ARC SUPPRESSION TECHNOLOGIES
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NOSPARC ARC SUPPRESSION METHOD AND SUSTAINABILITY

In the absence of any load current, an electromechanical relay or contactor would have a potential mechanical lifetime of 10 million to 20 million cycles. But when this same contactor is operated under electrical power, as is always the case, this mechanical lifespan is reduced to 5,000 to 100,000 cycles (depending on the application and contactor specifications).

At the heart of this dramatic falloff in operating life are the destructive effects of contact arcing, a phenomenon dating back to the earliest contactors more than a century ago. Arcing occurs between a relay's contact points each time they separate and close – twice for each switching cycle. Over time, it is this arcing that prematurely and unpredictably destroys the contact points and ends the life of the relay or contactor.

THE FOUNTAIN OF YOUTH FOR POWER RELAYS AND CONTACTORS

Because of contact arcing, every electromechanical switch is marketed with an estimated finite lifetime. For example, if a contactor with a specified 100,000-cycle electrical life completes an on/off cycle once every minute, it will reach its end-of-life (EOL) in a mere 69 days. Of course, the destructive forces of contact arcing can cause contactor failure at any time.

The natural EOL for a power contactor is failure in one of the following three modes:

- The contact points fail closed
- The contact points fail open
- The contact points fails with resistance

Patented, UL registered NOsparc arc suppressors prevent all arcing-related failure modes. They work by sensing the precise moment of contact point separation and then shunting the current through the NOsparc device itself. This process removes 99.9% of the arc energy from the relay or contactor, which effectively ends the self-destructive nature of contact arcing.

In a nutshell, NOsparc extends the life of a standard electromechanical relay or contactor by a factor of 10 times or more under normal, specified relay operating conditions. For example, if a contactor has a specified operating life that equates to one year, NOsparc will extend that lifetime to at least a decade.

HOW IT WORKS

NOsparc arc suppressors work by detecting the nascent arc as it forms and suppressing its energy - all within about 5 microseconds (5μs = 5 millionths of a second!). The result is a benign "arclet" with an arc energy of only a few microjoules, (μJ) as opposed to a full contact arc that is hundreds of milijoules (mJ) or more.

The reduction in arc energy is calculated using a Contact Arc Suppression Factor (CASF) that compares arc energy across unsuppressed vs. suppressed contacts. The typical CASF for switches using NOsparc arc suppressors are well over 1000. This means the arc energy is reduced 1000 times, or by more than 99.9%.

SUSTAINABILITY GAINS WITH NOSPARC ARC SUPPRESSION

NOsparc arc suppressors deliver more than cost savings and reliability. They also deliver pronounced sustainability benefits in two broad areas:

1) Direct greenhouse gas and electromagnetic benefits from the 1000x reduction in arc energy during the switching operation; and
2) Indirect benefits of increasing contactor life by 10 times and avoiding the downstream purchase and disposal of nine replacement contactors:
   - Failed contactors going to landfills as they are replaced
   - Reduced use of heavy metals required replacement switches
   - Reduced failures of downstream equipment (motors and compressors) caused by arc-related contactor failures.

As load current arcs across unsuppressed switch contacts, the destructive arc cracks the atmosphere between the contact points yielding Ozone (O3), Nitrous Oxides (NO, NOx) and other compounds. In addition, the arc-related destruction of the contact materials emits additional chemicals and particulates into the environment. This process is most pronounced when operating contactors because their open-to-air construction allows the arc's explosive power to blast these gases and particulates into the surrounding atmosphere.

The arc is also a source of electronic "pollution" called electromagnetic interference (EMI). EMI can damage electronic control systems in manufacturing and other nearby systems. This hazard often requires systems designers to add EMI shielding, which often uses lead and increases both the material and financial cost.

Simply put,

1) The 1000 times reduction in arc energy directly leads to:
   - 1000x decrease in arc-generated greenhouse gases
   - 1000x (i.e. 30 decibel) decrease in arc-generated electromagnetic interference (EMI)

2) Ten-times increase in switch life and related reliability yields:
   - 9x less need for metals, precious metals, and rare earth metals used in switch manufacture
   - 9x fewer switches sent to a landfill
   - Significant reduction in scrap due to switch-failure-related production outages
   - Significant reduction losses of motors, compressors, and other equipment cascading through a system shut down by switch failure.