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ENGINEERING MEMO

THE USE OF LIGHTNING ARRESTORS ON TRANSFORMERS FOR ELECTRIC FURNACES

As electric utility systems become larger and loads increase, the possibility of damage due to transient overvoltages increases. Overvoltages large enough to cause failures typically exist for only a few micro-seconds. If an overvoltage is large enough to create an arc across a transformer bushing to ground or between adjacent turns of a transformer winding, the 60 cycle power current will follow the arc and the heating of the power current may cause serious damage. Transformers can be protected from overvoltage damage by the proper use of surge capacitors or lightning arrestors used separately or in combination.

Depending on the waveshape, and duration of a transient, capacitors may only reduce the rate of rise of the transient, but not necessarily clip off the peak. In this situation, the transformer could still be damaged if the peak value of the overvoltage exceeds safe limits, regardless of the slope of the leading wavefront.

Lightning arrestors do not change the leading edge of the transient wavefront. They limit the peak value of transients and have been found, by experience, to provide the most reliable means of limiting overvoltages to safe values.

In order to assure maximum protection, arrestors must be located very close to the transformer bushings. We have found that transformers for electric furnaces can be protected best when station class arrestors are mounted within ten feet of the transformer bushings. Arrestors are always mounted on the transformer side of the switch or breaker controlling the transformer. The closer to the bushing, the better the protection. If the transformer supplier recommends surge capacitors, these should also be used.