

3.14. TESTING OF CABLES WITH INSULATION OF POLYETHYLENE (PE) AND CROSS-LINKED POLYETHYLENE (CLPE)

Zakharov M.A., Russia

By the results of scientific researches, cables with insulation of PE and CLPE must be not subjected to tests under DC voltage. Officially, tests by voltage with VLF of 0.1 Hz are recommended (standards VDE 0276-620).

Due to occurrence of spatial charges during testing under DC voltage, cables with insulation of PE and CLPE can be damaged or destroyed.

Negative DC voltage injects electrons in dielectric and creates spatial charges around the damaged place. Spatial volumes remain following completion of testing. When operational voltage is switched on, voltage gradient and negative spatial charge increase due to the positive half-wave.

Therefore, cables with insulation of cross-linked polyethylene are tested abroad exceptionally by voltage of very low frequency in accordance with applicable international standards. During testing of power cables with impregnated paper insulation, application of this method makes it possible to decrease significantly testing voltage as compared with tests by DC voltage.

Testing by sine voltage with VLF of 0.1 Hz preconditions the continuous increment of water treeings. However, smooth transfer of sine voltage results in slow increment of water treeings.

Seba KMT Company (Germany) is one of the leaders in development of the method of testing by voltage of very low frequency, as well as installations for testing power cable lines in operational conditions. As compared with testing methods, principle of oscillations (patented by the Seba KMT Company) at the voltage of cosine-rectangular shape in combination with repeat use of power remained in cable preconditions insignificant weight of installations and low power consumption, as well as high permissible capacity of test object at the same time. Seba KMT produces the series of testing installations VLF 20, VLF 28, VLF 40, VLF 54, VLF 60 and VLF 80 kV intended for testing power cable lines of rated voltage from 6 to 35 kV inclusively by the voltage with very low frequency of 0.1 Hz.

Method of testing by voltage of cosine-rectangular shape differs from other method in that wavefront in this case coincides with wavefront of AC voltage of 50 Hz frequency.

Testing voltage of the same shape makes it possible to measure leak currents during testing, which further allows the state of the main insulation of PE cables to be estimated.

Besides testing of cross-linked polyethylene, the main dielectric, sheath of such cables must be tested obligatory in order to determine its water-tightness. Otherwise, penetration of water into the cable will result in its quick breakage. Sheath is tested by DC voltage of 5 kV or 10 kV in accordance with requirements of cable manufacturer. Preliminary detection of damaged places is performed under bridge method, while accurate detection – under method of step voltage by means of high-sensitive galvanometer. Seba KMT produces MFO 5-1 installation specially intended for this purpose and implementing all above mentioned methods.

The Company's product range includes Easytest 10/20 kV installations providing the complete set of operations with the main dielectric and sheaths of cables of cross-linked polyethylene.