

CASE STUDY

ACME POWERWISE C3 TRANSFORMERS



THE FIRST NAME IN POWER SOLUTIONS



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At A Glance

Municipal office tower with 16 floors and 4 levels of underground parking. The building was completed in 1986, and 13 transformers rated from 15 KVA to 150 KVA were installed as part of the original construction plan.

The Organization

City government employees occupy almost 100% of the building with a range of sensitive offices including some associated with Homeland Security and law enforcement.

The Problem

The facility had outdated, inefficient transformers that were not designed to handle modern non-linear loads like computers, lighting ballasts and electronic HVAC equipment & controls. In addition, the transformers caused safety concerns.

The Solution

Thirteen Acme Powerwise C3 transformers were installed increasing efficiency and eliminating safety concerns.

Added Benefits

The new Acme Powerwise C3 transformers will produce energy cost savings of more than \$840,000 over 40 years and greatly reduce environmental emissions.

Case study

The large office building that is the subject of this case study needs to remain unnamed because sensitive, government activities occur inside. It is a municipal building in a large, American urban center.

"We don't talk about the building because it houses offices related to Homeland Security and law enforcement," said a municipal electrical foreman responsible for buildings throughout the city.

Problems with original transformers

Thirteen transformers were installed in the tower as part of the original construction project and supplied power to the computers, telephones, copiers, and other equipment used by the building's 300 office workers.

"There were two main problems with the original transformers," the electrical foreman said. "First, they weren't well-suited to the electrical needs of computers, which require a non-sinusoidal power supply to operate efficiently and worse, they developed a safety problem that could cause a fire, so we had to replace them."

Bid process

Requests for proposals must be issued before expenditures are approved by the city administration, so RFPs were sent to 5 vendors and each gave the city a recommendation.

"To me, the Acme representative was just a lot more knowledgeable and aware of the issue with transformers and non-sinusoidal waveforms," the foreman explained. "Other suppliers did not seem to have products that fit today's needs."

Another factor that impressed the foreman was the representative's assertion that the new Acme transformers would save the city a great deal of money and reduce the building's impact on the environment.

"I have to admit I was skeptical that the transformers could be that cost-effective and environmentally friendly," he said. His mind began to change when the representative explained innovative design and construction features that made the Acme transformers more energy efficient.





Changing transformer standards

The superiority of Acme transformers is partially due to evolving standards. "There were no efficiency standards for distribution transformers when the building's original units were installed," said Acme Electric Product Manager Mike Boyd. "That changed in 2007 when the federal government mandated that dry-type transformers meet NEMA TP1 energy efficiency standards."

Boyd said the reasoning for this change dated to a 2004 government study titled, "10 CFR Part 430—Energy Conservation Program for Commercial and Industrial Equipment: Energy Conservation Standards for Distribution Transformers; Proposed Rule."

The study established efficiency ratings for various transformer technologies, including dry-type, oil filled, and low and medium voltage.

Table 1

| Size (KVA) | Efficiency Comparison for all linear load at Unity Power Factor & 35% loading | | Percent Lower | Percent Improvement | 40 Year Estimated Savings* |
|------------|---|-------|---------------|---------------------|----------------------------|
| | Pre TP1 (est) | CSL-3 | % | % | \$ |
| 15 | 93.5% | 97.9% | 4.4 % | 68% | \$16,800 |
| 30 | 94.0% | 98.3% | 4.3 % | 72% | \$32,560 |
| 45 | 95.0% | 98.4% | 3.4 % | 68% | \$38,160 |
| 75 | 95.5% | 98.6% | 3.1 % | 69% | \$57,600 |
| 112.5 | 96.0% | 98.7% | 2.7 % | 68% | \$74,760 |
| 150 | 96.5% | 98.8% | 2.3 % | 66% | \$84,400 |
| 225 | 97.0% | 99.0% | 2.0 % | 67% | \$109,280 |
| 300 | 97.0% | 99.0% | 2.0 % | 67% | \$145,720 |
| 500 | 97.5% | 99.1% | 1.6 % | 64% | \$193,080 |

* 12 cents per KWh and 35% loading

Analyzing cost of ownership

"Although other suppliers were being considered," the Acme account representative said, "I was confident the Acme Electric Powerwise C3 transformers were the best choice because they would save a significant amount of money over the long term and reduce the building's impact on the environment." His confidence was based on what he termed the transformers' "cost of ownership."

"To calculate the cost of ownership," he said, "the initial purchase price of the transformers is added to the energy expenditures associated with the units over their life, which is projected to be up to 40 years. Our transformers save a lot of money when evaluated over time."

The municipality approved the account representative's recommendation and purchased 13 Powerwise C3 high efficiency transformers: one 15 KVA, one 30 KVA, one 50 KVA, five 45 KVA, and five 150 KVA.

Concerned about energy costs?

Acme Electric offers return-on-investment calculators that will help you estimate the savings that are possible when you install innovative ACME Electric transformers at your facility. For more information on money-saving transformer upgrades, please visit acmetransformer.com/C3.

More great products from Acme Electric

In addition to high-efficiency transformers, Acme Electric also manufactures:

- Dry-type Distribution Transformers
- Harmonic Mitigating Transformers
- Drive Isolation Transformers
- AC Line Reactors
- Industrial Control Transformers
- Low Voltage Lighting Transformers
- Buck Boost Transformers
- Panel-Tran® Zone Power Centers
- True-Power® Constant Voltage Regulators
- Transformer Disconnects
- DC Power Supplies

For more information on Acme products, please visit acmetransformer.com.



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N85 W12545 Westbrook Crossing Menomonee Falls, WI 53051 800.334.5214 acmetransformer.com

Going Green.

Greenhouse gas measurements associated with the municipal tower featured in the case study will also fall dramatically thanks to the 13 Acme transformers that were installed.

Over 40 years, it is estimated the transformers will reduce the building's CO2 emissions by 3,760 tons and SO2 and NOx emissions by 32 and 14 tons, respectively. Coal usage will be reduced by approximately 12,240 tons.

“Imagine the reductions in expenditures, emissions, and fossil-fuel use that could be realized if all buildings installed high efficiency CSL-3 transformers.” – Mike Boyd, Product Manager



Before & After Analysis

“Anyone who walked into the transformer room before and after the upgrade couldn’t help but notice the difference,” the electrical foreman said. “It’s that obvious. Now there is no noise, no vibration, and you can actually feel how much cooler the Acme units run.” The use of higher grade electrical steel in the core and copper foil to minimize eddy current losses is what makes Acme C3 transformers run quieter, cooler and a lot more energy efficient than standard TP1 transformers.

City personnel also conducted an objective analysis of how one of the new transformers performed on the job compared to the unit it replaced. A "before" picture was created by monitoring the performance of an old, 150 KVA transformer for three days using a Hioki meter that measured KW input and output with revenue class accuracy.

Next a new 150 KVA C3 transformer was monitored for three days using the same device to form an “after” picture. The old T9 150 KVA transformer had efficiencies ranging from 93.87% to 96.34%. The Acme Electric Powerwise C3 had efficiencies ranging from 97.44% to 98.37%.

Under these load conditions the CSL-3’s average efficiency was 97.99% versus 95.08% for the old transformer, a difference of 2.91%. "While this might seem small," Boyd commented, "the impact is tremendous when you consider transformers run 24 hours a day, 365 days per year for up to four decades."

Savings over time

Table 2 provides a long-term view and indicates that the 13 Powerwise CSL-3 transformers will save about \$14,900 annually, pay for themselves in 3.74 years, and produce savings of nearly \$600,000 over 40 years.

Table 2

| Project (City Bldg): (5)150, (6)45, (1) 30, (1)15 KVA | Pre TP1 Transformers | C3 Transformers |
|---|---------------------------------------|---------------------------------------|
| KVA | 1065 KVA | 1065 KVA |
| KW (@.976 PF) | 1039 KW | 1039 KW |
| % load | 35% (DOE average transformer loading) | 35% (DOE average transformer loading) |
| actual KW | 364 KW | 364 KW |
| efficiency @ % load | 95.08% | 97.99% |
| kWH per year | 3,351,796 | 3,252,258 |
| utility rate (\$KWHr) | 0.15 | 0.15 |
| yearly energy cost | \$502,769 | \$487,838 |
| savings | | \$14,931 each year |

Additional factors produce more savings

Potential savings are even greater when two additional factors are taken into account:

1. Peak demand utility charges; and
2. Reductions in cooling needs because the high efficiency transformers generate less heat than the units they replaced.

These factors increase the annual savings to \$20,924 and reduce the payback to 2.66 years. Over 40 years, the savings are approximately \$840,000. With energy costs rising approximately 4.1% a year, true savings are estimated at \$2,035,797 over 40 years.