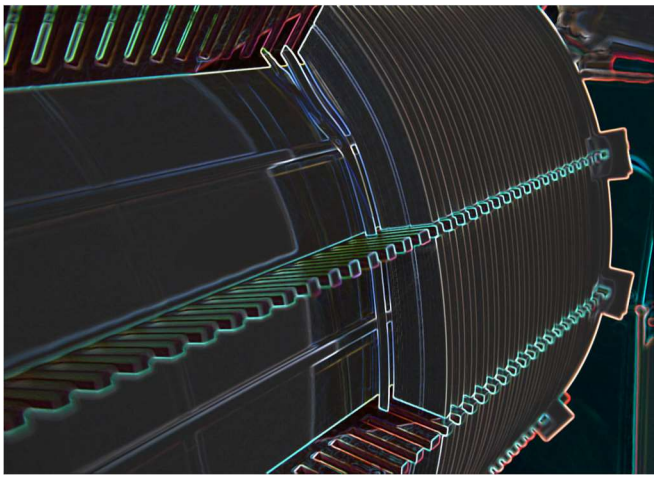
MGM TRANSFORMER COMPANY

DID YOU KNOW ?

(323) 726-0888 • (800) 423-4366 • www.mgmtransformer.com Issue #13 September 10, 2018

… Why impedance of a transformer is important?

Impedance is the current limiting characteristic of a transformer and is expressed in percentage. It is used for determining the interrupting capacity of a circuit breaker or fuse employed to protect the primary winding of a transformer. The impedance (or resistance to current flow) is important and used to calculate the maximum short circuit current which is needed for sizing, circuit breakers and fuses. This percentage represents the amount of normal rated primary voltage which must be applied to the transformer to produce full rated load current when the secondary winding is short circuited. The maximum short circuit current that can be obtained from the output of the transformer is limited by the impedance of the transformer and is determined by multiplying the reciprocal of the impedance times the full load current.



High and Low Impedance Transformers:

High impedance transformers have a lower fault or short circuit current and have *no need* for high AIC rated breakers. However, they will have a higher voltage drop or regulation.

Low Impedance transformers on the other hand have a lower voltage drop or regulation but have a higher fault or short circuit current and *will* need higher AIC rated breakers.

Why is impedance given in a percentage?

The percentage impedance of a transformer (Z%) is the voltage drop on full load due to the winding resistance and leakage reactance expressed as a percentage of the rated voltage.

Electrical impedance of the load is expressed in ohms, and the relationship between the current and the voltage in the circuit is controlled by the impedance in the circuit. In general, impedance has a complex value, which means that loads generally have a resistance to the source that is in phase with a sinusoidal source signal and reactance that is out of phase with a sinusoidal source signal. The total impedance is the vector sum of the resistance and the reactance.

The impedance is measured by shorting the low voltage terminals. With low voltage windings shorted, a voltage at the rated frequency is applied to the high voltage windings until full load current is circulated in low voltage windings. The ratio of voltage applied to circulate full load current to the primary voltage is the percentage impedance of the transformer.

The percentage impedance of the transformer is calculated as: Z%= (Impedance Voltage/Rated Voltage)*100

Thus a transformer with a primary rating of 110V which requires a voltage of 10V to circulate the rated current in the short-circuited secondary would have an impedance of 9%.