AC WITHSTAND VOLTAGE TEST OF 345KV CABLE SYSTEM

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ABSTRACT

Evaluating and detecting of the AC resonance test in the power cables, terminations and joints make it a quality control after installation and preventive signal during the test beforehand. In general, on site tests after installation on HV cable system were originally performed with DC voltage test for the correct installation. Nowadays DC test is recognized as being harmful for XLPE cable systems so that AC resonance test is applied for diagnostic purpose on 345kV cable system. Applying for the on site AC withstand test of the cable system with a sufficient voltage and duration (usually abbreviated to AC test) as such can find the exact fault point before operating the cable system.

To execute the AC test on HV cable circuit, we arranged the heavy mobile test system of variable frequency as well as designed test bushing of 500kV class for applying test voltage. It is very useful and essential in the sense of preventing major blackout. Before operating the cable system, AC Test has been proven its performance in the 345kV underground cable construction in Incheon, Korea.

Measurement principles have been developed and successfully applied on site.

KEYWORDS

AC withstand test, 345kV cable systems, preventing blackout, on-site test

INTRODUCTION

The availability of a measurements aimed to verify the cable systems accuracy on site are desirable and essential process, since KEPCO (Korea Electric Power Corporation) have been applied for the 345kV power cable system in many area including Incheon, Korea.

The goal of this construction is to stabilize the power supply around west capital area connects Power Plant which is located in Incheon and 345kV substation. More and more higher the voltage level, it is very important for us to check out the performance of the system and maintenance the circuit for diagnostic purpose.

The total cable length of the 345kV XLPE Power-Optical Fiber composite cable is about 4.3km, 2-circuit. Figure 1 shows the line diagram of the system with cable accessories.

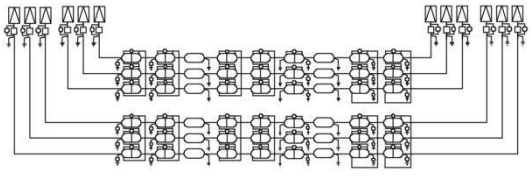

Fig. 1 : Line Diagram of the system

After Installation on the 345kV cable system, when supplying 250kV (relevant IEC publication 62067) for 60 minutes, we measured the dielectric strength in on-site cable for diagnostic purposes.

AC Test is one of the useful and essential in the sense of preventing major blackout. The reason is that, in case of this 345kV underground cable in a culvert, its ultra high voltage and its huge capacity that is directly linked to the Power Plant could cause a major blackout when there's a problem during the actual operation.

In October, 2010, after installing the cable and joints in construction area, we assembled the test bushing with GIS chamber directly and filled with SF6 gas inside. By using the mobile resonant test system, we carried out the AC Test of the 4.3km EHV cable circuits. On test, we detected a unusual signal during the AC test. In order to analyze the cause of the failure and find the exact fault point, we've used the pin pointing and burning process using the fault locator detection equipment.

As a result, we found a electric breakdown in joint-box. Nevertheless included test during manufacturing the process and routine tests carried out beforehand, a tiny risk could remain during the assembling the cable accessories on site. It was found out during the AC diagnosis and pre-test that is joint, it was obvious to replace this joint in order to eliminate the problem. We replaced it before service and continuously measured Partial Discharge of the cable system. Finally, throughout the AC on site test, we detected the fault and applied restorations with success.

The AC test on site is an essential tool for the asset management in a view for the control of the reliability.

APPLYING STANDARD

The international standard and the KEPCO specifications are applied for the after installation test of 345kV XLPE cable systems. Refering to the para 14.2 (AC voltage test of the insulation) of IEC 62067 (edition 1.1.2006. Power cables with extruded insulation and their accessories for rated voltages above 150kV up to 500kV-Test methods and requirements), describe the test conditions of the 345kV power cable system as below.

test conditions	Range of the test
waveform	Substantially sinusoidal
frequency	Between 20Hz and 300Hz
test voltage	250kV r.m.s (phase to ground)
duration	1 hour

Fig. 2 : AC Test conditions