

Interphase Spacers (IPSs) are widely used in the power transmission system. They are made of special composite of fiber-reinforced plastics (FRP), and the IPS is implemented between the different phases of transmission lines to prevent the danger of flashovers. Flashovers in the transmission lines may occur due to the excessively high amplitude vibrations, that are developed because of ice shedding from one of the conductors, and this cause high axial forces and may lead to failure in the system.

This project aims to optimize the usage of the IPSs in a transmission line system, mainly, by studying their buckling behavior as a result of the dynamic forces acting during conductor vibration following ice shedding. For reaching this goal, three different approaches will be applied.

An experimental approach is utilized to perform material tests on FRP material, mainly 3-point bending tests, to reveal the modulus of elasticity and flexural strength of the material. Furthermore, a set-up is developed for buckling tests on samples of the same material. It's noteworthy that the FRP material has high breaking strain and can withstand high compression loads. An analytical solver is also developed using MATLAB app designer to solve analytical equations and process data obtained from the experiments. Numerical tests are carried out using ANSYS software. A line body model is used to obtain displacements and forces acting on the IPS during vibration. The 3D model of the IPS is used to simulate buckling tests in the laboratory. The numerical model helps to decide the most adequate choice for the IPS in each specific configuration of the transmission line.

As a conclusion of the previously used methods, the behavior of the transmission line was observed and loads on the spacers were obtained and based on the polymer used in the FRP material, the diameter of the spacers can be safely reduced by 40%, improving production cost while maintaining safety in the transmission system.