

CADFEM Consulting

High Power Line Corona Rings Optimization

Electrostatics in ANSYS® Workbench™

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Task

The company Pfisterer Sefag develops and manufactures insulators and fittings for worldwide use in power supply networks. In the design process of new silicon insulators for high power transmission lines (fig 1), achieving a low enough electric field on the insulator surface is crucial in order to avoid damage due to corona discharges. Following a non-standard request from a customer who wanted to guarantee a lower electrical field than usually accepted, an optimization of the geometrical dimensions of conducting corona rings placed at the end of the insulator was required.

Solution

An electrostatic assumption was used with adapted maximum voltages. Since Electrostatic analyses are not included in the Mechanical module of Workbench, a 3D thermal static analysis was used with adapted units and material properties in order to calculate the electric field in the air (fig. 2) and in the structure.

The geometrical dimensions of the corona rings were parameterized and an iterative optimization procedure allowed a decrease of the maximum electric field value to a satisfying level.

Customer Benefit

Following this study Pfisterer Sefag has gained;

- A useful design to start experimental validation and production without extensive iterative prototyping.
- Increased knowledge about the influence of geometrical parameters on the electric field
- A private training based on this consulting work with a knowledge transfer that will allow engineers at Pfisterer Sefag to perform similar analyses themselves on future new designs using the intuitive Workbench Mechanical interface.

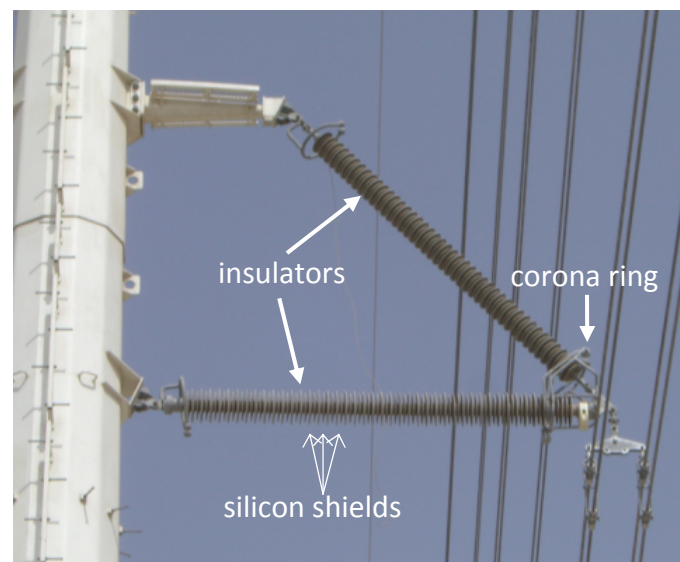


Figure 1: Silicon insulators supporting high voltage lines.

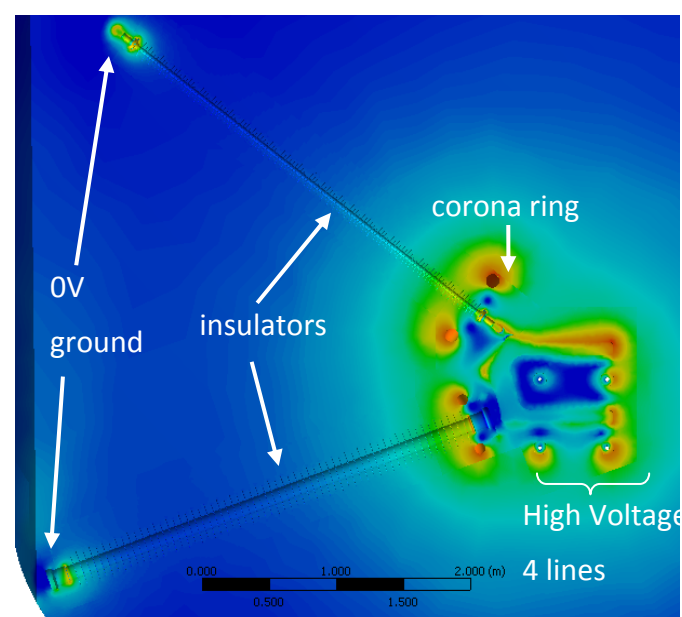


Figure 2: Electric field in the air surrounding the insulators and power line. The complete model included a total of 179 silicon shields for the two insulators.

Figures Courtesy of Pfisterer Sefag AG