

ShopTalk

Plant Operations Support Consortium

Volume 19, Number 2

Winter 2015

What is Power Factor Correction and Does It Affect Me?

By Tony Simon, Electrical Engineer, WSU Energy Program

As operators of facilities departments, we are tasked with keeping things running on a tight budget while still looking for more ways to save money. This, as you know, is a large undertaking. I'm asked time and time again about power factor correction, how it works and if it really helps save energy and/or money. This article is a brief introduction into power factor and how it may affect some of your facilities. Those planning to attend the 2015 Energy/Facilities Connections Conference (see page 8) can join me at my one-hour session where I will go into more detail on the subject.

The first thing to understand is that power factor correction does not save any energy. However, it can reduce your bill if, and only if, you are paying power factor penalties. PERIOD.

Whittled down to the basics, here are four steps to help you understand power factor and correction.

1. What is power factor?

Power factor (PF) is a comparison of how much current actually goes into your power draw in kW.

$$PF = \frac{\text{Real Power in kW}}{\text{Apparent Power in kVA}}$$

Technically, it is the ratio of your true real power in kW to apparent power in kVA.

Power factor is usually expressed as a decimal or percentage on your bill. Utilities tend to prefer end-user power factor values of 0.9 to 0.95; therefore, the closer your value is to this range, the better. What causes power factor to be lower than this preferred range is inductive loads, such as magnetic lighting ballasts (in older T12 and HID lighting) and AC induction motors that drive pumps, fans, and air compressors. This type of equipment requires extra current to generate magnetic fields in order for the devices to operate, but this extra current doesn't consume any energy.

Equipment such as baseboard electric heaters, strip

See **Power Factor** on page 5



Tony Simon

ShopTalk



Shop Notes

By Edwin Valbert,
Consortium Manager



Edwin Valbert

Welcome to 2015!

Your Consortium stands ready to help make it a great year for your facility.

As it is the tradition at this time of year to make resolutions, we hope you will make a resolution to use your Consortium membership even more in 2015. Whether you need help with a quick Internet search on a product, a review of a document you are about to send out, or a full-blown assessment of one of your buildings or processes, we are ready and willing to help. Our resolution is to make your job easier. Big or small, we are ready to taking something off your plate to help you be more efficient. Our goal is to be the employee you use that doesn't require a W-2.

Here are some recent ways members have utilized the Consortium:

- Identified items on a member's utility bill that required attention
- Researched products for sealing concrete pits
- Assisted with completion of a greenhouse gas emissions report
- Researched property ownership of land located next to a Consortium member
- Performed blower door tests on modular living units

- Provided Construction Management Services

We are also continuing our quest to provide educational opportunities for facilities professionals. Our latest webinar, **Understanding and Maximizing Economizer Performance**, was a big success this month. It was presented by Neil Bavins, President of PSR Mechanical, a commercial and industrial contractor located in Seattle, WA, specializing in maintenance, repair, and system upgrades. View it here: www.energy.wsu.edu/PublicFacilitiesSupport/PlantOperations/OnlineTrainings.aspx.

Keep our phone number (360-956-2230) and email (plantops@energy.wsu.edu) handy so we can help make 2015 a productive and positive year for you and your facility. ✖

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Shop Talk is a electronic newsletter of the Plant Operations Support Consortium, providing information focused on facility operations. We welcome feedback from readers. To provide feedback or to subscribe to the Consortium electronic Listserv, email us at PlantOps@energy.wsu.edu.

Archived issues of *Shop Talk* are available at:

www.energy.wsu.edu/PublicFacilitiesSupport/PlantOperations/ShopTalk.aspx

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Solid Waste and Recycling Issues – The Revenge of Grunge!

By Jay Donnaway, Sumner School District

No, the 1990s aren't back, so don't break out your flannel unless you're chilly. But after focusing on energy utilities for the past 20 years, it's time again to take a look at the grungy world of solid waste management.

Solid waste captured headlines in the '90s, when we institutionalized residential and commercial recycling efforts, which are now seamlessly woven into solid waste management systems pretty much everywhere. What new issues are rocking the world of solid waste?

The cost of garbage collection outpaces inflation

Costs continue to rise in the solid waste sector. In Pierce County, the cost of frontload garbage container service has risen over 15% over the past five years while cumulative national inflation was about 10%. Even though fuel prices have fallen significantly, strategic moves by waste haulers made permanent those price increases that were originally imposed as temporary fuel surcharges.

Meanwhile, recycling costs for single-stream collection have fallen 30%, thanks to negotiation and vigilance regarding pricing changes. Recycling is considered an open market activity in Washington, and is not regulated

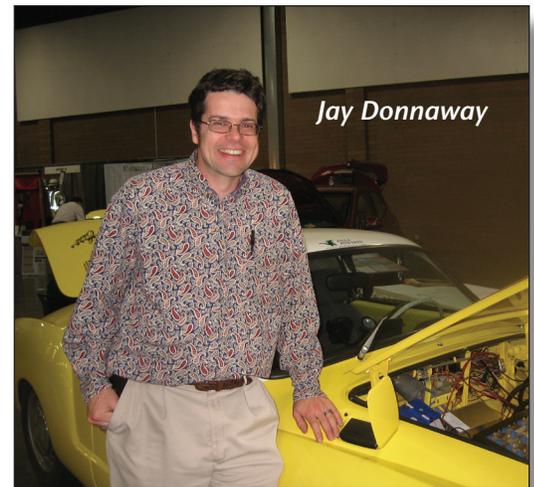
by the Washington State Utilities and Transportation Commission (UTC). But because many businesses just accept whatever services and prices are offered by their franchised solid waste hauler, they may be paying more than necessary.

As garbage pricing continues to outpace inflation, many long-held assumptions about the cost-effectiveness of different waste management methods are being scrutinized. Recycling continues to be a good investment, and more materials than ever are now included among recyclable items (depending on the municipality). Newer services, such as collecting food scraps and other organic wastes – termed *putrescibles* – separate from other solid wastes, prompt customers to ask if these waste stream reduction measures will help reduce collection costs.

Diverting putrescibles from the solid waste stream is a good thing

By removing the heaviest remaining waste fraction and the leading source of odor, leakage, and vermin from the solid waste stream, we open the door for more economical collection services. Some regulators require that unseparated garbage be picked up once a week, but once the food and other organic

wastes are separated from regular garbage, the remaining refuse can be collected in larger containers (usually 40 cubic yards) and picked up only as needed.



Larger collection containers take up more space at the customer's location and often require special access ramps or other site work. However, upsizing the collection containers can:

- Enhance safety by reducing the number of times the large collection trucks have to visit a site,
- Simplify the disposal of bulky waste, and
- Save money by reducing the frequency of garbage pick-ups. With a fixed cost of \$150 to \$200 per haul even before the garbage is tipped, those savings are significant.

See *Grunge* on page 7

Custodial Operations Can't Be Taken for Granted

By Sue Brown, Consortium Staff

As facility stewards, we are responsible for managing the facilities to protect the health and safety of anyone who uses them. As individuals, we can set an example by washing our hands often and after using the restroom. We can maintain a healthy lifestyle and vaccinate ourselves and our children. Through our actions, we can influence others to promote health and wellness.



Steve Turman, head custodian at Conway School District, utilizes a swab to test the cleanliness of a cafeteria table.

The preventive measures we take to protect human health in our built environments are increasingly important as the world population grows. Even though the panic over the spread of pandemics in other areas of the world has subsided (for the moment), we still need to be vigilant so pathogens are not transmitted through the air, human contact, or touched surfaces. We all know that whooping cough, MRSA, strep, measles, and enteroviruses can make people very sick, especially those with immature or compromised immune systems.

Something that only looks clean may not be clean enough

In light of these potentially harmful microorganisms, it is clear that our cleaning crews need to be trained, equipped, and informed so they can do their jobs competently. After all, they are the front-line employees who protect our health in the built environment. Unfortunately, many have learned that if something "looks" clean, that is all they need to be concerned about. Many cleaning workers are never trained to work to a microscopically clean standard. To highlight this consideration,

- Does your facility test surfaces for pathogen removal before and after cleaning takes place to



ensure that a high level of cleanliness is achieved?

- Does your cleaning crew know the touch points that are typically the most germ-laden? (*HINT: it's not the toilet seat.**)
- Has your staff been trained on process improvements and do they have the best tools and equipment to get the job done?
- Do you have sufficient staff to accomplish the tasks that need to be done to maintain a high, or even an average, level of cleanliness?

Call your Consortium for a custodial consultation

If you answered no to any of these questions, you may want to consider scheduling a custodial consultation through the WSU

See **Granted** on page 7

Power Factor

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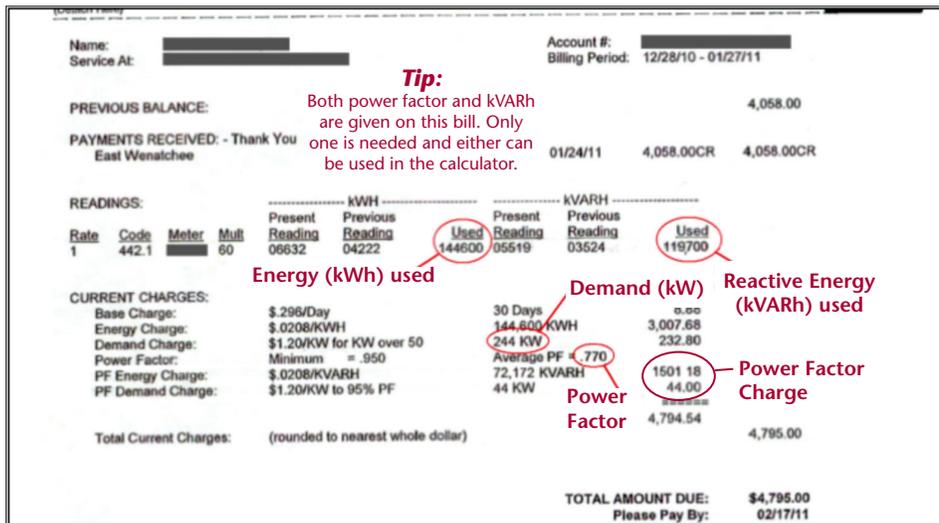
heaters in HVAC systems, and appliances such as toasters and ovens, don't require magnetic fields to be generated. For those types of equipment, all of the current is used to create heat, which, in effect, consumes energy. Therefore, they have power factor values of 1.0.

The bottom line with power factor is that it is all about the current.

2. Does power factor even impact me?

To answer that question, check your utility bill to see if you are paying penalties. Some things to look for include charges and/or adjustments such as power factor (PF), reactive power (kVAR), reactive energy (kVARh), and demand in kW or kVA.

Figure 1 is a utility bill that has power factor penalties.



If you cannot clearly identify if you have power factor penalties by looking at your bill, review your rate schedule and look for similar terminology such as power factor or reactive power to see if any adjustments or rates have been attached to them.

Every utility is unique and may treat power factor penalties differently.

Even if you aren't paying power factor penalties, reviewing your utility bills is a good way to find other

cost-saving opportunities, such as abnormal energy consumption patterns, weird spikes, overcharging, and late payment fees. As they say, "if you can measure it, you can manage it."

3. If I am paying a power factor penalty, how much is it costing my organization?

What should you do if you are paying power factor penalties? That depends on how high the penalties are and if it is economically feasible to correct them. Start by determining what the penalty is costing your organization each year. If the cost is minimal, it might make more sense to focus on energy-efficiency efforts instead.

To determine how much power factor penalties are costing you, take a deeper look at your utility billing information. Before breaking out the paper bills and

manually transcribing them, see if someone in your organization is already tracking utility bills in a spreadsheet. This might be done by the accounting department or energy manager, if your organization has one.

If you can't locate a tracking spreadsheet or log of utility expenditures, your utility representative may be of assistance and might even be able to send you a spreadsheet that has everything that you need. In some cases, you might have to create your own spreadsheet or

enter utility data into a software tool. If this is the case, please contact us – plantops@energy.wsu.edu – because we may be able to help you to streamline this process.

Whether you built a spreadsheet, got access to one from someone in your organization, or have one from the utility, identifying the annual power

See **Power Factor** on page 6

Power Factor

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factor costs could be as easy as adding up all of the monthly penalties. In more complicated cases, it may require additional analysis.

The utility bill shown in Figure 2 has energy, reactive energy, demand, and power factor all clearly listed. By looking at the actual fees, however, you can see that the utility is only charging for energy and demand.

Figure 2

Detailed Account Activity						
ITEM 5 - ELECTRIC SERVICE						
METER NUMBER	SERVICE PERIOD From To	ELAPSED DAYS	METER READINGS Previous Current	METER MULTIPLIER	AMOUNT USED THIS MONTH	
21332793	Dec 15, 2009 Jan 15, 2010	31	54631 55122	80.0	39,280 kwh	Energy (kWh) used
21332793	Dec 15, 2009 Jan 15, 2010	31	37408 37817	80.0	32,720 kvarh	Reactive Energy (kVARh) used
21332793	Demand Jan 15, 2010		1.501	80.0	120 kw	Demand (kW)
Power Factor Adjustment					12.0000 kw	
Power Factor					0.7683	Power Factor
Previous Month Estimated - Path To Meter Was Blocked Next scheduled read date: 02-15. Date may vary due to scheduling or weather.						
NEW CHARGES - 01/10		UNITS	COST PER UNIT	CHARGE		
Basic Charge - 3P						27.00
Demand Charge		132 kw	11.9900000			1,582.68
Energy Charge		39,280 kwh	0.0290060			1,139.36
Customer Efficiency Services			0.0465000			126.57
Home Electric Lifeline Program						7.82
Municipal Energy Sales/use Tax			0.0600000			172.54
Utah Sales Tax Non-residential			0.0685000			196.98
Total New Charges						3,252.95

A power factor adjustment of 12 kW is listed close to where the power factor is listed on the bill in Figure 2. This means that because there is a lower power factor, the utility is increasing the billed demand by a value of 12 kW (compare the 120 kW of metered demand shown above to the 132 kW of billed demand listed on the new charges table in Figure 2). On the new charges table, the bill shows that the building owner pays \$11.99 per kW per month, so the cost of having a low power factor is $12 \text{ kW} \times \$11.99 = \143.88 per month. If we assume that the demand and power factor are the same for every month of the year, the annual power factor penalty is $12 \times \$143.88$, which comes to \$1,726.56 per year.

Remember to keep things in perspective; if the power factor is costing you \$50 per year, it might not make sense to invest in power factor correction.

4. What type of equipment is needed to improve (correct) power factor?

The power factor correction is rated in kVARs and usually accomplished by installing capacitor banks. Depending on the type of circuit and how the loads fluctuate, an automatic type of capacitor bank can also be used (which adjusts the amount of kVARs needed based on the load). Some may even come with built-in controllers or communications equipment. Alternatively, a variable frequency drive installation on a motor that has a low power factor will usually correct the power factor up to 0.95.

Remember, correcting power factor does not reduce energy consumption, but it could lower your energy bill. If you are unsure about your power factor situation, don't hesitate to call your Plant Operations Support

Consortium at 360-956-2230, or email plantops@energy.wsu.edu.

The WSU Energy Program has also made available a Microsoft Excel-based tool, called the **Power Factor Correction Calculator**, to assist you with evaluating what you are paying in penalties and what correction might be needed. This resource is available online at <http://energyexperts.org/CalculatorsTools/PowerFactorCorrection.aspx>. ✖

Grunge

Continued from page 3

Separating wastes makes self-hauling a reasonable option

Once the bulky recyclables and icky putrescibles are removed, it becomes feasible to compact the remainder of the solid waste and haul it to the disposal site in a trailer or a stake bed truck. In Washington, customers can haul their own waste, which is important to know when renegotiating a hauling contract.

And don't forget to collect your own recyclables. Scrap paper and cardboard are accepted by processing plants throughout the state, and recyclables are much easier and cleaner to haul than mixed waste.



A stake bed truck can be very useful when hauling recyclables

Contact Jay with questions about this article or other recycling insights, jay_donnaway@sumnersd.org. ✖

Granted

Continued from page 4

Plant Operations Support Consortium. The Consortium's experienced and knowledgeable staff will look at your staffing level, the condition of your buildings, cleaning tools, equipment, chemicals, and cleaning processes that are being used, along with what is being cleaned, how often, and by whom. We will give recommendations for ways to develop a more efficient and effective cleaning program.

It is natural to feel anxious about an assessment. Having a third party assess the entire operation can be intimidating and intrusive, both for managers and cleaning workers. Plant Operations understands that and works with the entire team of management, workers, and distributors to

develop processes and procedures to move forward, not criticism of what has been done in the past. The biggest challenge is convincing everyone in custodial operations to buy into the idea that there are many opportunities for growth and improvement, just like in other professions. Comparing your cleaning operations to industry standards supports the idea that continuous improvement is preferable to stagnation.

Peter Drucker coined the expression, "If you can't measure it, you can't manage it." Understanding how the cleanliness of your facility compares to custodial industry standards can make your job easier and more productive. This knowledge can support your

efforts to pursue appropriate staffing levels, the need for more efficient equipment or processes, and time spent in training. It can show that you are a manager who cares about your workers and wants them to be the best they can be. Workers will want to stay on a team if they see that management is strongly committed to that team

Call your Consortium today at 360-956-2058 to discuss assessment options for your custodial operations. We are confident you will be glad you did. ✖

** Your chair, phone, desk, and lunchroom table are usually the most highly contaminated surfaces in an office environment. Time to get out the antibacterial wipes.*

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Camas

Central Kitsap

Centralia

Chilliwack, BC

Conway
Delta, BC
Enumclaw
ESD 101
ESD 114
ESD 121

Eton School

Federal Way
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the Sacred Heart
Highline
Inchelium
North Thurston
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Olympia

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Orondo
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Portland Public
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Shoreline
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Wishkah Valley

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Bellevue College
Clark College
**Clover Park Technical
College**
Columbia Basin College
Community Colleges of
Spokane

Everett Community
College
Highline Community
College
Lake Washington
Institute of Technology
Olympic College
Peninsula College
Pierce College
South Puget Sound
Community College
The Evergreen State
College
Washington
State University
Energy Program
Wenatchee Valley
College

Municipalities

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City of Tumwater
Clark County
Jefferson County
Lakehaven Utility
District
Lewis County
Pierce County Library
System
Skamania County
Thurston County
Whatcom County

Miscellaneous

Hopelink
Meydenbauer Center
Multicare System

Washington State Agencies

Corrections
Ecology
Enterprise Services
Fish & Wildlife
Health
Licensing
Natural Resources
Parks & Recreation
School for the Blind
Social & Health Services
State Patrol
Transportation
Veteran's Affairs

*Our warm welcome to
new members in **bold
blue** type. We look
forward to serving your
facility and operations
needs. ✨*

2015 Energy/Facilities Connections Conference

Staying Smarter Than Your Buildings

May 5-7, 2015

Located at the beautiful
Enzian Inn
Leavenworth, Washington

Mark Your Calendars!

Check out the EFC 2015 page at
www.energy.wsu.edu/efc,
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