

# First Cost is Not Always Best Cost!



Electrical equipment usually is marketed and purchased based on its initial cost, or first cost. However, increasing volatility of the electric utility industry, ever-rising energy costs, and occasional energy shortages can affect your plant, making the life cycle costs (LCC) of your electrical equipment critical.

Transformers, a continuous source of energy loss, are a prime example. Even when no load is being driven through them, energy is being consumed in the transformer core, a phenomenon called core losses or no-load losses. Transformers also are subject to winding loss or load loss due to inefficiencies in their coils.

These losses can be controlled during design. While a more-efficient transformer costs more to build than an inefficient one, the cost of lost energy over its life can substantially exceed the initial purchase price. Therefore, buyers should consider more than just first cost for transformers. Life cycle cost is important, too.

Transformer efficiencies can be improved by:

- The use of higher-efficiency windings to reduce load losses.
- The use of higher-efficiency silicon steel or amorphous metal to reduce core losses.
- Selecting the transformer KVA rating so that the transformer is at least 70 percent loaded during normal operation. This improves transformer efficiency and ensures faster payback of the initial investment of high-efficiency transformers.

The recent publication of NEMA TP-1, "Guide for Determining Energy Efficiency for Distribution Transformers", has spotlighted the issue.

NEMA TP-1 consists of two parts:

1. A simplified method to determine the equivalent first cost of losses, which will allow the user to tailor the transformer design to best suit their particular situation.
2. A definition of the minimum efficiencies that can be selected based on the required KVA rating, when the user chooses not to make the calculations.

Most major transformer manufacturers have designed both liquid- and dry-type transformers that meet the TP-1 efficiency requirements. Several states have adopted the TP-1 standard as their minimum requirements for transformer efficiency.

Using the TP-1 payback calculations proves the initial investment in efficient transformers is an excellent business decision. As you can see in the table, the simple payback for TP-1 efficiency (which is just the minimum requirement) is about two years at 90 percent load and four years at 60 percent load.



## For more information...

about efficient transformer design, contact Jaron Vande Hoef at (800) 827-1662 x 103 or e-mail him at [jaron.vandehoef@interstates.com](mailto:jaron.vandehoef@interstates.com).

### SAVINGS DUE TO PREMIUM DESIGN

Per Unit Load, x	Losses in W	Cost of Losses US\$/yr	Simple Payback (Years)	Present Value (US\$)
1.0	5,100	2,904	1.72	42,368
0.9	4,264	2,428	2.06	35,423
0.8	3,516	2,002	2.50	29,209
0.7	2,856	1,626	3.07	23,726
0.6	2,284	1,301	3.84	18,974
0.5	1,800	1,025	4.88	14,954

Savings based on 1500 KVA transformer with \$5,000 higher cost; Electricity cost = \$0.65/kwh  
 Source: S.Y. Merritt and S.D. Chaitrein, "No-load Versus Load Loss", in IEEE Industry Applications, Nov/Dec 2003

