EA Technology HV lab confirms the best method for testing MV GIS gear!

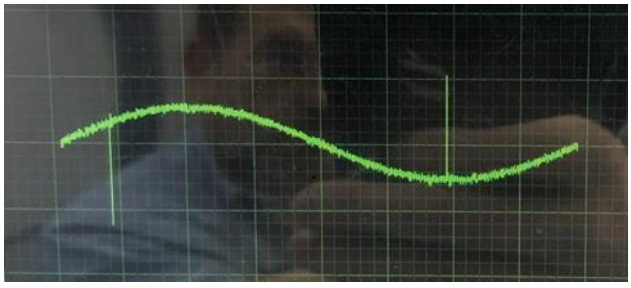
Partial discharge can lead to catastrophic failure of medium voltage switchgear. Low pressure gas insulated switchgear is constructed very differently from air insulated equipment. EA Technology performed online PD testing in their lab to confirm the best method for GIS PD testing.

Background

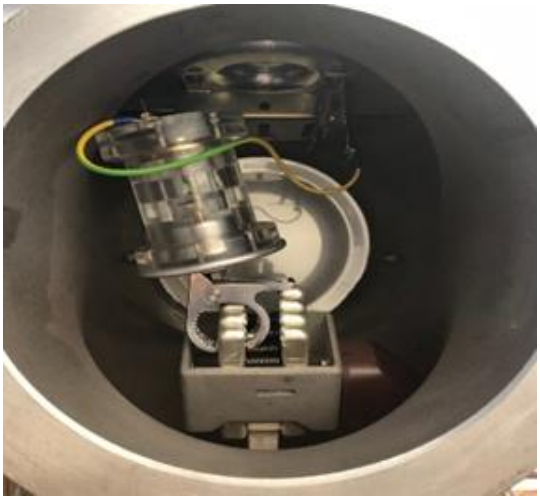
Partial Discharge (PD) can occur in metal clad switchgear operating above 2500V and can lead to devastating results. It occurs in the presence of high voltage field stress and is often undetected until it is too late.

Ultrasonic and TEV techniques are most commonly used for online testing of air insulated switchgear but may not work well for gas insulated switchgear due to its different construction.

Medium voltage, gas insulated switchgear uses SF6 gas as its insulating medium. A complete enclosure of the bus bars, disconnects, and even the vacuum circuit breaker is required to contain the SF6 gas. Because here is no airpath, ultrasonic measurements are usually ineffective. As there are various layers of enclosure, TEV detection needs to be confirmed.



Internal PD signature on lab test system



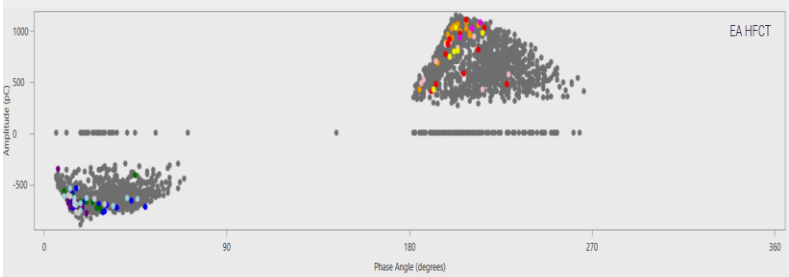
EA Partial Discharge Source installed on busbar

EA Test Plan

EA Technology set out to find the best method for PD testing this type of gear. We ran a series of tests using real PD sources embedded into various locations a popular brand of 24KV switchgear with GIS insulation and a vacuum circuit breaker. The switchgear had internal cone cable connections.

A lab quality directly connected PD system confirmed our test values. We looked at TEV and HFCT readings form various locations for various PD sources.

Case Study



HFCT phase resolved data from HFCT for internal PD on busbar

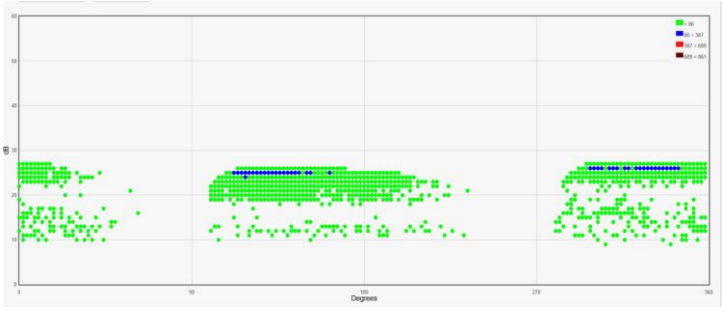
Test plan - continued

A custom- built device that generates internal PD was attached to the bus bars inside the gear and TEV / HFCT readings were taken. Both amplitude and phase resolved plots were recorded.

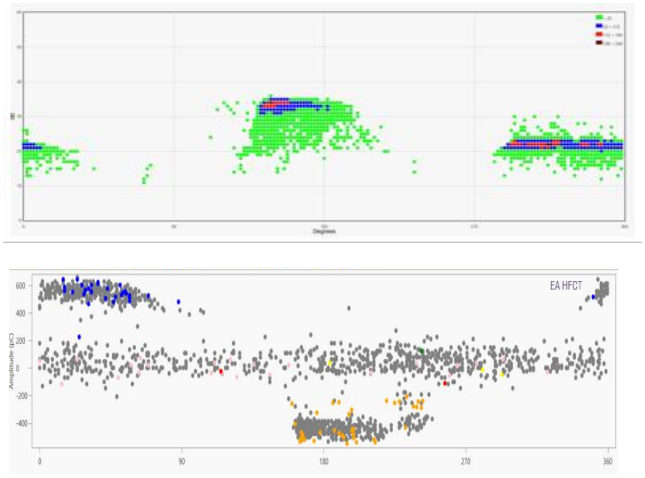
Results

With a source generating a low level (246 pC) of internal discharge at the bus bar, The HFCT on the cable shield produced a strong signal and clear phase resolved data. TEV signals were clearly visible on both the rear panel and on the cable sheath.

Corona generated in the bus bar compartment was also easily discerned by the HFCT on the cable shield. TEV detection of corona was less reliable.



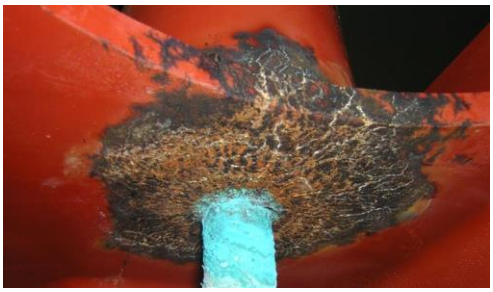
Phase resolved plot of TEV reading on rear of panel from PD on bus bar



Similar TEV and HFCT results for Air Insulated Switchgear

Take aways

- GIS switchgear generates a significant PD signature which can be detected.
- Both TEV and HFCT sensors work well for detecting PD inside the gas compartment.
- Ultrasonic only testing may not find PD in medium voltage GIS switchgear.
- Test for critical PD activity without taking outages – no need to de-energize.
- The sensors included with the UltraTEV Plus 2 can be used for periodic PD surveys on all gear
- The sensor technology used by the Astute monitor is similar and will work on GIS gear as well.
- Permanently mounted HFCT allow for fast easy surveying



Find PD before it's too late!

Application Note

Safer, Stronger, Smarter Networks

EA Technology LLC
400 Morris Avenue, Suite 240
Denville, NJ 07834 USA

t (862) 261-2759
e sales@eatechnologyusa.com
www.eatechnologyusa.com