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Mitigate voltage sag and swell in transmission line by using SEN Transformer

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ABSTRACT

Many different Flexible AC Transmission Systems (FACTS) devices have been studied in the literature in order to control the flow of power through transmission lines. The SEN Transformer (ST) proposed in the research literature [1] uses transformer technology to independently control the active and reactive power in a transmission line. Power flow control is essential to ensure preserving lines loading security, mange the congestion of power system, alleviate line overload, and semi-equally utilize the available transmission lines as far as possible. The traditional technology of transformer and tap changer is used to implement this novel technique. A "SEN" Transformer (ST) uses transformer and tap changers that are traditionally used to build a voltage-regulating transformer.

Keywords: "SEN" Transformer, Voltage Stability, Simulation, Power Transmission Control.**INTRODUCTION**

In 2003, SEN introduced the SEN Transformer, a device that functions similarly to the UPFC at a lower cost .This device functions on transformer-based tap changer technology and provides independent active and reactive power control like a UPFC. The basic design of the SEN Transformer looks like a three phase transformer, with multiple (Nine) secondary windings per phase uniquely coupled with the primary. For control operation, the secondary windings are designed with on-load tap changers. Figure 1 shows a single phase complex structure (phase A) of a SEN Transformer. The other two phases are connected in similar fashion and are controlled by load tap-changers.

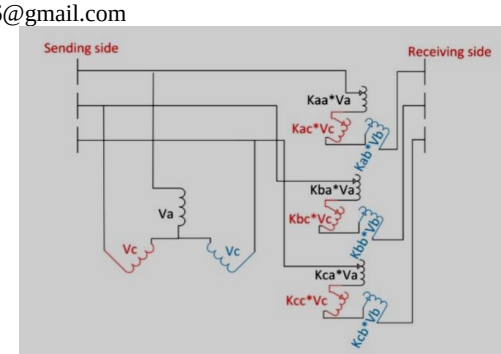

Figure 1. Schematic diagram of conventional ST

The power industry is in constant search for the most economical way to transfer bulk power along a desired path.

I. METHODS AND MATERIAL

In this paper, ST is proposed to be used to alleviate the transmission line overload in a single component outage contingency case. In this work, MATLAB/SIMULINK based ST model is built, a four bus system is modelled, and the ST model is connected to it.

II. RESULTS AND DISCUSSION

ST Model: The ST is a specially designed transformer with multiple windings having multiple tap positions in the secondary. The model for such a transformer is not available in MATLAB. Therefore, nine single-phase transformers, each having on-load tap changing capability have been used to model the ST.

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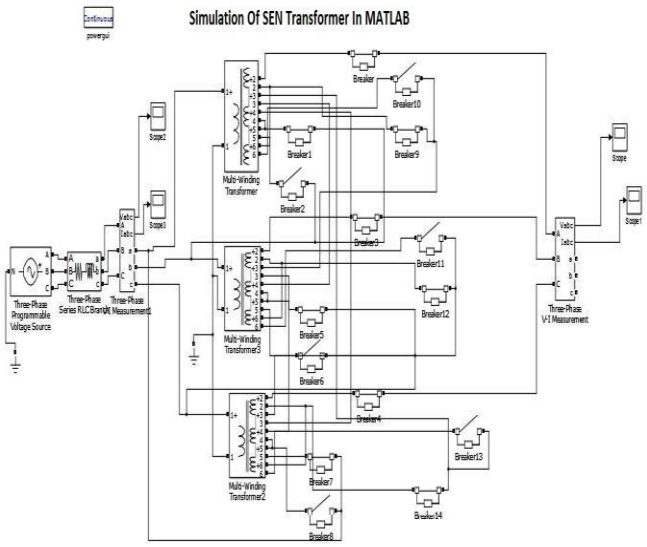
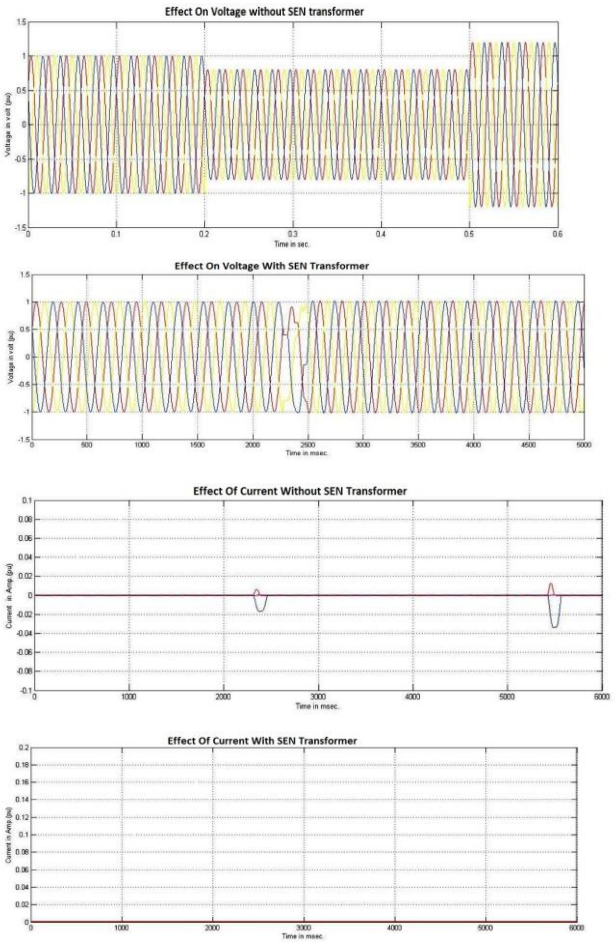


Output voltages of three transformers (contributing from phase) are added in series and then fed to one phase of the transmission line.



III. CONCLUSION

Although The power industry's pressing need for the most economical ways to transfer bulk power along a desired path may relieve grid congestion in certain markets during peak hours and integrate renewable energy from wind, solar, and so on.This can only be possible through an independent control of active and reactive power flows in the transmission lines. Independent control of active and reactive power flows leads to

• Reduction in reactive power flow, resulting in a reduction of losses in generators, transformers, and transmission lines, which increases the overall system efficiency.

• Freeing up the generators, transformers, and transmission lines to carry more active power.

• Power flow through the desired transmission paths that have high impedances, low power flow, and low line utilization.

• Avoidance of grid congestion by redirecting excess power flow from an overloaded line to underloaded lines, instead of tripping the overloaded line and creating possible blackouts when power flow is needed the most.

IV. REFERENCES

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