The Application of SF6 in Transmission and Distribution Networks

SF6 is essential for the transmission and distribution equipment and switchgear, because of its excellent dielectric, arc quenching, heat transfer and chemical recombination properties.

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PAPER

POSITION

CIGRE Position Paper on the Application of SF_6 in Transmission and Distribution Networks

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Contents

1. Introduction 34
2. Properties of SF_6 34
3. Advantages of SF_6 technology 34
4. Environmental impact . 35
5. Health and safety 36
6. The closed cycle concept and its implementation in Standards 36
7. Regulations 36
8. Alternatives to SF_6 technology 37
9. Interrupting performance of high voltage circuit breakers 38
10. Conclusions 39
11. References 39

Introduction

SF_6 is essential for the transmission and distribution equipment and switchgear, because of its excellent dielectric, arc quenching, heat transfer and chemical recombination properties.

This has been successfully proven since the 1960s for high-voltage equipment and since beginning of the 1980s for medium-voltage equipment. The size of equipment and switchgear has been significantly reduced since the beginning of the SF_6 technology. Nowadays, SF_6 technology is even more important to bring bulk power at high-voltage level closer to the consumers as for mega-cities.

Moreover, compact SF_6 switchgear support applications such as offshore platforms or wind power installations where small sizes and light weights are requested.

In spite of all the technical advantages of the SF_6 technology, SF_6 is a potent greenhouse gas which is covered by the Kyoto Protocol [1]. Therefore SF_6 must be managed within a closed cycle, avoiding any deliberate release to the atmosphere. During the last 20 years, as a consequence, significant effort has been undertaken to reduce SF_6 emissions. The focus for manufacturers and asset owners was on finding ways of increasing the tightness of equipment and reducing handling losses.

In spite of the fact that during the last 30 years significant efforts were made to search for SF_6 alternatives, no industrially viable alternative to SF_6 technology has been found with the same performance.

Properties of SF_6

Sulphur hexafluoride (SF_6) is a synthetic compound showing a unique combination of physical properties: high dielectric strength, high arc quenching capabilities (see Figure 1) and high heat transfer performance, which is about twice of air.

SF_6 is an odourless, tasteless, colourless, non-toxic, non-flammable, very stable and inert gas at room temperature.

Due to spontaneous recombination the molecule is extremely stable even at very high temperatures in the arc plasma during switching operation.

Advantages of SF_6 technology

Since the early 1960's, the Electrical Industry utilizes $_{SF_6}$ in Gas Insulated Switchgear (GIS), Gas Circuit Breakers (GCB), Live Tank Breakers (LTB), Dead Tank Breakers (DTB), Gas Insulated Lines (GIL), Gas Voltage Transformers (GVT), Gas Insulated Transformers (GIT), Gas Insulated Reactors (GIR).