

Compact Designing of Transmission Line Arrester

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Abstract

Lightning flashover is the major factor of line fault in overhead transmission lines in many countries, and it causes supply outage or voltage dips due to operation of the protection system. That is, lightning stroke to transmission line has been and would still be a threat to power supply reliability. Especially the social impact by these incidents becomes larger as the society is highly developed.

There are several countermeasures for lightning protection of transmission lines, such as differential insulation, multiple grounding wires and footing resistance reduction of transmission towers. They are effective solutions and implemented to many systems, however, may not be perfect to eliminate lightning flashover.

Transmission line arrester using metal oxide material with external series gap provides excellent lightning protection performance. The paper will firstly review this technology – basic design concept, required performance, application design etc., and summarize successful field experience in Japan for past twenty years. Then the technical advantage with externally gapped structure such as compact design, reliability and less maintenance, compared with gap-less type surge arrester, will be addressed from the viewpoint of transmission line use.

In effectively shielded transmission lines, lightning stroke current to transmission tower goes into the ground, bypassing via overhead grounding wires in both directions and tower structures. Therefore it is suggested that necessary lightning energy duty on the transmission line arrester can be drastically reduced, if the arrester is designed as free from line discharge energy requirement, i.e. externally gapped arrester.

The paper will secondly discuss the above breakthrough on externally gapped compact transmission line arrester. This new technology enables line arrester unit very compact and lightweight, which is mainly originated from reduced lightning discharge capability of MOV block.

The compact arrester unit can be mounted by replacement of existing arcing horn. This improvement of mounting structure makes installation work much easier, therefore considerable cost reduction will be expected on both material and installation, while lightning protection performance is maintained.

The paper will also address an evaluation on reliability for arrester failure due to excess lightning operating duty, which is resulted from computer analysis.