



S&C's Expertise Helps Customer Prove Module's Dielectric Performance

S&C Featured Solution: Laboratory Services—Lightning Impulse Dielectric Testing

Location: Nicholas J. Conrad Laboratory in Chicago

Customer Challenge

A global diversified product manufacturer of specialized components for nuclear power plants was completing dielectric testing on a single-phase pass-through module intended for the supply of medium-voltage power. The purpose of the testing was to verify the module's specified basic insulation level (BIL), or impulse-withstand value. Unfortunately, during the initial testing, unexpected flashovers occurred at a very low impulse-voltage level. It was not possible to easily identify the weak spot where the flashover had occurred since there was no evidence of external arcing, and the sample could not be disassembled to identify whether there were any internal arc marks.

For this reason, the unexpected flashover posed a significant dilemma for the customer. Although it was believed external flashover had occurred, the path had to be identified and dielectrically strengthened before testing of the internal dielectric strength of the single-phase pass-through module could continue. The question in the customer's mind was whether he should return home and report the findings or rely on S&C's expertise to identify a solution to the flashover problem so further testing could be conducted.

S&C Solution

The product manufacturer was conducting its testing at S&C's Nicholas J. Conrad High-Voltage Laboratory, located at the company's headquarters in Chicago. S&C engineers worked with the customer to successfully finalize the lightning impulse dielectric design testing.

The dielectric testing involved use of S&C's Impulse Generator, which is rated up to 1.2 megavolts, to energize the single-phase pass-through module. The test involved a series of full-wave 1.2-megavolt/50-microsecond lightning impulse withstand tests for both positive and negative polarities under dry conditions.

All tests were performed in accordance with applicable IEEE standards and S&C's laboratory procedures. The corrected value of crest voltage for actual atmospheric conditions was applied to the single-phase pass-through module as specified in the test standard.

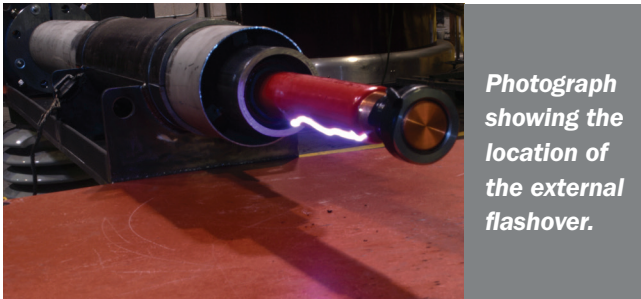
To help resolve the flashover issue, S&C used the laboratory's sophisticated visual imaging equipment to capture the flashover during an impulse event, thus identifying the exact location of the flashover. The imaging equipment showed the weak link that caused the low-level impulse flashover was at the end of the module assembly, between the grounded conduit and the noninsulated end of the bus bar, and not in the module itself. The customer indicated that the bus bar would normally be fully insulated in the field installation thereby eliminating any possibility of an external flashover.

S&C's expertise in dielectric testing solved the problem created by the weak link by applying soft-rubber diaphragms and dielectric grease to strengthen the weak dielectric portion of the bus bar, thereby allowing the complete dielectric testing of the internal components of the single-phase feed-through module.

"The customer was extremely pleased with S&C's expertise and ability to solve a complex issue to complete the testing. They look forward to continue working with S&C on future tests."

— Terry Bellei, PSS Consultant
S&C Electric Company

S&C's visual-imaging equipment helped identify the exact location of the external flashover.



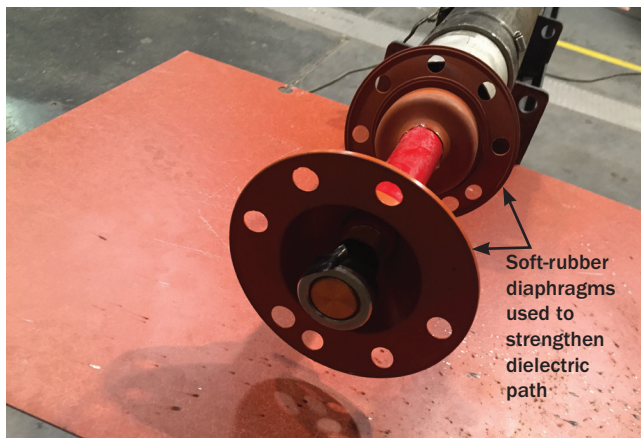
Photograph showing the location of the external flashover.

The techniques used to isolate the weak section and the captured flashover are shown in the photographs to the left.

Results

The customer was pleased that S&C's recommended enhancements to the bus bar effectively eliminated the section as the weak link and thus allowed successful completion of the tests on the single-phase module. The final testing demonstrated that the module successfully passed application of the IEEE's standard requirement of three consecutive impulses of each polarity.

As an extra step, the unit was tested for twelve positive and twelve negative lightning impulse polarities—nine more for each polarity than the standard requires—to further demonstrate the robustness of the single-phase pass-through module. The customer was extremely satisfied with S&C's personnel support in demonstrating the module successfully complied with the standard requirements and with the expertise S&C provided during the testing.



Photograph showing the solution strengthening the dielectric path.