

SILICONE TECHNOLOGY FOR RELIABLE PERFORMANCE OF JOINTS AND TERMINATIONS FOR HIGH VOLTAGE POLYMER POWER CABLES

Ruben **VOGELSANG**, Brugg Cables, (Switzerland), vogelsang.ruben@brugg.com

Hans-Jörg **WINTER**, Wacker Chemie AG, (Germany), hans-joerg.winter@wacker.com

Hansjörg **GRAMESPACHER**, Brugg Cables, (Switzerland), gramespacher.hansjoerg@brugg.com

Martin **GRUNWALD**, Wacker Chemie AG, (Germany), martin.grunwald@wacker.com

ABSTRACT

Since decades, high voltage polymer cable systems are the backbone of our power supply. In recent years, they've become more important. Significant parts of cable systems are their accessories, the terminations and joints. Reliability, costs and easiness of production or installation are key issues of accessories. Silicone rubber (SiR) provides a good material for the field grading parts of terminations and joints. More than 25 years of experiences show that the high dielectric strength, temperature stability, flexibility and the low ageing mechanisms are key advantages for application of SiR in terminations and joints when considering reliability and long lasting performance.

KEYWORDS

High voltage accessories, Silicone, Joints, Terminations, High voltage cable systems, Cables, Reliability

INTRODUCTION

High voltage cable systems are widely used in the power supply throughout the world. They have become an increasing part of the electric system in the recent decades [1]. High voltage cable systems consist of the cable itself, the high voltage accessories and additional items, such as cable clamps or cross-bonding boxes. High voltage accessories are terminations and joints. Terminations are used to connect cables with external devices, such as overhead lines, transformers or gas insulated switchgears (GIS). Joints are used to connect cables with each other.

The expected lifetime of cable systems are in the range of 40 – 50 years [2, 3]. To achieve such a long lifetime, beside operation parameters, the selection of the right design, material as well as installation methods for the terminations and joints are of outstanding importance. The central part of high voltage terminations and joints are stress cones and insulation bodies. A typical material used for stress cones and insulation bodies is silicone rubber (SiR). SiR has been in use for high voltage accessories for more than 25 years [2, 4].

After such a long time of application, it is a good moment to reveal the experiences that has been made with silicone technology in terms of usability and reliability for accessories of high voltage power cable systems.

DESIGN OF TERMINATIONS AND JOINTS FOR HIGH VOLTAGE POWER CABLES

Termination design

Terminations for polymer cables consist of a stress cone, an insulating compound, an insulator, a corona shield and the terminal stud.

Stress cones are pre-moulded sleeves, which ensure field grading between the outer semiconducting layer and the insulation. The insulating compound of terminations is in most cases silicone oil. In exceptional cases, SF₆ gas can be used as insulating compound. The insulator ensures the stability of the termination and realises the creepage distance. For outdoor terminations, insulators of composite or porcelain material are used. For GIS- or transformer terminations, insulators of epoxy resin are applied. The corona shield supports field grading at the top of the termination and the terminal stud realises the connection of the termination to external- or internal devices.

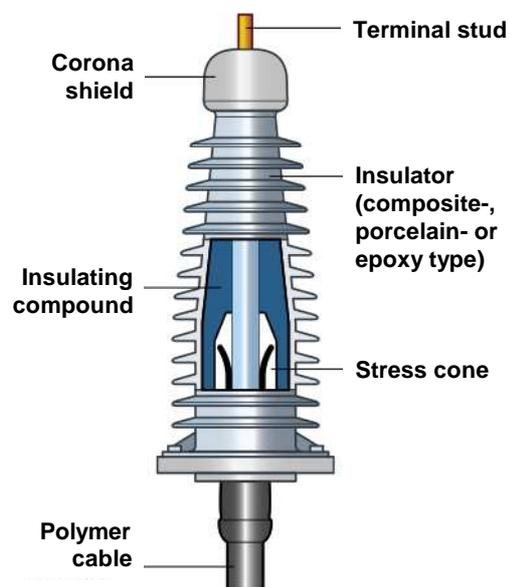


Fig. 1: Design of a termination for polymer cables