APPLICATION OF 6-750 kV SURGE ARRESTERS FOR LINE PROTECTION

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Introduction

The source of lightning overvoltages on the overhead line insulation can be both direct lightning strikes [1] into the overhead line (into a pylon-tower, into a lightning wire, into a phase wire) and induced voltages from lightning strikes into objects close to the overhead line. In all these cases to ensure the necessary level of the line insulation protection combinations of traditional lightning protection solutions are used [2,3]: installation of one or more lightning wires (traditionally above phase wires but sometimes even under), reduction of the grounding resistance of pylons, strengthening of line insulation.

In some cases, there are objective reasons (high values of the pylon grounding resistance due to high ground resistivity, the inability to use lightning wires due to strong wind and ice loads, etc.) why all these traditional methods cannot provide the necessary lightning protection of overhead lines. Then an effective way to increase lightning protection can be the installation on pylons so-called "suspended type" metal oxide surge arresters (MOA).

The effectiveness of increasing the lightning protection of overhead lines by installing suspended MOA has been confirmed by many theoretical studies, calculations, and operational experience [2-16]. Despite this, according to [11], which provides an analysis of more than 30 publications, there is still no consensus on many issues, including:

- the choice of the MOA type (with or without an open-air spark gap);
- optimal location on the pylons for a limited number of MOA (in the upper or lower phases; in the left/right phases or middle), providing the most effective reduction in the number of overhead line insulation overlaps;
- the required characteristics of the MOA and, above all, energy absorption capability.

A review of domestic and foreign publications, the results of which are summarized in [11], showed that many issues related to the calculation and application of suspended MOA are insufficiently studied. The consequence in some cases is the use of incorrect calculation models and the adoption of erroneous technical solutions based on the calculations performed. Little-studied are the issues, the understanding of which is necessary for the correct choice of the characteristics of surge arresters, such as the wave shape of the impulse currents through the MOA, the maximum current and energy loads on the MOA.

In Russia, there are still no regulatory documents regulating the installation of MOA on overhead lines, and foreign regulatory documents [3] contain only general recommendations that cannot be used to solve a specific technical problem. Considering the above, the study of transients during lightning overvoltages in overhead lines, the insulation of which is protected by suspended MOA, is the most important unsolved task.

The book explains the mechanism of occurrence of lightning overvoltages on overhead line insulation, formulates and substantiates in detail the scope of rational usage of MOA to protect overhead line insulation from lightning overvoltages, and provides a choice of the type and characteristics of suspended MOA.