Selenium Suppressors Outperform MOV Cousins

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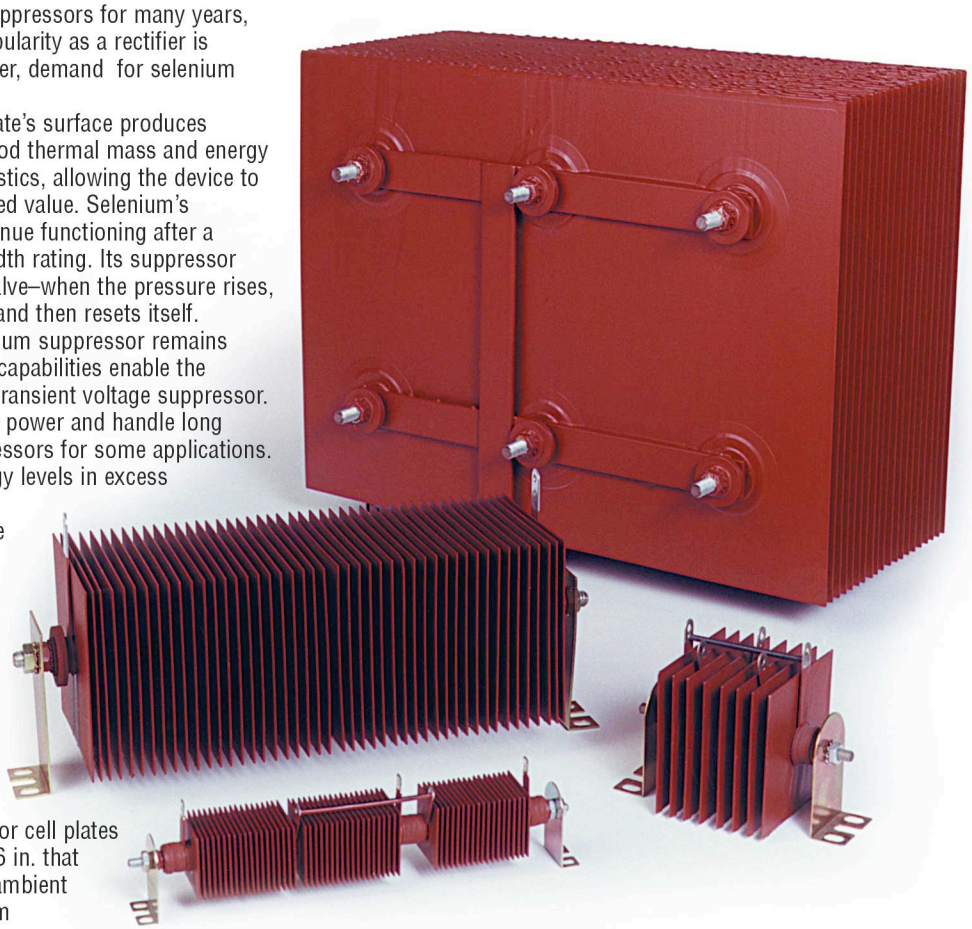
Used as semiconductor in rectifiers and suppressors for many years, selenium occurs naturally on the earth. Its popularity as a rectifier is fading in favor of its silicon equivalent. However, demand for selenium suppressors continues.

Depositing the elements on a metal substrate's surface produces selenium cells. This provides the cells with good thermal mass and energy dissipation as well as "self-healing" characteristics, allowing the device to survive energy discharges in excess of the rated value. Selenium's crystalline structure gives it the ability to continue functioning after a burst of energy in excess of its short pulse width rating. Its suppressor operation is comparable to a pressure relief valve–when the pressure rises, the relief valve opens, releases the pressure, and then resets itself.

Because of its unique properties, the selenium suppressor remains viable in many applications. Special clamping capabilities enable the selenium suppressor to find its own niche as transient voltage suppressor. Because of its ability to continuously dissipate power and handle long surges, it's better than MOVs or silicon suppressors for some applications.

The selenium suppressor can absorb energy levels in excess of its rated capability while maintaining its clamping characteristics on the next cycle. The layering of the suppressor onto the aluminum plate allows the suppressor's energy capabilities to follow that of a heat sink curve. This heat sink capability allows steady-state power dissipation up to 40 times that of an MOV. For a 130V suppressor, the selenium product allows steady-state dissipation of 2.5W to 80W, compared with an MOV that allows only 0.1W to 2.5W. The photo shows several selenium cells.



Manufacturers produce selenium suppressor cell plates in sizes varying from 1 in. x 1 in. to 12 in. x 16 in. that can function at a temperature of 0°C to 55°C ambient without any derating. The voltage of a selenium suppressor cell starts at $26V_{rms}$ or 22.5Vdc per cell plate. Users must keep the suppressor to 75V maximum due to the dielectric ceiling of the cell. The capacitive nature of the plate allows placement in series to attain higher voltage levels.

Other suppressors can handle high current, short pulse widths in the microsecond range, but the selenium suppressor can handle milli-second pulse width currents, making it a more robust suppressor than silicon devices. It has a typical response time of less than 1 ms and is capable of handling pulses with long decay times as seen in large DC motors or any inductive loads with L/R ratios in the 100 ms range.

Power conditioning systems, generators, and AC controllers are typical selenium suppressor applications. Suppressor applications are specifically used on the DC side of a rectified generator output, across SCRs on large controllers, across DC motors, and on transformers for line-to-line transient suppression.

Typical applications for selenium suppressors include:

- On the DC side of a rectified generator output.
- Across the SCRs on large controllers.
- Across DC motors.
- On transformers (for line-to-line suppression)
- Power conditioning (i.e. from power strips to service entrance).

For some devices, an MOV or a TVSS is better suited, and for others, a combination of suppressors is best. However, to the surprise of many electrical engineers, the capabilities unique to the selenium suppressor have enabled it to retain a firm place in today's market.

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