

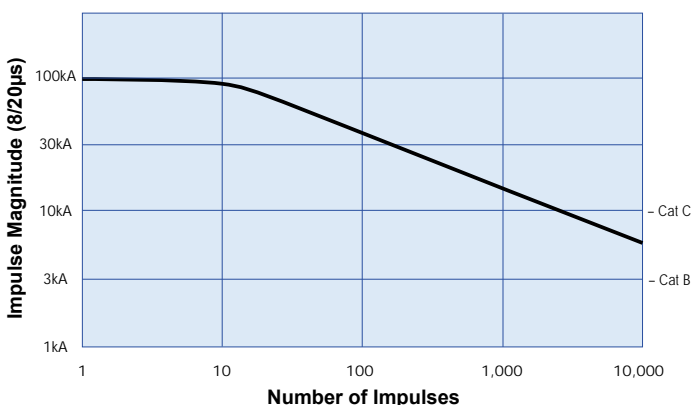
## The Need for SPD Indication

All SPD technologies exhibit finite operational lives. This typically depends upon the magnitude and number of occurrences of the applied impulse. As SPDs can be expected to give 10 to 15 years of service life, some form of "life status indication" is desirable.

This technical note concentrates on the end-of-life issues associated with Metal Oxide Varistors (MOVs) since this protection technology is most commonly employed by SPD manufacturers. The graph shows a device with a single shot 100kA 8/20µs surge rating. Such a device will not only provide protection to the rare large direct lightning strike which may occur at the service entrance, but will also offer a significant service life under the more common smaller switching impulse. It can be seen that such a device will safely arrest 3,000 surges at 10kA 8/20µs - the Cat C level ANSI/IEEE recommends for a service entrance location.

Different technologies are available to deal with MOV end-of-life. All feature permanent removal of the "depleted" MOV from the protection circuit:

- Containment - the MOV is allowed to destruct inside a robust enclosure
- Fusing - the resulting low impedance of the MOV causes mains current to rupture a series fuse
- Thermal protection - excess heat energy is detected prior to catastrophic MOV failure and it is removed from circuit by a thermally operated disconnect



Estimated life of TDS-MOVTEC

The MOV end-of-life typically occurs in two ways:

- 1) Towards the end-of life, the MOV's clamping threshold starts to lower due to the internal zinc oxide boundaries becoming over-stressed. This reaches a point where the SPD starts to clamp on the peaks of the nominal mains AC voltage. At this point, a thermal run-away condition occurs and the MOV moves into a low impedance state. This causes a large amount of energy from the mains current to flow and blow the MOV to an open circuit condition. Series fuses disconnect the MOV at this point.
- 2) Less common is the failure caused when the MOV is blown apart due to an excessively large impulse.

Due to the possible removal of protection, most SPD products will have some form of visual indication to show that protection is no longer being provided. Most often this takes the form of an indicator light being extinguished. As this SPD failure will leave the downstream equipment unprotected, better products will have some method of "predictive indication" before all protection is removed from circuit, such as a "percentage remaining" indication system.



Simple SPD end-of-life indication.

For service entrance protection which is the facility's first line of transient defense, enhancements such as an audible warning or the ability to connect alarm contacts to supervisory monitors are an added benefit.

