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Solutions to power problems

There are basically four types of equipment available today that will protect sensitive equipment from power problems relating to power quality at the electrical service entrance:

- Isolation Transformers (Shielded)
- Ferroresonant & Automatic Tap Changing Transformers
- Motor-Alternator Sets
- Uninterruptible Power Supplies

Shielded Isolation Transformers

Shielded isolation transformers have no voltage regulation ability so they provide no protection against brownouts. They are equipped with a Faraday (electrostatic) shield between primary and secondary windings. Since high frequency transients are capacitively coupled through the windings as opposed to being coupled by transformer action. The shield is an effective barrier against some transients. They are often used in combination with other equipment.

Dynamic Transformers

The ferroresonant and automatic tap changing transformers are generally small with varied efficiencies, and cost effective. However, they have little or no stored energy and therefore cannot protect equipment from outages more than four to eight milliseconds ($\frac{1}{4}$ to $\frac{1}{2}$ cycle). They cannot protect equipment from extremely high voltage transients as these units are wound like standard transformers, but these

units do an excellent job of protecting against brownout and transient conditions. Tap changers are generally very efficient throughout the load range, ferroresonant units have low part load efficiency because the core has to be saturated to cause oscillation, so losses are the same at full and part load.

Motor Alternator Sets

Motor-alternator sets give 100% protection against brownout conditions, all transients, and outages up to one half second. Most alternator sets have their motor and alternator in separate frames which give inherent protection from lightning and EMI. The motor alternator set protects against lightning and EMI because the input and output windings are separated by thick, magnetic shield and by at least one foot of air gap.

Uninterruptible Power Systems

The UPS gives 100% protection for all power line problems, except long term blackouts. However, some configurations offer much more protection than others. The chapters that follow will go into detail on hybrid static and rotary UPS's and their configurations.