Quasi-PRPD Pattern Analysis of Surface Discharges Arising on a Porcelain Bushing of an ESP unit under Rectified DC Voltage

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Abstract

Surface discharges occurring on a porcelain bushing under DC voltage not only causes an incipient fault condition but also can degrade the pertinent location once the surface deposition layer or the insulation material gets carbonized. Naturally, it becomes important to identify and analyze the surface discharges occurring on bushing. The current practice on analyzing surface discharges initiated under DC voltage employs partial discharge test methods that focuses on counting the PD events occurring over a time span. The method is sensitive but provides no information about the possible source of fault condition. In this context, a non-conventional, pattern based partial discharge analysis method on understanding the characteristics of electrical discharges occurring on the surface of a polluted bushing under DC voltage is studied. Initially, a half-wave bridge rectifier unit that produces an uncontrolled DC voltage is selected and employed. Later, the surface of the polluted bushing is energized, and the signals initiated by the surface discharges occurring on the surface contaminated bushing are recorded. Instead of counting the PD events, the pattern manifested by the surface discharges is correlated to the AC voltage input of the rectifier. Once this is accomplished, the pertinent findings are validated on an actual bushing installed in an electrostatic precipitator unit that is applied for cleaning producer gas of a biomass gasification plant.

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