

Electrical Partial Discharge

Partial discharges are localized ionization in electrical insulation caused by a high electrical field. They occur at a portion of insulation system and limited to the extent not causing full insulation breakdown. When they are initiated, high frequency transient current pulses will appear and persist for ranging from nano-seconds to micro-second, then extinguish themselves and re-occur repeatedly. The discharges can happen in all types of insulation, gaseous, liquid and solid acting as media. It can be initiated in the gas voids enclosed in solid insulation or bubbles within liquid insulating material, for examples, voids in epoxy insulator or gas bubbles dissolved in transformer oil. As the gas within the void has a dielectric constant much less than the surrounding insulating material, it experiences a significantly higher electric field which when becomes too high to cause gas break down, partial discharges occur. Partial discharges can also occur on the surface of solid insulating material if the surface tangential electric field is high enough to cause break down in surface insulation interface. This phenomenon commonly manifests itself on overhead line insulators particularly in days of high humidity. Overhead line insulators have air as their insulation media.

Partial discharges dissipate energy, generally in the form of heat, but sometimes in the form of sound and light as well, like the hissing and dim glowing from the overhead line insulators. Heat energy dissipation may cause thermal degradation of the insulation, although the level is generally low. For high voltage equipment, the integrity of insulation can be confirmed by detection of the partial discharge activities occurred through the equipment's life. To ensure supply reliability and long term operational sustainability, partial discharge in high voltage electrical equipment can be monitored closely with early warning signals for inspection and maintenance.

The Electrical Blog is contributed by Electrical Division. If you would like to know more about this topic please contact the Division Hon. Secretary Ir Gary Ko, cwko@kumshing.com.hk
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