Enhancement of Distribution System Performance using High Voltage Alternating Current Boost Converter and Fuzzy Controller

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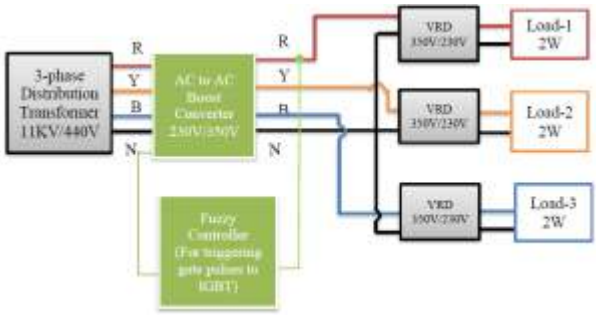
Abstract:

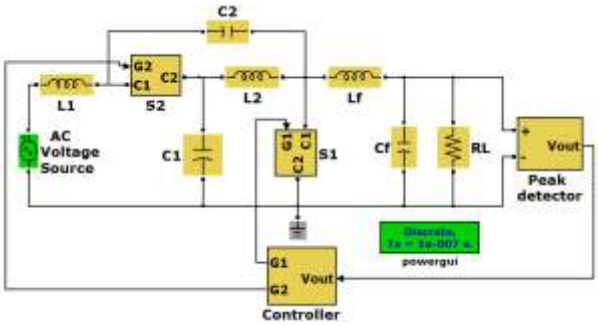
Power quality is one of the key factors in electrical systems and is taken into consideration to meet the demands of the customer. Voltage dips, momentary interruptions, harmonics and transient surges affect the reliability and quality of the power supply. High Voltage Distribution System (HVDS) is one of the methods used to improve the quality and reliability of the distribution system through a reduction in losses, voltage fluctuations and power consumption.

In this project, High Voltage Alternating Current (HVAC) Boost Converter with fuzzy controller in HVDS has been proposed for a cost effective solution to reduce distribution losses. Power is transmitted from the distribution station to consumer premises through the booster transformers and voltage regulators. Inrush currents or magnetizing currents and heating of insulation have been observed in transformers due to non-linear loads. As a result, the current drawn by the system is high. To overcome these effects, a step-up power converter with fuzzy control has been designed. Simulation studies have been carried out for verifying the utilities of the proposed design.

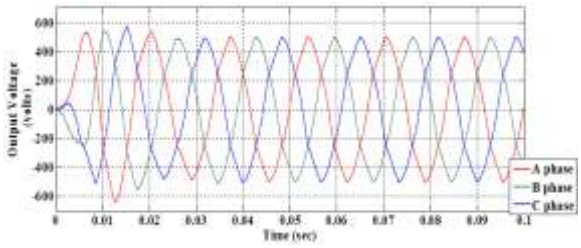
The performance of the designed fuzzy logic controller is compared with that of the existing booster transformer scheme. It has been found that the efficiency is improved by 4%, and power losses are reduced by 1.4% to maintain the voltage fluctuations within the acceptable levels. The proposed controller in this case study of the Old city area in Hyderabad has been shown to have the revenue savings increased by 12%.

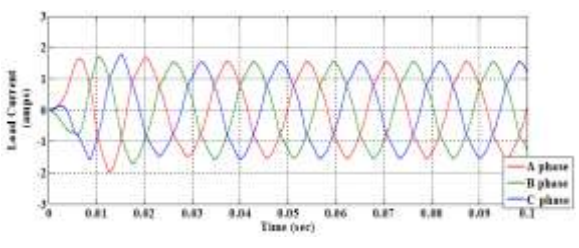


Block diagram of HVAC boost converter using fuzzy controller



Implementation of HVAC boost converter using controller





Results of three phase HVAC boost converter using fuzzy controller