ABSTRACT

The increasing consumption of electricity from year to year causes power quality to become an important factor in the distribution of electricity to consumers. This increase in electricity consumption goes hand in hand with the increasing use of electronic devices that can reduce the quality of distributed power. This is because in the electronic goods used there are non-linear loads that can cause harmonics. Harmonics that occur in an electric power system can cause an increase in electricity costs due to measuring errors in the kWh-meter, decreased performance to damage to electronic components. Harmonics produced by non-linear loads can be reduced by installing a harmonic filter in the electric power system.

In this research, a shunt active power filter that is integrated with a photovoltaic system will be designed with the aim of reducing harmonics in a three-phase electric power system connected to a non-linear load. The non-linear load used is a simple non-linear load modelling of the modified buiding loads in the Faculty of Electrical Engineering, Telkom University, namely Buildings P, O, and N. Active power filter designed using the Synchronous Reference Frame (SRF) method as harmonic current extraction and Hysteresis Current Control (HCC) as a switching pulse generator for the inverter and Voltage Source Inverter (VSI) as a harmonic compensation current injector unit in the grid. In the designed photovoltaic system, the output of the boost converter will be a voltage source for VSI in generating harmonic compensation currents. The whole system was designed with the help of Simulink Matlab R2018a. The simulation results show that the THD index value for each non-linear loading of each building decreases from 30.63% to 3.11% after being injected by the compensation current. The THD value for each non-linear loading after reduction is in accordance with the IEEE 519 standard, so it can be concluded that the model made is feasible for further research.

Keywords: Shunt Active Power Filter, Harmonic Reduction, SRF, HCC, PV