EHV TRANSFORMER SF6 / OIL CONDENSER TYPE BUSHING FAILURES DUE TO VERY FAST TRANSIENTS

Authors: Johnson Thomai, DAR Engineering,
Dr. Darshana Muthumuni & Les Recksielder, HVDC Manitoba Research Centre

EHV Transformer Bushing failure is a potential problem and it can also lead to Transformer damage. The latter problem is more serious in terms of loss of revenue, time and huge transformer repair expenses. Multiple failures of condenser type SF6 to OIL Bushing of 380kV Generating Transformers were experienced in one of the biggest power plant EHV Substation in Saudi Arabia. Utility along with consultants undertook detailed study to find root cause of failures. The failures resulted in shorter life on these Bushings i.e. 1/3rd of Transformer normal life and hence these failures are of serious concern. According to the Bushing Manufacturer recommendations, these Bushings are maintenance free and fitted with pressure monitoring devices to monitor bushing internal faults. The pressure monitoring device of the Bushing was able to sense the failure at the initial stage, only in one case. In other cases pressure monitoring system could not detect the failures at the initial stage which resulted in Bushing damage / Generating Transformer damage. These multiple failures experience forced the maintenance staff to do diagnostic tests to asses the condition of the remaining bushings in service. DGA test was done on 50% of the bushings and the results showed that all tested bushings failed in DGA test.

The system was in service since 1998 and it was running satisfactorily till the first Bushing failure which occurred after 9 years. The system has unique elements like SVC and long GIB connecting the GIS and the Generating Transformer.

To identify the root cause of the Generating Transformer bushing repeated failures, physical verification and detailed simulation studies were conducted. Physical verification includes analyzing and viewing the layers of the condenser foil and its paper insulation, installation practice, earthing points, maintenance records and system protection operation. Detailed electrical simulation studies covering switching studies, Ferro resonance, Harmonic resonance and very fast transient carried out and the results were studied in detail for the final conclusion.

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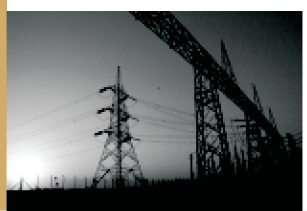

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dar@dar-engineering.com