Case Study

Towson University

Glen Tower Complex
(4) Glen Towers - A, B, C and D
Power System Optimization

Facility Description

Characteristics:

- 399,024 net sqft. – (4) Buildings .The (4) four buildings range between 11-13 floors each.
- (4), high rise residence halls and a dining facility. Approximately 1,550 student live in the Four Building Complex
- Buildings were constructed in from 1981-1983

Existing Conditions:

- 32 power distribution transformers
- 31 year old transformers
- Extremely light electrical load
- Average loading of system as percentage of capacity = 4.8%

Challenge

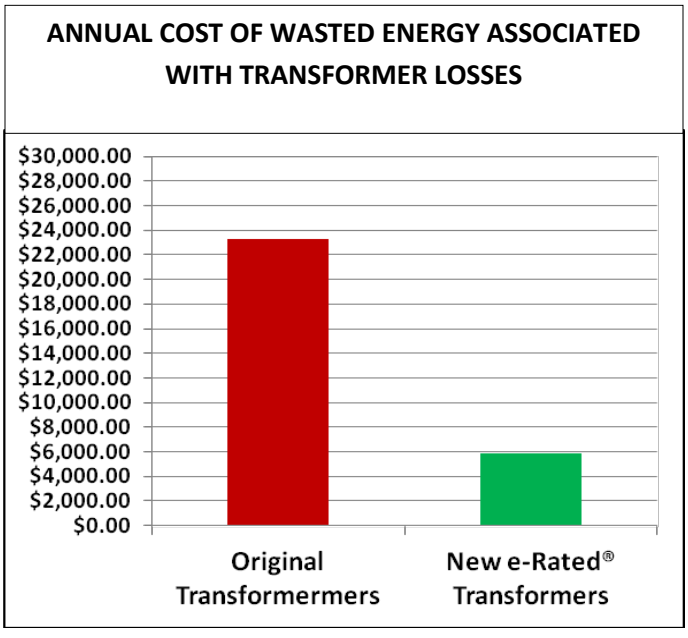
The power distribution systems in the (4) Glen Towers were operating inefficiently, due to the low efficiency of the existing low voltage transformers and the extremely light electrical load under which they were operating. As a result of the low load levels (4.8% average), the transformers were experiencing excitation or "no load" losses. The existing transformers were much larger than the electrical demand requires. As such, the transformers were using more energy than necessary. PQI was contracted by the Towson University to engineer a Power System Optimization Solution, which would reduce electrical losses, increase overall power quality and ensure system/load compatibility.

Solution

PQI engineered a Power System Optimization Solution, consisting of the replacement of all 32 transformers with strategically right-sized ***e-Rated®*** ultra-efficient transformers, which increased load levels and reduced excitation losses. Installing right-sized, ultra-efficient transformers provided an attractive ROI and project payback, which were enhanced by utility rebate

Impact

- ✓ **185,092** = Annual kWh savings
- ✓ **$20,912** = Total annual utility savings
- ✓ **$47,000** = Utility rebate (Baltimore Gas & Electric)
- ✓ **31.5%** = Percentage of project paid for by BGE
- ✓ **4.8 years** = Project Payback
- ✓ **$526,982** = Lifetime net profit (30 years)



POWER QUALITY INTERNATIONAL

Case Study

Johns Hopkins University School of Medicine

The Bunting Blaustein Cancer Research Building - Baltimore, MD

Facility Description

Characteristics:

- 122,000 net square –foot building
- Working space for 400+ researchers and staff includes numerous laboratories and offices
- Mission Critical Facility
- Completed in 2000

Existing Conditions:

- 19 power distribution transformers
- 13 year old transformers
- Extremely light electrical load
- Average loading of system as percentage of capacity = 7.4%
- Reasonable harmonics were identified

Challenge

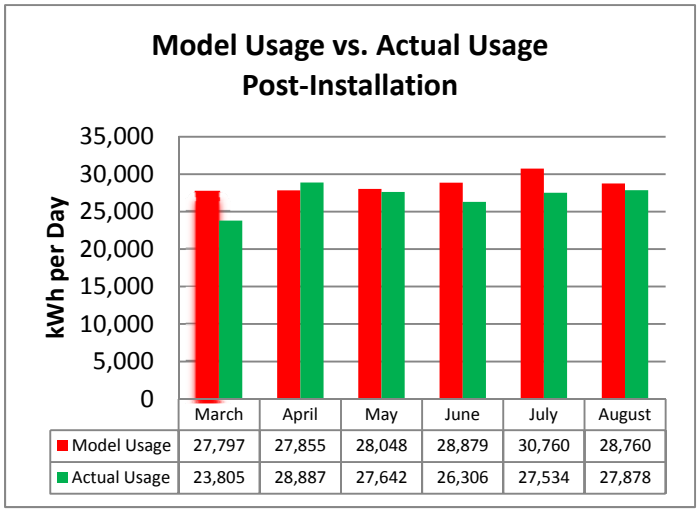
Throughout the facility, significant losses were occurring because of (i.) oversized distribution equipment and (ii.) current and voltage distortion caused by harmonic current producing electronic loads. Over the years, as electronic loads were continually being added to the existing distribution system, which was not designed to operate in an electronic (nonlinear) environment, the entire system and its loads began to operate less efficiently. PQI was contracted by the School of Medicine to engineer a Power System Optimization Solution, which would reduce electrical losses, increase overall power quality and ensure system/load compatibility.

Solution

PQI engineered a Power System Optimization Solution, consisting of the replacement of all 19 transformers with ultra-efficient harmonic mitigating transformers, which were strategically sized, designed and configured to achieve comprehensive harmonic mitigation and energy savings throughout the facility.

Impact

- ✓ **606,934** = Annual kWh savings
- ✓ **$60,693** = Total annual utility savings
- ✓ **$37,322** = PQI calculated energy savings (Only calculated savings in transformers)
- ✓ **$23,371** = Uncalculated energy savings (Savings achieved in system and loads by harmonic mitigation)
- ✓ **5.8%** = Reduction in energy costs
- ✓ **$86,250** = Utility rebate
- ✓ **1.7 years** = Project Payback



	March	April	May	June	July	August
Model Usage	27,797	27,855	28,048	28,879	30,760	28,760
Actual Usage	23,805	28,887	27,642	26,306	27,534	27,878

POWER QUALITY INTERNATIONAL

Case Study

Johns Hopkins University School of Medicine

The Koch Cancer Research Building - Baltimore, MD

Facility Description

Characteristics:

- 267,000 net square –foot building
- 5 floors of laboratories
- 10 stories of office space
- 250-seat, auditorium connects this tower to the Bunting Blaustein Cancer Research Building
- Mission Critical Facility
- Completed in 2006

Existing Conditions:

- 24 power distribution transformers
- 7 year old transformers
- Extremely light electrical load
- Average loading of system as percentage of capacity = 11.7%
- Reasonable harmonics were identified

Challenge

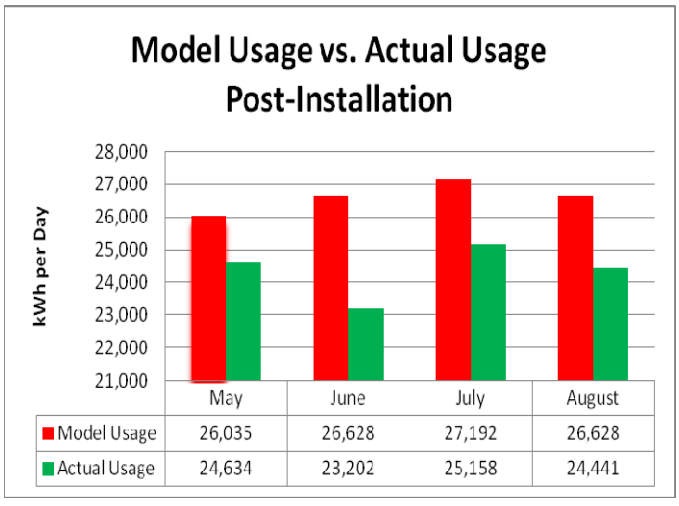
Throughout the facility, significant losses were occurring because of (i.) oversized distribution equipment and (ii.) current and voltage distortion caused by harmonic current producing electronic loads. Over the years, as electronic loads were continually being added to the existing distribution system, which was not designed to operate in an electronic (nonlinear) environment, the entire system and its loads began to operate less efficiently. PQI was contracted by the School of Medicine to engineer a Power System Optimization Solution, which would reduce electrical losses, increase overall power quality and ensure system/load compatibility.

Solution

PQI engineered a Power System Optimization Solution, consisting of the replacement of all 24 transformers with ultra-efficient harmonic mitigating transformers, which were strategically sized, designed and configured to achieve comprehensive harmonic mitigation and energy savings throughout the facility.

Impact

- ✓ **894,977** = Annual kWh savings
- ✓ **$89,498** = Total annual utility savings
- ✓ **$43,382** = PQI calculated energy savings (Only calculated savings in transformers)
- ✓ **$46,116** = Uncalculated energy savings (Savings achieved in system and loads by harmonic mitigation)
- ✓ **9.4%** = Reduction in energy costs
- ✓ **2.1 years** = Project Payback



POWER QUALITY INTERNATIONAL

Case Study

Johns Hopkins University School of Medicine

The Preclinical Building – Baltimore, MD

Facility Description

Characteristics:

- 2 floors above ground
- 2 floors below ground
- Completed in 1981

Existing Conditions:

- 2 large power distribution transformers
- 32 year old transformers
- Extremely light electrical load
- Average loading of system as percentage of capacity = 14.9%
- Reasonable harmonics were identified

Challenge

1. The published efficiencies of the transformers were less than today's minimum operating efficiency standard (NEMA TP 1) required by law. Additionally, the transformers in the system were nearing the end of their lifecycle and their operating efficiency had been degraded over the years.

2. Harmonic current and voltage distortion was identified at the transformers. Long circuit lengths cause voltage distortion to increase at the loads due to increased circuit impedance. Since the transformers were located in the basement, PQI expected voltage distortion to be quite high at many of the loads, some as far as 11 floors from the source. High voltage distortion caused the loads to operate inefficiently.

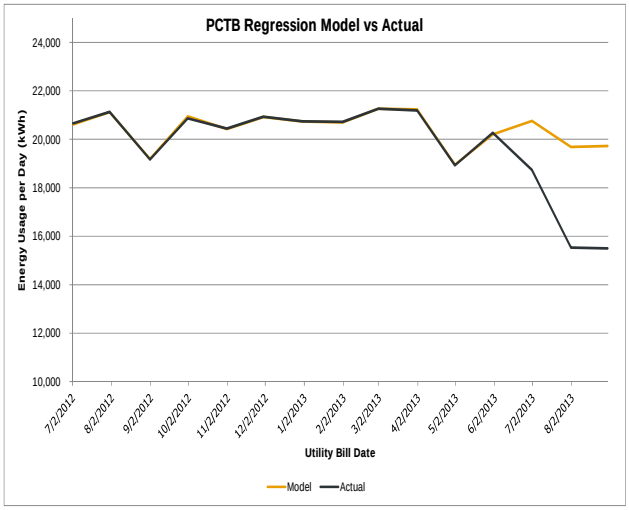
Solution

PQI engineered a Power System Optimization Solution that involved the replacement of both transformers with ultra-efficient, harmonic mitigating transformers. These transformers were strategically designed, resized and reconfigured to achieve harmonic mitigation, regulation of voltage distortion, excitation loss reduction, improved power quality and energy savings throughout the facility.

Impact

- ✓ **1,587,332** = Annual kWh savings
- ✓ **$158,733** = Total annual utility savings
- ✓ **21.3%** = Reduction in energy costs
- ✓ **3.1 Months** = Project Payback

The point at which the usage line splits from the model line represents the time of PQI's Solution installation.



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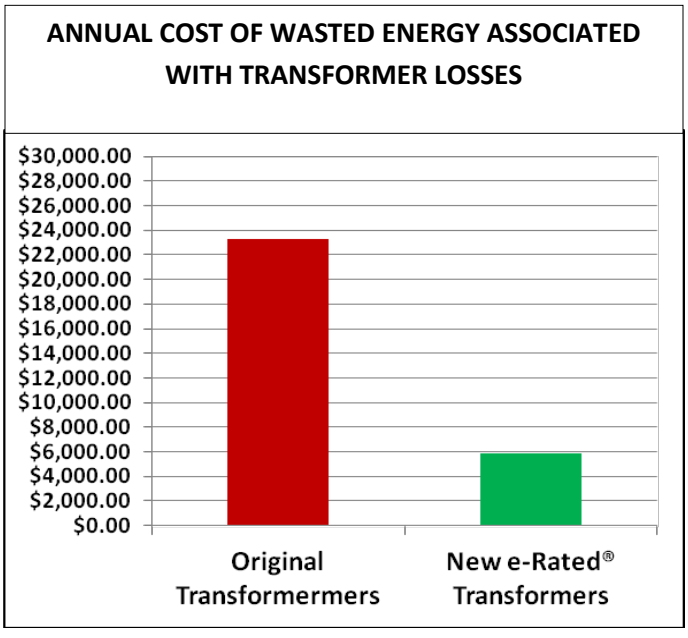

POWER QUALITY INTERNATIONAL
2404 Merchant Avenue | Odessa, FL 33556

POWER QUALITY INTERNATIONAL

CASE STUDY

U.S. Capitol Building

Washington, D.C.

+ Company

The U.S. Capitol Building, Washington, D.C. is one of the most famous buildings in the world. In 2000, the Architects of the Capitol Building, Washington, D.C., a federal government agency, contacted PQI regarding the replacement of all distribution transformers. Their motivation for doing so was based on the age of the existing transformers, the suitability of conventional transformers as a power source for nonlinear electronic loads, and an initiative to reduce electrical distribution system losses and improve energy efficiency.

+ Challenge

When ordering PQI's ultra-efficient transformers, the Architects of the Capitol specified additional shielded transformers.Following their installation, PQI learned that the electrical distribution systems were equipped with a 'power line carrier' systems. These systems inject a high frequency signal into the distribution systems that set off alarms when the Senators or Representatives are called to chambers for a vote. As might be expected, the new shielded transformers blocked the 'power line carrier' frequency, which rendered the alarm systems inoperable. Realizing their mistake in ordering shielded transformers, the Architects of the Capitol called to reorder all of the affected transformers.

+ Solution

As an alternative to reordering new PQI transformers, PQI was able to design a 'shield grounding network' that would allow the power line carrier frequency to pass through the transformers while allowing the shield to function as originally intended.

+ Impact

PQI's system-engineerd solution that integrated PQI ultra-efficient transformers in to the U.S. Capitol Building's electrical distribution system restored functionality to the voting system enabling all Senators and Representatives to vote without any system interfernce due to poor power quality.

POWER QUALITY INTERNATIONAL is the industry leader in the development, design and manufacturing of harmonic mitigating and energy -efficient transformer technologies. With a passion for solving problems and helping customers achieve power quality and energy efficiency, PQI delivers cost-effective solutions that ensure power quality and energy efficiency for the life of their customers facilities.

e-Rated®

(888) 539-7712
www.PowerQualityInternational.com