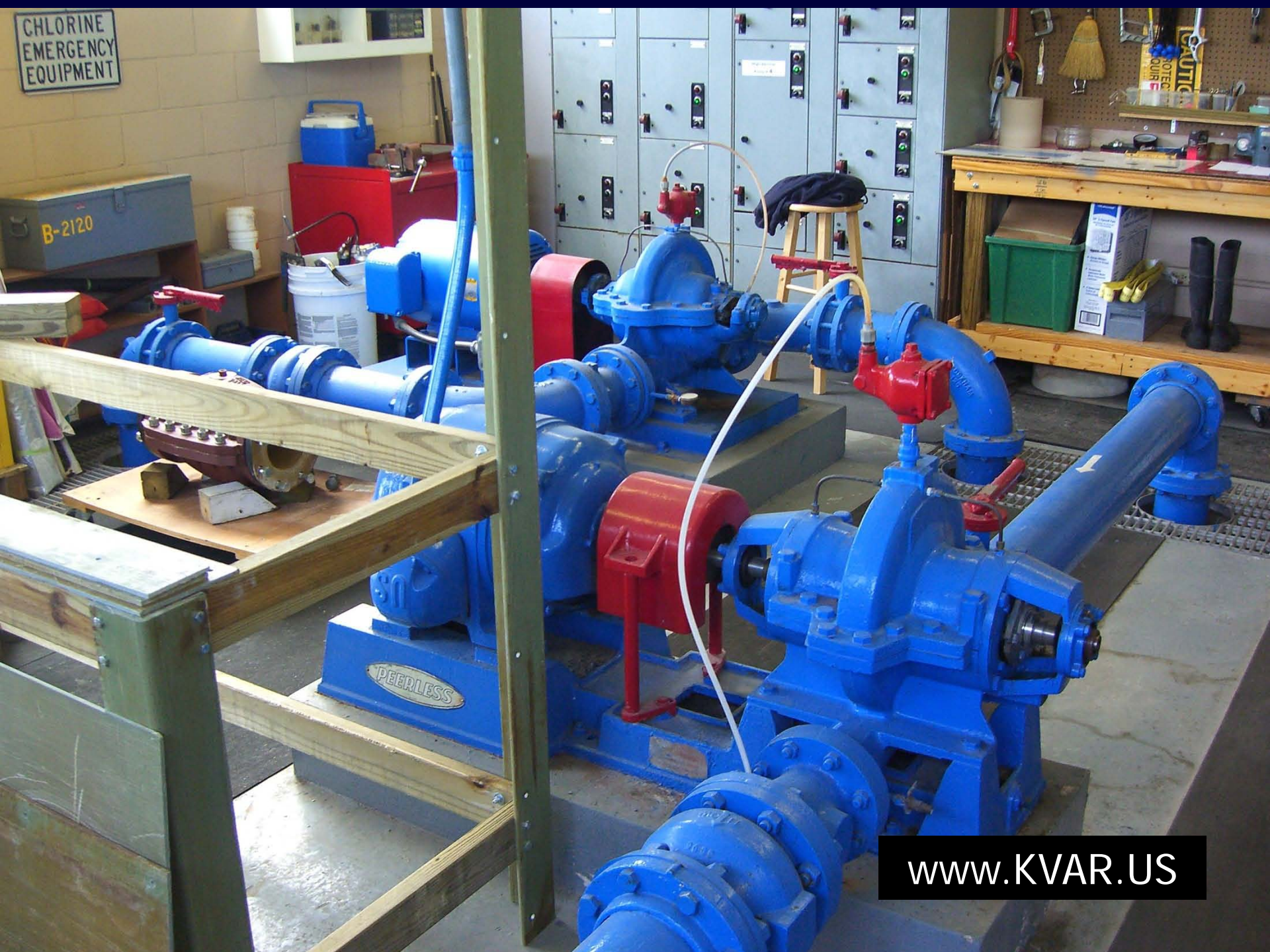
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CHLORINE
EMERGENCY
EQUIPMENT

B-2120

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GENERAL ELECTRIC
8000 LINE

DANGER

DANGER

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40 hp cooling
tower water
pump motor
Initial PF 52%

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**40 hp cooling
tower pump motor**

**Optimized PF
99.9%**



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Common Names Given to Electronic Power Converters

- **Adjustable Speed Drives**
- **Variable Frequency Drives – VFD's**
- **SCR Drives**
- **AC Motor Drives (ac/dc/ac)**

Consequences of High Harmonic Distortion Levels from VFD's?

- High blood pressure can create stress and serious problems in the human body
- High levels of harmonic distortion can create stress & problems for the utility's distribution system, the plant's distribution system and the equipment that is serviced
- The result may be the plant engineer's worst fear — the shutting down of important plant equipment ranging from a single machine to an entire line or process

Excessive Harmonics Penalty Charge

- Electric utilities are currently charging financial penalties and/or service interruption for customers injecting excessive harmonics into the utility system
- Customers may not be currently penalized for low power factor, however a harmonic distortion-based penalty structure, in the manner of IEEE 519, may be forthcoming to them.

The KVAR® EC offers substantial savings with a quick ROI without introducing excessive harmonics into the system



**Sizing Pump Motor with
“Soft Start” or “Rectifier”
at disconnect.**

**The KVAR® EC is always
sized & installed before
the “Soft Start” or
“Rectifier” (line side) if no
factory capacitance is
already present.**

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In conclusion...

- You can finally reduce motor temperatures, increase longevity, enlarge distribution capacity, have better voltage regulation, eliminate surges, remove power factor surcharge penalties & **SAVE MONEY!**
- Electrical Rates are climbing everywhere & Energy Conservation and going **Green** are buzz words
- KVAR has patented an apparatus and methodology for determining to an exact science, the amount of capacitance that is needed to optimize inductive motors to unity creating an ideal balance for maximum savings!
- **How much money can be saved at your facility as you slow down the electric meters...legally?**