Grenze International Journal of Engineering and Technology, Jul Issue

To Study the Breakdown Voltage for Different Electrode Configuration by using 10; 90, SF_6-N_2 Gas

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***Abstract*— Gas protected substation have been significant advancement in power transmission and circulation with demonstrated dependability and support free activity. The use of GIS has expanded quickly in the course of recent a very long time for their benefits. Despite its great electrical protection properties. SF_6 gas is accepted to be profoundly harmful and destructive compound, when exposed to electrical releases. Additionally SF_6 has high affectability to the non – consistency of electric field, which would reduce the great protection properties [1-2]. Because of the different downsides of SF_6, there is a compelling impulse worldwide to utilize gas combinations instead of SF_6 gas. Breakdown strength of gas combinations has been assessed. The testing high ac voltage is done. The examination rehashed with dielectric covering to the control transmitter. At the point when an adequately high electric field is applied to a gas, torrential slide ionization (TOWNSEND PROCESS) happens which will prompt breakdown. Breakdown Voltage (BDV) of air or gas assumes a significant part in the High Voltage Engineering. BDV of various terminal setups is one of significant investigations for Scientists and Engineers. Covers assume a significant part in the BDV of any High Voltage System. The Gas Insulated System can be mixture of N_2- SF_6. The blend of the gases is because of the way that SF6 gas alone is viewed as the ozone depleting substance.**

***Index Terms*— N_2- SF_6 gas mixture, Breakdown Voltage, Different electrodes configuration.**

I. Introduction

The most extensively and comprehensively studied molecular gases to date is Sulphur Hexa Fluoride (SF_6) gas. SF_6 gas is used widely as the insulating medium in gas insulated apparatus such as Gas Insulated Sub stations, owing to its favorable characteristics. SF_6 gas is a strong electronegative gas both at room temperature and at temperatures well above ambient, which principally accounts for its relatively high dielectric strength. The breakdown voltage of SF6 gas is nearly three times higher than air at atmospheric pressure [1]. SF_6 gas has a much higher insulating capacity and allows to put all three phases of the system close together in one common enclosure. Gas insulated systems have been widely used all over the world for their advantages of reduced weight, size volume and higher operating stresses. Even though the transition from conventional insulation system to GIS was smooth, there are still some technological problems relating to maintenance and long term performance of GIS. In recent years, the environmental impact of SF_6 gas leakage into the atmosphere has been

Grenze ID: 01.GIJET.7.2.502

the focal point of worldwide research. The Power Engineers all over the world are proceeding with caution and efforts are on to find possible replacement to SF_6 gas. SF_6 gas has a high global warming potential, 23,900 times that of CO_2 and was designated a regulated gas at the 3rd session of the Conference of the Parties to United Nations Framework Convention on Climate Change held in Kyoto. It is essential to reduce the use of SF_6, and to develop recovery technology for it and intense study is being carried out on various mixtures of gases that include small amount of SF_6, such as SF_6/N_2 gases with a smaller global warming potential than SF_6 [3,5].

II. Experimental Details

A. Experimental Set-up

The test equipment consists of breakdown voltage Measuring instrument with AC system.
Circuit connections for breakdown measurements for AC system

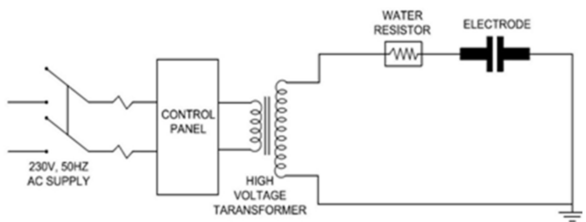


Figure 2.1: Circuit Connections for breakdown measurements for AC system

B. Experimental Procedure

Output terminal of the high voltage transformer is connected to the gas chamber. Place the different electrodes in gas chamber in their proper position. Now the main supply is switched on from control panel. Voltage is increased using increase button from the control panel till the Breakdown occur. Distance between the electrode increases from 1 to 10 mm. Before placing the next different electrodes in gas chamber, proper discharging is done through grounding.

III. Results and Discussions

A. PLANE (50 mm Dia)- SPHERE (40 mm Dia)

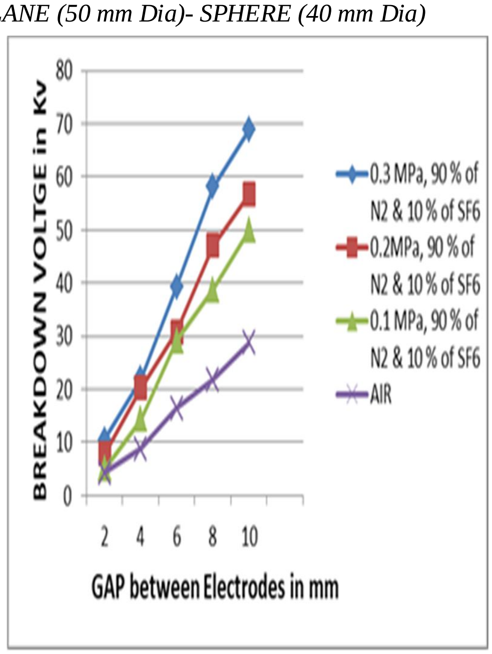


Figure – 3.1: AC breakdown voltage variation of air and 90 % of N_2 & 10 % of SF_6 for Plane-Sphere electrodes gap with different pressure in Mpa

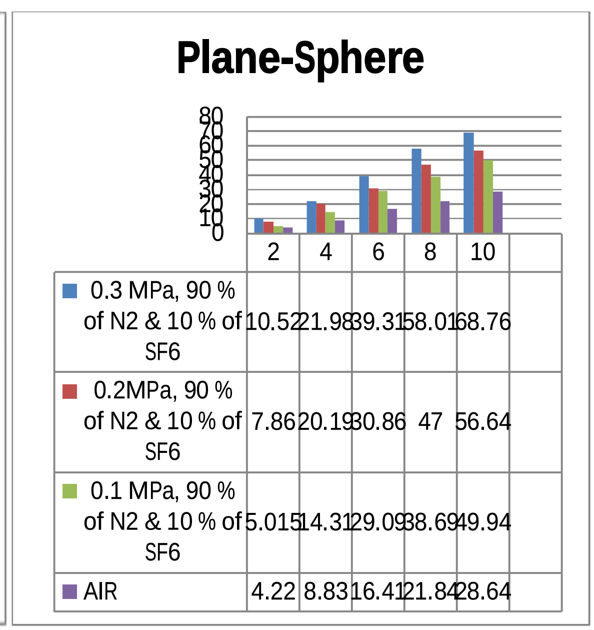
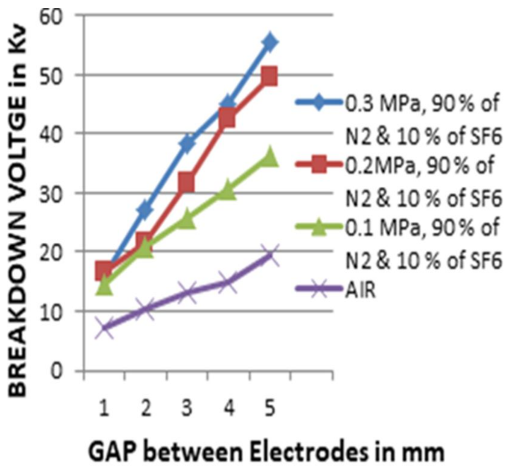


Figure-3.2: Bar graph

B. PLANE-PLANE (50 mm Dia)



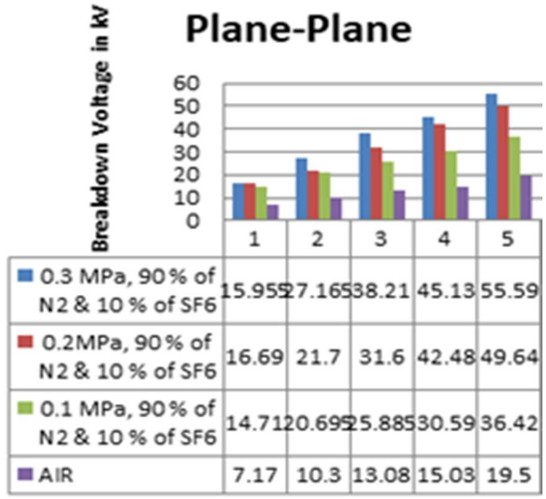
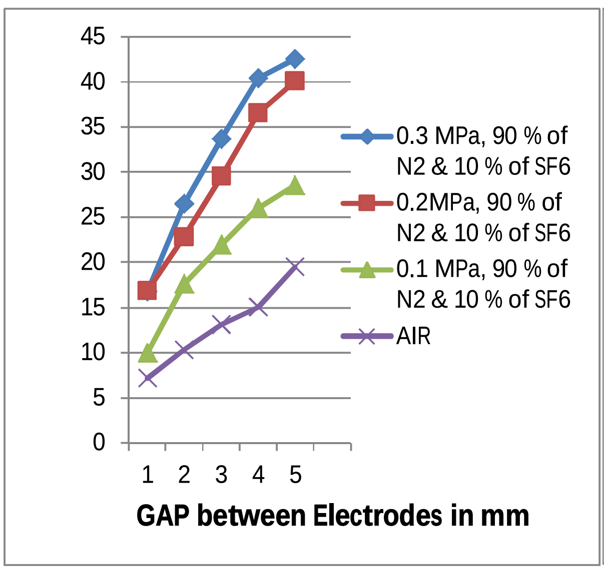


Figure – 3.3: AC breakdown voltage variation of air and 90 % of N_2 & 10 % of SF_6 for Plane-Plane electrodes gap with different pressure in Mpa

Figure-3.4: Bar graph

C. PLANE(50 mm Dia) - ROD ELECTRODE (15 mm Dia)



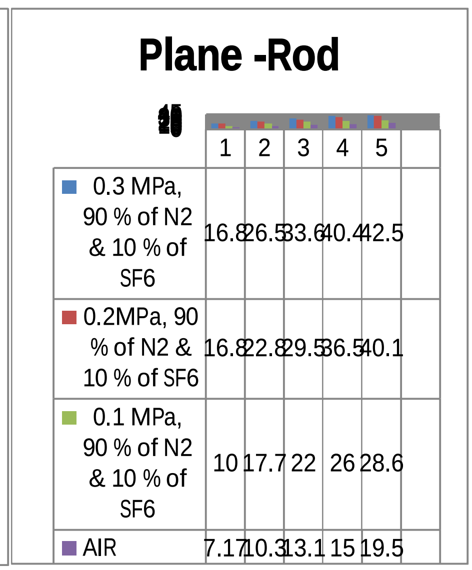


Figure – 3.5: AC breakdown voltage variation of air and 90 % of N_2 & 10 % of SF_6 for Plane-Rod electrodes gap with different pressure in Mpa

Figure-3.4: Bar graph

IV. Conclusions

In AC, it was observed that breakdown strength of Different electrodes creates different field distribution. Breakdown voltage varies with the variation of distance between the electrodes. Breakdown voltage varies with material and size of the electrodes. Breakdown voltage in SF6-N2 gas mixture is much higher the corresponding values in Air. Since Breakdown voltage in SF6-N_2 gas mixture is higher, the Breakdown strength is also higher when compared with air. Electrode of same shape with different dimension having high variation in Breakdown Voltage.

D. ROD – ROD ELECTRODE 15 mm Dia

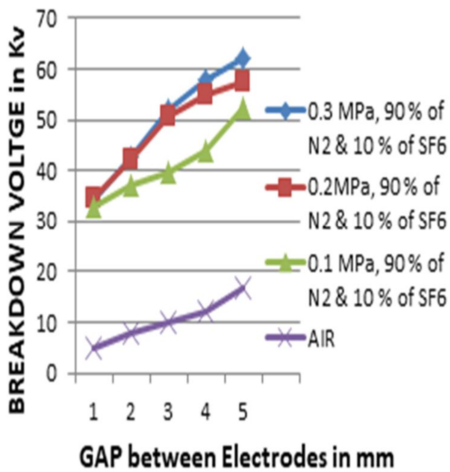


Figure – 3.7: AC breakdown voltage variation of air and 90 % of N_2 & 10 % of SF_6 for Rod-Rod electrodes gap with different pressure in Mpa

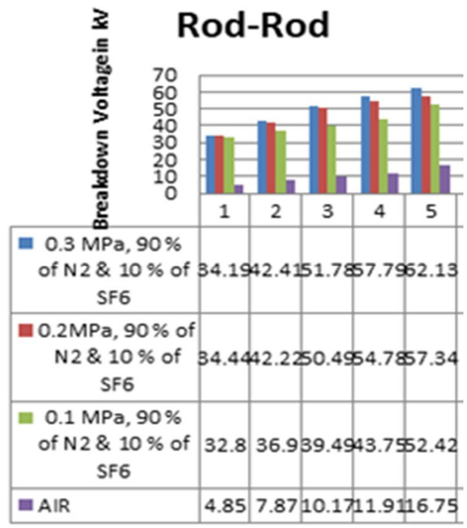
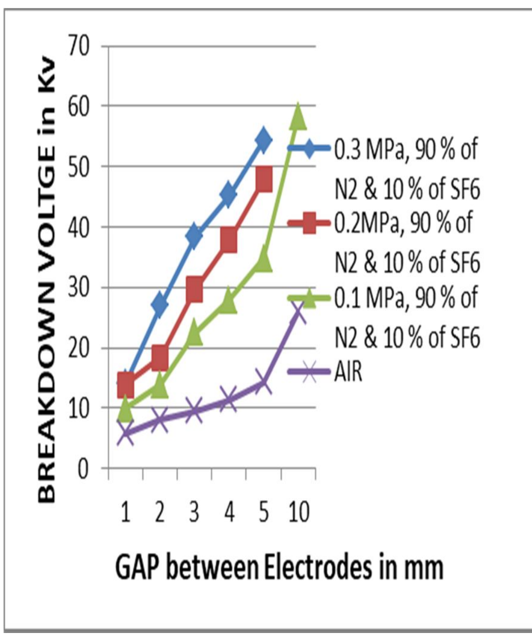
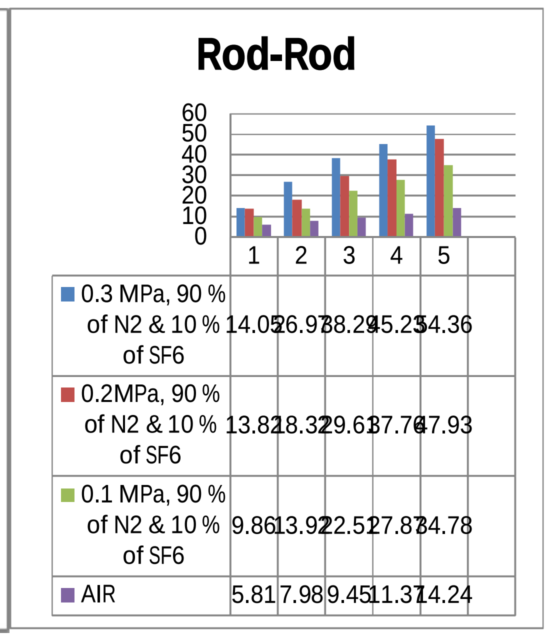


Figure-3.4: Bar graph

E. ROD – ROD ELECTRODE 20 mm Dia





In the forthcoming time the examinations and creations, can achieve flawlessness by accomplishing more investigations and advance investigations on HV.While conducting the experiment it was observed that the same experiment when conducted with electrode configuration of different dimension there was slight change in break down voltage.

ACKNOWLEDGMENT

This work was financially supported by SSAHE, Tumakuru, Karnataka (state) .The authors would like to thank Sri Siddhartha Institute of Technology, Tumakuru for having given the permission to conduct the Research in the HV Research Lab.

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BIOGRAPHIES

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