



EXPOSING MYTHS

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There is much misinformation and many misconceptions about electric power protection. Some of the confusion results from a general lack of familiarity with the topic by consumers. And some of it, unfortunately, results from manufacturers and vendors intentionally distorting, complicating or withholding information.

Although an examination of the behavior of electrical energy can be mind numbing in its complexity, it can also be simplified fairly easily. There are two basic, common types of electric power phenomenon that should be avoided; the high energy spike that is quick and powerful and can damage equipment, and lower energy, high frequency line noise that can cause interference in audio, video and other electronic systems.

We thought it would be of value to examine some of the commonly encountered messages, call them myths, if you like, that are being broadcast in the market. Of course, opinions vary. This is our attempt to set the record straight concerning AC line protection.

MYTH #1 HIGH DOLLAR DAMAGE INSURANCE

It sure sounds like a great idea and a huge marketing advantage for a product to offer to repair or replace damaged equipment. *Use me and if your equipment is ever damaged by AC line voltage spikes we'll replace it for free.* Ah, but read closely. If there was ever a need to read the fine print - this is it. Here is the actual text from one company that offers such a "protection policy"

P_____ will replace, pay to replace at fair market value, or pay to repair, up to \$5,000,000 equipment that is damaged by an AC power, cable, telephone, or lightning surge while connected to a properly installed P_____ surge protector. The surge protector must also show signs of surge damage or operate outside of design specifications.

Suppose, before a thunderstorm, we were to connect a large power cable between a lightning rod and a big screen TV. Suppose lightning struck the rod and blew up the TV. Clearly the rod and cable are providing no spike protection. Yet, they were "properly installed". And, they showed no "signs of surge damage" or of operation "outside of design specification". Would a damage claim be honored under these circumstances. We don't think so.

Another nice touch is the \$5 million coverage. Emotionally, you kinda hope your equipment blows up so you can get the 5 million bucks. Of course, it doesn't work that way. Who has \$5 million of

equipment, any way? Why don't they make it \$50 million or \$500 million?

MYTH #2 THE AMAZING, EXPLODING MOV

A Metal Oxide Varistor is an insulated, disc-like device that is commonly used to clamp high voltage events and protect connected equipment. It is noted for its rapid response time and ease of application in a wide variety of power environments.

One manufacturer of power conditioning products proudly states that their design does not use metal oxide varistors (MOVs) and, therefore, is better. To prove how superior their product is, they enjoy standing around trade show booths applying an electric charge and blowing up MOVs. So, what does that prove, we ask? Sure you can blow up MOVs. You can blow up anything - cars, buildings, bridges, tennis balls. Try to think of something that can't blow up!...Maybe water?

Varistors come in a broad array of power and voltage capacities. One size does not "fit all". So, naturally it is possible create a spectacle by running excessive current through an MOV for the sake of one quick, sensational flash of light. *Step right up, folks and see the amazing exploding MOV...* Given the right equipment we could blow up their product, too. So what.

It seems fashionable within the power conditioning community to malign the poor MOV as unreliable. It has been stated that a varistor's performance characteristic changes every time high surge current or energy is applied to it. That is not the case. A varistor may display a temporary variance of power handling capability after an initial impulse. But it will return to within close tolerance after further impulses. According to industry terminology, a 'failed' varistor device shows a +/- 10% change of performance characteristic. That is a pretty strict application of the term "failed". If you took a test in school and got a 90, would anyone say you failed? When properly specified and installed in a well engineered power protection system MOVs can withstand up to 10,000 amps in a single pulse and up to 3,000 amps for 100 pulses.

What about MOV failure over time? Do MOVs degrade over time? Sure they do. So do resistors and capacitors and light bulbs. Unfortunately, nothing lasts forever. If you fear your power protection device is getting a little "long in the tooth", it's a good idea to replace it or have it checked by a qualified technician. We recommend doing the same with your fire extinguishers and smoke detectors.

MYTH #3 CHEAP LINE PROTECTION

This is just common sense. You get what you pay for. But, as cell phones and computers become smaller and less expensive there is a perception that the same trends can apply to all products. To some extent they do. But, be careful. There are bargains to be had as well as over priced products. Comparison shopping is always a good idea. But, the \$9.99 power strip at the hardware store will not provide the same levels of protection as a more expensive model.

One clue will be the size of the package. Very small chassis have very small components which will not withstand a high current inrush. Further, they probably don't have more than one layer of protection. It is difficult for consumers to compare performance between competing products because different manufacturers publish different information. And few people really understand all the jargon,

anyway. Generally, bigger current and energy numbers are better. And, lower voltage numbers are better.

MYTH #4 UL 1449

This often cited standard is frequently interpreted as indicating that a particular protection device will perform in a superior fashion.

Quoting from page 5 of the UL standard 1449,

These requirements do not evaluate the effect of [protection devices] on connected loads, the effect of [protection devices] on harmonic distortion of the supply voltage, the degree of attenuation provided by [the protection device], nor the adequacy of the suppressed voltage rating of the [protection device] to protect specific equipment from upset or damage.

What UL1449 does is set standards of testing and rating the performance of protection devices. More importantly, it sets standards for safety from fire or shock. Protection components and some completed protection equipment may be tested to UL 1449. If a piece of completed protection equipment is certified to another standard this does not indicate that it provides any less protection simply because it was not tested to 1449.

MYTH #5 LINEAR FILTER COMPONENTS VERSUS NON-LINEAR MOVES

In a further discussion of the merit of MOVs, it has been stated by some that filter devices such as capacitors and chokes provide better AC surge protection. In some regards this may be true in controlled and defined circumstances. However, filter components have a response that is a linear function of surge current. For an AC protection device that will be expected to perform in a broad range of applications with a broad range of equipment a linear protection device has a big disadvantage. If the assumptions that are the basis for the protection circuit's design are incorrect the consequences for a linear suppressor are dramatic. A slight change in the source impedance relative to the assumption can result in a disproportionate increase in voltage at which a circuit begins to clamp, reducing the protection provided by the circuit.

MYTH #6 A UPS IS THE BEST DESIGN FOR POWER CONDITIONING

There is a **wide** misconception that all UPSs are good power conditioners. This not necessarily the case. It depends on the UPS. There are 2 types of UPS: standby and on-line. When utility power is at or near the nominal 120 volts the standby UPS provides no special protection. The presence of the battery has no effect. The power you get is cleaned by whatever components they place inside the chassis. They may do a good job of this - or they may not. You usually get what you pay for. When the utility power fails the UPS switches to inverted battery power, which could be pretty clean - depending on the quality of the inverter. But, this protection will last only for the run time of the battery, usually about 10 minutes.

On-line UPSs provide complete isolation from the utility power because they always convert battery DC voltage to AC to power the load. These are good machines - but are more expensive. List price for 15 amp on-line UPS is about \$1,500.