ON-LINE DIAGNOSTIC SYSTEM FOR SVL DEVICE ON UNDER-GROUND POWER CABLES

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ABSTRACT

In this paper, ODSS (Online Diagnosis System for SVL) for diagnosing the state of SVL (sheath voltage limiter) is described in detail about its development and implementing on sites. This ODSS has been operating successfully in underground cable tunnel over one year since this was developed, measuring leak current and counting the operating number of SVL. All data acquired from site are being accumulated; those are able to be used as reference for replacing aged SVL before it will come to exploding accident due to severe degradation

KEYWORDS

SVL, Online Diagnostic, Online Monitoring, Development, Underground, CT for Power supply, Leakage Current, µA order accuracy, Powerless, Surge Counter, Precision Current measurement, ODSS

INTRODUCTION

SVL is a voltage limiting device that protects PVC/PE jackets and the epoxy insulator for shield break of insulating splice from various surges. That is connected between metal sheath and ground or between epoxy insulator. As SVLs operate more frequently than lightning surge arresters for transmission lines and substations, ZnO element of SVL is more likely deteriorated by surges. In this paper, the ODSS developed for preventing damages in advance from dieletric breakdown of SVL, will be introduced on the process of development, the installation and the operation etc.

FEATURES OF ODSS

As ODSS has been installed and operating in underground cable tunnel, it is very difficult securing power source for the device (ODSS). In order to get the power source more easily we made a proofer CT (Current Transformer) that installs around underground cable. This ODSS is equipped with multifunction such as µA-current pickup circuit for a precise monitoring, analysis device of SVL, predicting the dead time of SVL, counter circuit for an SVL operating number by surge, event/trend storage device etc. Furthermore, to tie with existing underground cable monitoring system, ODSS has communication system for data transmission.

Power Source for device

As mentioned earlier, a low voltage power source for supplying to various systems such as monitoring system, ODSS system is generally not available everywhere in underground cable tunnel. So it is often drawn from distant location. In this case, besides additional costs for installation, voltage drop and a potential risk of fire accident by leakage current of drawn powerline rises. To avoid this, a CT for device power supply is installed around the underground cable and we could acquire conveniently the constant electric power (induced current) from it.

Leak Current Measurement

To analyze SVL, an accuracy of measuring leak current through SVL should be insured. Current under 0.1 mA should be measured and µA order display is needed. In case of lightning surge arresters used in overhead transmission line system, 10 mA is commonly used maximum rating for leak current. So the maximum leak current rating is also targeted to 10 mA in ODSS development. In underground cable tunnel, as a massive electromagnetic field occurs, a countermeasure for the fields is essential.

Surge Current Measurement

In contrast to small leak current less than 10 mA in SVL, the operating surge current of SVL is over hundreds Amperes. ODSS should be able to endure the massive current and count the operation numbers of SVL.

Storing Data

Though ODSS is an online device, it should be equipped with long-time trend/event data storing functions preparing against unpredictable communication failure due to cable disconnection, etc.

BLOCKS OF ODSS / DEVELOPMENT

Block Diagram of ODSS

ODSS is composed of power, analogue circuits, digital circuits, and interface blocks as described in Figure 1.

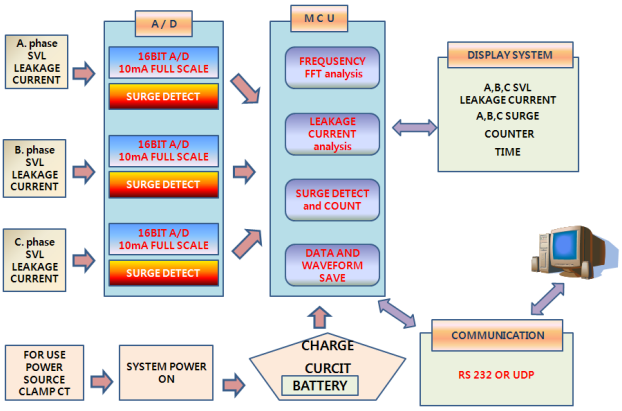

Figure 1. Block Diagram of ODSS