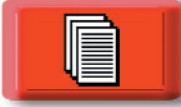




### AT ISSUE: ▼

The insulation power factor of a transformer is the ratio of the resistive current to the total current flowing in the transformer's insulation structure when tested under a sinusoidal voltage and prescribed conditions. [Another commonly used measurement, dissipation factor, divides the amount of resistive current by the amount of capacitive current flowing through the insulation.] A particular power [or dissipation] factor value is not necessarily significant. According to ANSI C57.12.90, Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers, "A factory power-factor test will be of value for comparison with field power-factor measurements to assess the probable condition of the insulation. It has not been feasible to establish standard power-factor values for liquid-immersed transformers."



### RECOMMENDATION: ▼

ANSI Standard C57.12.90 does not endorse any fixed or standard percentage power factor level for transformers. When specifying transformers, absolute values for power factor should not be defined.



### RATIONALE: ▼



#### RELIABILITY

Rectangular wound transformers made by Cooper Power Systems have solid, cured insulation barriers built from multiple layers of "B" stage epoxy-coated insulation. The epoxy coating creates a mechanically strong high-to-low, and winding-to-core, barrier.



In competitors' round coil designs, where insulation material constitutes a lesser percentage of the winding barrier, oil is the principal dielectric between windings. Oil has an inherently lower power factor level than insulation paper. Therefore, the Cooper design typically will have a higher power factor than the round coil design, even when each transformer holds exactly the same amount of moisture in its insulation.



#### FIRST COST

Cooper's rectangular coil construction has insulation packed between coils, and between the coils and core, to withstand short circuit forces.



On a Cooper rectangular wound design, specifying a limit on power factor could be quite constricting. In a request for bid, this could result in the quotation of a special, more costly design. Most users recognize this and do not stipulate a power factor limit in their product specifications.



#### PERFORMANCE

Power factor should be used only as a relative measurement of insulation condition - not as an absolute value. Methods of construction, core grounding techniques, and the use of switches, bushings, and other components can all have an effect on the power factor reading, as well as on overall transformer performance.



### THE BOTTOM LINE: ▼

Cooper Power Systems believes that long term reliability can best be enhanced by specifying impulse tests, by requiring short circuit certification for all transformer designs specified, by properly protecting the transformer with correctly rated lightning arresters, by not overloading the transformer beyond the ANSI C57.91 loading guide limitations, and by adhering to a maintenance program for the transformer.

